



44th
**ANNUAL
MEETING**



**PROGRAM
BOOK**

DALLAS

April 20-22, 2024

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Program Chair
Denise Carneiro-Pla, MD

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**as of March 25, 2024*

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**44th Annual Meeting
April 20 - 22, 2024**

American Association of Endocrine Surgeons
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E: info@endocrinesurgery.org
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2021-2022	Thomas Fahey	Fiemu Nwariaku	James Lee	Kepal Patel	Tracy Wang
2020-2021	Allan Siperstein	Richard Hodin	James Lee	Paul Gauger	Tracy Wang
2019-2020	Allan Siperstein	Richard Hodin	James Lee	Paul Gauger	Tracy Wang
2018-2019	Herbert Chen	Sonia Sugg	James Lee	Paul Gauger	Sareh Parangi
2017-2018	Martha Zeiger	Carmen Solórzano	Rebecca S. Sippel	Paul Gauger	Sareh Parangi
2016-2017	Peter Angelos	Samuel Snyder	Rebecca S. Sippel	Cord Sturgeon	Sareh Parangi
2015-2016	Steven K. Libutti	Douglas L. Fraker	Rebecca S. Sippel	Cord Sturgeon	
2014-2015	Gerard Doherty	William B. Inabnet, III	Nancy D. Perrier	Cord Sturgeon	
2013-2014	Sally E. Carty	Julie Ann Sosa	Nancy D. Perrier	Herbert Chen	
2012-2013	Miguel F. Herrera	Allan Siperstein	Nancy D. Perrier	Herbert Chen	
2011-2012	Ashok R. Shaha	Thomas J. Fahey, III	Peter Angelos	Herbert Chen	
2010-2011	Douglas B. Evans	Gerard M. Doherty	Peter Angelos	Steven K. Libutti	
2009-2010	Janice L. Pasieka	Jeffrey E. Lee	Peter Angelos	Steven K. Libutti	
2008-2009	Michael J. Demeure	Jeffrey F. Moley	Sally E. Carty	Steven K. Libutti	
2007-2008	Geoffrey B. Thompson	Terry C. Lairmore	Sally E. Carty	Douglas B. Evans	
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2004-2005	John A. Kukora	Andrew W. Saxe	Janice L. Pasieka	Geoffrey B. Thompson	
2003-2004	Paul LoGerfo	Ashok R. Shaha	Janice L. Pasieka	Geoffrey B. Thompson	
2002-2003	Quan-Yang Duh	Gary B. Talpos	Christopher R. McHenry	Geoffrey B. Thompson	

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2000-2001	Barbara K. Kinder	Martha A. Zeiger	Christopher R. McHenry	Michael J. Demeure	
1999-2000	Jay K. Harness	John S. Kukora	Paul LoGerfo	Michael J. Demeure	
1998-1999	George L. Irvin, III	Barbara K. Kinder	Paul LoGerfo	Quan-Yang Duh	
1997-1998	Blake Cady	E. Christopher Ellison	Paul LoGerfo	Quan-Yang Duh	
1996-1997	Jon A. van Heerden	George L. Irvin, III	Jay K. Harness	Quan-Yang Duh	
1995-1996	Richard A. Prinz	Jeffrey A. Norton	Jay K. Harness	George L. Irvin, III	
1994-1995	John M. Monchik	Jon A. van Heerden	Jay K. Harness	George L. Irvin, III	
1993-1994	Orlo H. Clark	Glen W. Geelhoed	Blake Cady	George L. Irvin, III	
1992-1993	Robert C. Hickey	Patricia J. Numann	Blake Cady	Robert D. Croom, III	
1991-1992	Stuart D. Wilson	Joseph N. Attie	Blake Cady	Robert D. Croom, III	
1990-1991	Caldwell B. Esselstyn	Brown M. Dobyns	Richard A. Prinz	Robert D. Croom, III	
1989-1990	Colin G. Thomas, Jr.	Carl R. Feind	Richard A. Prinz	Jon A. van Heerden	
1988-1989	John R. Brooks	Melvin A. Block	Richard A. Prinz	Jon A. van Heerden	
1987-1988	Edward Paloyan	Caldwell B. Esselstyn	Stuart D. Wilson	Jon A. van Heerden	
1986-1987	Oliver Beahrs	Robert C. Hickey	Stuart D. Wilson		
1985-1986	Chiu-An Wang	Edward Paloyan	Stuart D. Wilson		
1984-1985	Leonard Rosoff	John M. Monchik	Stuart D. Wilson		
1983-1984	Stanley R. Friesen	John A. Palmer	John M. Monchik		
1982-1983	Edwin L. Kaplan	Blake Cady	John M. Monchik		
1981-1982	Norman W. Thompson	Orlo H. Clark	John M. Monchik		
1980-1981	Norman W. Thompson	Orlo H. Clark	John M. Monchik		

OLIVER COPE MERITORIOUS ACHIEVEMENT AWARD

In April of 1984 at the American Association of Endocrine Surgeons Meeting in Kansas City, Drs. Edward Kaplan, Jack Monchik, Leonard Rosoff, Norman Thompson and Stuart Wilson proposed to the Council a new achievement award. The award honors a member of the AAES in recognition for contributions in the field of endocrine surgery as an investigator, teacher and clinical surgeon. It is not an annual award but is to be given to members of our Association who truly aspire to the spirit of this award.

On April 15, 1985 at the annual meeting of the AAES in Toronto, our President, Leonard Rosoff announced the first member to receive this award, Dr. Oliver Cope. In giving this award to Dr. Cope the decision of the Council was that from this day forward the award would be known as the Oliver Cope Meritorious Achievement Award for the American Association of Endocrine Surgeons.



Oliver Cope, MD

Professor of Surgery, Harvard University and the Massachusetts General Hospital
Awarded in Ontario in April 1985.



Stanley R. Friesen, MD, PhD

Professor of Surgery, University of Kansas
Awarded in Detroit, MI in April 1994.
Dr. Friesen served as the President of our Association in 1983-1984.



Norman W. Thompson, MD

Henry King Ransom Professor of Surgery, University of Michigan
Awarded in Atlanta, GA in April 2001.
Dr. Thompson served as our inaugural President from 1980-1982.



Jon A. van Heerden, MD

Professor of Surgery Mayo Clinic
Awarded in Charlottesville, NC in April 2004.
Dr. van Heerden served as our Recorder from 1987-1990, as our Vice-President in 1994-1995, and as President in 1996-1997.



Orlo H. Clark, MD

Professor of Surgery, UCSF Mount Zion Medical Center
Awarded in New York, NY in May 2006.
Dr. Clark served as our inaugural Vice-President from 1980-1982, and as President in 1993-1994.



Edwin L. Kaplan, MD

Professor of Surgery, University of Chicago
Awarded in Madison, WI in May 2009.
Dr. Kaplan served as our President in 1982-1983.



George L. Irvin, III, MD

Professor Emeritus of Surgery, University of Miami
Awarded in Pittsburgh, PA in April 2010.
Dr. Irvin served as our Recorder from 1993-1996, as
Vice-President in 1996-1997, and as President in 1998-
1999.



Stuart D. Wilson, MD

Professor Emeritus of the Department of Surgery,
Medical College of Wisconsin Awarded in Baltimore, MD
in April 2016.
Dr. Wilson served as our Secretary-Treasurer from 1984-
1988 and President in 1991-1992.



Quan-Yang Duh, MD

University of California San Francisco
Awarded in Los Angeles, CA in April 2019.
Dr. Duh served as our Recorder from 1996-1999 and
President in 2002-2003.



Janice Pasieka, MD

University of Calgary
Awarded virtually in April 2021
Dr. Pasieka served as our Secretary-Treasurer from
2003-2006 and President from 2009-2010.



Ashok Shaha, MD

Memorial Sloan Kettering Cancer Center
Awarded in Birmingham, AL in April 2023
Dr. Shaha served as our Vice President from 2003-2004
and President from 2011-2012

HONORARY MEMBERS

**Individuals who have made outstanding contributions
to the discipline of Endocrine Surgical Disease:**

J. Aidan Carney, MD, Pathologist

Stuart D. Flynn, MD, Pathologist

Ian D. Hay, MD, PhD, Endocrinologist

Virginia A. LiVolsi, MD, Pathologist

Frank LoGerfo, MD, Surgeon

G. E. "Ace" Pearse, MD, Endocrinologist

Thomas S. Reeve, MD, Endocrine Surgeon

F. John Service, MD, PhD, Endocrinologist

Britt Skogseid, MD, PhD, Endocrinologist

R. Michael Tuttle, MD, Endocrinologist

William F. Young, MD, MSc, Endocrinologist

RESIDENT/FELLOW PODIUM & POSTER COMPETITION WINNERS

The AAES Resident/Fellow Podium Competition was established in 1990 to encourage interest in endocrine surgery by those training as students and residents or fellows in general surgery. Presented work may be honored in either the Clinical or Basic Research categories. The AAES Poster Competition was established in 2007. The past three years of competition winners are shown below. For a complete list of past winners, visit www.endocrinesurgery.org/competition-awards

2023

Omair Shariq, MD – Mayo Clinic

“Primary Hyperparathyroidism in Patients with Multiple Endocrine Neoplasia Type 1: Impact of Genotype and Surgical Approach on Long-term Postoperative Outcomes”

Grayson Gimblet, BS – University of Alabama at Birmingham

“Thyroid Stimulating Hormone (TSH) Receptor as a Target for Imaging of Thyroid Cancer”

HEALTH EQUITY: Maeve Alterio, BS – WSU Elson S. Floyd College of Medicine

“Who Serves Where: A Geospatial Analysis of Access to Endocrine Surgeons in the United States and Puerto Rico”

POSTER: Alexis Antunez, MD, MS – Brigham and Women’s Hospital

“Cancer-related Fear and Worry in Patients with Low-Risk Thyroid Cancer: A Longitudinal Study”

POSTER: Rachael Guenter, PhD – University of Alabama at Birmingham

“Understanding Transcriptional Regulations of Notch3 Signaling in Pancreatic Neuroendocrine Tumor Cells”

2022

Reid McCallister, MS – University of Michigan

“Multi-genomic analysis of 243 adrenocortical cancer patient tumors identifies a novel microRNA biomarker target (miRNA 335-5p) strongly associated with poor survival”

Kristen Limbach, MD – City of Hope

“Baicalein activates AMPK, inhibits the mammalian target of rapamycin, and exhibits antiproliferative effects in pancreatic neuroendocrine tumors in vitro and in vivo”

POSTER: Omair Shariq, MD – University of Oxford, Mayo Clinic

“Epigenetic Targeting of Bromodomain and Extra-Terminal Domain Proteins as a Novel Therapy for Pancreatic Neuroendocrine Tumors”

POSTER: Sara Ginzberg, MD – University of Pennsylvania

“Disparities in Appropriate Thyroid Cancer Treatment, Before and After the Release of the 2015 American Thyroid Association Guidelines”

**All past awardees can be viewed online at
www.endocrinesurgery.org/competition-awards**

2023-2024 NEW MEMBERS

ACTIVE MEMBERS

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Courtney Balentine, MD
Cassandra Benay, MD
Taylor Brown, MD
Jessica Buicko, MD
Mustapha El Lakis, MD
Oliver Fackelmayer, MD
Sabha Ganai, MD, PhD
Rajshri Gartland, MD, MPH
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Thank you to all of our members who have generously donated to the AAES Foundation. Your contributions help support critical activities like Endocrine Surgery University, fantastic programming such as the Clark, Wilson, and Zeiger Lectures, as well as supporting and recognizing cutting-edge research through the LoGerfo Award and ThyCa Awards and scientific research prizes. With your help, the Foundation will support even more activities in the future. The Foundation recognizes cumulative lifetime giving according to these categories:

Rhino: \$2,500

Thompson Fellow: \$10,000

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PAST MEETINGS

The AAES Annual Meeting has been hosted in cities throughout the U.S., Canada and around the world since the first meeting in 1980. For a complete, historical list of all past AAES Annual Meeting locations, visit www.endocrinesurgery.org/past-meetings.

2023 **Birmingham, Alabama**
Local Arrangements Co-Chairs:
Brenessa Lindeman and Jessica
Fazendin

2022 **Cleveland, Ohio**
Local Arrangements Chair:
Vikram D. Krishnamurthy

2021 **Virtual**
Program Chair:
Carrie Cunningham

2020 Canceled due to COVID-19
pandemic

2019 **Los Angeles, California**
Local Arrangements Co-Chairs:
Michael Yeh, Masha Livhits

2018 **Durham, North Carolina**
Local Arrangements Co-Chairs:
Sanziana Roman, Julie Ann Sosa

2017 **Orlando, Florida**
Local Arrangements Chair:
Mira Milas

2016 **Baltimore, Maryland**
Local Arrangements Chair:
John A. Olson, Jr.

2015 **Nashville, Tennessee**
Local Arrangements Chair:
Carmen Solórzano

2014 **Boston, Massachusetts**
Local Arrangements Chair:
Richard A. Hodin

2013 **Chicago, Illinois**
Local Arrangements Chair:
Peter Angelos

2012 **Iowa City, Iowa**
Local Arrangements Chair:
Ronald Weigel

2011 **Houston, Texas**
Local Arrangements Chair:
Nancy D. Perrier

2010 **Pittsburgh, Pennsylvania**
Local Arrangements Chair:
Sally E. Carty

2009 **Madison, Wisconsin**
Local Arrangements Chair:
Herbert Chen

2008 **Monterey, California**
Local Arrangements Chair:
Quan-Yang Duh

2007 **Tucson, Arizona**
Local Arrangements Chair:
Michael J. Demeure

2006 **New York, New York**
Local Arrangements Chair:
Ashok R. Shaha

2005 **Cancun, Mexico**
Local Arrangements Chair:
Miguel F. Herrera

2004 **Charlottesville, Virginia**
Local Arrangements Chair:
John B. Hanks

SPECIAL SESSIONS

Attendees are welcome to attend any sessions unless specifically stated.

Lunch Session: State-of-the-Art Management of the Adrenal Patient: A Series of Focused Topics

Saturday, April 20, 2024, 12:15 PM – 1:15 PM

A Joint Session with Endocrine Society

With commercial support from Corcept Therapeutics

The experts in the field of adrenal disorders from endocrinology and endocrine surgery will present and discuss the state-of-the-art management of three common adrenal diseases. These include ACTH-independent hypercortisolism, controversies in the management of indeterminate adrenal mass, and genetic considerations of adrenal masses.

Lunch Session: State of Affairs and Future of Endocrine Surgery Education

Sunday, April 21, 2024, 12:00 PM – 1:00 PM

What is the current state of education in endocrine surgery across all levels of the continuum from training to practice? This panel will discuss the current state-of-the-art in endocrine surgical education and important directions for the future.

Breakfast Session: Why Managing Your Online Reputation Matters and How To Do It

Monday, April 22, 2024, 7:00 AM – 8:00 AM

This session provides practical tips on online reputation management including how to garner patient reviews, how to handle negative reviews, and considerations for those in employee vs private practice.

JFK, Dallas, and Parkland Hospital Lecture

Monday, April 22, 2024, 10:15 AM – 11:15 AM

Within six minutes of the shooting in Dealey Plaza, the limousine carrying President John F. Kennedy and Governor John Connally arrived at the Emergency entrance to Parkland Hospital. Using photographs, oral histories and unique materials from the Museum's Parkland Hospital Collection, Curator Stephen Fagin will detail the weekend of the Kennedy assassination.

Endocrine Surgical Innovation: Tips, Tricks, and Videos from the Experts

Monday, April 22, 2024, 11:15 AM – 12:15 PM

This session highlights some of the newest technologies and techniques in endocrine surgery, presented by seasoned experts with both technical experience as well as perspective. With a significant video component for each topic, this session is designed to be dynamic and highly practical, with the goal to impart to the audience a clear understanding of why and how one may use these new innovations.

UCSF CAROL & ORLO H. CLARK DISTINGUISHED LECTURE IN ENDOCRINE SURGERY



Professor Jad Abumrad

*Professor of Research, Vanderbilt University
Creator of Radiolab*

Saturday, April 20, 2024 at 11:00 AM

Jad Abumrad is the creator of Radiolab (<http://radiolab.org>), More Perfect (<http://moreperfectpodcast.org>), Dolly Parton's America (<http://dollypartonsamerica.org>) and the Vanishing of Harry Pace (<https://www.wnycstudios.org/podcasts/radiolab/projects/vanishing-harry-pace>), which collectively are downloaded over 120 million times a year. He's been called a "master of the radio craft" for his unique ability to combine cutting edge sound-design, cinematic storytelling and a personal approach to explaining complex topics, from the stochasticity of tumor cells to the mathematics of morality. Jad studied creative writing and music composition at Oberlin College in Ohio. He composed much of the music for Radiolab, and in the past has composed music for film, theater and dance.

Jad has received three Peabody Awards, the highest honor in broadcasting and two DuPont Awards. And in 2011, he received the prestigious MacArthur "Genius" Fellowship.

He's currently a Distinguished Professor of Research at Vanderbilt University.

UCSF CAROL & ORLO CLARK LECTURESHIP AT RECENT MEETINGS

- 2023 **Keith S. Heller, MD**, Retired, Professor of Surgery at NYU Langone Medical Center
Listening to our Artists
- 2022 **Thomas J. Giordano, MD, PhD**, University of Michigan
What Have We Learned From the Genomic Investigation of Endocrine Tumors?
- 2021 **André Lacroix, M.D., FCAHS, MD**, Centre hospitalier de l'Université de Montréal (CHUM)
Aberrant regulation of cortisol and aldosterone secretion in adrenal tumors and hyperplasias
- 2019 **Selwyn M. Vickers, MD, FACS**, University of Alabama School of Medicine
Relationships and Resilience: Lessons Learned from Mentors and Heroes
- 2018 **Julie Freischlag, MD FRCS**, Wake Forest University
Breakthrough to Brave
- 2017 **Jack A. Gilbert, PhD**, University of Chicago
Thyroid Cancer and the Microbiome
- 2016 **Steven A. Rosenberg, MD, PhD**, National Cancer Institute and George Washington University
The Curative Potential of T-cell Transfer Immunotherapy for Patients with Metastatic Cancer
- 2015 **Gary Hammer, MD, PhD**, University of Michigan
Translating Adrenal Stem Cells: Implications for Adrenal Disease
- 2014 **Yuri E. Nikiforov, MD, PhD**, University of Pittsburgh School of Medicine
Progress in Genomic Markers for Thyroid Cancer: How Does it Affect Patient Management?
- 2013 **Anders O.J. Bergenfelz, MD, PhD**, Lund University Hospital
Quality Control in Clinical Practice and Postgraduate Education in Endocrine Surgery
- 2012 **Atul A. Gawande, MD, MPH**, Brigham and Women's Hospital
Strategies for Improving Surgical Performance
- 2011 **Allan H. (Bud) Selig**, 9th Commissioner of Major League Baseball
Major League Baseball – 2011 Economic and Health Related Issues
- 2010 **Alexander J.B. McEwan, MB**, University of Alberta
The State of the Art of Radionucleotide Imaging and Therapy in Patients with Neuroendocrine Tumors
- 2009 **Jeffrey M. Trent, PhD**, Translation Genomics Research Institute
Genomics, and Biology Towards a More Personalized Medicine

- 2008 **F. John Service, MD, PhD**, Mayo Clinic
Hypoglycemia in Adults – 80th Anniversary of Hyperinsulinism
- 2007 **Virginia A. LiVolsi, MD**, University of Pennsylvania
Thyroid Nodule FNA and Frozen Section: Partners or Adversaries
- 2006 **Michael Bliss, PhD**, University of Toronto
Harvey Cushing and Endo- Criminology
- 2005 **David Duick, MD**, Phoenix, Arizona
Thyroid Nodules and Mild Primary Hyperparathyroidism: Examples of Clinical Perplexities or Unresolvable Conundrums
- 2004 **Edward R. Laws Jr, MD**, University of Virginia
The Diagnosis and Management of Cushing's Disease
- 2003 **Sissy M. Jhiang, MD**, The Ohio State University
Lessons From Thyroid Cancer: Genetics and Gene Therapy
- 2002 **William F. Young Jr., MD**, Mayo Clinic
Adrenal-Dependent Hypertension: Diagnostic Testing Insights
- 2001 **Andrew F. Stewart, MD**, University of Pittsburg
Parathyroid Hormone-Related Protein: From Hypercalcemia of Malignancy to Gene Therapy from Diabetes
- 2000 **James Shapiro, MD**, University of Alberta
Pancreatic Islet Cell Transplantation
- 1999 **James Hurley, MD**, Cornell University
Post-Operative Management of Differentiated Thyroid Cancer
- 1998 **Susan Leeman, PhD**, Boston University
The NeuroPeptides: Substance P and Neurotensin
- 1997 **Bertil Hamberger, MD, PhD**, Karolinska Institute
The Nobel Prize
- 1996 **Victor E. Gould, MD**, Rush-Presbyterian-Medical Center
The Diffuse Neuroendocrine System: Evolution of the Concept and Impact on Surgery
- 1995 **Ivor M.D. Jackson, MD**, Providence, Rhode Island
Regulation of TSH Secretion: Implications for Disorders of the Thyroid Function
- 1994 **Gordon J. Strewler, MD**, San Francisco, California
The Parathyroid Hormone Related Protein: Clinical and Basic Studies of a Polyfunctional Protein
- 1993 **John L. Doppman, MD**, National Institutes of Health
Recent Advances in Endocrinologic Imaging
- 1992 **Donald Coffey, PhD**, Bethesda, Maryland
New Concepts Concerning Cancer
- 1991 **Gregory B. Bulkley, MD**, Johns Hopkins University
Endothelial Xanthine Oxidase: A Radical Transducer of Signals and Injury

MEDICAL COLLEGE OF WISCONSIN- STUART D. WILSON, M.D. HISTORICAL LECTURE



Janice Pasieka, MD
University of Calgary

Sunday, April 21, 2024, 8:00 AM

Dr. Janice L Pasieka, FRCSC, FACS, graduated from the University of Western Medical School and did her General Surgery Training at the University of Calgary. She then did two and a half years of Endocrine Surgical Training. The first year was spent in Dr. David Hanley's lab at the University of Calgary, then a year at the

University of Michigan, under the mentorship of Dr. Norman Thompson followed by 6 months at the Karolinska Institute in Stockholm, Sweden with Dr. Bertil Hamberger. She then returned to Calgary and has devoted her clinical practice solely to endocrine surgical diseases. At the Tom Baker Clinic Centre, Dr. Pasieka was the driving force behind the development of a multidisciplinary clinic for Neuroendocrine Tumours as well as the Multidisciplinary Hereditary Endocrine Clinic. She was responsible for the development an American Association of Endocrine Surgeons (AAES) accredited fellowship program in Endocrine Surgery that has gone on to train numerous endocrine surgeons world-wide. As City-wide Division Chief of General Surgery, in 2002, Dr. Pasieka implemented a novel way of doing general surgical call for the division that improved patient care and both academic productivity and well-being of the faculty. This ACESS service has gone on to be modified and is now the standard model of call coverage across Canada. She has recently been awarded the Outstanding Clinical Research Award (2019) and the Life-time Achievement Award (2022) from the Department of Surgery. Dr. Pasieka served as Secretary-Treasurer of the AAES and in 2010 she became the first Canadian and second woman to become President. She has served on the Council of the International Association of Endocrine Surgeons (IAES), and as Secretary-Treasurer from 2016 -2022. In 2022, Dr. Pasieka became President-elect of the IAES. Dr. Pasieka was the Canadian James IV Traveling Surgical Fellow 2006 and recently was appointed to the James VI Board of Directors. In 2007, the Women's Executive Network named her as one of Canada's 100 Most Powerful Women. Dr. Pasieka served as a Governor of the American College of Surgeons and Associate Editor of the World Journal of Surgery. In April 2021, Dr. Pasieka was awarded the prestigious 'Oliver Cope Meritorious Achievement Award' from the AAES, in recognition of her substantial contributions to the field of endocrine surgery, becoming the first woman and the 10th recipient of this award. Her areas of interests (besides running, mountain biking, road cycling, hiking and snowshoeing with her dog Kocher) revolves around neuroendocrine tumours, adrenal disease, thyroid cancer and the study of surgical outcomes in patients with hyperparathyroidism. To date she has over 160 peer-review publications, is editor of three Endocrine Surgical textbooks and has written over 28 book chapters

MEDICAL COLLEGE OF WISCONSIN- STUART D. WILSON, M.D. HISTORICAL LECTURE AT RECENT MEETINGS

- 2023 **William R. Rainey, PhD**, University of Michigan
Historic and Cellular Origins of Primary Aldosteronism
- 2022 **Christopher McHenry, MD**, MetroHealth
A Historical Look at Cleveland: Its Healthcare Institutions and Contributions to Endocrine Surgery
- 2021 **Clifford Ko, MD, MS, MSHS, FACS, FASCRS**, American College of Surgeons
Evaluating and Achieving Surgical Quality in 2021
- 2019 **James McClintock, MD**, University of Alabama at Birmingham
From Penguins to Plankton - the Dramatic Impacts of Climate Change on the Antarctic Peninsula
- 2018 **John L. Cameron, MD**, John Hopkins Hospital
William Stewart Halsted; Our Surgical Heritage (Also an Endocrine Surgeon!)
- 2017 **David L. Nahrwold, MD**, Northwestern University
Surgery, Surgeons and their College
- 2016 **Samuel A. Wells, Jr., MD**, National Cancer Institute
The Diagnosis and Treatment of Thyroid Cancer: A Historical Perspective
- 2015 **Robert Beazley, MD**, Boston University School of Medicine
The Glands of Owen...Who Was Owen?
- 2014 **Patricia J. Numann, MD**, SUNY Upstate Medical University
Ode to an Indian Rhinoceros
- 2013 **Orlo H. Clark, MD**, University of California, San Francisco
Recognition of Endocrine Glands and Abnormalities by Artists and Surgeons
Wen T. Shen, MD, MA, University of California, San Francisco
From 'Kindred Spirits' to the Social Network
- 2012 **Murray F. Brennan, MD**, Memorial Sloan-Kettering Cancer Center
Re-Operative Parathyroid Surgery Circa 1975
- 2011 **Jon A. van Heerden, MD**, Medical University of South Carolina
Pheochromocytoma Resection: Now and Then
- 2010 **Norman W. Thompson, MD**, University of Michigan
The Time Was Right
- 2009 **Edwin L. Kaplan, MD**, University of Chicago
Radiation Induced Thyroid Cancer – A Chicago Experience



ANNUAL MEETING INFORMATION

ACCREDITATION

PROGRAM OBJECTIVES

This activity is designed for all endocrine surgeons seeking the latest developments in endocrine surgical technique and related research. The intent of the program is to improve the quality of patient care and improve overall patient safety. Audience participation and interaction will be encouraged. The content and format of the program have been determined based on evaluations and suggestions of attendees of previous programs.

At the completion of this activity, attendees will be able to:

1. Recognize racial and gender disparities in the diagnosis and management of endocrine diseases.
2. Describe the feasibility and outcomes of newly developed protocols, techniques, and guidelines in the management of thyroid, parathyroid, adrenal, and GI Neuroendocrine diseases.
3. Compare and contrast protocols for the management of thyroid, parathyroid and adrenal diseases.

Award of CME credits by ACS is based on compliance of the program with the ACCME accreditation requirements and does not imply endorsement by ACS of the content, the faculty, or the sponsor of the program.

Successful completion of this CME activity, which includes participation in the evaluation component, enables the learner to earn credit toward the CME and Self-Assessment requirements of the American Board of Surgery's Continuous Certification program.

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

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This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of American College of Surgeons and American Association of Endocrine Surgeons. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™

The American College of Surgeons designates this live activity for a maximum of 27.25 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the *AMA PRA Category 1 Credits™* listed above, a maximum of **9.25** credits meet the requirements for Self-Assessment.



CME CERTIFICATES AND EVALUATIONS

You may complete your attendance verification, meeting evaluation and self-assessment posttest online. You will receive your electronic CME certificate after completing the evaluation and posttests. Your final CME hours will be submitted to the ACS. Members of the ACS will have their credits posted to the ACS website around 30 days post-activity if your ACS number is provided.

The website to claim your CME credits will be emailed to all Meeting attendees.

Credit Summary	CME	Self-Assessment
Advanced Course: State of the Art in 2024	8.00	
Opening Session	1.00	
UCSF Carol & Orlo H. Clark Distinguished Lecture in Endocrine Surgery	1.00	
State-of-the-Art Management of the Adrenal Patient: A series of focused topics	1.00	
Scientific Session 1 with Distinguished Moderator	1.25	1.25
Scientific Session 2	1.00	1.00
Scientific Session 3	1.00	1.00
Presidential Address	1.00	
Scientific Session 4	1.00	1.00
Medical College of Wisconsin Stuart D. Wilson, M.D. Historical Lecture	0.75	
Scientific Session 5 with Distinguished Moderator	1.25	1.25
Scientific Session 6 with Distinguished Moderator	1.25	1.25
Presidential Lunch Session: State of Affairs and Future of Endocrine Surgery Education	1.00	
Interesting Cases Session	1.25	
Scientific Session 7	1.00	1.00
Why Managing Your Online Reputation Matters and How To Do It	1.00	
Scientific Session 8	1.50	1.50
JFK, Dallas, and Parkland Hospital	1.00	
Endocrine Surgical Innovation: Tips, Tricks, and Videos from the Experts	1.00	
	27.25	9.25

DISCLOSURE INFORMATION

In accordance with the ACCME Accreditation Criteria, the American College of Surgeons must ensure that anyone in a position to control the content of the educational activity (planners and speakers/authors/discussants/moderators) has disclosed all financial relationships with any commercial interest (termed by the ACCME as “ineligible companies”, defined below) held in the last 24 months (see below for definitions). Please note that first authors were required to collect and submit disclosure information on behalf all other authors/contributors, if applicable.

Ineligible Company: The ACCME defines a “commercial interest” as any entity producing, marketing, re-selling, or distributing health care goods or services used on or consumed by patients. Providers of clinical services directly to patients are NOT included in this definition.

Financial Relationships: Relationships in which the individual benefits by receiving a salary, royalty, intellectual property rights, consulting fee, honoraria, ownership interest (e.g., stocks, stock options or other ownership interest, excluding diversified mutual funds), or other financial benefit. Financial benefits are usually associated with roles such as employment, management position, independent contractor (including contracted research), consulting, speaking and teaching, membership on advisory committees or review panels, board membership, and other activities from which remuneration is received, or expected. ACCME considers relationships of the person involved in the CME activity to include financial relationships of a spouse or partner.

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Claire Nomine-Criqui	IBSA	Speaker	Honorarium
Julie Ann Sosa	1. Exelixis and Eli Lilly 2. Novo Nordisk, Astra Zeneca, Eli Lilly	1. Research Partner 2. Other	1. Research Funding 2. Consulting Fees
Insoo Suh	1. Medtronic 2. Iota Biosciences 3. Prescient Surgical 4. Corcept	1. Consultant 2. Consultant 3. Other 4. Consultant	1. Consulting Fees 2. Owner equity 3. Other 4. Consulting Fees

The following Speakers, Moderators or Discussants have nothing to disclose:

Sara Abou Azar	Christopher Carnabatu	Lauren Fishbein
Mohammad Aboueisha	Samantha Carroll	Alexandros Nicolaou
Jad Abumrad	Sally E Carty	Flaris
Peter Abraham	Stephanie J. Chan	Aaron Fleishmann
Iram Ahmad	Joshua Chao	Darci C Foote
Ege Akgun	Herbert Chen	Amanda C Foshag
Ramsha Akhund	Nathalie Chereau	Trenton R Foster
Iram S Alam	Dawn Chirko	Douglas L Fraker
Shaghayegh Aliabadi	Daniel M Chopyk	Samuel Frey
Ashba Allahwasaya	Phillip Chung	Thomas Fuchs-Buder
John D. Allendorf	Reagan A Collins	Man Him Matrix Fung
Stephen G Andrews	Christopher R Connelly	Andrew Gabrielson
Likolani Arthurs	Marine Coste	Haley Gainer
Younes Atlassy	Steven Craig	Zoran Gajic
Lisa Avery	Seth Wyatt Croslow	Pierpaolo Gallucci
Dilay Aykan	Carmela De Crea	Terry P Gao
Solomon Baah	Angelo M de Mattos	Tracy J Gao
Amanda L Bader	Priya H Dedhia	Elizabeth A.R. Garfinkle
Sanjana Balachandra	Jaydira Del Rivero	Shadin Ghabra
Courtney J Balentine	Kylie Dickerson	Andrea Gillis
Martin J Barriio	William R Doerfler	Sara Ginzberg
Yaser Bashumeel	Joy Z Done	Thomas J. Giordano
Tim N Beck	Sophie Dream	Anthony Glover
Tim Beck	Delphine Drui	Bahar Golbon
James F Bena	Quan-Yang Duh	Jorge L Gomez-Mayorga
Toni Beninato	Benzon M Dy	Paul H Graham
Florence Bihain	Dawn M Elfenbein	Claire E Graves
Panagiotis Bletsis	Emily Engelbrecht-Wiggans	Benjamin C Greenspun
Iuliana Bobanga	Samuel Joseph Enumah	Russell L Griffin
Anastasia K Bogdanovski	Katharine Esselen	Rebecca Griffiths
Colleen Brensinger	Caleb Fan	Karlie Gross
Jordan M Broekhuus	Rivka Farrell	Philippe Guerci
Laurent Brunaud	Jessica Fazendin	Ali Gunduz Sarioglu
Cécile Caillard	Grant Feuer	Rogeh Habashi
Michael J Campbell	Caitlin B Finn	Christian Hadeed
Kendyl Carlisle	Brendan M Finnerty	Gili Halfteck
		Michael Hebert

Katherine Heiden	Ekaterina Koelliker	Annamaria Martullo
Alexandra Helbing	Timothy Kravchenko	Pouria Mashouri
Shelby Holt	Lauren N Krumeich	Caterina Masino
Kristen M HoSang	Eric J Kuo	Aarti Mathur
James Howe	Lindsay E Kuo	Kelly L McCoy
Shawn Hsu	Saba Kurtom	Christopher R McHenry
Lina Hu	Hyungju Kwon	Robert McIntyre
Yinin Hu	Stefania La Rocca	Travis J McKenzie
Q. Lina Hu	Amanda M Laird	Catherine M. McManus
Erich P. Huang	Sarah Landau	Jessica Liu McMullin
Daniel Hubbs	Brian Lang	Mitchell Mead
Elizabeth M Huffman Cooper	Antonio Laurino	Stephen Mennemeyer
David T Hughes	Aur�lie Le Thuaut	Mira Milas
Elena G. Hughes	James A Lee	Eric Miralli�
Jaryd Hunter	Denise Lee	Dan Moldoveanu
Mohammad Hussein	Joshua Leisring	Chace Moleta
Hattie H Huston- Paterson	Judy Li	Alberto J Monreal
Jasmine Hwang	Chih-Yi Liao	Francis D Moore
Dara Z Ikejiani	James Y Lim	Alessandra L Moore
Peter P. Issa	Frank Lin	Lilah F Morris-Wiseman
Benjamin C James	Allison Lin	Kashif Munir
Catherine B Jensen	Brenessa Lindeman	Mohammad Murcy
Judy Jin	Rachel Liou	Nimesh V. Nagururu
Jessan A Jishu	Jason B Liu	Sergio M Navarro
Taylor O Julsrud	Masha J Livhits	Matthew Nehs
Hadiza S. Kazaure	Kristin L Long	Sang Ngo
Theresa H Keegan	Texell Longoria-Dubocq	Phi-Linh Nguyen-Thi
Luke Keele	Yan Luk	Elan Novis
Rachel R Kelz	Sarah M Lund	Miriam A Nuno
Marin Kheng	Melanie L Lyden	Fiemu Nwariaku
Hyeji Kim	Naim Maalouf	Ashley O'Donoghue
Lizabeth J. King	William MacDonald	Federico Palacardo
Katja Kiseljak- Vassiliades	Don L Mai	Megan Parmer
Jill Kneprath	Alexander Manzella	Janice L. Pasieka
Tomohiro Ko	Yifan Mao	Jesse Passman
	Teagan E Marshall	Jesse D Pasternak
	Elisa L Marten	Kepal N Patel

Francesco Pennestri	James E. Sharpe	Tanaz Vaghaiwalla
Meghan Perez	Jonas Shellenberger	Elizabeth Vann
Nancy Perrier	Helen Shih	Lillie Grace Veazey
John E. Phay	Joyce Shin	Alex Vitrak
Susan C. Pitt	Angelica Silva-Figueroa	Charles Vollmer
Liudmila V Popova	Aayushi Sinha	Heather Wachtel
Nikita Pozdeyev	Allan Siperstein	Rongzhi Wang
Priscilla Francesca Procopio	Mahes Sivarajah	Robert A Wermers
Sergey Protserov	Lauren Slattery	Margaret Wierman
Christopher Raeburn	Carmen Solórzano	Kyle Wierzbicki
Marco Raffaelli	Zhixing Song	Scott M. Wilhelm
Rajam Raghunathan	Rachel Stemme	Jonathan E Williams
Kimberly M Ramonell	Cord Sturgeon	Michelle Williams
Gustavo Romero-Velez	Marie W Su	Jordan A Williamson
Esther Diana Rossi	John X Sun	Parker Willmon
Gary D. Rothberger	Jonathan Sweedler	Brianna L Wind
Gery W Ryan	Solomiya Syvyk	Alexis L Woods
Youngjae Ryu	Dominique D Szymkiewicz	James X Wu
Alaa Sada	Dianelys Tabla Cendra	Rong Xia
Salmanfaizee Sadakkadulla	Lindsay Talemal	Huijun Xiao
Samira M. Sadowski	Yonqi Tan	Rongbing Xie
Parima Safe	Aida Taye	Mingzhao Xing
Melis Salman	Fasika M Tedla	Dongxiang Xue
Vivek R. Sant	Julia Terhune	Liuliu Yang
Anthony Saxton	Subotheni Thavaneswaran	Michael W Yeh
Randall P Scheri	Amanda Tibbels	Linwah Yip
Nicolas Scheyer	Samantha Thomas	Allen T Yu
David F Schneider	Joseph Tobias	Elvina Yunasan
Marisha Schwab	Rajbir Toor	Rasa Zarnegar
Carolyn D. Seib	Danielle R. Trakimas	Heming H Zhao
Stefanie Seo	Kristin E Trone	Polina Zmijewski
Young-Ji Seo	Abhinay Tumati	
Luca Sessa	Douglas Turner	
Pankaj Shah	Timothy Ullmann	
Meghal Shah	Hunter J Underwood	
Xhesika Shanja	Melis Uysal	



AGENDA

THURSDAY, APRIL 18, 2024

- 7:00 AM – 4:30 pm Endocrine Surgery University (UTSW)
Satellite Symposia – No CME Credit Provided
- 2:00 pm – 6:00 pm AAES Council Meeting (invitation only)
(Hyatt Regency Dallas)
- 6:30 pm – 8:30 pm Endocrine Surgery University, Fireside Chat Dinner
(invitation only, Hyatt Regency Dallas)

FRIDAY, APRIL 19, 2024

- 7:00 am – 11:30 am Endocrine Surgery University, continued (UTSW)
Satellite Symposia – No CME Credit Provided
- 8:00 am – 5:00 pm Advanced Course: State of the Art in 2024 (Hyatt
Regency Dallas)
- 1:00 pm – 5:00 pm AAES Fellows' Ultrasound Course (UTSW)
- 6:00 pm – 8:00 pm AAES Council Dinner (invitation only)
- 8:30pm – 10:30 pm Y'all Invited! Networking Social
(Community Beer Co.)

SATURDAY, APRIL 20, 2024

(all program sessions will take place at the Hyatt Regency Dallas unless otherwise noted)

- 8:00 am – 6:00 pm Registration Open
- 8:00 am – 9:00 am New Member Breakfast (invitation only)
- 8:30 am – 9:30 am Poster Judging
- 10:00 am – 11:00 am AAES Opening Session
- 11:00 am – 12:00 pm UCSF Carol & Orlo H. Clark Distinguished Lecture in
Endocrine Surgery
Professor Jad Abumrad
- 12:00 pm – 1:30 pm Lunch Break
- 12:15 pm – 1:15 pm Lunch Session (optional): State-of-the-Art
Management of the Adrenal Patient: A series
of focused topics (Joint session with Endocrine
Society)
- 1:30 pm – 2:45 pm Scientific Session I with Distinguished Moderator
(Papers 1-4)
- 2:45 pm – 3:45 pm Scientific Session II (Papers 5-8)
- 3:45 pm – 4:45 pm Break with Sponsors & Poster Viewing
Company Showcase: Corcept Therapeutics
- 4:45 pm – 5:45 pm Scientific Session III (Papers 9-12)
- 5:45 pm – 6:45 pm Presidential Address with Dr. Carmen Solórzano
- 6:45 pm – 7:45 pm President's Reception

SUNDAY, APRIL 21, 2024

7:00 am – 5:30 pm	Registration Open
7:00 am – 8:00 am	Breakfast and Scientific Session IV (Papers 13-16)
8:00 am – 8:45 am	MCW Stuart Wilson, M.D. Historical Lecture, Janice Pasieka, MD
8:45 am – 9:30 am	Break with Sponsors & Poster Viewing
9:30 am – 10:45 am	Scientific Session V with Distinguished Moderator (Papers 17-20)
10:45 am – 12:00 pm	Scientific Session VI with Distinguished Moderator (Papers 21-24)
12:00 pm – 1:30 pm	Lunch Break
12:15 pm – 1:15 pm	Presidential Lunch Session (optional): State of Affairs and Future of Endocrine Surgery Education
1:30 pm – 2:45 pm	Interesting Cases Session
2:45 pm – 3:30 pm	Break with Sponsors & Poster Viewing Company Showcase: Veracyte
3:30 pm – 4:30 pm	Scientific Session VII (Papers 25-28)
4:30 pm – 5:00 pm	AAES Business Meeting (Active, Allied Specialist, Corresponding, and Senior members may attend)
6:30 pm – 7:30 pm	Meet and Greet Socials: <i>Latin American members</i> <i>Affiliate Provider members</i> <i>Mentorship Program Participants</i> <i>ReMAP Participants</i>
7:00 pm – 8:00 pm	Cocktail Hour
8:00 pm – 10:00 pm	Gala Reception & Award Announcements

MONDAY, APRIL 22, 2024

7:00 am – 11:30 am	Registration Open
7:00 am – 8:00 am	Breakfast Session (optional): Why Managing Your Online Reputation Matters and How To Do It, hosted by the Endocrine Surgeon Identity Committee
8:00 am – 9:30 am	Scientific Session VIII (Papers 29-34)
9:30 am – 10:15 am	Break with Sponsors & Poster Viewing
10:15 am – 11:15 pm	JFK, Dallas, and Parkland Hospital Lecture, Mr. Stephen Fagin
11:15 am – 12:15 pm	Endocrine Surgical Innovations: Tips, Tricks, and Videos from the Experts



SCIENTIFIC PROGRAM

◆ Denotes Resident/Fellow Research Competition Paper

NOTE: Author listed in **BOLD** is the presenting author

The Scientific Program includes only sessions that are eligible for CME credit. Credit amounts for each session are listed on page 31.

SCIENTIFIC PROGRAM

Saturday, April 20, 2024

10:00 AM – 11:00 AM

AAES OPENING SESSION

- Welcome
- In Memoriam
- Welcome to Dallas
- Introduction of 2024 New Members – Shaghayegh Aliabadi, MD
- Research Award Presentations – Benjamin James, MD
 - Paul LoGerfo Research Awards
 - ThyCa: Thyroid Cancer Survivors' Association Award for Thyroid Cancer Research

11:00 AM – 12:00 PM

UCSF CAROL & ORLO H. CLARK DISTINGUISHED LECTURE IN ENDOCRINE SURGERY

Professor Jad Abumrad

12:15 PM – 1:15 PM

LUNCH SESSION (OPTIONAL): STATE-OF-THE-ART MANAGEMENT OF THE ADRENAL PATIENT: A SERIES OF FOCUSED TOPICS

A joint session with Endocrine Society

With commercial support from Corcept Therapeutics

Moderator: Naris Nilubol, MD – National Institute of Health

Speakers: Lauren Fishbein, MD, PhD – UC Health, F. Thurston Drake, MD, MPH – Boston University School of Medicine and Boston Medical Center, Oksana Hamidi, DO – UT Southwestern

1:30 PM – 2:45 PM

SCIENTIFIC SESSION I WITH DISTINGUISHED MODERATOR (PAPERS 1-4)

MODERATORS:

Jyotirmay Sharma, MD - Emory University School of Medicine

Dawn Eifenbein, MD, MPH - University of Wisconsin

◆01. Is Biochemical Screening Enough to Guide Calcium-Sensing Receptor Gene Mutational Analysis when Diagnosing Familial Hypocalciuric Hypercalcemia?

Alexandros Nicolaou Flaris¹, Taylor O Julsrud², Robert A Vierkant³, Trenton R Foster¹, Benzon M Dy¹, Travis J McKenzie¹, Robert A Wermers⁴, Melanie L Lyden¹

¹Department of Endocrine Surgery, Mayo Clinic, ²Department of Surgery, Mayo Clinic, ³Division of Clinical Trials and Biostatistics, Mayo Clinic, ⁴Department of Endocrinology and Metabolic Diseases, Mayo Clinic

◆02. Calcium Phosphate Deposition, Tertiary Hyperparathyroidism, and the Long-Term Effect on Kidney Allografts

John X Sun¹, Kristin E Trone¹, Christopher R Connelly¹, David C Woodland¹, Angelo M de Mattos², James Y Lim¹

¹*Department of Surgery, Oregon Health & Science University*, ²*Department of Nephrology, Oregon Health & Science University*

◆03. Is Thymectomy Necessary During Parathyroidectomy for Secondary Hyperparathyroidism in ESKD Patients?

Joy Z Done¹, Andrew Gabrielson², Darci C Foote¹, Jennine Weller¹, Lilah F Morris-Wiseman¹, Aarti Mathur¹

¹*Division of Endocrine Surgery, Department of Surgery, Johns Hopkins University School of Medicine*, ²*Department of Urology, Johns Hopkins University School of Medicine*

◆04. Predicting Hypocalcemia by Intraoperative Parathyroid Hormone Decline in Normohormonal Primary Hyperparathyroidism: A multi-institutional validation study

Timothy Kravchenko¹, Caitlin B Finn², Doug Fraker³, Rachel R Kelz³, Carrie Cunningham⁴, Heather Wachtel³, Lauren N Krumeich¹

¹*Michigan Medicine Health System*, ²*Weill Cornell Medicine*, ³*University of Pennsylvania*, ⁴*Massachusetts General Hospital*

2:45 PM – 3:45 PM

SCIENTIFIC SESSION II (PAPERS 5-8)

MODERATORS:

David Bimston, MD - Memorial Center for Integrative Endocrine Surgery
Abbey Fingeret, MD - University of Nebraska

◆05. Neoadjuvant Systemic Therapy for Inoperable Thyroid Cancers: Impact on tumor resectability

Kylie Dickerson¹, Mira Milas¹, Rosemarie Metzger¹, Chafeek Tomeh², Thomas Shellenberger², Iram Ahmad³, Michael Hebert⁴, Christian Nasr⁵, J. Alex Nelson¹, Elizabeth Westfall⁶, Richard Eisen⁷, Jiaxin Niu⁸

¹*Endocrine Surgery, University of Arizona - Phoenix and Banner Health*, ²*Surgical Oncology/Head and Neck Surgery, Banner M.D. Anderson Cancer Center*, ³*Endocrinology, CommonSpirit Health*, ⁴*Pharmacology, Banner M.D. Anderson Cancer Center*, ⁵*Endocrinology, University of Arizona - Phoenix and Banner Health*, ⁶*Radiology, University of Arizona - Phoenix and Banner Health*, ⁷*Pathology, University of Arizona - Phoenix and Banner Health*, ⁸*Medical Oncology, Banner M.D. Anderson Cancer Center*

◆06. Improvement in Thyroid-Specific Quality of Life Following Radiofrequency Ablation of Benign Thyroid Nodules: A USA Study

Reagan A Collins¹, Catherine McManus², Rachel Liou², Eric J Kuo², James A Lee², Jennifer H Kuo²

¹Texas Tech University Health Sciences Center, ²Columbia University

◆07. Tumor size in the Initial Surgical Decision-Making for Differentiated Thyroid Cancer

Saba Kurtom¹, Jason B Liu², William R Doerfler¹, Michael Calcaterra¹, Kelly L McCoy¹, Alaa Sada¹, Kimberly M Ramonell¹, Sally E Carty¹, Marina N Nikiforova¹, Yuri E Nikiforov¹, Linwah Yip¹

¹University of Pittsburgh, ²Brigham and Women's

◆08. Evaluating the Clinical Performance of an Updated microRNA Classifier in Indeterminate Thyroid Nodule Management: A multi-institutional study

Abhinay Tumati¹, Teagan E Marshall¹, Benjamin Greenspun¹, Sara Abou Azar², Xavier M Keutgen², Amanda M Laird³, Toni Beninato³, Rasa Zarnegar¹, Thomas J Fahey III¹, Brendan M Finnerty¹

¹New York-Presbyterian Hospital/Weill Cornell Medical Center, ²The University of Chicago Medicine, ³Rutgers Robert Wood Johnson Medical School

3:45 PM – 4:45 PM

BREAK WITH SPONSORS AND POSTER VIEWING

4:45 PM – 5:45 PM

SCIENTIFIC SESSION III (PAPERS 9-12)

MODERATORS:

David Hughes, MD - University of Michigan

Rajshri Gartland, MD, MPH - Massachusetts General Hospital, Harvard Medical School

◆09. Exploring Ethnic Diversity and Clinical Outcome Variabilities in Well-Differentiated Thyroid Cancer Among the Asian Population

Heming H Zhao¹, Scott M. Wilhelm¹

¹University Hospitals Cleveland Medical Center

◆10. Language-Based Exclusion and the Subsequent Racial/Ethnic Disparities in Thyroid Cancer Clinical Trials

Likolani Arthurs¹, Samuel Fredericks¹, Younes Atlassy¹, Rajam Raghunathan¹, Iram S Alam¹, John Allendorf¹, Gary Rothberger¹, Jason Prescott¹, Kepal Patel¹, Insoo Suh¹

¹NYU Langone Health

◆11. The Association of Medicaid Expansion and

Parathyroidectomy for Benign Disease: Insurance status remains an important factor in access to high-volume centers

Marin Kheng¹, Alexander Manzella², Tomohiro Ko¹, Joshua Chao¹, Amanda M Laird³, Toni Beninato³

¹*Rutgers Robert Wood Johnson Medical School*, ²*General Surgery, Rutgers Robert Wood Johnson Medical School*, ³*Rutgers Cancer Institute of New Jersey*

◆ 12. Surgery Produces More Durable, Long-Term Results in the Treatment of Graves' Disease Compared to Radioactive Iodine Ablation

Emily Engelbrecht-Wiggans¹, Kendyl Carlisle¹, Elvina Yunasan², Caleb Fan¹, Kashif Munir², Julia Terhune¹, Douglas Turner¹, Yinin Hu¹

¹*Department of Surgery, University of Maryland School of Medicine*, ²*Department of Medicine, University of Maryland School of Medicine*

5:45 PM – 6:45 PM

PRESIDENTIAL ADDRESS

Carmen Solórzano, MD

Sunday, April 21, 2024

7:00 AM – 8:00 AM

SCIENTIFIC SESSION IV (PAPERS 13-16)

MODERATORS:

Gerard Doherty, MD - Brigham and Women's Hospital

Naira Baregamian, MD, MMS - Vanderbilt University Medical Center

13. Intraoperative Hemodynamic Instability During Laparoscopic Adrenalectomy for Pheochromocytoma Without Preoperative Medical Preparation Versus Non-Secreting Tumor

Claire Nomine-Criqui¹, Amelie Delens², Phi-Linh Nguyen-Thi³, Florence Bihain⁴, Nicolas Scheyer⁵, Lea Demarquet⁵, Philippe Guerci⁶, Thomas Fuchs-Buder⁶, **Laurent Brunaud**⁷

¹*Department of Surgery (CVMC, 7eme étage) and INSERM NGERE, Université de Lorraine, University Hospital Nancy, CHRU Brabois Adultes, France*, ²*Departement de chirurgie, Centre Hospitalier CHR Metz*, ³*Department of Medical Informatics and Evaluation, University of Lorraine, CHU Nancy*, *Department of Medical Informatics and Evaluation*, ⁴*Department of Surgery (CVMC, 7eme étage), Université de Lorraine, University Hospital Nancy, CHRU Brabois Adultes*, ⁵*University of Lorraine, CHU Nancy, Department of Endocrinology, Nancy, France.*, ⁶*University of Lorraine, CHU Nancy, Department of Anesthesiology and Critical Care Medicine, Nancy, France.*, ⁷*Department of Surgery (CVMC, 7eme étage) and INSERM*

NGERE, Université de Lorraine, University Hospital Nancy, CHRU
Brabois Adultes

14. Novel Repurposing of Sulfasalazine to Synergize with Cisplatin for Improved Treatment of Adrenocortical Carcinoma Through the SLC7A11/xCT- IncRNA OIP5-AS1 Network Pathway

Chitra Subramanian¹, Kelli McNamara¹, Seth Wyatt Croslow², Yonqi Tan², Katja Kiseljak-Vassiliades³, Margaret Wierman³, Jonathan Sweedler², **Mark S. Cohen**⁴

¹Biomedical and Translational Sciences, Carle Illinois College of Medicine at the University of Illinois Urbana Champaign, ²Chemistry, University of Illinois Urbana Champaign, ³University of Colorado Anschutz School of Medicine, ⁴Surgery, Carle Illinois College of Medicine at the University of Illinois Urbana Champaign

◆15. Staining Patterns of Aldosterone Synthase in Patients Undergoing Surgery for Primary Aldosteronism: Clinical and biochemical correlation and proposal of nomenclature system

William MacDonald¹, Thomas J. Giordano², Joshua Leisring³, Anil Parwani⁴, Priya H. Dedhia¹, John Phay¹, Lawrence S. Kirschner⁵, Barbra S. Miller¹

¹Surgery, The Ohio State University, ²Pathology, University of Michigan, ³Internal Medicine - Nephrology, The Ohio State University, ⁴Pathology, The Ohio State University, ⁵Internal Medicine - Endocrinology, The Ohio State University

◆16. Avoidable Biopsies? Validating computer-aided diagnosis (CAD) software in indeterminate thyroid nodules

Christopher Carnabatu¹, David Fetzer², Alexander Tessnow³, Shelby Holt¹, Vivek Sant¹

¹Endocrine Surgery, University of Texas Southwestern, ²Radiology, University of Texas Southwestern, ³Endocrinology, University of Texas Southwestern

8:00 AM – 8:45 AM

MCW STUART WILSON, M.D. HISTORICAL LECTURE

Janice Pasioka, MD

8:45 AM – 9:30 AM

BREAK WITH SPONSORS AND POSTER VIEWING

9:30 AM – 10:45 AM

SCIENTIFIC SESSION V WITH DISTINGUISHED MODERATOR (PAPERS 17-20)

MODERATORS:

Marybeth Hughes, MD - Eastern Virginia Medical School

John Allendorf, MD - NYU Langone Health

◆17. DAXX Associated with Aggressive Pancreatic Neuroendocrine Tumor Behavior After R0 Resection

Benjamin C Greenspun¹, Amanda C Foshag¹, Abhinay Tumati¹, Teagan Marshall¹, Dongxiang Xue¹, Liuliu Yang¹, Shuibing Chen¹, Thomas J Fahey III¹, Rasa Zarnegar¹, Brendan M Finnerty¹
¹Surgery, Weill Cornell Medicine

◆18. Recurrence and Treatment Trends of Pancreatic Neuroendocrine Tumors: An 18-year review

Amanda L Bader¹, Sarah Landau¹, Jasmine Hwang¹, Jesse Passman¹, Major K Lee¹, Douglas Fraker¹, Charles Vollmer¹, Heather Wachtel¹

¹Department of Surgery, Hospital of the University of Pennsylvania

◆19. Surgery Enhances the Effectiveness of Peptide Receptor Radionuclide Therapy in Metastatic Gastroenteropancreatic Neuroendocrine Tumors

Joseph Tobias¹, Sara Abou Azar¹, Rushabh Gujarathi¹, Tanaz Vaghaiwalla², Chih-Yi Liao¹, Xavier Keutgen¹

¹University of Chicago, ²University of Tennessee Health Science Center

◆20. Oncogenic Mutations in the TP53 and PI-3-Kinase/AKT Pathway are Independent Predictors of Survival for Advanced Thyroid Cancer: Analysis from the molecular screening and therapeutics (most) program

Elan Novis¹, Anthony Glover², John Grady³, Audrey Silvestri⁴, Subotheni Thavaneswaran⁵, Frank Lin⁶, Mandy Ballinger⁷, David Thomas⁸

¹St Vincent's Hospital, Sydney, St Vincent's Clinical School, University of NSW, Sydney Australia, ²The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, ³The Kinghorn Cancer Centre Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, ⁴The Kinghorn Cancer Centre, Garvan Institute of Medical Research, Omico, the Australian Genomic Cancer Medicine Centre, Australia, ⁵The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, The NHMRC Clinical Trials Centre, University of Sydney, Australia, ⁶The NHMRC Clinical Trials Centre, University of Sydney, ⁷The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, Omico, the Australian Genomic Cancer Medicine Centre, Australia, ⁸The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, Omico, the Australian Genomic Cancer Medicine Centre, Australia, Centre for Molecular Oncology, University of New South Wales, Australia

SCIENTIFIC SESSION VI WITH DISTINGUISHED MODERATOR

(PAPERS 21-24)

MODERATORS:

Elizabeth Grubbs, MD - MD Anderson Cancer Center

David Velázquez, MD, MS, PhD - Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán

◆21. Assessing Large Language Model (LLM) Responses to Online Patient Questions on Thyroid Cancer and Disease: Can LLM address unmet patient information needs and reduce provider burnout?

Rajam Raghunathan¹, Anna R. Jacobs², Vivek R. Sant³, Elizabeth J. King¹, Gary D. Rothberger⁴, Jason D. Prescott¹, John D. Allendorf⁵, Carolyn D. Seib⁶, Kopal N. Patel¹, Insoo Suh¹

¹Section of Endocrine Surgery, New York University Grossman School of Medicine, ²NYU Grossman Long Island School of Medicine, ³Department of Surgery, UT Southwestern Medical Center, ⁴Division of Endocrinology, New York University Grossman Long Island School of Medicine, ⁵Department of Surgery, New York University Grossman Long Island School of Medicine, ⁶Department of Surgery, Stanford University School of Medicine

◆22. The State of Affairs: Assessing the scope of endocrine surgery exposure in general surgery residencies across the U.S.

Kristen M HoSang¹, Lindsay Talemal¹, Terry P Gao¹, Lindsay E Kuo¹
¹Temple University Hospital

◆23. A SIMPL Analysis: Identifying deficiencies in general surgery trainees autonomy and competence in performing thyroidectomy and parathyroidectomy

Jonathan E Williams¹, Aayushi Sinha¹, Susan C Pitt¹, David T Hughes¹, Hunter J Underwood¹
¹Surgery, University of Michigan

◆24. Entrustable Professional Activities in Endocrine Surgery: A National Pilot Study

Polina Zmijewski¹, Chandler McLeod¹, Ramsha Akhund¹, Ashba Allahwasaya¹, Taylor Lafrinere², Jessica Fazendin¹, Sally E Carty³, Paul H Graham⁴, David Hughes⁵, Melanie Lyden⁶, Barbra Miller⁷, Brendan Finnerty⁸, Linwah Yip³, Brenessa Lindeman¹
¹University of Alabama at Birmingham, ²myTIPreport, ³University of Pittsburgh, ⁴The University of Texas MD Anderson Cancer Center, ⁵University of Michigan, ⁶The Mayo Clinic, ⁷The Ohio State University, ⁸Weill Cornell Medical College

12:15 PM – 1:15 PM

PRESIDENTIAL LUNCH SESSION (OPTIONAL): STATE OF AFFAIRS AND FUTURE OF ENDOCRINE SURGERY EDUCATION

MODERATOR: Carmen Solórzano, MD - Vanderbilt University Medical Center
SPEAKERS: Brenessa Lindeman, MD, MEHP - University of Alabama at Birmingham, David Hughes, MD - University of Michigan Health System, and Beth Sutton, MD - Wichita Falls, TX, President-Elect, American College of Surgeons

1:30 PM – 2:45 PM

INTERESTING CASES SESSION

MODERATOR: Michael Yeh, MD – University of California, Los Angeles

2:45 PM – 3:30 PM

BREAK WITH SPONSORS AND POSTER VIEWING

3:30 PM – 4:30 PM

SCIENTIFIC SESSION VII (PAPERS 25-28)

MODERATORS:

Priya Dedhia, MD, PhD - The Ohio State University
Nicole Zern, MD - Valley Medical Center

◆**25. Objective Assessment of Changes in Non-Specific Symptoms after Parathyroidectomy for Primary Hyperparathyroidism**

Gustavo Romero-Velez¹, James F Bena¹, Huijun Xiao¹, Dara Z Ikejiani¹, Eren Berber¹, Katherine Heiden¹, Vikram Krishnamurthy¹, Joyce Shin¹, Allan Siperstein¹, Judy Jin¹
¹*Cleveland Clinic*

◆**26. Atypical Parathyroid Neoplasm with Soft Tissue Extension: Is Tis Accurate?**

Hope A Feldman¹, Angelica Silva-Figueroa², Gili Halfteck², Michelle Williams², Naifa Busaidy², Steven Waguespack², Paul Graham², Nancy Perrier²
¹*Geisinger Medical Center*, ²*MD Anderson Cancer Center*

◆**27. Timing of Parathyroidectomy after Kidney Transplantation: A cost-effectiveness analysis**

Rongzhi Wang¹, Stephen Mennemeyer¹, Rongbing Xie¹, Rhiannon Reed¹, Jessica Liu McMullin², Andrea Gillis¹, Jessica Fazendin¹, Brenessa Lindeman¹, Jayme E. Locke¹, Herbert Chen¹
¹*UAB*, ²*University of Utah*

◆**28. Optimizing Parathyroidectomy in the Elderly: Delayed intraoperative PTH kinetics**

Peter P. Issa¹, Eman Toraih¹, Mohammad Aboueisha¹, Mahmoud Omar¹, Abdallah S. Attia¹, Mohammad Hussein¹, Mohamed Shama¹, Emad Kandil¹
¹*Tulane SOM*

Monday, April 22, 2024

7:00 AM – 8:00 AM

BREAKFAST SESSION (OPTIONAL): WHY MANAGING YOUR ONLINE REPUTATION MATTERS AND HOW TO DO IT

SPEAKERS: James Lee, MD - Columbia University Medical Center, Richard Harding, MD - Arizona Advanced Surgeons LLC, Michael Yeh, MD - University of California, Los Angeles

8:00 AM – 9:30 AM

SCIENTIFIC SESSION VIII (PAPERS 29-34)

MODERATORS:

Rebecca Sippel, MD - University of Wisconsin-Madison

F. Thurston Drake, MD, MPH - Boston University School of Medicine and Boston Medical Center

29. The Effect of Surgical Management in Mitigating Fragility Fracture Risk Among Individuals with Primary Hyperparathyroidism

Bahar Golbon¹, Rogeh Habashi², Jonas Shellenberger³, Rebecca Griffiths³, Lisa Avery⁴, Minna Woo⁵, Daniel Pincus⁶, Antoine Eskander⁷, Jesse D Pasternak¹

¹Surgery, University Health Network (UHN), ²McMaster University, ³ICES Queen's, ⁴Biostatistics, University Health Network (UHN), ⁵Endocrinology and Metabolism, University Health Network (UHN), ⁶Orthopaedic Surgery, Sunnybrook Health Sciences Centre, ⁷Otolaryngology, Sunnybrook Health Sciences Centre

30. Parathyroid Near-Infrared Autofluorescence Use for Parathyroidectomy in Mild Primary Hyperparathyroidism: Results from a randomized monocentric trial

Samuel Frey¹, Sahar Bannani², Cécile Caillard¹, Maëlle Le Bras³, Delphine Druil³, Pascale Guillot⁴, Aurélie Le Thuaut⁵, Eric Mirallié¹

¹Chirurgie Cancérologique, Digestive et Endocrinienne, Institut des Maladies de l'Appareil Digestif, University Hospital Center of Nantes, ²General Surgery, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia, ³Service d'Endocrinologie, Diabétologie et Nutrition, University Hospital Center of Nantes, ⁴Service de Rhumatologie, University Hospital Center of Nantes, ⁵Plateforme de statistiques - Direction de la Recherche, University Hospital Center of Nantes

31. Is Desmoplastic Stromal Reaction Useful to Modulate Lymph Node Dissection in Sporadic Medullary Thyroid Carcinoma?

Priscilla Francesca Procopio¹, Francesco Pennestri², Esther Diana Rossi², Stefania La Rocca³, Carmela De Crea², **Marco Raffaelli**²

¹Fondazione Policlinico Universitario Agostino Gemelli IRCCS, ²Fondazione Policlinico Universitario Agostino Gemelli IRCCS Università Cattolica del Sacro Cuore, ³Ospedale San Pietro Fatebenefratelli

32. Prognostication with Thyroid GuidePx® in the Context of Tall Cell Variants

Steven Craig¹, Cynthia Stretch², Haley Pedersen³, Young Joo Park⁴, Adrian Harvey², Oliver F Bathe²

¹University of Wollongong, ²University of Calgary, ³Qualisure Diagnostics Inc., ⁴Seoul National University College of Medicine

33. Variable Practice Patterns in the Surgical Management of Renal Hyperparathyroidism

Sophie Dream¹, Jennifer Kuo², Brenessa Lindeman³, Herbert Chen³, Lindsay Kuo⁴

¹Medical College of Wisconsin, ²Columbia University, ³University of Alabama at Birmingham, ⁴Temple University

34. Early Second Radiofrequency Ablation Treatment Gave Rise to Significantly Greater Nodule Shrinkage at 12 Months than Single-Session Treatment for Large-Volume Benign Thyroid Nodules

Man Him Matrix Fung¹, Yan Luk¹, Brian Lang¹

¹Division of Endocrine Surgery, Department of Surgery, University of Hong Kong

9:30 AM – 10:15 AM

BREAK WITH SPONSORS AND POSTER VIEWING

10:15 AM – 11:15 AM

JFK, DALLAS, AND PARKLAND HOSPITAL LECTURE

Mr. Stephen Fagin

11:15 AM – 12:15 PM

ENDOCRINE SURGICAL INNOVATION: TIPS, TRICKS, AND VIDEOS FROM THE EXPERTS

MODERATORS: Insoo Suh, MD - NYU Langone Health, and Scott Wilhelm, MD - University Hospitals/Case Medical Center

SPEAKERS: Carmen Solórzano, MD – Vanderbilt University, John Phay, MD – The Ohio State University, Jennifer Kuo, MD, MS – Columbia University, Kepal Patel, MD – NYU Langone, Colleen Kiernan, MD – Vanderbilt University, Tracy Wang, MD, MPH – Medical College of Wisconsin

12:15 PM

MEETING ADJOURN



ABSTRACTS

◆ Denotes Resident/Fellow Competition Paper

NOTE: Author listed in **BOLD** is the presenting author

◆01. Is Biochemical Screening Enough to Guide Calcium-Sensing Receptor Gene Mutational Analysis when Diagnosing Familial Hypocalciuric Hypercalcemia?

Alexandros Nicolaou Flaris¹, Taylor O Julsrud², Robert A Vierkant³, Trenton R Foster¹, Benzon M Dy¹, Travis J McKenzie¹, Robert A Wermers⁴, Melanie L Lyden¹
¹*Department of Endocrine Surgery, Mayo Clinic,* ²*Department of Surgery, Mayo Clinic,* ³*Division of Clinical Trials and Biostatistics, Mayo Clinic,* ⁴*Department of Endocrinology and Metabolic Diseases, Mayo Clinic*

Background: Familial hypocalciuric hypercalcemia (FHH) mimics primary hyperparathyroidism (1HPT) biochemically, and preoperatively differentiating the two is critical. AAES recommends screening for FHH in patients with 24hr urine Ca (UCa) <100mg and for calcium to creatinine clearance ratio (CCCR) <1%. We explored the biochemical and clinical profiles of genetically tested patients to determine the usefulness of the AAES screening recommendations for FHH.

Methods: Retrospective review of patients who underwent mutational analysis of calcium-sensing receptor gene (CASR) in the setting of possible 1HPT. Patients were tested either preop for suspected FHH, or postop due to failed surgery.

Results: 238 patients were tested for CASR between 2013-2023. 203 (85%) were Negative (NEG), 19 (8%) were Positive (POS) and 16 (7%) had Variants of Unknown Significance (VUS). POS and VUS patients underwent genetic testing at a younger age than NEG patients (mean: POS 49, VUS 57, NEG 62 years, $p=0.002$). Mean serum calcium was lower in NEG patients (NEG 10.1, VUS 10.3, POS 10.8 mg/dl, $p<0.001$). Mean 24hr UCa was comparable among groups (NEG 121mg, VUS 132 mg, POS 150mg, $p>0.05$) as was mean PTH (NEG 78, VUS 68, POS 68 pg/ml, $p>0.05$). 53% of all POS patients had 24 hr UCa>100mg and 21% had 24hr UCa>200mg. 20% of POS patients had a CCCR>1%. For POS patients with imaging, sestamibi was inconclusive or negative for 7/9, and showed multiglandular disease for 2/9. Ultrasound was negative for 8/9 and showed 2 possible parathyroids in 1/9. 91/238 (38%) underwent surgery. Of all patients, 70% were tested preop (0% POS, 3% VUS) and 30% were tested postop (24% POS, 3% VUS).

Conclusions: FHH demonstrates non-negligible biochemical overlap with 1HPT, making it very difficult to distinguish patients preoperatively. Most patients with FHH have 24hr UCa above the AAES recommended threshold for considering genetic evaluation. CCCR will identify most patients at risk for FHH and should be routinely calculated. In addition, patients with FHH may have a higher likelihood of having imaging findings that are negative or equivocal. Modifying current FHH screening guidelines to a more liberal approach with consideration of negative or equivocal imaging may reduce surgical failures.

◆02. Calcium Phosphate Deposition, Tertiary Hyperparathyroidism, and the Long-Term Effect on Kidney Allografts

John X Sun¹, Kristin E Trone¹, Christopher R Connelly¹, David C Woodland¹, Angelo M de Mattos², James Y Lim¹

¹*Department of Surgery, Oregon Health & Science University,* ²*Department of Nephrology, Oregon Health & Science University*

Background: Tertiary hyperparathyroidism (tHPT) adversely effects kidney allografts, with studies showing up to 85% higher risk of allograft failure. Calcium phosphate (CaPhos) deposition is hypothesized as an underlying cause. We aim to analyze routine allograft biopsies to investigate risk factors for CaPhos deposition and understand its long-term impact on allograft function.

Methods: This is a single-institution retrospective study of patients who underwent kidney transplantation between January 2017 and June 2019. Exclusions included pediatric patients, patients with simultaneous transplants, previous kidney transplants, and patients without 12-month allograft biopsies. Pre- and post-transplant variables (calcium, parathyroid hormone (PTH), renal function labs, bone densities) and medications were collected. Glomerular filtration rate (GFR) was calculated using the MDRD equation. tHPT was defined as an elevated PTH and hypercalcemia beyond 3-months post-transplant or being prescribed cinacalcet. Allograft failure was defined as needing dialysis post-transplant or re-transplantation. Three- and 12-month allograft biopsies were reviewed for CaPhos deposition. Chi-squared, t-test, and univariate regression were used for statistical analysis.

Results: Of 159 kidney transplant patients, 59 (37%) were diagnosed with tHPT. Longer pre-operative dialysis vintage (OR=1.487, 95% CI[1.207-1.833]) and pre-operative cinacalcet usage (OR=17.267, 95% CI[6.341-47.016]) were predictive of post-transplant tHPT. 36/59 (61%) tHPT patients had CaPhos deposition on 3- or 12-month kidney allograft biopsy compared to 23/100 (23%) patients without tHPT ($p<0.05$). tHPT (OR=5.561, 95% CI[2.611-11.842]) was the primary risk factor for CaPhos deposition. CaPhos deposition and tHPT were not associated with worse GFR at 3-years post-transplant. At 3-year post-transplant, 21/59 (36%) patients remain on cinacalcet. In tHPT patients, cinacalcet usage was not associated with improved renal function at 3-years post-transplant. There were 3/159 (2%) patients who had allograft failure, 2 of which had both tHPT and CaPhos deposition.

Conclusions: Pre-operative risk factors for tHPT included longer dialysis vintage and cinacalcet use. tHPT was the main risk factor for CaPhos deposition in kidney allografts. Many patients remain on cinacalcet beyond 1-year post-transplant. In our population, although CaPhos deposition and tHPT were not significantly associated with lower GFR, these findings were present in 2/3 (67%) patients with allograft failure. Further studies are needed to investigate.

◆03. Is Thymectomy Necessary During Parathyroidectomy for Secondary Hyperparathyroidism in ESKD Patients?

Joy Z Done¹, Andrew Gabrielson², Darci C Foote¹, Jennine Weller¹, Lilah F Morris-Wiseman¹, Aarti Mathur¹

¹Division of Endocrine Surgery, Department of Surgery, Johns Hopkins University School of Medicine, ²Department of Urology, Johns Hopkins University School of Medicine

Background: Some guidelines suggest consideration of transcervical thymectomy at the time of parathyroidectomy for patients with secondary hyperparathyroidism (SHPT) to reduce the likelihood of persistent or recurrent hyperparathyroidism. We sought to examine how frequently thymectomy is performed and its impact on recurrence of SHPT.

Methods: Using TriNetX, an electronic health record and claims network with multi-institutional data, we conducted a retrospective cohort study of adults on dialysis who underwent parathyroidectomy with (PTx+Thy) or without (PTx) thymectomy between 2004 and 2023. Rates of thymectomy, repeat parathyroidectomy and calcimimetic use were compared between PTx and PTx+Thy cohorts. Recurrence was defined by the need for reoperation or postoperative calcimimetic use.

Results: Among 2,372 patients with end stage kidney disease (ESKD) who underwent surgery for SHPT, 2114 (89.1%) underwent PTx and 258 (10.9%) underwent PTx+Thy. Rates of PTx+Thy decreased over time, from 41.7% in 2004 to 24.3% in 2011 and 11.1% in 2023. Preoperatively, compared to PTx patients, those who underwent PTx+Thy had higher mean PTH (1236 vs. 927pg/mL, $p=0.0003$) and calcium (9.7 vs. 9.4mg/dL, $p=0.0002$). There was no difference in mean age at time of surgery or proportion of patients on calcimimetics between groups. However, post-operatively, there was no statistical difference in the mean PTH level (179 vs. 184pg/mL, $p=0.791$), proportion of patients on calcimimetics (12.2 vs. 11.6%, RR 1.052, 95% CI 0.73—1.50), risk of any reoperation at 5 years post-operatively (5.3 vs. 3.8%, RR 1.37, 95% CI 0.73—2.59), or rates of kidney transplantation (8.9 vs. 8.5%, $p=0.819$) between PTx and PTx+Thy groups.

Conclusions: Thymectomy is infrequently performed during PTx for SHPT and rates continue to decline. These data show that thymectomy does not decrease recurrence of SHPT requiring calcimimetics or repeat PTx. Future studies should aim to identify patients who are most likely to benefit from thymectomy.

◆04. Predicting Hypocalcemia by Intraoperative Parathyroid Hormone Decline in Normohormonal Primary Hyperparathyroidism: A multi-institutional validation study

Timothy Kravchenko¹, Caitlin B Finn², Doug Fraker³, Rachel R Kelz³, Carrie Cunningham⁴, Heather Wachtel³, Lauren N Krumeich¹

¹Michigan Medicine Health System, ²Weill Cornell Medicine, ³University of Pennsylvania, ⁴Massachusetts General Hospital

Background: Normohormonal primary hyperparathyroidism (PHPT) is characterized by hypercalcemia and inappropriately normal parathyroid hormone (PTH) levels. Parathyroidectomy is the only treatment. We previously reported that postoperative hypocalcemia is predicted when intraoperative PTH (IOPTH) decline exceeds only 75% in normohormonal PHPT compared to 88% in classic PHPT. We sought to validate these parameters using a multi-institutional cohort.

Methods: We performed a retrospective cohort study incorporating patients with PHPT who underwent a parathyroidectomy (2002-2019) at two additional independent institutions (validation cohort). Normohormonal PHPT was defined as calcium ≥ 10.3 mg/dL and PTH ≤ 65 pg/mL. Patients underwent PTH testing preoperatively and ≥ 15 minutes after parathyroidectomy. The primary outcome was postoperative hypocalcemia (≤ 8.8 mg/dL) ≥ 6 months postoperatively, evaluated with proportion tests and receiver operating characteristic curves. Test characteristics of the previously derived cutoffs were then evaluated in the validation cohort.

Results: The validation cohort was comprised of 1,036 patients, 115 (11.1%) with normohormonal PHPT. Median age was 60 years (IQR:52-69); 814 (78.6%) were female. The median follow-up time was 10.6 months (IQR:7.7-14.7). In patients with normohormonal PHPT, median preoperative calcium was 10.8 mg/dL (IQR:10.3-11.2) and PTH was 52 pg/mL (IQR:44-57). The optimal IOPTH cutoff to avoid hypocalcemia was lower in patients with normohormonal (64%, area under the curve [AUC] 0.65) compared to classic (74%, AUC 0.57) PHPT. Overall rates of hypocalcemia were similar for normohormonal and classic PHPT, respectively (14.6% vs. 11.9%, $p=0.44$). However, once an IOPTH decline $\geq 64\%$ was achieved, rates were significantly higher at 26% in normohormonal PHPT compared to 12% in classic PHPT ($p=0.02$). When the optimal cutoffs from the original derivation cohort were applied to the validation cohort, negative predictive values and specificity for hypocalcemia were 86% and 94% for normohormonal PHPT and 89% and 93% for classic PHPT, respectively, while positive predictive values and sensitivity were $<20\%$.

Conclusions: This multi-institutional study externally validated previous findings that patients with normohormonal PHPT have a higher risk of postoperative hypocalcemia, and hypocalcemia is predicted by the extent of IOPTH decline. IOPTH exceeding approximately 70% in patients with normohormonal PHPT may warrant heightened measures to identify and manage hypocalcemia.

◆05. Neoadjuvant Systemic Therapy for Inoperable Thyroid Cancers: Impact on tumor resectability

Kylie Dickerson¹, Mira Milas¹, Rosemarie Metzger¹, Chafeek Tomeh², Thomas Shellenberger², Iram Ahmad³, Michael Hebert⁴, Christian Nasr⁵, J. Alex Nelson¹, Elizabeth Westfall⁶, Richard Eisen⁷, Jiaxin Niu⁸

¹Endocrine Surgery, University of Arizona - Phoenix and Banner Health, ²Surgical Oncology/Head and Neck Surgery, Banner M.D. Anderson Cancer Center, ³Endocrinology, CommonSpirit Health, ⁴Pharmacology, Banner M.D. Anderson Cancer Center, ⁵Endocrinology, University of Arizona - Phoenix and Banner Health, ⁶Radiology, University of Arizona - Phoenix and Banner Health, ⁷Pathology, University of Arizona - Phoenix and Banner Health, ⁸Medical Oncology, Banner M.D. Anderson Cancer Center

Background: Limited treatment options exist for inoperable thyroid cancers. Neoadjuvant (NEO) use of systemic tyrosine kinase inhibitors (TKI) has been anecdotally reported. We aimed to evaluate whether NEO-TKI therapy facilitates surgical resection in these challenging patients.

Methods: Single-institution experience of 42 patients receiving TKI for papillary (PTC), follicular (FTC) and anaplastic thyroid carcinomas (ATC) during 2018-2023 was reviewed. Our center has a well-established multidisciplinary pathway with protocol-driven management of advanced thyroid cancers. TKI regimens included dabrafenib/trametinib, lenvatinib/pembrolizumab or lenvatinib alone.

Results: 10/42 patients with median age 56 years (range 19-80 years; gender F4/M6) received NEO-TKI with intent to improve resectability of primary (n=5, 2 FTC/3 PTC) or recurrent/residual tumors (n=5, 1 ATC/4 PTC). All had locoregionally advanced disease: cT size 9±2.6 cm with bulky/matted lymphadenopathy (9) and adjacent vital structure involvement (trachea/esophagus 5, jugular/subclavian veins 2, sternum 1). All were deemed either unresectable or resectable with unacceptable morbidities. Seven patients exhibited distant metastases to lung (n=6), vertebral/axial bone (2) or sternum (1). Genomic analysis detected BRAF V600E mutation in 1/1 ATC and 6/7 PTC, and NRAS/TERT or HRAS/TERT in both FTC. Most patients received TKI alone for <6 months; 1 patient received TKI plus immunotherapy. NEO-TKI yielded clinical results within weeks, including visible mass reduction and cessation of hemoptysis from tracheal invasion. Seven patients have received initial or completion thyroidectomy with nodal dissection and 3 recently initiated NEO-TKI therapy. All operative patients achieved R0 resection without major surgical complications or need to resect aerodigestive structures. Patients tolerated NEO-TKI generally well with only 1 minor toxicity requiring dose adjustment and 1 congestive heart failure episode that halted TKI but not surgery. Patients with distant metastases continued to receive adjuvant TKI. At mean 2 yrs post-operative follow-up, all patients are alive without new locoregional recurrence.

Conclusions: NEO-TKI seems extremely effective in downstaging surgically unresectable thyroid cancers to achieve R0 resection while avoiding unnecessary surgical morbidities. Multidisciplinary approach with early genomic profiling to guide personalized NEO-TKI is essential. Prospective studies using NEO-TKI are urgently needed as this series suggests neoadjuvant therapy may have a significant role in future management of inoperable thyroid cancers.

◆06. Improvement in Thyroid-Specific Quality of Life Following Radiofrequency Ablation of Benign Thyroid Nodules: A USA Study

Reagan A Collins¹, Catherine McManus², Rachel Liou², Eric J Kuo², James A Lee², Jennifer H Kuo²

¹Texas Tech University Health Sciences Center, ²Columbia University

Background: Over recent decades, radiofrequency ablation (RFA) has emerged as an effective minimally invasive technique for benign thyroid nodules, with European and Asian studies reporting improved quality of life (QOL) following treatment. We aimed to assess the health-related QOL of patients with benign thyroid nodules treated with RFA in the United States (US).

Methods: This is a prospective single-institution study of patients treated with RFA over a 4-year period. QOL was evaluated using the Thyroid-Related Patient-Reported Outcome (ThyPRO)-39, a thyroid-specific quality of life instrument covering 13 domains of QOL validated for patients with benign thyroid disease. Nodule characteristics and ThyPRO-39 scores were assessed at baseline, 3-months post procedure, and last follow-up (range: 3-12 months). Paired t-test was used to assess differences in scores before and after RFA with standardized effect size (SES) analysis. Effect sizes between 0.2-0.5 were classified as small, 0.5-0.8 as moderate, and >0.8 as large.

Results: A total of 58 patients with 80 nodules were treated. The median volume reduction ratio (VRR) at 1, 3, 6, and 12 months was 45.1% (IQR:28.0-57.6), 66.6% (53.5-75.9), 73.3% (65.4-83.1), and 80.6% (68.4-89.8), respectively. There was improvement in all ThyPRO-39 scores at 3-month and last follow-up. At 3-month follow-up, significant improvement ($p<0.05$) was observed for goiter symptoms (mean: 28.5 vs. 10.6), hyperthyroid symptoms (13.8 vs. 8.0), anxiety (30.5 vs. 18.8), appearance (28.7 vs. 9.9), and overall QOL (30.0 vs. 10.4). All effect sizes were small except hypothyroid symptoms, eye symptoms, depressivity, and impaired daily life (SES<0.2). At last follow-up, significant improvement ($p<0.05$) was observed for goiter symptoms (28.5 vs. 8.9), anxiety (30.5 vs. 21.7), appearance (28.7 vs. 10.1), and overall QOL (30.0 vs. 11.2). Effect sizes were small for all scales except hyperthyroid symptoms, anxiety, depressivity, emotional susceptibility, and impaired daily life (SES<0.2), and impaired social life and appearance (SES 0.5-0.8).

Conclusions: In the largest US study to date assessing QOL following RFA, we observed an expected VRR and improvements in thyroid-specific QOL, particularly goiter, anxiety, and appearance. These findings underscore the potential of RFA to address the physical aspects of thyroid nodules and improve QOL of patients with benign thyroid nodules.

◆07. Tumor size in the Initial Surgical Decision-Making for Differentiated Thyroid Cancer

Saba Kurtom¹, Jason B Liu², William R Doerfler¹, Michael Calcaterra¹, Kelly L McCoy¹, Alaa Sada¹, Kimberly M Ramonell¹, Sally E Carty¹, Marina N Nikiforova¹, Yuri E Nikiforov¹, Linwah Yip¹

¹University of Pittsburgh, ²Brigham and Women's

Background: Preliminary modifications to ATA guidelines propose thyroid lobectomy for patients with intrathyroidal (clinical T1N0) differentiated thyroid cancer (DTC) 1-4 cm with consideration for possible non-operative surveillance when size ≤ 2 cm. To inform both decision for and extent of initial surgery, we aim to evaluate if molecular results can complement tumor size to identify DTC associated with disease recurrence.

Methods: Patients from 2007-2013 and 2017-2023 who had molecular testing (MT) and initial thyroidectomy for DTC were included. Contemporaneous MT results on either preoperative FNA cytology or histology were subsequently categorized into 3 previously described molecular risk groups (MRG Low, Intermediate, and High). Primary outcome was structural recurrence.

Results: In all, 1962 patients with DTC had initial lobectomy (13.7%) or total thyroidectomy (86.3%). With median follow-up of 44 mos (IQR 24-96), the recurrence rate was 4.1% with median time to recurrence of 17.5 mos (IQR 11-31.5). After excluding 223 patients with tumor size >4 cm, 3.8% had recurrence which occurred at equivalent rates in patients with tumor size 1-2 cm compared to 2.1-4 cm (3.5% vs. 4.3%, $p=0.44$). MT results were available for 1020, and MRG-Low, IM, and High Risk were identified in 42.7%, 54.4%, and 2.8% with recurrences in 0.7%, 7.2%, and 3.5%, respectively ($p<0.001$). Among 1-2 cm DTC, recurrences were more common in MRG-IM than MRG-Low cohorts (5.8% vs. 0.9%, $p=0.003$). Similarly, among DTC 2.1-4 cm, recurrences were more likely in patients with MRG-IM compared to those with MRG-Low tumors (11.3% vs. 0.5%, $p<0.0001$). Only 29 DTC were ≤ 4 cm MRG-High Risk, and 1 recurrence has occurred to date in a patient with a 2.1-4 cm tumor.

Conclusions: With median follow-up of 44mos, the recurrence rate for DTC ≤ 4 cm was low (3.8%). Tumor size was not the primary determinant and MT status was also associated with recurrence. MRG-IM DTC 1-2 cm had an ~6% risk and initial thyroid lobectomy should be considered, while MRG-Low DTC had a $<1\%$ risk of recurrence regardless of tumor size. When considering de-escalated treatment for the newly proposed ATA cutoff of 2 cm, initial decision-making may be further optimized with identification of preoperative MRG.

◆08. Evaluating the Clinical Performance of an Updated microRNA Classifier in Indeterminate Thyroid Nodule Management: A multi-institutional study

Abhinay Tumat¹, Teagan E Marshall¹, Benjamin Greenspun¹, Sara Abou Azar², Xavier M Keutgen², Amanda M Laird³, Toni Beninato³, Rasa Zarnegar¹, Thomas J Fahey III¹, Brendan M Finnerty¹

¹New York-Presbyterian Hospital/Weill Cornell Medical Center, ²The University of Chicago Medicine, ³Rutgers Robert Wood Johnson Medical School

Background: Integrating microRNA markers with next-generation sequencing panels holds promise for improving risk assessment of cytologically indeterminate thyroid nodules (ITNs). We previously reported limited utility of MPTv1, which combined ThyGeNEXT[®]'s mutation panel and ThyraMIR[®]'s binary microRNA risk classifier, in stratifying RAS-mutated ITNs. Here, we aimed to externally validate the recently updated ThyraMIR[®]v2 platform (MPTv2) in a real-world clinical setting.

Methods: An oncogene panel, ThyGeNEXT[®], and a three-tiered classifier leveraging pairwise microRNA comparisons, ThyraMIR[®]v2, were assessed using a previously-studied cohort of Bethesda III/IV nodules (for validating MPTv1) from three tertiary care centers between 2017-2021. MPTv2 results were classified as positive at risk of malignancy (ROM) $\geq 10\%$. A subanalysis evaluated ThyraMIR[®]v2's clinical utility in RAS-mutated ITNs.

Results: 351 patients with 366 ITNs underwent MPTv2 analysis. Positive MPTv2 (111/366; 30.3%) showed similar patient age (57.1 vs 60.0, $p=0.104$), female sex (75.7% vs 68.6%, $p=0.211$), and nodule size (2.5 vs 2.3cm, $p=0.155$) to negative MPTv2. MPTv2+ nodules, compared to MPTv2-, had higher operative rates (76.6% vs 18.8%, $p<0.0001$) and cancer/NIFTP diagnosis (65.9% vs 25.0%, $p<0.0001$). Compared to MPTv1, MPTv2's overall sensitivity, specificity, NPV, and PPV are 82.4% (+1.8%), 81.2% (+6.8%), 91.2% (+1.1%), and 65.9% (+9.0%), respectively.

Within the subgroup of RAS-mutated nodules ($n=68$), ThyraMIR[®]v2 classified them as positive (36.8%), moderate (55.9%), or negative (7.4%). Significant size differences were noted among the positive, moderate, and negative groups (2.3 vs 2.7 vs 1.5cm, $p=0.037$). Malignancy prevalence in the moderate cohort was 54.8% (17/31). Since all the moderate group's RAS-mutated nodules had ROM $\geq 10\%$, this group was combined with the positive cohort. Among RAS nodules, no significant differences existed in operative rate (81.0% vs 60.0%, $p=0.272$) or cancer/NIFTP diagnosis (58.8% vs 66.7%, $p>0.999$) between the positive/moderate and negative groups. For RAS-mutated nodules, ThyraMIR[®]v2 demonstrated a sensitivity, specificity, NPV, and PPV of 93.8%, 4.5%, 33.3%, and 58.8%, respectively.

Conclusions: MPTv2 enhances ITN malignancy stratification compared to MPTv1. ThyraMIR[®]v2 improves detection of malignant RAS-mutated nodules but increases false positives. While this might be seen as leading to unnecessary surgery, not all clinicians are comfortable following RAS-mutated nodules. Therefore, clinical characteristics should complement MPTv2 results for managing RAS-mutated ITNs effectively.

◆09. Exploring Ethnic Diversity and Clinical Outcome Variabilities in Well-Differentiated Thyroid Cancer Among the Asian Population

Heming H Zhao¹, Scott M. Wilhelm¹

¹University Hospitals Cleveland Medical Center

Background: Well-differentiated thyroid cancer (WDTC) comprises approximately 95% of all thyroid cancers in the US. While numerous studies have investigated the demographics and predisposing factors for WDTC among different racial groups, the primary focus has been on White, Black, and Hispanic populations. Despite Asian Americans constituting 5.7% of US population, research has often categorized them as a homogenous group or as "other", neglecting the diversity within Asian ethnicities. This study aims to understand the demographic impacts and outcomes of WDTC in the Asian population. We hypothesize that significant variations exist, leading certain ethnicities to present with more advanced stages of disease and experience poorer outcomes compared to their Asian and White counterparts.

Methods: We analyzed the National Cancer Database (NCDB) from 2004 to 2019, categorizing the Asian population based on the available ethnicities (Chinese, Japanese, Filipino, Korean, Vietnamese, Laotian, Hmong, Kampuchean, Thai, Asian Indian, Pakistani, and Pacific Islander). Multivariable logistic regression assessed the associations between ethnic groups and disease stage/nodal positivity. Survival outcomes were evaluated using Kaplan-Meier and Cox's regression analyses.

Results: Among the Asian ethnic groups, Chinese, Japanese, Korean, and Laotian had higher percentages of stage III disease, while Filipino, Korean, and Laotian had higher proportions of stage IV disease compared to the White population. Hispanic (30.9%), Japanese (32.1%), Filipino (30.2%), and Hmong (36.4%) patients demonstrated a higher nodal positivity rate compared to White patients (21.7%). Furthermore, most Asian groups had more patients with metastasis compared to the White population. Laotian patients exhibited an eight-fold increased likelihood of metastasis (OR: 8.13, CI:2.63-25.1, P<0.05), while Asian Indians showed nearly three times higher odds (OR: 2.95, CI:1.63-5.35, P<0.05) compared to White patients. Japanese, Laotian and Kampuchean patients experienced worse five- and ten-year overall survival rates when compared to the White population.

Conclusions: Our study revealed substantial variation in disease characteristics and outcomes among diverse Asian ethnic groups with WDTC. This challenges the notion of Asians as a homogenous population, emphasizing the importance of tailored approaches for disease management needs faced by this heterogeneous group of patients.

◆ 10. Language-Based Exclusion and the Subsequent Racial/Ethnic Disparities in Thyroid Cancer Clinical Trials

Likolani Arthurs¹, Samuel Fredericks¹, Younes Atlassy¹, Rajam Raghunathan¹, Iram S Alam¹, John Allendorf¹, Gary Rothberger¹, Jason Prescott¹, Kopal Patel¹, Insoo Suh¹
¹*NYU Langone Health*

Background: Racial and ethnic disparities in thyroid cancer care may be mitigated by improving enrollment of more diverse patient populations in clinical trials. We studied clinical trial eligibility criteria and enrollment to assess barriers to equitable representation of underrepresented groups in thyroid cancer studies.

Method: Clinicaltrials.gov was searched for studies related to thyroid cancer treatment conducted between 1993-2023. The inclusion and exclusion criteria of each study were examined. For published studies, reported demographic information was collected. The observed enrollment by race was compared to the expected distribution as determined using data from the U.S. Census and the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) database. Over- and underrepresentation was defined as the ratio of observed-to-expected (O/E) enrollment by race/ethnicity group.

Results: Of 309 thyroid cancer-related clinical trials, 23 (7.4%) used language as an exclusion criterion. Most were interventional studies (n=239, 77.3%), university-initiated (194, 62.8%), and drug/device-focused (195, 63.1%). Of the studies that excluded by language, 20 (87.0%) were university-initiated. Eighty-eight trials were subsequently published, with 16 (18.2%) reporting race and/or ethnicity distributions. Within this cohort, 81.5% were White, 4.3% Black, 4.3% Hispanic, 4.1% Asian/Native Hawaiian, and 0.2% Native American. The expected distribution of thyroid cancer by race was 65.9% White, 7.1% Black, 18.9% Hispanic, 7.1% Asian/Native Hawaiian, and 1.0% Native American. When comparing O/E ratios, White Americans over-represented with a ratio of 1.2 (p<0.0001). Underrepresented groups included Asian/Native Hawaiian (O/E 0.6, p=0.0085), Black (O/E ratio 0.6, p=0.0140), Native American (0.2, p=0.0722), and Hispanic patients (0.2, p<0.0001).

Conclusions: Over the last three decades, 1 in 13 clinical trials involving thyroid masses excluded patients based on language, most likely those initiated by universities. In the fraction of published studies to report on racial/ethnic demographics of study participants, Asian/Native Hawaiian, Black, and Hispanic patients were significantly underrepresented. Improved reporting of demographics in published studies, elimination of exclusion criteria such as language that hinder enrollment of minority patients in clinical trials, and improved outreach and education to underrepresented patients about trials could help achieve more equitable care for all patients with thyroid cancer.

◆ **11. The Association of Medicaid Expansion and Parathyroidectomy for Benign Disease: Insurance status remains an important factor in access to high-volume centers**

Marin Kheng¹, Alexander Manzella², Tomohiro Ko¹, Joshua Chao¹, Amanda M Laird³, Toni Beninato³

¹Rutgers Robert Wood Johnson Medical School, ²General Surgery, Rutgers Robert Wood Johnson Medical School, ³Rutgers Cancer Institute of New Jersey

Background: For endocrine malignancies, ACA-directed Medicaid expansion has been associated with improved access to surgical care at high-volume centers. Its impact on benign disease, however, is unclear. We evaluated the association between Medicaid expansion and parathyroidectomy for benign disease at high- and low-volume centers based on insurance status.

Methods: The Vizient Clinical Data Base was queried for parathyroidectomies with benign diagnoses. Patients were grouped by insurance status: private insurance, Medicare, Medicaid, uninsured, and other. Pre- and post-expansion periods were defined as 2010-2013 and 2014-2015, respectively. Hospitals were stratified into tertiles (T1 to T3) by operative volume, with T1 representing the highest-volume centers (>66th percentile). Odds of parathyroidectomy were calculated and a difference-in-differences analysis was performed.

Results: A total of 30,986 patients at 315 hospitals were identified. Patients were predominantly over 50 years old (79.1%), female (75.7%), identified as white (78.5%), and had private insurance (49.9%). During the study period, uninsured and Medicaid patients had increasing odds of operation at lower-tertile centers (OR: T1=ref; uninsured: T2=10.0, T3=15.8; Medicaid: T2=6.2, T3=13.5; all $p<0.001$). Medicare patients were less likely to undergo operation at the lowest-tertile centers (OR: T3=0.92, $p=0.002$). Privately insured patients were the least likely to receive care at the lowest-volume centers (OR: T3=0.7, $p<0.001$).

Medicaid patients in non-expansion states had 12-16 times higher odds of parathyroidectomy at lower-volume hospitals compared to their counterparts in expansion states (expansion/non-expansion states: pre-expansion T3=2.3/28.0; post-expansion T3=1.3/21.4). Across all states, expansion was associated with an increase in the proportion of parathyroidectomy for Medicaid patients, with larger gains seen at higher-volume centers (T1=5.0%, $p=0.01$; T2=3.1%, $p=0.001$; T3=2.7%, $p=0.03$). Expansion was not associated with changes in payor distribution for uninsured, Medicare, or privately insured patients.

Conclusions: Medicaid expansion was associated with an increase in parathyroidectomy for patients with Medicaid at high-volume centers. However, disparities in the surgical treatment of uninsured and under-insured patients with benign parathyroid disease persist. Access to surgical treatment at high-volume centers for these patients remains limited in states that did not adopt Medicaid expansion.

◆12. Surgery Produces More Durable, Long-Term Results in the Treatment of Graves' Disease Compared to Radioactive Iodine Ablation

Emily Engelbrecht-Wiggans¹, Kendyl Carlisle¹, Elvina Yunasan², Caleb Fan¹, Kashif Munir², Julia Terhune¹, Douglas Turner¹, Yinin Hu¹

¹Department of Surgery, University of Maryland School of Medicine, ²Department of Medicine, University of Maryland School of Medicine

Background: Common treatments for Graves' disease include antithyroid (AT) medications, radioactive iodine (RAI) ablative therapy, and thyroidectomy. RAI avoids surgical morbidity, but rate and durability of remission varies across studies. This study directly compared the long-term results of Graves' disease treated by surgery vs RAI. We hypothesized that treatment with RAI would be associated with lower rates of long-term biochemical remission and higher likelihood of retreatment.

Methods: This retrospective cohort study included individuals with a diagnosis of Graves' disease who either had surgical treatment, RAI, or a combination of the two at a tertiary referral center. Retreatments were defined as repeat RAI or surgery following index treatment with either approach. Remission was defined by normalization of thyroid stimulating hormone without re-initiation of AT or retreatment. Relapse was defined as recurrent hyperthyroidism after an initial period of euthyroidism. Outcomes were compared using Fischer's exact tests. Significance was defined at an alpha of less than 0.05. The cumulative incidence of retreatment was calculated for all study time points.

Results: Index definitive therapy was total thyroidectomy for 75 patients and RAI for 104 patients. The median follow-up time was 53 months. Including retreated cases, the overall rate of remission at last follow-up was 96% in the surgery group and 87% in the RAI group ($p=0.09$). Rate of retreatment was more than three-fold higher after RAI relative to surgery, 18.3% vs 5.3% ($p=0.01$). Persistent or relapsed hyperthyroidism was significantly more likely in the RAI group at 1-, 3-, 6-, 12-, and 24-months post-treatment ($p < 0.001$ to 0.02). Among RAI patients who achieved euthyroidism within 6 months, 18% developed relapse requiring AT therapy or retreatment. The cumulative incidence of retreatment shows a dramatic inflection point in the RAI group at 1-2 years after index treatment.

Conclusions: Surgery is more durable than RAI for Graves' disease. Hyperthyroidism relapse and need for retreatment after RAI is a chronic concern and can arise even years after index treatment.

13. Intraoperative Hemodynamic Instability During Laparoscopic Adrenalectomy for Pheochromocytoma Without Preoperative Medical Preparation Versus Non-Secreting Tumor

Claire Nomine-Criqui¹, Amelie Delens², Phi-Linh Nguyen-Thi³, Florence Bihain⁴, Nicolas Scheyer⁵, Lea Demarquet⁶, Philippe Guerci⁶, Thomas Fuchs-Buder⁶, **Laurent Brunaud**⁷

¹Department of Surgery (CVMC, 7eme étage) and INSERM NGERE, Université de Lorraine, University Hospital Nancy, CHRU Brabois Adultes, France, ²Departement de chirurgie, Centre Hospitalier CHR Metz, ³Department of Medical Informatics and Evaluation, University of Lorraine, CHU Nancy, Department of Medical Informatics and Evaluation, ⁴Department of Surgery (CVMC, 7eme étage), Université de Lorraine, University Hospital Nancy, CHRU Brabois Adultes, ⁵University of Lorraine, CHU Nancy, Department of Endocrinology, Nancy, France., ⁶University of Lorraine, CHU Nancy, Department of Anesthesiology and Critical Care Medicine, Nancy, France., ⁷Department of Surgery (CVMC, 7eme étage) and INSERM NGERE, Université de Lorraine, University Hospital Nancy, CHRU Brabois Adultes

Background: Control of hemodynamic features during adrenalectomy for pheochromocytoma is highly recommended by current guidelines to minimize perioperative cardiovascular complications. However, episodes of intraoperative hemodynamic instability have been observed during adrenalectomies with other indications than pheochromocytoma. Prospective data evaluating intraoperative hemodynamic variations during adrenalectomy regardless of the indication are lacking. The objective of this study was to compare the hemodynamic instability score (HI-score) assessed during unilateral adrenalectomy for pheochromocytoma without preoperative medical preparation to non-secreting tumor.

Methods: The HI-score is a validated score quantifying the degree of hemodynamic instability using predefined thresholds (BP, HR, infusion rates of vasoactive drugs and fluids). This is a single continuous variable ranging from 0 to 160, with published median values of 44 in low-risk surgery, 38 to 50 in pheochromocytoma patients after pretreatment using alpha-blockers, and 59 in high-risk surgery. Hemodynamic intraoperative data were collected prospectively every 20 seconds using VitalSignsCapture (GNU) during laparoscopic unilateral adrenalectomies (NCT06062082). No specific preoperative medical preparation was used in included patients.

Results: During the study period, 60 consecutive patients (30 pheochromocytomas versus 30 non-secreting tumors) were included, with a median number of data collections between induction and discharge from the OR (total procedure time) of 318. Median preoperative secretion was 6 times normal in pheochromocytoma group. Mean cumulative intraoperative time outside the target blood pressure range expressed as a percentage of total procedure time was 13.3 vs. 6.8% for SBP >160 mmHg ($p=0.01$), 0.99 vs. 0.04% for SBP >250 mmHg ($p=ns$), and 2.4 vs. 2.8% for MAP <60 mmHg ($p=ns$), respectively. The HI-score during total procedure time was 33 (iqr 27-43) and 20 (11-26) in the pheochromocytoma and non-secreting tumor group, respectively ($p<0.01$). Hi-scores were similar in patients with versus without long-term antihypertensive treatment in both groups ($p=ns$). The median length of hospital stay and 30-day morbidity rate were 1.5 days and 6.6%, respectively, with no difference between both groups.

Conclusions: Although intraoperative hemodynamic instability remains higher in the pheochromocytoma group without preoperative medical preparation, both groups have similar hypotensive episodes and are classified as "low risk surgery". These data question the utility of preoperative medical preparation in patients with pheochromocytoma.

14. Novel Repurposing of Sulfasalazine to Synergize with Cisplatin for Improved Treatment of Adrenocortical Carcinoma Through the SLC7A11/xCT- IncRNA OIP5-AS1 Network Pathway

Chitra Subramanian¹, Kelli McNamara¹, Seth Wyatt Croslow², Yonqi Tan², Katja Kiseljak-Vassiliades³, Margaret Wierman³, Jonathan Sweedler², **Mark S. Cohen**⁴

¹*Biomedical and Translational Sciences, Carle Illinois College of Medicine at the University of Illinois Urbana Champaign*, ²*Chemistry, University of Illinois Urbana Champaign*, ³*University of Colorado Anschutz School of Medicine*, ⁴*Surgery, Carle Illinois College of Medicine at the University of Illinois Urbana Champaign*

Background: Our recent multi-genomic analysis of adrenocortical carcinomas (ACC) identified SLC7A11 as a novel biomarker. The FDA approved anti-inflammatory drug, sulfasalazine (SAS), induces ferroptosis by blocking SLC7A11 expression. We hypothesized that SAS can be repurposed to target ACC cells and synergize with standard ACC therapies like cisplatin in vitro.

Methods: Expression of SLC7A11 and its association with ACC survival was analyzed using GEPIA. Validated ACC cell lines NCI-H295R, ACC1 and ACC2 were grown in 2D culture. Cell Titer Glo assay was used to calculate viability. Synergy with cisplatin was determined using Chow-Talalay analysis. Western blot(WB) analysis evaluated apoptosis and other changes in target proteins. RT-PCR identified changes in steroidogenic enzymes and cell cycle proteins. Lipid peroxidation was identified using C11BODIPY. Mass spectrometry(MS) analyzed changes in lipids.

Results: TCGA database analysis in GEPIA showed SLC7A11 and linked IncRNA OAP5-AS1 are highly expressed in ACC tumors (n=77) compared to normal adrenals(n=128; p<0.05). This was associated with poor overall(OS) and disease-free survival(DFS) with a hazard ratios(HR) for SLC7A11 of 5.2;p(OS)=0.00046, and 2.7;p(DFS)=0.022. While for OAP5-AS1 HRs were 4.3;p(OS)=0.00012 and 4.8;p(DFS)=0.00011, respectively. Treatment with SAS for 72h had an IC50 value of 0.6031±0.044, 0.4125±0.055, and 0.7994±0.09mM for NCI-H295R, ACC1, and ACC2 cell-lines respectively. SAS(125uM) synergized with standard dose cisplatin for all 3 ACC cell-lines with a combination index<1. All ACC cell-lines treated with SAS resulted in cleavage of PARP, upregulation of p-Akt and p-ERK, and down-regulation of GPX4 and SLC7A11(p<0.05) by WB analysis. MCM2 and MCM7 cell-cycle proteins shown to decrease ACC survival were down-regulated by RT-PCR after SAS treatment of NCIH-295R(95.6% and 90%),ACC1(68% and 66.2%),and ACC2(57% and 17.4%;p<0.01 each). Evaluation of steroidogenic enzymes showed up-regulation of CYP19A1,CYP11B1,CYP11B2,and CYP21A2(p<0.01 each). Treatment of ACC cells with SAS led to lipid peroxidation using C11BODIPY indicating induction of ferroptosis. MS analysis of lipid metabolism showed significant down regulation of phosphatidyl choline (PC), phospho-ethanolamine (PE) and sphingomyelin (SM), p<0.05 each.

Conclusions: SAS down-regulates the SLC7A11-OAP5-AS1 network in ACCs by targeting the Akt/ERK pathway and lipid metabolism. It induces ferroptosis and synergizes with cisplatin in ACCs in vitro, warranting additional translational investigation to evaluate its role as a novel repurposed therapy for ACC.

◆ **15. Staining Patterns of Aldosterone Synthase in Patients Undergoing Surgery for Primary Aldosteronism: Clinical and biochemical correlation and proposal of nomenclature system**

William MacDonald¹, Thomas J. Giordano², Joshua Leisring³, Anil Parwani⁴, Priya H. Dedhia¹, John Phay¹, Lawrence S. Kirschner⁵, Barbra S. Miller¹

¹*Surgery, The Ohio State University,* ²*Pathology, University of Michigan,* ³*Internal Medicine - Nephrology, The Ohio State University,* ⁴*Pathology, The Ohio State University,* ⁵*Internal Medicine - Endocrinology, The Ohio State University*

Background: The ability to evaluate aldosterone synthase (CYP11B2) staining patterns as part of routine clinical practice in patients undergoing unilateral adrenalectomy for primary aldosteronism (PA) now exists. How patient outcomes are impacted according to staining patterns is not well described, and no widespread system of categorization of staining patterns exists. We hypothesized that clinical and biochemical outcomes after unilateral adrenalectomy are impacted by different CYP11B2 staining patterns, and benefit will come from development of a system of categorization.

Methods: A retrospective review of patients undergoing adrenalectomy for PA between 1/2015 and 9/2023 was conducted. Demographics, clinical data, adrenal vein sampling (AVS) results, pathology reports, and CYP11B2 staining patterns were analyzed. Staining patterns were categorized and a system of nomenclature developed. Clinical and biochemical outcomes were compared with age, sex, race, AVS, CYP11B2 staining patterns, and other variables. Descriptive and statistical analyses were performed using SPSS.

Results: 43 patients (21 male, 24 Caucasian, 15 Black, 4 Other) were identified. Median age was 46.6 years (range 31.4-66.0). Mean adenoma size was 2.0±0.83cm. Pre-operative mean arterial pressure (MAP) was 106.5±11.6mmHg and at last follow-up 95.2±11.3mmHg, with a decrease in antihypertensive WHO Defined Daily Dose of 2.93±2.79. Median change in aldosterone after adrenalectomy was 43.7±46.7ng/dL. Complete biochemical cure was noted in 35/43 (81.4%) and complete clinical cure in 27.9%. Adrenocortical cancer (ACC) was diagnosed once. 6 patterns of CYP11B2 staining were identified. 23/43 revealed CYP11B2 staining in adenomatous tissue only. Non-adenomatous staining was noted in single or multiple micronodules, hyperplastic areas, and ACC. Staining in 3/23 involved only a portion of the adenoma. 4/9 patients age <40 had areas of CYP11B2 staining in non-adenomatous tissue. There were no differences between staining pattern and sex (p=0.990), race (p=0.933), or age (Eta=0.017). There was no difference between staining pattern and clinical (p=0.909) or biochemical (p=0.857) outcomes, or adrenal vein sampling interpretation (p=0.271; clear lateralization vs. evidence of lateralization).

Conclusions: Adrenalectomy specimens reveal aldosterone synthase in non-adenomatous tissue in many patients treated for PA. The impact of these patterns on clinical outcomes requires additional investigation. Uniform categorization of staining patterns will allow for consistent reporting across studies.

◆ 16. Avoidable Biopsies? Validating computer-aided diagnosis (CAD) software in indeterminate thyroid nodules

Christopher Carnabatu¹, David Fetzer², Alexander Tessnow³, Shelby Holt¹, Vivek Sant¹
¹Endocrine Surgery, University of Texas Southwestern, ²Radiology, University of Texas Southwestern, ³Endocrinology, University of Texas Southwestern

Background: Cytologically indeterminate thyroid nodules are a persistent source of diagnostic uncertainty, especially when molecular testing does not return benign results. Currently four artificial intelligence (AI) systems have been approved to risk-stratify thyroid nodules through sonographic characterization. We sought to validate the ability of one such AI system, Koios DS (Koios Medical, Chicago, IL), to aid in improving risk stratification of indeterminate thyroid nodules.

Methods: A retrospective single-institution dataset was compiled of 28 Bethesda III/IV thyroid nodules from 2018-2023, all of which underwent molecular testing and surgical resection. Surgical pathology served as ground truth for classifying outcomes. Thyroid ultrasound studies were retrieved, and ACR TI-RADS levels were recorded. Nodules were retrospectively evaluated using the AI CAD. The nodule of interest was selected by a coauthor blinded to pathologic results, and both an automated TI-RADS level and AI-risk adjusted TI-RADS level (AI-adapter) were recorded. Agreement between radiologist and automated TI-RADS was assessed using Cohen's kappa statistic. Performance of malignancy classification was compared between radiologist and AI-risk adjusted scoring. Biopsy thresholds were re-evaluated using AI-risk adjusted TI-RADS levels.

Results: In this cohort, 7 (25%) nodules were malignant on surgical pathology. Median nodule size was 2.4 cm (IQR 1.8-2.9 cm). Median radiologist TI-RADS level was TR-4 (IQR 3.7-4.2) and automated TI-RADS level TR-4 (IQR 3-4), with Kappa 0.25 ("fair agreement"). Median AI-risk adjusted TI-RADS was 3 (IQR 2-4). Malignancy classification by radiologist provided sensitivity 100%, specificity 33.3%, PPV 33.3%, and NPV 100%, compared to AI-risk adjusted TI-RADS performance with sensitivity 85.7%, specificity 76.2%, PPV 54.5%, and NPV 94.1%. Utilizing AI risk-adjusted TI-RADS, 14 of 28 biopsies would have been recommended against, 13 of which were surgically benign and the remainder a 1.2 cm papillary thyroid cancer.

Conclusions: Automated TI-RADS levels consistently agreed with radiologist-derived levels for indeterminate thyroid nodules. In most cases, AI-risk adjusted scoring downgraded TI-RADS levels using its AI-adapter. Malignancy classification with AI-adapter improved PPV significantly over traditional TI-RADS at minimal cost of NPV. Risk stratification with the addition of the AI-adapter may allow for more accurate patient counseling and avoid biopsies in select cases that would otherwise return cytologically indeterminate and require diagnostic surgery.

◆17. DAXX Associated with Aggressive Pancreatic Neuroendocrine Tumor Behavior After R0 Resection

Benjamin C Greenspun¹, Amanda C Foshag¹, Abhinay Tumati¹, Teagan Marshall¹, Dongxiang Xue¹, Liuliu Yang¹, Shuiping Chen¹, Thomas J Fahey III¹, Rasa Zarnegar¹, Brendan M Finnerty¹
¹*Surgery, Weill Cornell Medicine*

Background: Pancreatic neuroendocrine tumors (PNETs) can exhibit a wide spectrum of behavior, ranging from localized indolent tumors to aggressive metastatic disease. *ATRX*, *DAXX*, and *PTEN* mutations have been proposed as drivers in the tumorigenesis of PNETs, as well as independent poor prognostic factors for metastasis and mortality. We sought to identify genomic signatures of disease specific mortality and recurrence after surgery for curative intent to validate these findings.

Methods: PNET patients in The Cancer Genome Atlas who underwent whole exome sequencing with available survival data were identified using cBioPortal. Clinicopathologic variables, genomics, treatment patterns, and outcomes were retrospectively analyzed, employing two-tailed hypothesis tests ($p < 0.05$ considered significant) using Prism 9®.

Results: 70 patients with disease specific survival data who underwent R0 resection were identified. 45/70 patients were disease free while 25/70 patients had disease specific mortality or recurrent disease (aggressive cohort). For demographic and epidemiologic factors, there were no significant differences in age ($p = 0.2445$), sex ($p = 0.2005$) or median follow up ($p = 0.1223$). For clinicopathologic variables, the aggressive cohort had significantly greater tumor size (median 5 vs 3.2cm, $p = 0.0117$), vascular invasion (88 vs 40%, $p = 0.0002$), and N1 stage (68 vs 35.6%, $p = 0.0127$). Perineural invasion and extrapancreatic spread were not significantly different. Tumor mutation burden (TMB) was significantly greater in the aggressive cohort (median 0.77 vs 0.43 mutations/Mb, $p = 0.0041$). There were no significant differences in *MEN1*, *ATRX*, or *PTEN*; however, *DAXX* mutations were significantly more frequent in the aggressive cohort (36 vs 11.1%, $p = 0.0261$).

Conclusions: Our analysis demonstrated the prognostic significance of *DAXX* mutations after R0 resection. Although TMB was significantly greater in patients with advanced disease, it is unlikely to be clinically significant, as this value is below the threshold for which other solid organ malignancies have benefited from immunotherapy. Future studies investigating *DAXX* mutations as a prognostic tool to guide adjuvant therapy and drive potential targeted treatments are warranted.

◆18. Recurrence and Treatment Trends of Pancreatic Neuroendocrine Tumors: An 18-year review

Amanda L Bader¹, Sarah Landau¹, Jasmine Hwang¹, Jesse Passman¹, Major K Lee¹, Douglas Fraker¹, Charles Vollmer¹, Heather Wachtel¹

¹*Department of Surgery, Hospital of the University of Pennsylvania*

Background: Pancreatic neuroendocrine tumors (PNETs) represent 1-2% of pancreatic neoplasms. While prognosis is generally favorable, approximately 10% recur after surgical resection. With advances in multimodal therapy, the management of recurrences has changed substantially. This study aims to describe the patterns of recurrence and respective treatments and compare the impact of multimodal therapy on survival in recurrent PNET.

Methods: This is a single-institution retrospective study of patients diagnosed with a PNET from 2004-2022. Primary outcomes included overall survival, disease-specific survival, and recurrence-free survival. Survival probabilities were calculated using the Kaplan-Meier method and probabilities were compared using log-rank tests. Cox proportional hazards multivariable modeling was performed.

Results: In total, 300 patients were included, 207 of which had non-metastatic disease at presentation. Of these, 94.7% (196/207) had surgery at the time of diagnosis, 25.5% of whom recurred (51/196). Average time to recurrence was 47 months, with liver as the most common site of first recurrence (72.6%, 37/51). The most common initial treatment of recurrence was a somatostatin analogue (SSA) (67.6%, n=25) followed by surgery (25.5%, n=13). Patients with recurrent disease were treated on average with ≥ 2 different treatment modalities; however, there was no difference in survival between patients treated with SSA alone versus those treated with SSA and either surgery, liver-directed embolization, or peptide receptor radionucleotide therapy (PRRT) ($p=0.25$). Overall survival for patients without metastasis at diagnosis was 94% and 78% at 5 and 10 years, respectively; these numbers drop to 32% and 15% for patients with metastases at diagnosis. Across all patients, there was no significant difference in overall survival between patients with and without recurrence (HR 1.09, 95% CI: 0.6–2.0, $p=0.80$). However, there was a significance difference in disease-specific mortality between those that recurred and those that did not ($p<0.001$).

Conclusions: Of patients with PNET managed with upfront surgical resection, a quarter developed recurrent disease, most commonly intrahepatic. Adjuvant treatment of these recurrences employed both locoregional, liver-directed, and systemic therapies. Overall survival was similar between groups, reflecting the indolent nature of PNETs. However, patients with recurrent disease had higher disease-specific mortality despite multimodality therapy.

◆ 19. Surgery Enhances the Effectiveness of Peptide Receptor Radionuclide Therapy in Metastatic Gastroenteropancreatic Neuroendocrine Tumors

Joseph Tobias¹, Sara Abou Azar¹, Rushabh Gujarathi¹, Tanaz Vaghaiwalla², Chih-Yi Liao¹, Xavier Keutgen¹

¹University of Chicago, ²University of Tennessee Health Science Center

Background: Resection of the primary tumor and surgical debulking are part of the armamentarium to treat metastatic well-differentiated gastroenteropancreatic neuroendocrine tumors (GEP-NETs). With the advent of systemic therapies such as Peptide Receptor Radionuclide Therapy (PRRT, ¹⁷⁷Lutetium-DOTATATE), the role and sequence of surgical therapy in metastatic GEP-NETs might be questioned. Drawn from our own anecdotal experience, we hypothesized that surgical resection prior to PRRT enhances its effectiveness in patients with metastatic GEP-NETs.

Methods: This is a retrospective cohort study of 94 patients with metastatic well-differentiated GEP-NETs treated with ¹⁷⁷Lutetium-DOTATATE PRRT at a quaternary care center between 2017 and 2023. We compared demographic, pathologic and outcome variables of 60 patients who underwent surgery (resection of primary tumor and/or surgical debulking), to those from 34 patients who never had surgery. The primary outcome was progression-free survival (PFS) according to RECIST. ⁶⁸Ga or ⁶⁴Cu-DOTATATE PET CT were used to calculate tumor volumes (TV) using the MIM Encore workstation. Multivariable regression was used to model the effect of TV on response to PRRT.

Results: Both the surgical and non-surgical cohorts were matched in terms of age, sex, tumor grade (I-III) and number of PRRT cycles. The surgery cohort had more small bowel NETs (31 vs. 6, $p=0.03$), but there were no differences in other primary sites. Within the surgery cohort, 58 patients had their primary tumors resected, of which 36 also underwent debulking of metastatic disease. Median TV prior to initiation of PRRT was 182mL (IQR 86-451) in the surgery cohort compared to 620mL (IQR 380-958) in the no-surgery cohort ($p<0.001$). Kaplan Meier analysis of median PFS after PRRT was 26.47 months (95% CI, 18.2-30.53) in the surgery cohort compared to 14.97 months (95% CI, 11.50-21.03) in the no-surgery cohort [HR 0.62, $p=0.06$]. Controlling for surgery and primary tumor site, there was also a strong trend towards improved PFS with tumor volumes less than 300mL [HR 1.85, $p=0.09$].

Conclusions: Primary tumor resection and surgical debulking enhance the effectiveness of ¹⁷⁷Lutetium-DOTATATE PRRT in the treatment of metastatic well-differentiated GEP-NETs. This favorable effect might be the result of lower tumor burden achieved through surgical resection.

◆20. **Oncogenic Mutations in the TP53 and PI-3-Kinase/AKT Pathway are Independent Predictors of Survival for Advanced Thyroid Cancer: Analysis from the molecular screening and therapeutics (most) program**

Elan Novis¹, Anthony Glover², John Grady³, Audrey Silvestri⁴, Subotheni Thavaneswaran⁵, Frank Lin⁶, Mandy Ballinger⁷, David Thomas⁸

¹St Vincent's Hospital, Sydney, St Vincent's Clinical School, University of NSW, Sydney Australia, ²The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, ³The Kinghorn Cancer Centre Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, ⁴The Kinghorn Cancer Centre, Garvan Institute of Medical Research, Omico, the Australian Genomic Cancer Medicine Centre, Australia, ⁵The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, The NHMRC Clinical Trials Centre, University of Sydney, Australia, ⁶The NHMRC Clinical Trials Centre, University of Sydney, ⁷The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, Omico, the Australian Genomic Cancer Medicine Centre, Australia, ⁸The Kinghorn Cancer Centre, Garvan Institute of Medical Research, St Vincent's Clinical School, University of NSW, Sydney Australia, Omico, the Australian Genomic Cancer Medicine Centre, Australia, Centre for Molecular Oncology, University of New South Wales, Australia

Background: Thyroid cancers with oncogenic mutations in the PI-3-Kinase/AKT pathway have a higher risk of recurrence, however the survival significance of these genetic mutations remain poorly understood. This study assessed the prognostic value of genomic profiles for advanced thyroid cancer patients who had progressed on conventional treatment across different histological types.

Methods: The genomic profile of thyroid cancer patients recruited to a molecular oncology clinical trial for treatment-refractory advanced cancer were analysed. Patients' archival tumour samples underwent comprehensive genomic profiling (CGP) using a panel-based sequencing assay and reviewed by a molecular tumour board (MTB). The primary outcome was overall survival (OS) from the diagnosis of metastatic disease, and genomic profiles were stratified by oncogenic mutations and by the presence of cancer related pathways.

Results: From 2018-21, 4955 patients were recruited to the clinical trial with 44 (0.9%) having a diagnosis of thyroid cancer with 9% medullary (MTC), 39% differentiated (DTC), 30% poorly differentiated (PDTC) and 23% anaplastic thyroid cancers (ATC). The median age was 59 years and 55% were female. Sequencing of the 40 follicular derived thyroid cancer samples revealed two variants per patient (range 0–6) with *TP53* mutations present in 17 patients (42.5%), followed by *BRAFV600E* (11, 27.5%), *NRAS* (9, 22.5%), PI-3-Kinase/AKT pathway mutations (9, 22.5%) and *TERT* promoter mutations (7, 17.5%). Both *TP53* and PI-3-Kinase/AKT pathway alterations were associated with reduced OS (HR=5.19, 95% CI 1.59-16.70, P=0.02 and HR=10.12, 95% CI 1.61 to 63.76, P=0.01). Multivariate Cox regression showed both histological type (ATC, HR = 12.93, 95% CI 2.41-88.50, P=0.004), PDTC, HR=5.19, 95% CI 1.17-25.54, P=0.039) and *TP53* and/or PI-3-Kinase/AKT pathway mutations (HR = 4.73, 95% CI 1.40 to 19.14, P=0.017) were independently associated with OS. Following MTB, 57% received a genomically matched treatment recommendation, with 9% starting treatment as per the MTB recommendation.

Conclusions: In this advanced thyroid cancer population, the presence of *TP53* and/or PI-3-Kinase/AKT pathway mutations were an independent predictor of OS. These results suggest that genomic profiling has a role in informing prognosis and can be used to further stratify risk and treatment independent of histology for patients diagnosed with advanced thyroid cancer.

◆21. Assessing Large Language Model (LLM) Responses to Online Patient Questions on Thyroid Cancer and Disease: Can LLM address unmet patient information needs and reduce provider burnout?

Rajam Raghunathan¹, Anna R. Jacobs², Vivek R. Sant³, Lizabeth J. King¹, Gary D. Rothberger⁴, Jason D. Prescott¹, John D. Allendorf⁵, Carolyn D. Seib⁶, Kopal N. Patel¹, Insoo Suh¹

¹*Section of Endocrine Surgery, New York University Grossman School of Medicine*, ²*NYU Grossman Long Island School of Medicine*, ³*Department of Surgery, UT Southwestern Medical Center*, ⁴*Division of Endocrinology, New York University Grossman Long Island School of Medicine*, ⁵*Department of Surgery, New York University Grossman Long Island School of Medicine*, ⁶*Department of Surgery, Stanford University School of Medicine*

Background: Patient electronic messaging has increased clinician workload contributing to non-billable hours and burnout. Large language models (LLMs) can respond to patient queries, but there are no objective studies on the accuracy, quality, and empathy of LLM responses in thyroid disease.

Methods: This cross-sectional study randomly selected 33 out of 52 patient questions found on an online community (Reddit's /askdocs). All questions were found through a "thyroid+cancer" or "thyroid+disease" search and had verified-physician responses. Additional responses to each question were generated using ChatGPT v3.5 and v4. Questions and responses were anonymized and graded for accuracy, quality, and empathy using a 4-point Likert scale by providers who were blinded. Providers included 3 endocrine surgeons, 1 endocrinologist, and 1 endocrine surgery physician assistant (n=5). Results were analyzed using a single-factor ANOVA.

Results: In terms of accuracy, results showed an average rating of 3.12/4 (SD 1.011), 3.53/4 (SD 0.677), and 3.73/4 (SD 0.531) for physician, GPT-3.5, and GPT-4 responses, respectively ($p<0.01$); 4 was defined as "completely true information," and 3: "greater than 50% true information." In terms of quality, results showed an average rating of 2.45/4 (SD 0.702), 2.98/4 (0.671), and 3.26/4 (0.671) for physician, GPT-3.5, and GPT-4 responses, respectively ($p<0.01$), where 4 was defined as "provided information beyond what was asked," 3: "completely answers the question," and 2: "partially answers the question." In terms of empathy, results showed an average rating of 1.69/4 (S 0.778), 2.64/4 (SD 0.676) and 3.24/4 (SD 0.732) for physician, GPT-3.5, and GPT-4 responses, respectively ($p<0.01$); 4 was defined as, "anticipates and infers patient feelings from the expressed question," 3: "mirrors the patient's feelings," 2: "contains no dismissive comments," and 1: "dismissive towards patient feelings." Physician responses were identified by survey respondents as containing "dangerous or false information" 11% of the time, compared with 2% for GPT-3.5 and 1% GPT-4 responses. The highest level of empathy (4) was recognized most frequently in GPT-4 responses (41%) compared to GPT 3.5 (15%) and physician responses (5%).

Conclusions: Large language model responses to patient queries about thyroid disease are shown to be more accurate, more complete, more empathetic, and more consistent than physician responses.

◆22. The State of Affairs: Assessing the scope of endocrine surgery exposure in general surgery residencies across the U.S.

Kristen M HoSang¹, Lindsay Talemal¹, Terry P Gao¹, Lindsay E Kuo¹

¹*Temple University Hospital*

Background: Endocrine surgery (ES) is a core component of general surgery (GS) training. The aim of this study was to evaluate the current landscape of ES education in surgical residency, and any association with entrance into ES fellowships.

Methods: Program websites for all 345 AGCME-accredited GS residency programs were identified; those with information on rotation schedules were included. Programs were categorized by U.S. region, program type, number of residents, and type of ES experience (dedicated, combined with another subspecialty, or none). ES faculty were defined as AAES members or having a self-reported thyroid/parathyroid/adrenal practice. Programs which graduated an AAES fellow from 2013 onwards were identified. Program characteristics associated with type of ES experience, having ES faculty, and entrance into ES fellowship were determined using chi-square analysis.

Results: 313(91%) programs had information regarding residency rotations: 110(35%) in the South, 82(26%) Northeast, 75(24%) Midwest, 45(14%) West, and 1(0.3%) Other. There were 106(34%) university-based programs, 78(25%) community-based, 120(38%) community-based/university affiliated(CB/UA), and 9(2.7%) military. Most programs reported ES educational experiences: 63(20%) with dedicated rotations and 198(63%) combined, while 52(16.6%) had none reported. Most programs (240, 77%) had a self-identified endocrine surgeon on faculty. The West had a disproportionately high percentage of programs with no ES experience (20, 44%, $p<0.01$). While community-based programs a disproportionately low presence of endocrine surgeons (54, 22.5%, $p<0.01$), CB/UA programs had the highest rate of no ES experience (22, 18%, $p<0.01$). There were no associations between program size and presence of an endocrine surgeon or an ES experience. Of the 212 ES fellows in the U.S. in the last 10 years, most came from large (185,87%), university-affiliated (161,76%) programs. The Northeast graduated 73(34%) residents to ES fellowships, disproportionately higher than all other regions ($p<0.01$).

Conclusions: Nearly 24% of GS programs have no self-identified endocrine surgeon on faculty, and 17% report no specific ES educational experience. Region and program type were strongly associated with ES exposure, while program type was associated with the presence of a dedicated endocrine surgeon. Efforts are needed to ensure that surgical residents, regardless of location, size, or program type, receive comprehensive, high quality ES education.

◆23. A SIMPL Analysis: Identifying deficiencies in general surgery trainees autonomy and competence in performing thyroidectomy and parathyroidectomy

Jonathan E Williams¹, Aayushi Sinha¹, Susan C Pitt¹, David T Hughes¹, Hunter J Underwood¹

¹*Surgery, University of Michigan*

Background: Although many parathyroid and thyroid procedures are performed by non-fellowship trained general surgeons in the United States, there is growing uncertainty regarding the preparedness of graduating residents to perform these procedures competently. This study investigates trends in competency and autonomy among general surgery residents performing parathyroid and thyroid procedures using a national survey-based dataset.

Methods: A retrospective analysis of the Society for Improving Medical Professional Learning (SIMPL) database was performed. Survey-based case data from categorical general surgery residents performing parathyroidectomy or thyroidectomy procedures between 2015 and 2023 were included. Operative performance was dichotomized into “not competent” (defined as receiving a faculty rating of “unprepared,” “inexperienced,” or “intermediate performance”) and “competent” (defined as receiving a faculty rating of “practice-ready” or “exceptional”). Operative autonomy was also dichotomized into “no meaningful autonomy” (defined as receiving a faculty rating of “show and tell” or “active help”) and “meaningful autonomy” (defined as receiving a faculty rating of “passive help” or “supervision only”). Agreement between resident and faculty evaluations were assessed. Logistic regression was used to examine resident performance and autonomy using PGY level and case complexity as covariates.

Results: A total of 907 parathyroidectomy and 1,555 thyroidectomy procedures from 77 participating general surgery residency programs were included. A competent performance was observed in 28.3% of parathyroidectomies and 31.7% of thyroidectomies, while meaningful autonomy was observed in 31.6% of parathyroidectomies and 32.3% of thyroidectomies. Residents and faculty agreed on performance and autonomy granted in most cases, however when discordant residents often underestimated their performance or granted autonomy. Performance did not vary by case complexity, however autonomy decreased with increasing case complexity. The likelihood of a PGY5 resident achieving a competent performance rating or meaningful autonomy rating was 73% and 56%, respectively.

Conclusions: A substantial amount of graduating general surgery residents do not demonstrate competent performance or meaningful autonomy in cervical endocrine procedures. The discrepancy between competent performance and meaningful autonomy suggests that these factors remain challenging to assess. Further educational initiatives are needed to improve the competence of graduating general surgeons performing parathyroidectomy and thyroidectomy procedures given geographic disparities in access to high-volume endocrine surgeons.

◆24. Entrustable Professional Activities in Endocrine Surgery: A National Pilot Study

Polina Zmijewski¹, Chandler McLeod¹, Ramsha Akhund¹, Ashba Allahwasaya¹, Taylor Lafrinere², Jessica Fazendin¹, Sally E Carty³, Paul H Graham⁴, David Hughes⁵, Melanie Lyden⁶, Barbra Miller⁷, Brendan Finnerty⁸, Linwah Yip³, Brenessa Lindeman¹
¹University of Alabama at Birmingham, ²myTIPreport, ³University of Pittsburgh, ⁴The University of Texas MD Anderson Cancer Center, ⁵University of Michigan, ⁶The Mayo Clinic, ⁷The Ohio State University, ⁸Weill Cornell Medical College

Background: Entrustable Professional Activities (EPAs) are an assessment framework designed to facilitate competency-based education. The American Association of Endocrine Surgeons (AAES) drafted EPAs for Comprehensive Endocrine Surgery (ES) to assess learners in core topics and has been engaged in a national pilot study of these assessments.

Methods: Fourteen EPAs were defined. There were 10 “core” EPAs, with 6 having 3 phases (pre, intra, and post-operative) and four single-phase. There were also four elective EPAs, all of which were 3-phase. Beginning in July 2022, 10 institutions volunteered to collect 3-item MAs of ES fellow and general surgery resident performance in EPAs electronically using a web-based platform, where entrustment was measured on a 5-point scale.

Results: A total of 699 MAs were submitted between 7/22-9/23, with a wide range between programs (3- 468, median: 24). Among 3-phase core EPAs, the intraoperative phase was most commonly assessed (n=496), followed by the pre- and post-operative phases (n= 108 and 55, respectively). Sixty-five MAs were submitted for elective EPAs and 39 for single phase EPAs. Five-hundred MAs were completed for ES fellows or chief residents, 22 for PGY2s, 163 for PGY3s, and 6 for PGY4s. Of 500 entrustment ratings of fellows or chief residents, 208 (41.6%) overall were in the “practice ready” (4) or “can teach others” (5) category. Entrustment scores for fellows and chief residents improved longitudinally throughout the year, with 37.5% achieving highest (4/5) entrustment scores in the first 6 months of the academic year and 80.4% achieving highest scores in the second half of the year (p<0.001). Intraoperative entrustment scores were lowest in the adrenal category, with only 12% of learners achieving highest entrustment, vs. 54.8% in the thyroid category, and 63.4% in the parathyroid category (p<0.001). Learners were more likely to achieve highest entrustment in the first 6 months for preoperative (59.6%) and postoperative (55%) phases of care, compared to the intraoperative phase of care (29.9%) (p<0.001).

Conclusions: This contributes to concurrent validity evidence for ES EPAs. Entrustment scores improved longitudinally throughout the academic year, and learners were likely to achieve entrustment earlier in nonoperative phases of care.

◆25. Objective Assessment of Changes in Non-Specific Symptoms after Parathyroidectomy for Primary Hyperparathyroidism

Gustavo Romero-Velez¹, James F Bena¹, Huijun Xiao¹, Dara Z Ikejiani¹, Eren Berber¹, Katherine Heiden¹, Vikram Krishnamurthy¹, Joyce Shin¹, Allan Siperstein¹, Judy Jin¹

¹Cleveland Clinic

Background: Parathyroidectomy (PTX) is indicated in patients with primary hyperparathyroidism (PHPT) who have osteoporosis or nephrolithiasis. While consensus is not uniform in PTX for non-specific symptoms, patient-reported questionnaires have demonstrated improved quality of life (QOL) afterwards. The aim of this study was to evaluate fatigue and sleep patterns after PTX using objective data from continuous wearable devices.

Methods: This is a prospective study of consecutive patients undergoing PTX for PHPT from August 2022-July 2023. Each patient received a Fitbit-Inspire (Fitbit-Inc, San Francisco, CA) to continuously track physical activity and sleep patterns, starting 1-month before to 6-months after surgery. Euthyroid patients who underwent thyroidectomy (TT) served as controls. A disease-specific validated QOL questionnaire (PROMPT) was completed at baseline and 6-months. Data was compared within and between groups using linear mixed effect models and presented as changes with 95% confidence intervals.

Results: Fifty-one patients were included (PTX=38, TT=13) in this interim analysis, of which 84% were women. At baseline, patients in the PTX and TT groups were similar except PTX patients were older (64 vs 41 years, **p<0.001**), had fewer daily steps (5,784 vs 8,589, p=0.17) and lower percent of deep sleep (12% vs 19%, **p<0.001**). Baseline PROMPT score was similar between groups (44 vs 49, p=0.31). There was a decrease in steps for both groups 2-weeks postoperatively (PTX= -1,659 [-2,505,-814] **p<0.001**; TT= -1,733 [-3,390,-76] **p=0.04**) but no significant change was seen at 6-months or within groups. When comparing data adjusted for age from baseline to 6-months postoperatively, the PTX group showed a decrease in the number of night awakenings (-1.9 [-3.1,-0.8], **p<0.001**), the deep sleep percent was increased but not significant (0.27 [-0.97,1.51], p=0.67). The PROMPT score (-17.12 [-22.0,-11.6], **p<0.001**) also improved, including its sleep subdomain (-12.8 [-20.9,-4.6], **p<0.01**).

Conclusions: While patient-reported outcomes have demonstrated improved sleep after PTX, this is the first study to offer objective findings that could explain such changes. Prior to PTX, the percentage of deep (restorative) sleep was observed to be significantly less. After PTX, patients had fewer nighttime awakenings, and with improvement on the overall and sleep specific PROMPT questionnaires.

◆26. Atypical Parathyroid Neoplasm with Soft Tissue Extension: Is Tis Accurate?

Hope A Feldman¹, Angelica Silva-Figueroa², Gili Halfteck², Michelle Williams², Naifa Busaidy², Steven Waguespack², Paul Graham², Nancy Perrier²

¹Geisinger Medical Center, ²MD Anderson Cancer Center

Background: Atypical parathyroid neoplasms (APN) represent a diagnostic challenge where the distinction between benign and malignant is not always apparent. In the American Joint Committee on Cancer (AJCC) 8th edition, APNs are defined as pathological Tis disease while T1 parathyroid carcinoma (PC) is limited to the parathyroid gland with extension limited to soft tissue. We aimed to determine whether atypical parathyroid neoplasm with soft tissue extension has a clinical course more similar to APN without soft tissue extension or to PC with soft tissue extension, and validate the novel Tis category.

Methods: After obtaining IRB approval, we identified all patients treated at a single institution for PC and APN between January 1990 and July 2021 in a prospectively maintained database. Patients without two years of follow-up data were excluded from analysis. Continuous variables were compared using analysis of variation (ANOVA). Analyses were performed using R version 4.0.2

Results: Seventy-one patients were identified that met inclusion criteria of whom 49 (69%) had parathyroid carcinoma with soft tissue extension, 7 (10%) had atypical parathyroid neoplasm with soft tissue extension and 15 (21%) had atypical parathyroid neoplasm without extension. The groups were comparable with regard to age of diagnosis ($p=.362$). After an average follow-up duration of 84 months from date of diagnosis, 7 patients with T1 PC went on to develop distant metastases whereas 0 patients with APN developed distant metastases. There were no documented mortalities among patients with APN, whereas 14 patients with PC died during the follow-up period. Of the mortalities, 5/14 (35.7%) were attributable to disease.

Conclusions: Atypical parathyroid neoplasm represents an entity that is distinct from parathyroid carcinoma. Despite the fact that there may be a subset of patients with APN with soft tissue extension, the clinical course more closely follows that of a patient with APN rather than a patient with PC with the soft tissue extension. Therefore, APN should be categorized as Tis in the novel AJCC staging guideline.

◆27. **Timing of Parathyroidectomy after Kidney Transplantation: A cost-effectiveness analysis**

Rongzhi Wang¹, Stephen Mennemeyer¹, Rongbing Xie¹, Rhiannon Reed¹, Jessica Liu McMullin², Andrea Gillis¹, Jessica Fazendin¹, Brenessa Lindeman¹, Jayme E. Locke¹, Herbert Chen¹

¹UAB, ²University of Utah

Background: Hyperparathyroidism can persist after successful kidney transplantation (KT), necessitating intervention. Parathyroidectomy is the definitive treatment for KT recipients; however, medical management with cinacalcet is increasingly utilized as an alternative. The financial consequences of each treatment remain unclear. As financial toxicity is increasingly recognized as a significant barrier to medical care, we aimed to identify the most cost-effective strategy for managing hyperparathyroidism from the KT recipient's perspective.

Methods: We constructed a patient-level discrete event simulation (DES) model to compare parathyroidectomy and cinacalcet-based medical management. The effects of hyperparathyroidism on allograft survival and all-cause mortality were considered in the DES model with a time horizon of 15 years. Our base case was a 55-year-old KT recipient with persistent hyperparathyroidism and hypercalcemia. The primary outcome was the cost-effectiveness measured by cost per quality-adjusted life years (QALY). The out-of-pocket costs were obtained from Medicare data. An incremental cost-effectiveness ratio (ICER) < \$50,000/QALY was considered cost-effective.

Results: The monthly out-of-pocket cost of cinacalcet ranged from \$12 to \$1177, depending on Medicare Part D, with a base case cost of \$160. Our base case analysis showed that parathyroidectomy was the dominant treatment with lesser cost (\$1340 vs. \$7482) and greater effectiveness (3.16 QALY vs. 2.87 QALY) than cinacalcet. One-way sensitivity analysis on the cinacalcet treatment duration showed that parathyroidectomy became more cost-effective at 6 months. Two-way sensitivity analysis on the monthly cost of cinacalcet and the duration of treatment with cinacalcet showed that if the monthly cost of cinacalcet increased to \$300, parathyroidectomy quickly became more cost-effective than cinacalcet within 3 months post-KT.

Conclusions: The out-of-pocket cost of cinacalcet varies greatly and increases medical expenses for KT recipients with prolonged treatment. Parathyroidectomy becomes more cost-effective if KT recipients continue cinacalcet treatment for longer than 6 months. KT recipients with persistent hyperparathyroidism should be referred for parathyroidectomy promptly after transplantation.

◆28. Optimizing Parathyroidectomy in the Elderly: Delayed intraoperative PTH kinetics

Peter P. Issa¹, Eman Toraih¹, Mohammad Aboueisha¹, Mahmoud Omar¹, Abdallah S. Attia¹, Mohammad Hussein¹, Mohamed Shama¹, Emad Kandil¹
¹Tulane SOM

Background: Intraoperative parathyroid hormone (iPTH) monitoring is essential during parathyroidectomy for primary hyperparathyroidism (pHPT). The Miami criteria requires >50% iPTH drop within 10 minutes of parathyroid gland excision. However, the impact of age on achieving these criteria in pHPT patients is unknown. We examined the influence of age on iPTH kinetics during parathyroidectomy for pHPT.

Methods: This retrospective study evaluated pHPT patients undergoing parathyroidectomy at a high-volume tertiary center. Patients with secondary and tertiary HPT were excluded. Patients were stratified into younger (<65 years) and older (≥65 years) cohorts. iPTH levels were analyzed at baseline and 5-minute intervals post-resection. Regression models were used to analyze predictors of delayed iPTH drop.

Results: The study included 271 biochemically cured pHPT patients. Older patients (n=141) exhibited reduced renal function (median eGFR 70 vs 90 mL/min, p<0.001). The mean time to >50% iPTH drop was 17.6 minutes in the elderly, which is significantly prolonged compared to 3.45 minutes in younger patients (n=130) (p<0.001). Age was an independent predictor of delayed iPTH decay on multivariate regression analysis (p<0.001).

Conclusions: Intraoperative PTH kinetics are significantly delayed in elderly pHPT patients compared to younger counterparts, even after controlling for renal function. An understanding of these slowed PTH dynamics can prevent over-exploration and iatrogenic hypoparathyroidism in older patients. Surgeons should exercise patience in applying the Miami criteria to elderly patients and avoid premature removal of additional parathyroid glands based on delayed PTH drops.

29. The Effect of Surgical Management in Mitigating Fragility Fracture Risk Among Individuals with Primary Hyperparathyroidism

Bahar Golbon¹, Rogeh Habashi², Jonas Shellenberger³, Rebecca Griffiths³, Lisa Avery⁴, Minna Woo⁵, Daniel Pincus⁶, Antoine Eskander⁷, Jesse D Pasternak¹
¹*Surgery, University Health Network (UHN)*, ²*McMaster University*, ³*ICES Queen's*, ⁴*Biostatistics, University Health Network (UHN)*, ⁵*Endocrinology and Metabolism, University Health Network (UHN)*, ⁶*Orthopaedic Surgery, Sunnybrook Health Sciences Centre*, ⁷*Otolaryngology, Sunnybrook Health Sciences Centre*

Background: Primary hyperparathyroidism (PHPT) predominately affects post-menopausal women and causes severe complications, including osteoporosis and fragility fractures. The curative treatment is parathyroidectomy. Surgical management is safe and effective, with low complication rates and durable biochemical cure rates in high-volume centers. One of the PHPT-associated complications, bone fractures, is more pronounced in the elderly and causes a significant risk of premature death. There is a paucity of data describing specific fracture risk reduction after parathyroidectomy, possibly resulting in undertreatment of PHPT. The purpose of this study was to use linked population-based data to determine whether surgical management of PHPT was associated with a reduction in fragility fracture risk.

Methods: This population-based cohort study uses administrative health databases. We identified adults ≥ 18 years biochemically diagnosed with PHPT between 2007–2017. Patients were included if their calcium was ≥ 2.6 mmol/L (≥ 10.42 mg/dL) with concurrent parathyroid hormone of ≥ 2.2 pmol/L (≥ 20.75 pg/mL). We followed patients and compared fracture incidence between those who had parathyroidectomy and those who did not. We used inverse-probability of treatment weighting to estimate the average treatment effect in the treated. Fine-Gray competing risk regression models were used to determine the association between surgery and time to fracture.

Results: Among a cohort of 28,059 with a biochemical diagnosis of PHPT, the mean age (SD) was 65 (14.2), and 75% (N=21,139) were female. Only 12.6% (N=3,523) underwent parathyroidectomy. A larger proportion in the surgical group presented with highly elevated calcium (≥ 2.85 mmol/L [≥ 11.42 mg/dL]) compared to patients in the non-surgical group (25.5% vs 4.1%, SMD=0.632). Further, patients treated with parathyroidectomy were more likely to present with elevated PTH (≥ 6.8 pmol/L [≥ 64.12 pg/mL]) (91.9% surgical vs. 40.9%, SMD=1.282). Crude cumulative incidence of fracture at 12 years post-diagnosis was 11.9% (N=219) in surgical patients and 18.2% (N=2,193) in non-surgical patients. Parathyroidectomy prevented one fracture for every 24 surgeries performed (weighted risk difference=4.3%, 95% CI=1.1%–7.3%) and reduced the hazard of fracture by 19% (weighted HR=0.81, 95% CI=0.68–0.97).

Conclusions: Individuals with PHPT in a large, publically-funded healthcare system may sustain preventable fractures due to surgical undertreatment. Parathyroidectomy significantly reduces the long-term risk of fragility fractures in PHPT patients.

30. Parathyroid Near-Infrared Autofluorescence Use for Parathyroidectomy in Mild Primary Hyperparathyroidism: Results from a randomized monocentric trial

Samuel Frey¹, Sahar Bannani², Cécile Caillard¹, Maëlle Le Bras³, Delphine Drui³, Pascale Guillot⁴, Aurélie Le Thuaut⁵, Eric Mirallié¹

¹*Chirurgie Cancérologique, Digestive et Endocrinienne, Institut des Maladies de l'Appareil Digestif, University Hospital Center of Nantes*, ²*General Surgery, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia*, ³*Service d'Endocrinologie, Diabétologie et Nutrition, University Hospital Center of Nantes*, ⁴*Service de Rhumatologie, University Hospital Center of Nantes*, ⁵*Plateforme de statistiques - Direction de la Recherche, University Hospital Center of Nantes*

Background: Multiglandular parathyroid disease is observed in about 45% of normocalcemic and 15% of mild hypercalcemic primary hyperparathyroidism (PHPT). This situation is challenging, as it requires bilateral cervicotomy with four-gland exploration, and is associated with a higher rate of persistence. Parathyroid near infrared autofluorescence (NIRAF) tends to be used more frequently to prevent hypocalcemia after total thyroidectomy. However, its interest for decreasing operating time and for parathyroid identification during bilateral four-gland exploration remains debated.

Methods: Consecutive patients with sporadic mild PHPT (defined as serum calcium <2.85 mmol/L regarding elevated or non-adapted serum PTH level) were included in this prospective, monocentric, randomized, open labelled trial. Patients underwent randomization between two arms: classic parathyroidectomy (PTx) (classic group) and PTx with NIRAF using Fluobeam® device (Fluoptics®, Grenoble, France) (NIRAF group). All procedures were planned bilateral neck exploration and performed by two experienced surgeons (>40 PTx per year for >15 years). The primary outcome was the mean operating time. Secondary outcomes included: number of visualized and excised glands, rate of complications and cure rate. Based on previous sample size calculation (hypothesizing 25% reduction in operating time using NIRAF with 80% power and an alpha risk of 5%), 66 patients were included in each arm.

Results: 132 patients were included (66 per group): mean age was 64.0±12.0 years, 85.6% were females, mean pre-operative serum calcium level was 2.63±0.11 mmol/L and mean serum PTH level was 91.8±36.9 pg/mL. The mean operating time did not significantly differ between the two groups (47.1±15.4 and 51.2±22.9 minutes in the classic and NIRAF group, respectively) in intention to treat analysis. The use of NIRAF did not significantly modify the number of identified or resected glands (3.2±0.9 versus 3.1±1.0, and 1.2±0.5 versus 1.3±0.5 respectively), nor the rate of complications. The cure rate was similar between groups (92.9% and 93.9% in group 1 and 2, respectively).

Conclusions: In this study, the use of NIRAF, in the hand of experienced surgeons, was not associated with shorter operating time for parathyroidectomy by bilateral neck exploration in mild PHPT patients. Its use did not increase operating time. Nevertheless, its use should be evaluated for training surgeons.

31. Is Desmoplastic Stromal Reaction Useful to Modulate Lymph Node Dissection in Sporadic Medullary Thyroid Carcinoma?

Priscilla Francesca Procopio¹, Francesco Pennestri², Esther Diana Rossi², Stefania La Rocca³, Carmela De Crea², Marco Raffaelli²

¹Fondazione Policlinico Universitario Agostino Gemelli IRCCS, ²Fondazione Policlinico Universitario Agostino Gemelli IRCCS Università Cattolica del Sacro Cuore, ³Ospedale San Pietro Fatebenefratelli

Background: The extension of index operation for surgical treatment of unifocal sporadic medullary thyroid carcinoma (MTC) remains a matter of debate, especially regarding lymphadenectomy. Different peri-operative parameters have been investigated in order to better stratify the risk of nodal metastases (pN1). Recently, the intraoperative evaluation of the presence of desmoplastic stromal reaction (DSR) surrounding the tumor cells has been significantly associated with the prediction of nodal metastasising pattern. As such, it may play a key role in guiding surgical extent in the future.

Methods: Data from all patients who underwent operations between January 1997 and October 2022 with pathological report of MTC were collected. The primary endpoint of the study was the evaluation of risk factors for nodal metastases. The secondary endpoints consisted of the analysis of the correlations between DSR and nodal metastases and sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of DSR for nodal metastases.

Results: Among 246 patients who underwent surgical treatment for MTC, 139 (56.5%) sporadic cM0 patients were eligible for this study and 57 (23.2%) patients (including 17 pN1 lesions) were retrospectively evaluated for DSR. After univariable analysis, median CT (195 vs 73 pg/mL, $p=0.004$), presence of DSR (DSR+) (100% vs 17%, $p=0.002$) and median lesion size (2 vs 1.1 cm, $p=0.042$) were significantly associated with nodal metastases. By means of ROC analysis, we identified the best predictors for CT and lesion size as 113 pg/ml and 2 cm, respectively. After backward stepwise logistic regression, DSR+ and CT>113 pg/mL were identified as independent risk factors for nodal metastases. In our analysis, DSR+ showed a specificity of 100%, a sensitivity of 82.5%, a PPN of 18.4% and a NPV of 100% for nodal metastasis.

Conclusions: Our results suggest that for minimal disease (absence of DSR and CT<100 pg/mL) a more conservative surgical treatment may be performed. Differently, central +/- lateral neck dissection should be considered in case of advanced disease (DSR+ and CT>500 pg/mL). In the "gray zone", surgical treatment should be tailored on patient and lesion features. Further studies with wider sample size are necessary in order to validate our results.

32. Prognostication with Thyroid GuidePx® in the Context of Tall Cell Variants

Steven Craig¹, Cynthia Stretch², Haley Pedersen³, Young Joo Park⁴, Adrian Harvey², Oliver F Bathe²

¹University of Wollongong, ²University of Calgary, ³Qualisure Diagnostics Inc., ⁴Seoul National University College of Medicine

Background: The tall cell variant (TCV) of papillary thyroid cancer (PTC) generally has a worse prognosis compared to the classical variant. Thyroid GuidePx® is a genomic classifier capable of classifying PTC into three molecular subtypes on a fine needle aspirate. Type 3 is characterized by aggressive biology and high recurrence rates regardless of size and lymph node status while Type 1 & 2 have low recurrence rates particularly in early tumors (1-4 cm, no lymph nodes). The purpose of this study was to examine the interaction of TCV histology with Thyroid GuidePx® risk stratification.

Methods: Gene expression data from 728 patients (including 44 TCV cases) from TCGA, Canada, and South Korea were submitted to the Thyroid GuidePx® classifier and dichotomized by early PTC (tumor size 1-4 cm, no lymph node disease) (N=369; 51%) or advanced PTC (N=359; 49%). Early PTCs are considered candidates for lobectomy. Structural recurrence was the primary outcome measure in our analysis. Median follow-up was 37.6 months.

Results: Thyroid GuidePx® identified 129 (35%) Type 1 PTCs, 168 (45.5%) Type 2 PTCs, and 72 (19.5%) Type 3 early PTCs. The recurrence rates for early Type 1, Type 2, and Type 3 PTCs were 3.9%, 1.9%, and 19.4%, respectively. There were no Type 1 TCVs. In Type 2 PTCs, the incidence of TCV was higher in advanced vs. early PTCs (10.2% vs. 4.2%, $P=0.04$). Notably, none of the seven early Type 2 TCVs recurred. In Type 3 PTCs, the prevalence of TCVs was similar in early and advanced tumors (10% vs 9%, *NS*). In early Type 3, TCVs trended towards higher recurrence (28.6% vs 18.5%, *NS*). In advanced Type 3, the recurrence rate was higher in TCVs (50% vs. 14.3%, $P=0.01$).

Conclusions: Thyroid GuidePx® reliably identifies a low-risk subgroup (early Type 1 and Type 2 PTCs) for which conservative procedures would be appropriate. TCVs in this subgroup are uncommon (1.2%), and none of the TCVs in this subgroup recurred. Type 3 PTCs have higher recurrence rates in early and advanced PTC's. TCV appears to further increase recurrence in this subgroup.

33. Variable Practice Patterns in the Surgical Management of Renal Hyperparathyroidism

Sophie Dream¹, Jennifer Kuo², Brenessa Lindeman³, Herbert Chen³, Lindsay Kuo⁴
¹Medical College of Wisconsin, ²Columbia University, ³University of Alabama at Birmingham, ⁴Temple University

Background: Hyperparathyroidism is common among patients with chronic kidney disease, end stage kidney disease, and kidney transplant. The American Association for Endocrine Surgery(AAES) published clinical practice guidelines that address the surgical treatment of secondary(SHPT) and tertiary(THPT) hyperparathyroidism. The purpose of this study is to determine practice patterns for the surgical management of SHPT and THPT prior to guideline publication.

Methods: With the approval of the AAES, a Qualtrics email survey was sent to AAES membership in 2022 about current clinical decision-making for SHPT and THPT. Respondents were divided into groups based on surgical sub-specialty (endocrine surgery vs non-endocrine surgery), yearly parathyroidectomy volume, and yearly parathyroidectomy volume for SHPT/THPT. Descriptive statistics were performed; the role of volume was evaluated.

Results: There were 142 responses; 114(84%) identified as endocrine surgeons. The majority (62%) perform >50 parathyroidectomies yearly, but most perform fewer than 10 parathyroidectomies for SHPT/THPT per year (<10/year: 53.7%, 10-30/year: 41.9%, >30/year: 4.4%). Subtotal parathyroidectomy is most commonly performed for SHPT(83%) and THPT(52%), but transcervical thymectomy variably performed for both. There was no consensus regarding starting calcitriol preoperatively (always 43%, never 25%, depends on vitamin D levels 24.4%) or stopping cinacalcet (2weeks prior 28%, surgical day 29%, postoperatively 20%). There was no consensus on the PTH level to define cure for SHPT (60-240pg/mL 33%, <300pg/mL 26%), or a threshold for reoperation (>800pg/mL 25.3%, >9x normal 26%). Surgeons who perform >10 parathyroidectomies/year for SHPT/THPT were less likely to consider the patient's preoperative vitamin D levels to inform their decision to start calcitriol before surgery (<10 cases/year 34%, ≥10 15%, p=0.023), were more likely to use ultrasound preoperatively (<10 80%, ≥10 95%, p=0.035), were more likely to have a postoperative hypocalcemia protocol managed by the surgical team (<10 49%, ≥10 58%, p=0.029), and were more likely to use intraoperative PTH monitoring for tertiary hyperparathyroidism (<10 70%, ≥10 87%, p=0.046).

Conclusions: The majority of respondents perform fewer than 10 parathyroidectomies yearly for SHPT/THPT. Subtotal parathyroidectomy was most commonly performed, but there was little other consensus regarding preoperative management, intraoperative decision-making, and postoperative care. Opportunity exists through guideline dissemination to improve heterogeneity of care provided to SHPT/THPT patients.

34. Early Second Radiofrequency Ablation Treatment Gave Rise to Significantly Greater Nodule Shrinkage at 12 Months than Single-Session Treatment for Large-Volume Benign Thyroid Nodules

Man Him Matrix Fung¹, Yan Luk¹, Brian Lang¹

¹*Division of Endocrine Surgery, Department of Surgery, University of Hong Kong*

Background: Although radiofrequency ablation (RFA) is a good alternative to thyroidectomy in managing symptomatic benign thyroid nodules, several sessions are often necessary to achieve desirable shrinkage in larger-volume ($\geq 20\text{mL}$) nodules. Since little is known on the optimal timing between RFA sessions, we hypothesized an early retreatment within 6 months could improve nodule shrinkage. This study compared the 12-month volume reduction rate (VRR) and morbidity between single-session RFA and two-sessions RFA within 6 months for large benign thyroid nodules.

Methods: Consecutive patients undergoing RFA for cytologically-proven benign thyroid nodules $\geq 20\text{ml}$ were prospectively recruited. Patients were assigned to undergo either single-session RFA (Group I) or two-sessions RFA within 6 months (Group II). All were followed up with ultrasonography for at least 12 months after the first RFA. Nodule volume was defined by width x length x depth x 0.523. VRR was defined as (baseline – current-volume)/baseline volume x 100%. Compressive symptoms were recorded with a 0-100 visual analogue scale (VAS). Complications were documented.

Results: During the study period, 67 benign thyroid nodules $\geq 20\text{ml}$ received RFA. After exclusion, 43 nodules (Group I: n=23, Group II, n=20) from 42 patients (Female: 36, mean age: 53 ± 15 years) were analyzed. Treatment interval between the two RFA sessions in Group II was 76 ± 64 days. Both groups had comparable baseline nodule volumes ($33.2 \pm 14.9\text{mL}$ vs. $34.3 \pm 12.5\text{ml}$), characteristics and clinical parameters ($p > 0.05$). 6-month VRR was comparable (Group I $65.7 \pm 13.2\%$ vs Group II $68.6 \pm 13.3\%$, $p = 0.264$) but 12-month VRR was significantly greater in Group II than Group I ($75.6 \pm 11.5\%$ vs $65.9 \pm 17.1\%$, $p = 0.019$). From 6-month to 12-month, Group II nodules had continued shrinkage ($22.3 \pm 22\%$, $p = 0.012$) while Group I did not ($p = 0.503$). From baseline to 12-months, Group II patients had significant reduction of compressive VAS ($p = 0.004$) but Group I did not ($p = 0.180$). Two-sessions RFA within 6 months was the only significant factor associated with 12-month VRR $\geq 75\%$ (OR 4.375 (1.210 – 15.812), $p = 0.024$). There were no vocal cord paresis or hematoma requiring operation in both groups.

Conclusions: Early retreatment (i.e. two-sessions RFA within 6 months) led to significantly superior nodule shrinkage at 12-month and better symptom relief when compared to single-session RFA. It did not appear to increase morbidity.



POSTERS

◆ Denotes Resident/Fellow Competition Poster

NOTE: Author listed in **BOLD** is the presenting author

◆01. An Assessment of Risk Factors for Bankruptcy Among Thyroid Cancer Patients in Massachusetts

Anastasia K Bogdanovski¹, Jorge L Gomez-Mayorga¹, **Jordan M Broekhuis**¹, Ashley O'Donoghue², Aaron Fleishmann¹, Katharine Esselen³, Lina Hu¹, Benjamin James⁴
¹*Surgery, Beth Israel Deaconess Medical Center,* ²*Center for Healthcare Delivery Science, Beth Israel Deaconess Medical Center,* ³*Gynecology Oncology, Beth Israel Deaconess Medical Center,* ⁴*Chief, Section of Endocrine Surgery, Beth Israel Deaconess Medical Center*

Background: Patients with thyroid cancer (TC) experience higher rates of bankruptcy compared to more morbid cancers. While some theorize this is related to the relatively young age at diagnosis, risk factors for objective financial toxicity have not been well-studied. We aimed to identify factors associated with severe financial toxicity defined by bankruptcy filings in TC patients.

Methods: Massachusetts Cancer Registry data from 2010-2019 were linked with patient financial attributes from a national credit bureau. Patients between the ages of 18 and 80 with TC as defined by ICD code C739 were identified, excluding those with bankruptcy prior to diagnosis or any other cancer diagnosis. Sociodemographic and clinical covariates were obtained, and a multivariable Cox proportional hazards model was specified to estimate independent associations with bankruptcy.

Results: Among 8,187 patients with TC, 88 (1.1%) filed for bankruptcy, with a median follow up time of 5.1 years. 79% of patients were female, 80% identified as white, 59% were single, 85% were under 65 years old, 59% were non-smokers, 73% had localized disease, and 91% had papillary pathology.

After adjusting for covariates, patients under 65 years old (HR=5.1, 95% CI: 1.6-16.2, p=0.006), those unmarried (HR=1.6, 95% CI: 1.1, 2.5, p=0.02), and with any history of tobacco use (HR=1.8, 95% CI: 1.2, 2.7, p=0.007) had a higher estimated rate of bankruptcy. As ADI quintile increased (more disadvantage), the risk of bankruptcy increased. Compared to patients in the first quintile, those in the third and fourth quintiles were more likely to experience bankruptcy (HR: 3.2, 95% CI: 1.3, 7.8, p=0.01 and HR: 3.2, 95% CI: 1.3, 8.0, p=0.01), with the fifth quintile most vulnerable for bankruptcy (HR: 4.2, 95% CI: 1.6, 11.1, p=0.003). There was no impact of sex on the risk of bankruptcy.

Conclusions: We found that younger age, living in disadvantaged neighborhoods, unmarried status, and tobacco use were risk factors for bankruptcy after TC diagnosis. Communication of these risks with TC patients and development of intervention-based policies aimed at reducing financial toxicity are needed.

◆02. Incidence, Characteristics and Costs of Patients Readmitted for Hypoparathyroidism after Thyroidectomy for Differentiated Thyroid Cancer in California

Alexis L Woods¹, Judy Li¹, Theresa H Keegan¹, Miriam A Nuno¹, Claire E Graves¹, Michael J Campbell¹

¹University of California, Davis

Background: Post-thyroidectomy hypoparathyroidism is a common complication, but most patients can be managed as an outpatient. The objective of this study was to identify the incidence, characteristics and costs associated with inpatient readmissions for hypoparathyroidism after thyroidectomy for differentiated thyroid cancer.

Methods: The California Cancer Registry and Health Care Access and Information (HCAI) databases were linked to identify patients who underwent a total or near-total thyroidectomy for differentiated thyroid cancer between 2005 and 2018. Patients were followed for subsequent inpatient readmissions within 2 years after surgery. Cumulative incidence and multivariable Cox proportional hazards models were used to evaluate factors associated with a readmission. Total charges were extracted from the HCAI database.

Results: Among 41,474 patients who underwent thyroidectomy for thyroid cancer, 572 (1.38%) patients required inpatient readmission for hypoparathyroidism. The median time between thyroidectomy and first readmission was 5 days, with 52.9% of inpatient readmissions occurring within one month. The median number of readmissions for hypoparathyroidism in the 2 years following thyroidectomy was 3 and the median length of stay was 2 days.

The two-year cumulative incidence of readmission for hypoparathyroidism was similar when evaluated by age, gender, race, Charlson Comorbidity Index, insurance type and socioeconomic status. Patients with >4 lymph nodes (LN) removed had an increased incidence of readmission (0.27% vs 0.19%, $p=0.027$), while those treated at an American College of Surgeons Commission on Cancer (ACS CoC) center trended toward a lower incidence of readmission (0.19% vs 0.23%, $p=0.055$). In multivariable analysis, the only factor associated with readmission for hypoparathyroidism was having >4 LN removed at surgery (HR 1.61 [95% CI=1.13, 2.29], $p=0.008$).

Charges associated with first readmission for hypoparathyroidism were higher than charges for patients admitted for other reasons (median charge/day of \$9,493 vs \$7,868, $p<0.001$). 739/1513 hospital readmissions for hypoparathyroidism had charges recorded totaling \$19,209,513 over the study period.

Conclusions: Most inpatient readmissions for post-thyroidectomy hypoparathyroidism occur soon after surgery and the costs are significant. Patient factors do not appear to be associated with readmission, but patients undergoing neck dissections and those not seen at an ACS CoC center may be at increased risk of readmission.

◆03. Long Term Outcomes after Repeat Lymph Node Dissections for Persistent or Recurrent Differentiated Thyroid Cancer

Martin J Barriio¹, Nikita Pozdeyev², Robert McIntyre¹, Maria Albuja Cruz¹, Bryan R Haugen², Christopher Raeburn¹

¹Endocrine Surgery, University of Colorado, ²Endocrinology, University of Colorado

Background: The primary treatment for locoregional recurrent or persistent differentiated thyroid cancer (DTC) is repeated lymph node dissection; however, there are limited reports on the safety and long-term efficacy of multiple operations. The aim of this study is to determine the long-term outcomes after re-operation for recurrent or persistent DTC.

Methods: Patients who underwent a cervical lymph node dissection between 1998-2022 at our institution for recurrent or persistent DTC were included in this study. Demographics, initial thyroid surgery, subsequent lymph node dissections, and follow up information were acquired by chart review of the electronic medical record. Patients were classified into excellent, biochemical incomplete, structural incomplete, and indeterminate response per American Thyroid Association guidelines.

Results: There were 316 patients who underwent at least one repeat operation for persistent/recurrent DTC. Mean follow up was 6.2 years (range: 0.5–16.7) after their most recent surgery. After one, two, three and four re-operations, 112/316 (35.4%), 17/82 (20.7%), 3/25 (12%), and 0/3 (0%) patients ($p < 0.001$) had an excellent response, respectively, resulting in a cumulative excellent response rate of 41.8% (132/316) at last follow up. The overall risk for significant permanent complications such as permanent hypoparathyroidism (2.9%) or recurrent laryngeal nerve injury (2.2%) was 5.1% (14/275). The risk of either of these complications was significantly higher in patients undergoing re-operative central neck dissection (CNDx) when the initial surgery included a CNDx (8.7%, 10/115) compared to those who had not previously had a CNDx (2.5%, 4/160, $p < 0.02$).

Conclusions: Surgery remains the primary treatment for recurrent or persistent DTC, however, the likelihood of an excellent response significantly decreases with each additional operation. The risk of permanent complications are overall low but are significantly more likely to occur during redo CNDx. Thus, the goals, risks and benefits need to be carefully considered prior to each reoperation for DTC, especially in the central neck compartment.

◆04. Primary Thyroid Lymphoma: A multi-center retrospective review

Marie W Su¹, Tim N Beck², Jill Knepprath³, Gustavo Romero-Velez², Katherine B Heiden², Christopher R McHenry⁴

¹Case Western Reserve University School of Medicine, ²Endocrine Surgery, Cleveland Clinic, ³General Surgery, University Hospitals Cleveland Medical Center, ⁴General Surgery, MetroHealth Medical Center

Background: Primary thyroid lymphoma (PTL) accounts for 1-8% of thyroid malignancies and 2-7% of extranodal lymphomas. There is no consensus regarding the preferred diagnostic method or role of surgery. Our study aimed to investigate the clinical presentation, diagnosis, treatment, pathologic subtypes, and outcomes for PTL. With no uniform method for diagnosis and treatment, understanding the differences may help to optimize work-up and management.

Methods: We conducted a multicenter retrospective cohort study with patients diagnosed with PTL between 1990 and 2022. Demographic data, clinical parameters, diagnostic and treatment methods, pathology, and outcomes were retrieved. Laboratory, pathology, and flow cytometry reports were reviewed to identify specific subtypes of PTL and the presence of Hashimoto's thyroiditis.

Results: 32 patients with PTL met inclusion criteria. All were referred for evaluation of a thyroid nodule or marked thyroid enlargement; 21 (66%) had compressive symptoms from mass effect, 12 (38%) had hypothyroidism, and 3 (9%) had B symptoms. Definitive diagnosis was made from incisional biopsy in 10 (31%) patients, fine needle aspiration biopsy in 6 (19%), core needle biopsy in 1 (3%) and surgical pathology in 15 (45%). The subtypes of PTL included diffuse large B-cell lymphoma (DLBCL) in 14 (44%) patients, mucosa-associated lymphoid tissue (MALT) in 5 (16%), follicular in 4 (13%), unspecified marginal zone in 4 (13%), mixed DLBCL subtypes in 3 (9%) and unspecified non-Hodgkin's in 2 (6%). Hashimoto's thyroiditis was present in 15 (47%) patients. Nineteen (59%) patients received chemotherapy alone or in combination with radiation and/or surgery; 8 (25%) had surgery alone; 5(16%) received radiation alone or in combination with surgery. One (3%) patient with follicular lymphoma recurred and one (3%) with DLBCL had disease progression. Five (15%) patients died after a mean 6.5 yr. following presentation, 1 from disease progression, and 4 from unrelated causes.

Conclusions: The diagnosis of PTL remains a challenge. In 78% of patients, PTL was not diagnosed until after incisional biopsy or thyroidectomy. There is opportunity for needle biopsy with flow cytometry to help facilitate earlier diagnosis and treatment of PTL. Suspicion should be high, particularly for a rapidly enlarging thyroid gland with associated Hashimoto's thyroiditis.

◆05. Is Total Thyroidectomy Necessary for All Papillary Thyroid Cancers with Lateral Neck Nodal Metastasis?

Iram S Alam¹, Zoran Gajic², Younes Atlassy², Likolani Arthurs¹, Eren Esen¹, Fang Zhou³, Rong Xia³, Jason Prescott¹, Gary Rothberger⁴, Kepal N Patel¹, Insoo Suh¹
¹*Surgery, NYU Langone Medical Center,* ²*NYU Langone Medical Center,* ³*Pathology, NYU Langone Medical Center,* ⁴*Medicine, NYU Langone Medical Center*

Background: Papillary thyroid cancer often follows an indolent course with a favorable prognosis. This has led to evolving guideline-based de-escalation of treatment options for low-risk patients. Recently, the purported benefit of total thyroidectomy (TT) over unilateral lobectomy for selected cases of intermediate-risk PTC (IR-PTC), even in the presence of clinical lateral neck nodal metastasis (cN1b), has come into question.

Methods: A retrospective analysis of the National Cancer Institute's Surveillance, Epidemiology, and End Results database was performed to study patients with IR-PTC with ipsilateral cN1b disease from 1975-2020. Kaplan-Meier curves and log-rank tests were used to compare disease-specific survival (DSS) difference between lobectomy and TT at 10 years. Multivariable Cox proportional hazards analysis was performed to determine the independent association of lobectomy versus TT with DSS, correcting for age, sex, T-stage, receipt of radioactive iodine (RAI), extrathyroidal extension, and lymph node ratio, defined as the ratio of pathologically positive lymph nodes to total number examined.

Results: Among 3,043 IR-PTC patients with cN1b disease (median [interquartile range] age, 45 [26] years), 42 underwent lobectomy, 2,901 underwent TT, and 100 did not undergo surgery. Unadjusted DSS at 10 years in the lobectomy and TT groups were 51.0% (95% CI, 31.4%-82.8%) and 86.8% (95% CI, 84.8%-88.9%), respectively. On multivariable analysis of all patients, older age (hazard ratio [HR], 1.08; $p < 0.001$) and male gender (HR, 1.74; $p < 0.001$) were associated with lower adjusted DSS, whereas treatment with TT (HR, 0.387; $p = 0.005$) and receipt of RAI (HR, 0.604; $p < 0.001$) were associated with improved adjusted DSS. The effects of extent of surgery and RAI on DSS differed based on discrete age cutoffs. In patients under 45 years, extent of surgery (lobectomy vs TT) did not affect 10-year DSS ($p = 0.744$), and in patients under 38 years, treatment with RAI did not improve 10-year DSS ($p = 0.201$).

Conclusions: This longitudinal cohort study found that both the extent of surgery (lobectomy versus TT) and administration of RAI were not associated with a difference in DSS in younger patients with IR-PTC with ipsilateral cN1b disease. In these selected patients, future studies are needed to further investigate whether unilateral surgical clearance without RAI might offer satisfactory oncological outcomes.

◆06. Outcomes in Surgical Management of Graves' Disease: Transcervical versus transoral thyroidectomy

Stefanie Seo¹, Max Plitt¹, Nimesh V. Nagururu¹, Danielle R. Trakimas², Kaitlyn V. Frazier², Aarti Mathur³, Lilah Morris-Wiseman³, Ralph P. Tufano⁴, Jonathon O. Russell²
¹Johns Hopkins University School of Medicine, ²Otolaryngology-Head and Neck Surgery, Johns Hopkins University School of Medicine, ³Surgery-Surgical Oncology, Johns Hopkins University School of Medicine, ⁴Head and Neck Endocrine Surgery, Sarasota Memorial

Background: Total thyroidectomy is the definitive treatment for Graves' disease (GD). Transoral endoscopic thyroidectomy vestibular approach (TOETVA) has cosmetic benefits over the traditional transcervical approach (TCA) and is well-established for GD, but the outcomes in this patient population remain unclear. Our aim is to compare surgical and clinical outcomes in patients who received TCA or TOETVA for GD.

Methods: We performed a retrospective cohort study of patients with GD who received TCA or TOETVA total thyroidectomy at our institution. All included patients met criteria and were offered a choice of either surgical method. All were treated between September 2016 and March 2022. Collected data included patient demographics, clinical and surgical variables, pathology, and post-operative complications. Patients were excluded if they were under 18 years of age or received a neck dissection or re-operation.

Results: A total of 87 TCA and 59 TOETVA cases met inclusion criteria for this study. The TOETVA group was younger (TCA vs. TOETVA; 45.5 vs. 35.9 years, $p < 0.0001$) and more likely to be female (73.6% vs. 93.2%, $p = 0.002$) but had comparable BMI to the TCA group. There were no significant differences in the median maximum lobe size (TCA vs. TOETVA; 5.5 vs. 5.4cm, $p = 0.5$). Complication rates were similar between groups. Of the minor complications (temporary RLN injury, temporary hypoparathyroidism, seroma, and infection), temporary hypoparathyroidism was the most prevalent with 8 (9.2%) cases in the TCA and 7 (11.9%) in the TOETVA groups. There were 5 (5.8%) and 3 (5.1%) cases of major complications (permanent RLN injury, permanent hypoparathyroidism, and hematoma) in TCA and TOETVA cohorts respectively. Multivariable regression for age, sex, length of hospital admission, and surgery date (before or after 2020) confirmed no significant associations between surgery method and complication rates.

Conclusions: Surgical management of GD remains a viable treatment strategy, with comparable rates of both minor and major complications in TCA versus TOETVA cases. Patient preference should dictate the ultimate choice of surgical approach.

◆07. Improved Disease-Specific Survival for Medullary Thyroid Cancer with Distant Metastases After Multikinase Inhibitor Approval

Teagan Marshall¹, Federico Palacardo¹, Benjamin Greenspun¹, Abhinay Tumati¹, Dilay Aykan¹, Texell Longoria-Dubocq¹, Rasa Zarnegar¹, Thomas J Fahey¹, Brendan Finnerty¹
¹Weill Cornell Medicine

Background: Medullary thyroid cancer (MTC) historically had limited response to cytotoxic treatments before approval of multikinase inhibitors (MKIs) in 2011. Our prior work demonstrated no overall survival benefit of systemic therapy (ST) in the post-approval era. Herein, we examine the impact of ST on disease-specific survival (DSS) in MTC patients with distant metastasis before and after MKI approval.

Methods: The Surveillance, Epidemiology, and End Results (SEER) database was used to identify MTC patients with distant metastasis (2004-2017). Pre-MKI (2004-2010) and Post-MKI approval (2011-2017) cohorts were compared.

Results: Of 260 patients, 46.7% underwent thyroid surgery and 37.7% received ST. No differences were observed in age, sex, race, T or N stage, or radiation treatment between pre-MKI and post-TKI cohorts ($p > 0.05$). Post-MKI patients were more likely to receive ST (43.8% vs 29.8% $p = 0.02$). Total thyroidectomy was inversely associated with receiving ST in both Pre- and Post-MKI cohorts (OR 0.14, CI 0.04-0.55, $p = 0.005$; OR 0.21 CI 0.07-0.64 $p = 0.006$).

In the Kaplan-Meier analysis evaluating only patients who received ST, 5-year DSS was improved in patients who received ST in the Post-MKI cohort compared to Pre-MKI (41.5% vs 20.0% $p = 0.02$). On Cox regression for the same subgroup, being diagnosed Post-MKI approval was the only significant predictor of DSS (HR 0.55 CI 0.29-0.96 $p = 0.02$).

On sub-analysis of the post-MKI cohort, Kaplan-Meier estimate demonstrated an improved 5-year DSS for those who received ST only compared to those who did not receive any treatment (38.7% vs 30.8%, $p = 0.02$). Surgery without ST had the highest 5-year DSS of 60.0%, followed by combined ST and surgery at 47.6% ($p = 0.02$). After adjusting for patient and disease factors, surgery without ST and combined surgery with ST were the only treatment groups associated with a statistically significant survival benefit on Cox regression (HR 0.19, CI 0.07-0.54, $p = 0.002$; HR 0.36, CI 0.13-0.99, $p = 0.048$).

Conclusions: Systemic therapy is associated with improved DSS in the Post-MKI approval era. Still, surgery, with or without systemic therapy, yields better outcomes than systemic therapy alone. Multimodal therapy with surgery and systemic therapy should be considered for on a patient-specific basis, even in the presence of distant metastatic disease.

◆08. Impact of Margin Positivity After Thyroidectomy for Localized Papillary Thyroid Cancer

Young-Ji Seo¹, Sang Ngo², Sarah S. Park², Adan M. Rodriguez², Chace Moleta³, Dipti P Sajed³, Ming-Yeah Hu², Elena G. Hughes¹, Michelle L Shu², Masha J Livhits¹, Michael W Yeh¹, James Wu¹

¹Department of Surgery, UCLA David Geffen School of Medicine, ²UCLA David Geffen School of Medicine, ³Pathology, Department of Pathology, UCLA David Geffen School of Medicine

Background: The clinical significance of microscopic margin positivity in localized papillary thyroid cancer (PTC) remains uncertain. Smaller studies have suggested margin positivity increases rates of biochemical recurrence, while others show no difference. The purpose of our study was to assess the impact of microscopic margin positivity on cancer outcomes.

Methods: We performed a retrospective analysis of thyroidectomy specimens in our institutional pathology database from the years 1985 – 2016. We excluded patients with less than 1-year follow-up, evidence of regional or distant metastases, and medullary or anaplastic thyroid cancer. An independent pathologist (CM) performed re-review of cases with indeterminate margin status. Margins were classified as positive, negative if >1mm away from the surgical margin, and indeterminate if it abutted the surgical margin. Patient, tumor, and treatment characteristics were compared using single factor analysis of variance test. Fisher exact test was used for positive-margin cohort sub-analysis.

Results: Median age of the study cohort (n=187) was 53 years with a median follow-up of 254 months (interquartile range 151-340 months). Following independent re-review, 30 (16%) had positive margins, 109 (59%) had negative margins, and 48 (25%) had indeterminate margins. There was no difference in age, sex, nodule size, or lymphovascular invasion between the three groups. However, the positive margin cohort had higher rates of gross extrathyroidal extension [ETE] (40% positive vs 8% negative vs 8% indeterminate, p<0.01). Patients underwent similar rates of radioactive iodine [RAI] ablation (70 vs 45 vs 67%, p=0.09). Margin positivity was associated with higher rates of recurrence (17 vs 0.9 vs 8%, p<0.01). In the subset of patients with positive margins, there was no significant difference in recurrence rates among patients who received RAI (n=21) compared to those who did not receive RAI (n=9) (19 vs 11%, p=0.86). Additionally, 12 patients with positive margins had gross ETE, of which 2 recurred, and 18 did not have gross ETE, of which 3 recurred (17 vs 17%, p=0.70).

Conclusions: Patients with localized PTC and microscopic margin positivity have high rates of recurrence at 17%. In subset analysis of the margin positive cohort, gross ETE status and postoperative RAI did not impact recurrence rates.

◆09. Obesity is Associated with Post-Thyroidectomy Hematoma

Marisha Schwab¹, Haley Gainer¹, Timothy Ullmann², Todd Beyer²

¹General Surgery, Albany Medical Center, ²Endocrine Surgery, Albany Medical Center

Background: Obesity is an independent risk factor for post-operative complications following many surgical procedures. However, it is unknown whether obesity affects outcomes following thyroidectomy. We hypothesized that obese patients are at increased risk for thyroidectomy-specific complications, including neck hematoma.

Methods: The thyroidectomy-specific National Surgical Quality Improvement Program (NSQIP) database was queried to identify all patients who underwent traditional (open) thyroid lobectomy or total thyroidectomy from 2016-2021. Patients with substernal goiters, de-differentiated cancers, or concurrent neck dissections were excluded. Patients were grouped by BMI, according to the World Health Organization (WHO) classification of obesity, and the odds of thyroidectomy-specific complications: neck hematoma, laryngeal nerve injury, and hypocalcemia were compared across groups using multivariable regressions.

Results: A total of 22,797 patients were included. 5,209 (22.8%) of these patients were of normal weight (BMI 18.5 to <25), 6,742 (29.6%) were overweight (BMI 25 to <30), 5,206 (22.8%) were obesity class I (BMI 30 to <35), 2,873 (12.6%) were obesity class II (BMI 35 to <40), and 2,525 (11.1%) were obesity class III (BMI ≥ 40). There were more Asian patients in the normal weight group compared to the obesity class III group (13.7% vs 0.7%), conversely white and African American patients were over-represented in the obesity class III group compared to normal weight (57.6% vs 50.5% and 24.3% vs 7.1% respectively, $p < 0.001$). Multivariable regressions adjusted for patient demographics, comorbidities, surgical indication, extent of surgery, and surgical technique showed that increased BMI was an independent predictor of post-operative hematoma (overweight aOR 1.51; obesity class I aOR 1.54; obesity class II aOR 1.67; obesity class III aOR 1.56; all $p < 0.05$). There was no association between obesity and nerve injury or hypocalcemia.

Conclusions: Obesity is an independent risk factor for post-operative hematoma following thyroidectomy. Surgeons may consider counseling obese patients that increased BMI is associated with higher bleeding risk.

◆10. Hemithyroidectomy for Differentiated Thyroid Cancer: How often is it definitive surgical treatment?

Parima Safe¹, Daniel Hubbs¹, Mahes Sivarajah¹, Rasa Zarnegar¹, Brendan M. Finnerty¹, Thomas J. III Fahey¹

¹*Surgery, Weill Cornell Medicine*

Background: Over the past decade, recommendations regarding the extent of a thyroidectomy for differentiated thyroid cancers (DTC) have evolved from pursuing a total thyroidectomy to hemithyroidectomy. However, little data is available regarding how often a hemithyroidectomy will be adequate treatment in patients with DTC. Here we aim to determine how often hemithyroidectomy is sufficient surgical therapy in patients presenting with thyroid nodules that ultimately prove to be cancer.

Methods: This is a retrospective cohort study of patients who presented for hemithyroidectomy and had a final pathologic diagnosis of DTC from 2015-2022. Rates of intraoperative conversion, initial completion thyroidectomy and subsequent completion thyroidectomy for recurrence were recorded.

Results: 277 patients were identified with DTC with initial operative plans for a hemithyroidectomy. 76.2% were female and the mean age was 47.1 years (range 14-84 years). The majority (65.7%) were identified as Bethesda 5 or 6 on preoperative cytology, while 28.5% were Bethesda 3 or 4 and the remainder had benign (5.05%) or no cytology (1.08%) results.

29 patients (10.47%) required intraoperative conversion to total thyroidectomy based on operative findings – predominantly due to grossly positive lymph nodes (70.0%) or gross extrathyroidal extension (41.4%) – and these tumors were more likely to be papillary thyroid cancers with tall cell features (31.0% vs 12.1%, $p=0.02$).

26 patients (9.4%) underwent initial completion thyroidectomy based on final pathology. The majority (20) were due to histopathologic findings that demonstrated radioactive iodine therapy would be indicated and the remainder due to patient preference.

A total of 16 patients developed recurrent DTC necessitating a subsequent completion thyroidectomy (mean follow-up 28.77 months). The most common site of recurrence was the contralateral lobe (43.75%). 73.65% of patients were ultimately managed with hemithyroidectomy alone. The overall rate of recurrence for patients managed with a hemithyroidectomy was 6.45%.

Conclusions: Patients scheduled for a hemithyroidectomy that prove to have DTC can be counseled that they have approximately a 75% likelihood of requiring only a hemithyroidectomy with an expectation of a short-term recurrence of 6%.

◆11. **Comparative Survival Outcomes of Total Thyroidectomy vs. Lobectomy/Subtotal in T1 Medullary Thyroid Cancer**

Jessan A Jishu¹, Eman Toraih², Salmanfaizee Sadakkadulla¹, Solomon Baah¹, Yaser Bashumeel¹, Mohammed Hussein², Emad Kandil²

¹Tulane University School of Medicine, ²Surgery, Tulane University School of Medicine

Background: Optimal surgical management of small localized MTC tumors is a controversial topic. Total thyroidectomy is considered by many as the standard of care, but lobectomy may provide comparable oncologic control with less morbidity. We compared outcomes for total thyroidectomy versus lobectomy for T1 MTC using a national cohort data.

Methods: We identified 2,702 MTC patients including 398 patients with T1N0/1M0 MTC in the National Cancer Institute's Surveillance, Epidemiology, and End Results registry from 2010-2019 who underwent total thyroidectomy or lobectomy. Data on timing for surgery following the diagnosis and data on additional neck dissection were also analyzed. Thyroid cancer mortality and overall survival were compared between surgical groups using multivariable Cox models.

Results: Overall survival was similar between total thyroidectomy and lobectomy groups (86.8% vs. 87.2%, $p=0.95$). Cancer related mortality was 5.7% for total thyroidectomy and 8.1% for lesser surgery ($p=0.47$). On multivariable analysis, there was no significant difference in thyroid cancer mortality (HR=0.44, $p=0.23$) or overall mortality (HR=0.77, $p=0.60$) between surgical groups. In subgroup analysis, survival was similar between total thyroidectomy and lobectomy, regardless of additional neck dissection and age groups. Interestingly, delayed surgery >1 month after diagnosis was associated with worse overall survival ($p=0.012$).

Conclusions: For localized T1N0/1M0 MTC, lobectomy/subtotal thyroidectomy achieved similar long-term overall and thyroid cancer-specific survival compared to total thyroidectomy in this large population-based analysis. Delayed surgical intervention is associated with worse survival and additional neck dissection showed no benefit for this select group of patients.

◆ 12. Association Between Malabsorptive Conditions and Post-Operative Hypocalcemia After Neck Surgery

Jesse Passman¹, Sara Ginzberg¹, Lauren Krumeich², Colleen Brensinger¹, Amanda Bader¹, Jasmine Hwang¹, Rachel Kelz¹, Heather Wachtel¹

¹University of Pennsylvania Health System, ²University of Michigan

Background: Hypocalcemia is a common complication following parathyroidectomy and total thyroidectomy. While it is known that rates of postoperative hypocalcemia are increased in patients with prior Roux-en-Y gastric bypass, the impact of other gastrointestinal conditions is not well understood. In this study, we evaluate rates of postoperative hypocalcemia as a function of medical and surgical malabsorptive states.

Methods: We performed a retrospective cohort study utilizing the Optum Claims Database in patients undergoing parathyroidectomy and/or total thyroidectomy from 2004–2022. Patients were identified by CPT codes and categorized by malabsorptive conditions as defined by ICD9/10 codes including: gastrectomy or gastric restriction, gastrointestinal bypass, enterectomy, enterostomy, pancreatectomy, colostomy, Crohn's disease, and Celiac disease. The primary outcomes were early (<7 days) and late (7–365 days) post-operative hypocalcemia, defined by diagnosis code, laboratory parameters, or intravenous calcium administration. Univariable and multivariable logistic regression adjusting for sociodemographic factors and comorbidities were performed to determine the association between malabsorptive conditions and outcomes.

Results: Of 25,993 patients, 56.8% underwent total thyroidectomy, 40.9% parathyroidectomy, and 2.4% both procedures concurrently. The median age was 61 years (IQR 50–72). 77.2% were female. 2.2% had an included surgical condition and 1.9% had an included medical condition. In total, 7.4% experienced early and 16.9% late postoperative hypocalcemia. Unadjusted, history of gastrectomy (OR 1.42, $p=0.046$), pancreatectomy (OR 3.45, $p=0.002$), bypass (OR 1.41, $p=0.036$), and enterostomy (OR 1.58, $p=0.033$) were significantly associated with hypocalcemia within one year of the index procedure. Enterectomy (OR 1.23, $p=0.327$), colostomy (OR 1.19, $p=0.426$), Crohn's disease (OR 1.21, $p=0.162$), and Celiac disease (OR 1.14, $p=0.427$) had no association. On multivariable analysis, only pancreatectomy (OR 2.54, $p=0.020$) remained associated with post-operative hypocalcemia within one year. Female gender (OR=1.11, $p=0.003$), combined thyroidectomy/parathyroidectomy (OR=2.11 compared to parathyroidectomy, $p<0.001$), simultaneous neck dissection (OR=1.70, $p<0.001$), chronic kidney disease (OR=1.25, $p<0.001$), and presence of any Elixhauser comorbidities also increased risk.

Conclusions: While postoperative hypocalcemia may occur in any patient undergoing parathyroidectomy or total thyroidectomy, patients with prior pancreatectomy are at higher risk. Further investigations should evaluate appropriate prevention strategies in patients with malabsorptive conditions potentially impacting their risk of post-operative hypocalcemia.

◆13. 55 is the New TERT-y: Understanding the relationship between patient age and the molecular landscape of papillary thyroid carcinoma through next generation tumor sequencing

Jordan A Williamson¹, Quyen M Diep¹, Michael D Williams², Sean M Wrenn²
¹Rush Medical College, ²Surgery, Rush University Medical Center

Background: Papillary Thyroid Carcinoma (PTC) occurs throughout life. However, younger patients tend toward indolent progression, with lower risk of death and metastasis. The molecular mechanisms behind the age-related differences in tumor behavior remain understudied, although some genes (BRAF, TERT) are linked to increased age and worsened prognosis.

Methods: Using the Tempus LENS software, we analyzed a national database of de-identified solid tumor samples that underwent next generation sequencing (NGS) via the Tempus xT assay. Inclusion criteria were primary tumors classified as PTC (or subvariant) and <180 days from diagnosis to biopsy (amongst other criteria). Mutations with a population frequency of <0.1 were excluded. Univariate statistical analysis was employed to test for associations between genetic mutations and average age (older cohort >55 vs. younger <55), gender, tumor stage (M0 vs M1) and BRAF/TERT co-mutation.

Results: 377 unique solid-tumor NGS specimens were analyzed and stratified based on the presence or absence of the genetic mutations with a frequency >0.1 (n = 56). Demographic analysis revealed those >55 were disproportionately male (p <.001). Mutations significantly more frequent in the age <55 cohort were: BCL6 (p =.048), BMPR1A (p =.027), LMNA (p =.027), MUTYH (p=.037), MYB (p =.037). TERT was more frequent in age>55 (68% vs. 32%, p <.001), as was the BRAF/TERT co-mutation (68% vs. 32%, p<.001). TERT was also disproportionately seen in males (p =.017). Several genes were significantly more likely to appear in subjects with a BRAF/TERT co-mutation, including ATM, BRCA2, BRIP1, MEN1 and MSH3, PMS2, and TP53 (p≤.002). The ETV6 mutation was associated with increased risk of M1 disease (67% vs 33%, p =.04).

Conclusions: TERT and the TERT/BRAF co-mutation are more frequent in older patients. No other mutations individually were more common in the older cohort- however BRAF/TERT co-mutation increased the probability of additional co-mutations. Additionally, ETV6 trended more common in elderly and carried significantly higher rate of distant metastasis. These data also identify unique mutations more prevalent in the younger cohort which may carry clinical significance. TERT remains closely associated with the >55 population and is associated with numerous potentially deleterious co-mutations.

◆14. Closing the Distance: Equitable innovations for rural thyroid cancer treatment

Hattie H Huston-Paterson¹, Yifan Mao², Gery W Ryan³, Iuliana Bobanga⁴, James X Wu¹, Michael W Yeh¹

¹Section of Endocrine Surgery, UCLA, ²David Geffen School of Medicine, UCLA, ³RAND, ⁴Mat Su Regional Medical Center

Background: Patients residing in rural and frontier areas experience worse thyroid cancer outcomes than those in urban areas. This novel qualitative study sought the perspectives of rural surgeons to identify practical measures that could mitigate the disparities in thyroid cancer care between rural and urban contexts.

Methods: We contacted general and head and neck surgeons at all of California's Critical Access Hospitals (n=35), which are remote, rural hospitals, and requested self-referral to our study through the American College of Surgeons. We performed semi-structured qualitative interviews with surgeons at rural hospitals to understand the assets and vulnerabilities of rural hospitals in providing the highest quality care to patients with thyroid cancer. Responses were coded and analyzed using mixed-methods qualitative analysis methodology.

Results: Rural surgeons (n=10) from a geographically diverse sample of states (AK, AR, CA, NE, NC, NM, TX, UT, WY) participated. All initially trained in general surgery; 50% had fellowship training (20% endocrine surgery) and performed a median of 7 thyroidectomies annually. Rural surgeons from all training backgrounds felt adequately trained to treat thyroid cancer and reported a strong desire to provide comprehensive thyroid cancer care. Most reported patients' strong preference to be treated near home. Key challenges to local, comprehensive thyroid cancer care included: limited or no access to medical endocrinology, lack of continuing education on thyroid cancer management, and professional isolation in decision-making. One surgeon reported significant resource constraints, specifically lack of nerve monitoring and inexperienced operating room staff. Rural surgeons identified connections with university health systems, expert colleagues, and telemedicine consultations as valuable assets in treating thyroid cancer in geographically isolated hospitals.

Conclusions: This study identified key challenges and clear avenues for interventions in treating rural thyroid cancer patients. Rural surgeons specifically suggest: improving access to endocrinology specialists, developing educational initiatives on thyroid cancer management, and fostering connections and collaborations with urban colleagues to reduce professional isolation.

◆15. Commercially Negotiated Price Variation for Thyroidectomy: Sometimes less is more

Catherine B Jensen¹, Mitchell Mead¹, Hunter J. Underwood², Andrew Ibrahim¹, Susan C. Pitt¹

¹Center for Health Outcomes & Policy, University of Michigan, ²Department of Surgery, University of Michigan

Background: The Hospital Price Transparency Rule, enacted in January 2021, requires hospitals to publicly disclose prices for a wide range of healthcare services to enhance transparency and empower patients to make informed decisions. Among the most common index procedures for thyroid cancer are thyroid lobectomy (TL), total thyroidectomy (TT), and TT with central neck dissection (TT+CND). The impact of reporting commercial negotiated prices for thyroidectomy on decision-making is unknown. Therefore, we sought to examine intrahospital price variation across these common thyroidectomy procedural codes.

Methods: We used the Turquoise Health Database, which aggregates price data published by US hospitals under the Hospital Price Transparency Rule. We identified commercial prices for the thyroidectomy procedures of interest using CPT codes 60220 (TL), 60240 (TT), and 60252 (TT+CND) and characterized the variation in reported prices at the hospital level. We excluded uninsured and self-pay prices. Additional analyses examined intrahospital commercial price variation between procedures by evaluating the ratio of median price between TL:TT and TT+CND:TT.

Results: Overall, 1,844 hospitals (29.8%) reported a commercial price for TL, TT, and TT+CND. For TL (60220), characterization of negotiated prices revealed the following: mean \$8713, median \$6491, interquartile range (IQR) \$9435, and max \$43000. For TT (60240), we found: mean \$9446, median \$7147, IQR \$8926, and max \$48593. For TT+CND (60252), prices included: mean \$7923, median \$5340, IQR \$7839, and max \$40000. Analysis of intrahospital ratios of median price for TT versus TL found that 8% of hospitals had lower prices for TT than TL, 42% had equal prices for the two procedures, and 51% had higher prices for TT. Evaluation of prices for TT+CND compared to TT found that 33% of hospitals had lower prices for TT+CND than TT, 20% had equal prices, and 46% had higher prices for TT+CND.

Conclusions: This study is the first of our knowledge to assess commercially negotiated price variation across thyroidectomy procedures. Surprisingly, some hospitals exhibit higher negotiated prices for less extensive surgery. While price transparency may encourage patients to opt for more cost-effective options, it is essential to acknowledge the potential for this to lead patients to choose more extensive surgery.

◆16. The Multilingual Divide: The quality of online thyroid cancer information across languages

Terry P Gao¹, Kristen Hosang¹, Dianelys Tabla Cendra¹, Tracy J Gao², Lindsay E Kuo¹
¹Temple, ²Sidney Kimmel Medical College

Background: The management of thyroid cancer can be complex, involving individualized treatment strategies tailored to each patient. To navigate these complicated treatment decisions, patients may turn to the internet to gain insights into their condition. However, the reliability of online information is uncertain. This challenge may be further compounded for non-English speaking patients seeking information in their primary language. This study evaluates the quality of online information on thyroid cancer treatment for English and non-English speaking patients.

Methods: The top three search engines(Google, Bing, and Yahoo) were searched in October 2023 using 8 queries related to thyroid cancer care in English, Spanish, and simplified Chinese; English, Spanish and Chinese are the most common languages spoken in the US. 96 websites per language were identified. Duplicate websites and non-accessible websites were excluded. Websites were categorized based on site type(academic, hospital-affiliated, foundation/advocacy, commercial, or unspecified) and information source(U.S.-based or foreign). Information quality was assessed using the JAMA benchmark criteria(0-4) and DISCERN tool(1-5) by two independent reviewers per language, each fluent in the respective language. Inter-rater reliability was assessed with Cohen's kappa. Reviewer scores were averaged to determine the final score. Categorical variables and mean scores were compared using X^2 analysis and one-way analysis of variance, respectively.

Results: In total, 62 English, 37 Spanish, and 52 Chinese sites were evaluated. English and Spanish websites more commonly originated from a US source(80.6% and 53.8%, respectively) compared to Chinese sites(21.2%, $p<.001$). English sites were primarily academic(35.5%), Spanish sites most often originated from foundation/advocacy groups(30.8%), and Chinese sites frequently had hospital or commercial affiliations(28.8% each, $p=0.01$). Mean JAMA scores for English, Spanish, and Chinese-language websites were 2.49 ± 1.30 , 2.45 ± 1.36 , and 1.33 ± 0.74 , respectively($p<0.001$). Mean DISCERN scores for English, Spanish, and Chinese-language websites were 3.58 ± 0.57 , 3.39 ± 0.58 , and 2.57 ± 0.41 , respectively($p<0.001$). The degree of inter-rater reliability ranged from moderate to substantial agreement($p<.001$).

Conclusions: The quality of online thyroid cancer treatment information is generally poor, evident in low JAMA and DISCERN scores across all languages. Importantly, Chinese-language sites had notably lower quality scores compared to English and Spanish sites. Enhancing online information, especially in non-English languages, presents a significant opportunity.

◆17. Exploring Actionable Targets to Address Disparities in Thyroid Cancer

Survival: A student of patients with aggressive variants of papillary thyroid cancer
Alberto J Monreal¹, Samantha Thomas², Randall P Scheri¹, Anthony Saxton³, Hadiza S. Kazaure¹

¹Surgery, Section of Endocrine Surgery, Duke University Medical Center, ²Department of Biostatistics & Bioinformatics, Duke University, Duke University Medical Center, ³General Surgery, Duke University Medical Center

Background: Data characterizing disparities in patients with aggressive variants of papillary thyroid cancer (PTC) are sparse.

Methods: Patients aged ≥ 18 years with aggressive variants of PTC (tall cell, diffuse sclerosing, or insular) were abstracted from the National Cancer Database (2004-19). Non-Hispanic White (NHW), Hispanic, and Non-Hispanic Black (NHB) patients were analyzed. A Cox proportional hazards model was used to estimate the association of overall mortality with race/ethnicity and also stratified by race/ethnicity; hazard ratios (HRs) are reported.

Results: There were 7,350 patients; median age was 50 years. The majority were female (72.5%); 5,974 (81.3%) were NHW, 901 (12.3%) were Hispanic, and 475 (6.5%) were NHB. Median follow-up time was 75.9 months for NHW, 61 months for Hispanic and 72.9 months for NHB. Compared to NHW, Hispanic and NHB patients had lower income ($p < 0.001$), education ($p < 0.001$), and higher uninsured rates ($p < 0.001$). NHB patients had larger tumors ($p < 0.001$), lower rates of lymph node dissection ($p < 0.001$), and higher rates of non-operative management ($p = 0.03$). Rates of radioactive iodine treatment were lower for Hispanic (38.1%) and NHB (38.3%) patients compared to NHW (45.4%, $p < 0.001$).

After multivariable adjustment, race/ethnicity was significantly associated with mortality; survival was worst for NHB patients (HR 1.39, 95% CI 1.03-1.88, $p = 0.002$, NHW: reference). Overall, the strongest risk factor for mortality for all patients was clinical stage at diagnosis (HRs for Stage II-IV with Stage I as reference): 2.61, 4.07, 7.36, overall $p < 0.001$). However among NHB patients, the risk of death was substantially higher for each clinical stage (HRs for Stage II-IV: 4.91, 8.37, 10.49, $p = 0.004$). Sub-analysis by race/ethnicity showed that non-private insurance (HRs 1.97-2.1, overall $p < 0.001$) was the strongest sociodemographic risk factor for mortality for NHW, while age ≥ 55 years was strongest for Hispanic patients (HR: 8.76, $p < 0.001$). No sociodemographic risk factors were identified for NHB patients.

Conclusions: Our findings suggest that actionable targets to improve thyroid cancer survival and health equity vary by race/ethnicity. For NHB patients, higher clinical stage at diagnosis and worse survival by stage indicate the need for earlier diagnosis and access to specialized care. For Hispanic patients, improved follow-up, particularly for older patients, may enhance survival.

◆ 18. Higher Distressed Community Index is Associated with Worse Features in Thyroid Cancer

Joy Z Done¹, Rachel Stemme², Mingzhao Xing³, Darci C Foote¹, Jennine Weller¹, Alexandra Helbing⁴, Jonathon Russell⁵, Lilah F Morris-Wiseman¹, Aarti Mathur¹
¹Division of Endocrine Surgery, Department of Surgery, Johns Hopkins University School of Medicine, ²Division of Surgical Oncology, Department of Surgery, Johns Hopkins Hospital, ³Laboratory for Cellular and Molecular Thyroid Research, Division of Endocrinology, Diabetes & Metabolism, Department of Medicine, Johns Hopkins University School of Medicine, ⁴Parkview Health, ⁵Division of Head and Neck Endocrine Surgery, Dept of Otolaryngology, Johns Hopkins Hospital

Background: Prior research has demonstrated disparities in diagnosis and treatment of thyroid cancer. We sought to identify associations between the oncologic features of thyroid cancers and patient living communities.

Methods: We leveraged a retrospective single institution cohort study of patients with thyroid cancer. Demographic, clinical, pathologic, outcome data, and zip codes were collected. We performed logistic regression using Distressed Communities Index (DCI) to identify associations between oncologic features and DCI.

Results: Of 1,062 patients, 72.1% were female and mean age at time of diagnosis was 46.8 years. The majority of patients had classical papillary thyroid cancer (PTC) (75.5%) and follicular variant PTC (21.1%). More patients lived in “prosperous” communities (41.7%, n=442) compared to “at risk” or “distressed” communities (16.7%, n=177). White patients were less likely to live in “distressed” communities compared to non-White patients (OR 0.40, 95% CI 0.26—0.60). Mean tumor size was 2.0cm (range 0.1-10.5cm) at the time of diagnosis, 10.5% of patients had tumors >4cm, and 37.7% had multifocal tumors. The majority of patients presented with Stage I (87.8%) disease, 31.7% had lymph node metastases, 17.8% had extrathyroidal extension, and 14.8% had vascular invasion on pathology. Tumor mutations included BRAF (34.1%), TERT (12.7%), and BRAF and TERT (6.5%). Death from thyroid cancer was 3.3% and recurrence rate was 20.3%. After adjusting for race, those living in “distressed” communities were more likely to have tumors >4cm (OR 1.90, 95% CI 1.06—3.42), be diagnosed at Stage 3 or 4 (OR 2.95, 95% CI 1.34—6.45), and have higher rates of recurrence (OR 1.65, 95% CI 1.09—2.53) and death due to thyroid cancer (OR 4.18, 95% CI 1.72—10.2) compared to those in “prosperous” communities. There were no associations between DCI and tumor mutations or multifocality.

Conclusions: Patients living in “distressed” communities are diagnosed with more advanced thyroid cancer and have higher rates of recurrence and death although no difference in tumor mutational profile. Future studies should aim to further elucidate environmental and social risk factors that impact thyroid cancer diagnosis, barriers to access to care, and outcomes.

◆19. Effect of Variations in Perioperative Adjuncts by Race on Outcomes After Thyroidectomy

Lauren Slattery¹, Fiemu Nwariaku¹, Jessica Liu McMullin¹

¹University of Utah

Background: Racial disparities in access to specialist care for patients with thyroid disease have previously been established. However, it is unknown if practice patterns and postoperative surgical outcomes vary by race. Our objective was to determine if there are variations in practice patterns and postoperative surgical outcomes between white and non-white patients undergoing thyroidectomy.

Methods: We identified patients undergoing thyroidectomy between 2013-2021 from the National Surgical Quality Improvement Program Procedure Targeted Thyroidectomy (NSQIP-Tx) dataset and classified race by white patients and non-white patients. Propensity score matching was performed on gender, ASA class, CPT code, surgical indication (i.e., nodule, Graves' disease, goiter, etc.), age group, and BMI group. This resulted in matched cohorts of white and non-white patients. The use of perioperative adjuncts were compared between the two matched cohorts. Additionally, we analyzed postoperative outcomes including hematoma, recurrent laryngeal nerve (RLN) injury (RLNI), and hypocalcemia.

Results: Among 49,865 patients, 25,979 were white and 23,886 were non-white. Following propensity score matching, the matched cohorts included 19,132 patients in each cohort. RLN monitoring was used less frequently amongst non-white patients (57.0% non-white vs 69.3% white, $p<0.01$) and higher rates of RLNI were seen in non-white patients (6.3% non-white vs 5.1% white, $p<0.01$). Amongst non-white patients, postoperative calcium and parathyroid hormone levels were checked more frequently (62.9% and 46.1% nonwhite vs 58.5% and 30.2% white respectively, $p<0.01$), however postoperative calcium and/or vitamin D replacement was prescribed less frequently (50.7% non-white vs 61.9% white, $p<0.01$). Hypocalcemia events occurred prior to discharge in 4.3% of non-white patients vs 3.0% of white patients ($p<0.01$) and within 30 days in 5.6% nonwhite patients vs 4.7% white patients ($p<0.01$). There was no significant difference in postoperative hematoma rates.

Conclusions: We found significant variation in the use of perioperative adjuncts between white and non-white patients as well as variation in postoperative outcomes. These observed variations could have implications regarding inequities in care and access to specialist surgeons.

20. The Addition of Ultrasound-Guided Cervical Plexus Block Enhanced Post-Operative Pain Control in Unilateral Thermal Ablation of Thyroid Nodules **Man Him Matrix Fung¹, Yan Luk¹, Brian Lang¹**

¹Division of Endocrine Surgery, Department of Surgery, University of Hong Kong

Background: Despite being a non-invasive procedure, patients can still experience pain and discomfort during and shortly following thermal ablation of thyroid nodules. Currently, pain is managed by a bolus injection of perithyroidal local anesthesia (LA) ± intravenous sedation. We hypothesized the addition of ultrasound-guided intermediate cervical plexus block (CPB) to perithyroidal LA and intravenous sedation may enhance pain control during and after thermal ablation of thyroid nodules. This prospective study examined whether the addition of CPB to perithyroidal LA and sedation could further reduce post-operative pain in unilateral thermal ablation of thyroid nodules.

Methods: Consecutive patients aged ≥18 years who underwent unilateral radiofrequency ablation (RFA) or microwave ablation (MWA) of benign thyroid nodules were recruited. Prior to ablation, all received intravenous midazolam and pethidine, and perithyroidal lidocaine (LA) under standardized protocol. Group I further received ultrasound-guided CPB (10ml 0.25% Bupivacaine injected between sternocleidomastoid muscle and prevertebral fascia on the treatment side). Group II did not receive CPB. Post-operative pain was charted immediately, at 4-hours and on Day-1 morning after ablation using a 0-10 numerical rating scale (NRS). All patients filled in the Quality-of-Recovery-9 (QoR9) questionnaire at 4 hours after ablation prior to discharge.

Results: Over a 10-month period, 83 patients underwent unilateral thermal ablation of thyroid nodules. After exclusion, 56 patients (RFA: 30, MWA: 26) were analyzed (Group I: n=28, Group 2: n=28). The baseline patient and nodule characteristics, ablation methods, sedative and LA doses were comparable ($p>0.05$). Group I had significantly lower immediate NRS (1 (0-3) vs 3 (1.25 -5.75), $p=0.011$). More patients in Group I had zero immediate NRS (46.4% vs 21.4%, $p=0.048$). No significant differences were observed in NRS at 4-hours (1 (0-3) vs 2 (1.0-3.75), $p=0.158$), Day-1 morning (2 (0-2) vs 1.5 (0-3.25) $p=0.585$) and total QoR9 scores (16 (14 – 17) vs 16 (12 – 17) $p=0.904$). All patients were discharged within the same day. No adverse events related to ablation or CPB occurred.

Conclusions: Ultrasound-guided intermediate CPB in addition to perithyroidal LA and sedation improved immediate pain control following unilateral thermal ablation of thyroid nodules. It did not affect quality of recovery.

21. Evaluating Effect of Gender and Age Surgeons on Patients Outcomes in Thyroid Surgery: Change is happening!

Nathalie Chereau¹, Constance Bouygues², Gaëlle Godiris-Petit², Severine Nouillet², Sebastien Gaujoux², Fabrice Menegaux²

¹Endocrine surgery, Pitié Salpêtrière Hospital, ²Pitié Salpêtrière Hospital

Background: Female and male physicians differ in their practice of medicine in ways that might substantially affect patient outcomes. Objective of this study: To examine whether gender and experience training of the surgeon is associated with short and long term outcomes among patients undergoing thyroid surgeries

Methods: Method: This cohort study evaluated all patients operated for thyroid surgery in a high-volume endocrine surgery center between 2007 and 2022. Postoperative adverse outcomes were defined as any surgical complications after thyroid surgery: hypocalcemia, neck hematoma or recurrent laryngeal nerve (RLN) paralysis.

Postoperative hypocalcemia was defined as a serum calcium level of less than 8 mg/dL after TT that was symptomatic with overt manifestations. Hypocalcemia was considered permanent if the plasma parathyroid hormone (PTH) levels six months postoperatively were less than 15 pg/mL, and the patient continued to require oral calcium and vitamin D supplementation. RLN palsy was considered permanent if there was no proof of recovery using laryngoscopy within six months of the operation.

Junior surgeons were defined as qualified doctors in clinical training during the 4 first years. Others (general practitioner, academic doctors) were senior surgeons.

Results: Results: 25.008 patients were included (12.205 operated by male surgeon and 12.803 by female surgeon). The prevalence of postoperative adverse outcomes was higher for male surgeons (2.093; 17%) than for female surgeons (1.721; 14%) ($p < 0.0001$). Senior female surgeons have the lowest risk of postoperative complications (691/5.989; 11.5%) compared to others (junior female surgeons (1.030/6.814; 15.1% (junior male surgeons (892/5.187; 17.2%), senior male surgeons (1.201/7.014; 17.1%),) ($p < 0.001$)). After adjusting for surgical procedure (complexity; cancer staging; patient); the risks of permanent hypocalcemia and RLN palsy were higher among patients treated by male than female surgeons (13.3% vs 9.8% OR=1.09 and 3.3% vs 2.9%; OR= 1.06 respectively).

Conclusions: After adjusting for surgical procedure, the findings of this cohort study suggest that patients treated by senior female surgeons have lower rates of adverse postoperative outcomes in thyroid surgery.

22. Malignancy in Hyperfunctioning Nodules: Higher than previously reported and implications for biopsy

Ekaterina Koelliker¹, Lauren Norell Krumeich², Rajshri Gartland¹

¹*Surgery, Massachusetts General Hospital*, ²*Surgery, University of Michigan*

Background: An estimated <5% of hyperfunctioning nodules harbor malignancy. Given this low malignancy rate, it remains unclear which hyperfunctioning nodules warrant biopsy. We sought to reevaluate the risk of malignancy within different pathologies of hyperfunctioning nodules and identify sonographic and histologic features suggestive of malignancy.

Methods: We retrospectively evaluated patients with toxic multinodular goiter (MNG), solitary toxic nodule, and Graves' disease who underwent partial or total thyroidectomy (2017-2022) at a tertiary medical center and had at least one hyperactive nodule ≥ 1 cm identified on preoperative ultrasound and radioactive iodine (RAI) uptake test. We compared TI-RADS sonographic features and histologic features between benign and malignant hyperfunctioning nodules using Kruskal Wallis testing.

Results: 83 hyperactive nodules among 64 patients were included: 34 (41%) within toxic MNGs, 23 (36%) solitary toxic nodules, and 26 (31%) within Graves' disease. Median age was 55 (40-66), and 49 (79%) were female. There were 12 malignancies >1 cm (14%): 9 papillary thyroid cancers and 3 follicular thyroid cancers. Of these, 11 (92%) had met TI-RADS criteria for preoperative fine needle aspiration (FNA), compared to 34 (49%) of the benign lesions. Of the 45 (54%) total nodules that met criteria for FNA, 33 (73%) were performed. Histologic results among the malignancies were most commonly Bethesda IV (20%), V (40%), and VI (20%), whereas the benign nodules were more commonly Bethesda II (85%) or III (3.7%, $p=0.0001$). Molecular testing was infrequently performed ($N=5$, 6%). Malignancies were more common among solitary toxic nodules ($N=6$, 26%) and Graves' disease ($N=5$, 19%) compared to toxic MNG ($N=1$, 3%, $p=0.02$).

Shape taller than wide (25% vs. 0%, $p=0.001$), punctate echogenic foci (33% vs. 3%, $p=0.03$), and TI-RADS score (6[IQR:3.5-7] vs 3[IQR:2-4], $p=0.001$) distinguished malignant and benign lesions. High risk features including BRAF positivity ($N=10$), lymphovascular invasion ($N=4$), multifocality ($N=9$), tall cell features ($N=2$), and lateral lymph node involvement ($N=2$) were common. 3 patients underwent completion thyroidectomy and RAI.

Conclusions: TI-RADS and Bethesda characterizations predict malignancy among hyperfunctioning thyroid nodules, and malignancy was more common than previously reported. FNA may be warranted for suspicious nodules that are solitary toxic or within Graves' disease, particularly when nonoperative strategies are being considered.

23. The Efficacy of Radiofrequency Ablation for Thyroid Nodules with Atypia of Undetermined Significance: Preliminary findings

Youngjae Ryu¹, Shawn Hsu², Eric Kuo², Catherine McManus², Rachel Liou², Jennifer Kuo², James Lee²

¹*Columbia University Irving Medical Center*, ²*Columbia University Irving Medical Center*

Background: Radiofrequency ablation (RFA) is an emerging method for the safe and effective management of benign thyroid nodules. However, few studies have assessed its efficacy in treating thyroid nodules with indeterminate cytology. The objective of this study was to determine the efficacy of RFA in treating nodules with atypia of undetermined significance (AUS) that have been molecularly profiled benign (BIII-MPN).

Methods: We analyzed outcome data of prospectively enrolled patients who underwent RFA for BIII-MPN thyroid nodules at our institution. All patients were required to have two biopsies prior to ablation. Primary outcome measures included the volume reduction ratio (VRR), symptom score (range 0-10), and cosmetic score (range 0-3) at 1, 3, 6, and 12-months after RFA, as well as the rate of complications. Descriptive statistics were used to summarize demographic variables, and Wilcoxon rank sum was used to compare this cohort to a concurrent patient cohort treated with RFA for benign thyroid nodules.

Results: A total of 257 nodules in 191 patients were included (benign: 238 in 171; BIII-MPN: 19 in 17). The baseline median volume of benign and BIII-MPN nodules were 17.6 (interquartile range [IQR]: 9.5, 29.7) ml and 17.9 (IQR: 6.7, 36.3) ml, respectively ($p=0.667$). There was no difference in median VRR between the two cohorts during the study period (benign 42.5% vs. BIII-MPN: 46.5% at 1 month, $p=0.654$; 61.1% vs. 65.6% at 3 months, $p=0.614$; 69.7% vs. 70.5% at 6 months, $p=0.288$; 77.7% vs. 83.6% at 12 months, $p=0.531$). There was similar improvement in symptom and cosmetic scores between the two cohorts. Additionally, the rate of procedural complications did not significantly differ, with four patients with BIII-MPN nodule experiencing discomfort during the procedure. One patient with BIII-MPN did exhibit growth and PET-avidity of the nodule >1 year post-ablation and went on to have thyroidectomy.

Conclusions: The efficacy of RFA in terms of VRR, symptom and cosmetic scores, and complications is comparable between benign and BIII-MPN thyroid nodules. Our preliminary results suggest that RFA may be a feasible management option for AUS thyroid nodules, although further research is warranted to confirm long-term effectiveness of RFA.

24. More than 50% of the Patients with Clinically Unifocal T1b/small T2 Node Negative Papillary Thyroid Carcinoma Scheduled for Thyroid Lobectomy May Require Completion Thyroidectomy if the Node Status is Evaluated

Antonio Laurino¹, Francesco Pennestri¹, Annamaria Martullo¹, Pierpaolo Gallucci¹, Francesca Prioli¹, Luca Sessa², Esther Diana Rossi¹, Carmela De Crea¹, Marco Raffaelli¹

¹Fondazione Policlinico Universitario Agostino Gemelli IRCCS, ²Fondazione Istituto Gemellioglio Cefalù

Background: In absence of lymph node metastases or aggressive pathologic features, thyroid lobectomy (TL) should be preferred over total thyroidectomy (TT) for small unifocal papillary thyroid carcinoma (PTC). Occult, despite non-microscopic (>2 mm), lymph node metastases may be present in clinically node-negative (cN0) PTC and increase the risk of recurrence. Nonetheless, prophylactic central neck dissection is not recommended.

Methods: Among 4176 patients who underwent thyroidectomy for malignancy between September 2014 and September 2023, 102 (2.4%) with proven or suspected unifocal cT1b/small cT2 (<3 cm) cN0 PTC were scheduled for TL plus ipsilateral central neck dissection (I-CND). Removed nodes were sent for frozen section examination (FSE). If FSE was positive, completion thyroidectomy (CT) was accomplished during the same procedure. Following multidisciplinary tumor board (MTB) discussion, in presence of aggressive pathologic features, CT was proposed within 6 months from index operation.

Results: There were 36 males and 66 females, with a median age of 37.4 years: 96 (94.1%) cT1b and 7 cT2. FSE was positive for occult node metastases in 33 cases (32.3%) who underwent immediate CT. At definitive pathological examination, the median number of removed and metastatic nodes was 13 (range 5-29) and 5 (range 1-16), respectively. Multifocality was present in 24 cases (72.7%), angioinvasion in 26 (78.8%), aggressive variants in 6 (5.8%) and extracapsular extension in 1 (3.0%). Among the remaining 69 patients, 23 (33.3%) were scheduled for CT. Reasons for reoperation were presence of occult node metastases not detected at FSE in 12 patients (52.2%), multifocality in 16 (69.6%), angioinvasion in 12 (52.2%), aggressive variants in 4 (17.4%) and extracapsular extension in 3 (13.0%) (combination of 2 or more risk factors in 15 patients). Overall, 56 patients (54.4%), initially scheduled for TL, underwent immediate or delayed CT.

Conclusions: Overall, more than 50% of patients with unifocal cT1b/small cT2 (1-3 cm) cN0 PTC scheduled for TL may require CT because of aggressive features, mainly lymph node metastases. An intraoperative decision-making approach based on I-CND associated with FSE of the removed nodes, may ensure accurate staging and risk stratification, thus reducing the risk of recurrence and the need for reoperation.

25. Microscopic Positive Margin in Papillary Thyroid Carcinoma Does Not Always Require High-Dose Radioactive Iodine

Hyungju Kwon¹, Hyeji Kim¹

¹Department of Surgery, Ewha Womans University Medical Center, Ewha Womans University

Background: Radioactive iodine (RAI) treatment is recommended for patients with microscopic positive margin after thyroidectomy for differentiated thyroid cancer. However, there is controversy whether higher RAI activity is needed to improve local control. The aim of this study was to investigate the efficacy and effect of RAI activity on local recurrence in patients with microscopic margin-positive papillary thyroid carcinoma.

Methods: A retrospective cohort study was conducted for 213 patients who had microscopic positive margin and received RAI after total thyroidectomy for papillary thyroid carcinoma. Among them, 129 patients who received 1.1 GBq at the first RAI treatment were classified as the low-dose group, and 84 patients received 3.7-7.4 GBq were classified as the high-dose group.

Results: The basal clinicopathological characteristics were similar between the groups except for gross extrathyroidal extension (20.2% in low-dose vs. 34.5% in high-dose, $P = 0.019$). Although initial ablation success rate after 1st dose of RAI was lower in low-dose group (60.5% vs. 78.6%, $P = 0.006$), the mean number of RAI therapy for ablation was not different between groups (1.4 ± 0.6 vs. 1.3 ± 0.8 , $P = 0.120$), and total dose of RAI was lower in the low-dose group (1.9 ± 1.8 GBq vs. 5.9 ± 4.4 GBq, $P < 0.001$). Moreover, the 5-year recurrence rate was comparable between the groups (3.9% vs. 4.8%, $P = 0.618$). Multivariate analysis indicated that initial stimulated thyroglobulin levels ≥ 10 ng/ml (Hazard Ratio[HR] 20.7, 95% CI 1.9–221.9, $P = 0.012$) and N1b stage (HR 16.1, 95% CI 1.8–145.4, $P = 0.013$) were significantly associated with recurrence, whereas initial RAI dose showed no association.

Conclusions: The overall efficacy of low-dose RAI was comparable with that of high-dose RAI in patients with microscopic positive margin. Treatment with low-dose RAI can be considered for initial adjuvant RAI therapy in patients with microscopic residual disease.

26. Transcriptional Pathway Analysis Identified Age-Specific Differences in Immune Cell Function and Cytokine Activity in Papillary Thyroid Carcinoma

Aditya S Shirali¹, Dominique D Szymkiewicz¹, Francis D Moore¹, Fahong Yu²

¹Surgery, University of Florida, ²Interdisciplinary Center for Biotechnology Research, University of Florida

Background: Cancer progression in older adults has been linked to immunosenescence and inflammaging, characterized by reduced effector immune cell function and accumulation of inflammatory proteins, respectively. Increased age confers a worse prognosis for differentiated thyroid cancer, yet the presence of age-specific biologic alterations has yet to be identified. We sought to determine the existence of age-specific differences in the immune cell and inflammatory repertoire of papillary thyroid cancer (PTC).

Methods: RNA sequencing data of PTC samples were obtained from The Cancer Genome Atlas (TCGA). Given the use of 55 years as cutoff by the American Joint Committee on Cancer 8th edition for PTC, samples were divided into G1 (<55 years), G2 (≥55 years, ≤64 years), G3 (≥65 years, ≥74 years), and G4 (≥75 years). Ingenuity pathway analysis and gene ontology were used to identify differentially regulated pathways and genes.

Results: 505 PTC samples with complete data were retrieved from the TCGA data portal. This was further divided into G1 (n=330), G2 (n=93), G3 (n=51) and G4 (n=31) based on age. Comparison of G1 vs G2, G1 vs G3, and G1 vs G4 differentially expressed genes (DEG) found 412, 885, and 455 DEGs, respectively (padj<=0.01). Pathway analysis revealed B cell development (48.9%, 30.3%, and 20.4% overlap), IL-15 signaling (40.8%, 24.2%, and 17.0% overlap) and FCRIIB signaling in B lymphocytes (39.7%, 25%, and 17.3% overlap) as common top differentially regulated pathways in each comparison. Gene set enrichment analysis (GSEA) identified suppression of humoral immune response and immunoglobulin complex (p<2.5e-05) and activation of extracellular matrix (p<5.0e-05) in G1 vs G2, suppression of immunoglobulin complex and B cell receptor signaling (p<2e-05) and activation of mitochondrial matrix (p<2e-05) in G1 vs G3, and suppression of immunoglobulin complex and B cell receptor signaling (p<0.005) and activation of cytokine activity (p<0.01) and cytokine receptor binding (p<0.015) in G1 vs G4.

Conclusions: Age-specific suppression of immune cell function, particularly transcripts involved in B cell signaling, and activation of extracellular matrix, mitochondrial, and cytokine activity are identified through transcriptional pathway analysis in PTC. Further validation studies are needed to identify the impact of immunosenescence and inflammaging in PTC.

◆27. Readmission and Cost of Parathyroidectomy by Admission Status in Secondary Renal Hyperparathyroidism

Jasmine Hwang¹, James Sharpe¹, Caitlin Finn², Amanda Bader¹, Solomiya Syvyk¹, Luke Keele¹, Douglas L Fraker³, Heather Wachtel³, Rachel R Kelz³

¹*Surgery, University of Pennsylvania Health System*, ²*Surgery, NewYork-Presbyterian Weill Cornell*, ³*Endocrine and Oncologic Surgery, University of Pennsylvania Health System*

Background: Our previous work shows increased outpatient parathyroidectomy among patients with secondary hyperparathyroidism of renal origin. The safety of this approach is unknown given the comorbidities and potential for hungry bone syndrome in this population. Herein, we compare outcomes of parathyroidectomy by admission status in patients with secondary renal hyperparathyroidism.

Methods: Adult patients who underwent elective parathyroidectomy for secondary renal hyperparathyroidism in 11 states were identified in the Healthcare Cost and Utilization Project State Inpatient and State Ambulatory Surgery Databases (2013-2019). Patients were classified by admission status: inpatient and outpatient (overnight or same-day). The primary outcome was 30-day readmission and secondary outcome was encounter costs adjusted for inflation. Covariates included patient sociodemographics, comorbidities, contraindications to outpatient surgery, and operative factors. Balancing weights, a computational generalization of inverse propensity score weighting, were used to create populations with similar covariate distributions between groups by admission status. After achieving balance on covariates, 30-day readmission rates were compared using logistic regression. Costs were compared using quantile regression estimating median differences.

Results: Among 3,956 parathyroidectomy patients with secondary renal hyperparathyroidism, 1,751 were inpatients. Outpatients included 957 overnight and 794 same-day discharges. Inpatients were more likely to be younger, non-white, have non-private insurance, and increased comorbidities than outpatients ($p < 0.05$). Overall readmission rate was 14.0%. Readmission varied significantly between inpatients and outpatients (Inpatient: 17% vs Outpatient: 11%; $p < 0.01$). Readmission was similar among outpatients (Overnight: 13% vs Same-day: 10%; $p = 0.06$). Median overall cost was \$8,097 [Interquartile Interval (IQI): \$5,647-12,220]. Costs differed by admission status (Inpatient: \$10,790 [IQI: \$7,481-15,444] vs Outpatient: \$5,702 [IQI: \$4,313-7,697]; $p < 0.01$) (Overnight: \$6,170 [IQI: \$4,643-8,292] vs Same-day: \$5,154 [IQI: \$3,446-6,470]; $p < 0.01$).

After covariate balancing, there were no significant differences in patient factors by admission status. The adjusted odds of 30-day readmission were similar between inpatients and outpatients (OR [95% CI]: 1.13 [0.88-1.44]; $p = 0.35$). The adjusted odds of 30-day readmission were lower for overnight stays compared to same-day discharges (OR [95% CI]: 0.64 [0.45-0.91]; $p = 0.01$). Adjusted median costs varied significantly by admission status (Inpatient: \$10,790 [IQI: \$7,481-15,444] vs Outpatient: \$6,756 [IQI: \$4,324-7,732]; $p < 0.01$) (Overnight: \$6,170 [IQI: \$4,643-8,292] vs Same-day: \$5,154 [IQI: \$3,799-8,866]; $p < 0.01$).

Conclusions: Select patients with secondary renal hyperparathyroidism may undergo outpatient parathyroidectomy safely with reduced costs. Overnight stay may be safer than same-day discharge in the outpatient setting.

◆28. Is 50% Too Much? Evaluating the ideal intraoperative PTH drop for patients with normohormonal hyperparathyroidism

C. Corbin Frye¹, Zhixing Song², Ashba Allahwasaya², Andrea Gillis², Jessica Fazendin², Brenessa Lindeman², Herbert Chen²

¹Washington University in St. Louis, ²The University of Alabama at Birmingham

Background: Compared with classic primary hyperparathyroidism, patients with normohormonal primary hyperparathyroidism (NH-pHPT) are thought to exhibit slower intraoperative parathyroid hormone (ioPTH) declines, although the ideal ioPTH drop threshold in these patients is not known. Additionally, the clinical significance of higher or lower baseline PTH levels within NH-pHPT is poorly characterized.

Methods: We performed a retrospective, multi-institutional review of patients who underwent surgery for pHPT. All patients had pHPT and were classified into three groups based on their baseline PTH level: Classic (PTH >100% of upper limit of normal, ULN; n=1593), High Normal (PTH 76-100% of ULN; n=282), and Low Normal (PTH ≤75% of ULN; n=245). Cure was defined as the absence of hypercalcemia at 6 months. Ideal ioPTH thresholds were determined using Receiver Operator Curves and positive predictive value. Patients with multi-gland disease were excluded from the ioPTH kinetics analyses (to reduce variability) but were included in the ioPTH threshold analyses (to improve clinical utility).

Results: The absolute rate of ioPTH fall was significantly slower in the Low Normal group ($p < 0.001$), but this difference was abrogated when corrected for baseline PTH ($p = 0.46$). The average percent drop of ioPTH at 15 minutes was lower in the Low Normal group compared to Classic pHPT (62.8% drop vs 70.7% drop; $p < 0.05$). The Low Normal group was less likely to reach a 50% ioPTH drop threshold compared to the High Normal (73.1% vs 85.6%; $p < 0.05$) and Classic groups (73.1% vs 88.9%; $p < 0.001$), even though there was no difference in 6-month cure ($p = 0.39$) or recurrence rates ($p = 0.26$). In our dataset, the ideal ioPTH drop threshold at 15 minutes for the Low Normal group was 25%, which would have correctly predicted cure in 46 patients (18.8%) that were otherwise considered not cured using a 50% threshold, without the addition of any false positives.

Conclusions: NH-pHPT may not be a clinical monolith, as it is frequently considered to be. In our dataset, patients with low normal PTH levels behave clinically different than those with high normal PTH levels or classic pHPT. In these patients, surgeons could consider using a lower ioPTH threshold than what the Miami criteria would suggest.

◆29. Time to Quality of Life Improvement After Parathyroidectomy In Patients With Primary Hyperparathyroidism: A prospective longitudinal study

Rongzhi Wang¹, Ramsha Akhund¹, Marshall Lewis¹, Ashba Allahwasaya¹, **Sanjana Balachandra**¹, M.Chandler McLeod¹, Peter Abraham¹, Andrea Gillis¹, Jessica Fazendin¹, Brenessa Lindeman¹, Herbert Chen¹

¹UAB

Background: Primary hyperparathyroidism (pHPT) can affect multiple organ systems, leading to subjective renal and skeletal manifestations, as well as objective neurocognitive symptoms. A majority of patients choose non-surgical management due to a lack of subjective complications and unconsciously endure an impaired quality of life (QoL). We sought to evaluate the impact of parathyroidectomy on QoL and time to QoL improvement in patients with pHPT.

Methods: This prospective study was conducted at a tertiary medical center from 2021 to 2023. A validated disease-specific questionnaire, Primary Hyperparathyroidism Quality of Life (PHPQoL), was administered to patients with pHPT preoperatively, 2 weeks post-parathyroidectomy, and then monthly for up to 12 months. The questionnaire examined 9 items for physical domains and 7 items for emotional domains, using a 5-point Likert Scale. Patient demographics, comorbidities, perioperative laboratory results, and surgical outcomes were collected. One-way within-subject ANOVA with Bonferroni correction was performed for trend analysis.

Results: Of 124 patients enrolled, most were White (68.5%), female (80.6%) with a mean (SD) age of 59 ± 16. Eleven (8.9%) patients underwent reoperative parathyroidectomy. The overall cure rate was 97.6%. The PHPQoL scores significantly improved 2 weeks after parathyroidectomy compared to preoperative scores. [median (IQR) 64.8 (54.7–78.1) vs. 48.4 (32.8–62.5), p=0.004] The improved PHPQoL scores were maintained from 2 weeks to 12 months after parathyroidectomy. (p>0.05) Similarly, the physical and emotional domain scores significantly improved 2 weeks after parathyroidectomy and were sustained through the end of follow-up. The most commonly resolved symptoms were fatigue (82.8%), brain fog (79.5%), and depression (74.6%). Irritation (33.7%), back pain (62.9%), and memory loss (62.9%) were less likely to resolve.

Conclusions: QoL of patients with pHPT quickly improved within 2 weeks after parathyroidectomy. This surgical benefit was durable and persisted for 12 months postoperatively. Incorporating the QoL improvement should be considered when making surgical decisions for pHPT.

◆30. Medical Treatment with Bisphosphonates for Osteoporosis in Patients with Primary Hyperparathyroidism Does Not Improve Outcomes Compared to Surgery Alone

Peter J Abraham¹, Rongzhi Wang¹, Andrea Gillis¹, Lindy Reynolds¹, Russell L Griffin¹, Jessica Fazendin¹, Brenessa Lindeman¹, Herb Chen¹

¹The University of Alabama at Birmingham

Background: Osteoporosis is the most common cause of bone fracture among elderly patients in the United States. Many osteoporotic patients are managed medically with bisphosphonates, which is estimated to cost Medicare \$2 billion annually. Although most instances of osteoporosis are due to demographic risk factors, some patients develop osteoporosis secondary to underlying clinical pathologies such as primary hyperparathyroidism (PHPT). The definitive treatment for these osteoporotic PHPT patients is treatment of the underlying disease via parathyroidectomy. However, many providers initiate medical treatment with a bisphosphonate prior to endocrine surgical referral, which can be costly to the patient. It is unclear whether this combination of medical and surgical therapy is superior to surgery alone for patients with concomitant PHPT and osteoporosis. This study compares combined medical and surgical therapy against surgical therapy alone for PHPT patients with concomitant osteoporosis.

Methods: An institutional database of patients who underwent surgery for PHPT from October 2016 through July 2023 was reviewed. Anyone with a diagnosis of osteoporosis, osteopenia, or with an abnormally low pre-operative dual-energy x-ray absorptiometry (DEXA) score was included. Patients were separated into two groups based on the administration of bisphosphonates prior to their operation. Outcomes including 6-month cure rates, complication rates, and postoperative bone density scores were compared across groups.

Results: We identified 1,055 patients who underwent parathyroidectomy during the study period. Of these, 138 (13.1%) patients were classified as osteopenic or osteoporotic based on preoperative DEXA score. Eighty-one (58.7%) patients were started on bisphosphonates prior to their parathyroidectomy. There were no significant differences between the bisphosphonate and non-bisphosphonate groups with regards to baseline characteristics or outcomes including prior fracture rate, 6-month cure rate, recurrence rate, and postoperative hypocalcemia ($P>0.05$). Similarly, there were no significant differences between groups with regards to improvement or stabilization in DEXA scores following parathyroidectomy.

Conclusions: Most patients with concomitant PHPT and osteoporosis are treated with combination medical and surgical therapy. In our cohort, there was no demonstrated benefit of adding bisphosphonate therapy to parathyroidectomy for these patients. We recommend parathyroidectomy alone for patients with PHPT and osteoporosis which would save Medicare an estimated 100 million dollars annually.

◆31. Multidisciplinary Approach to Treating Patients with Renal

Hyperparathyroidism

Xhesika Shanja¹, Christian Hadeed¹, Marine Coste¹, Allen T Yu¹, Samantha Carroll¹, Denise Lee¹, Gustavo Fernandez-Ranvier¹, Randall Owen¹, Fasika M Tedla², Aida Taye¹

¹Surgery, Mount Sinai Hospital, Icahn School of Medicine, ²Nephrology, Mount Sinai Hospital, Icahn School of Medicine

Background: Management of patients with secondary or tertiary hyperparathyroidism remains challenging. Our aim was to develop an institution-wide renal hyperparathyroidism program (R-HPTH) consisting of nephrology, transplant, endocrinology, and endocrine surgery teams to select appropriate patients for surgery.

Methods: We retrospectively compared data collected during the multidisciplinary program meetings starting in September 2022 to a historical control of patients evaluated between January 2021 and December 2022. Adult patients with secondary and tertiary HPT disease were included. The primary endpoint was assessing changes in management because of the program. Multivariate analysis controlling for program, age, gender, pre-operative calcium levels and pre-operative phosphorus levels were used with standard appropriate statistical analysis.

Results: 52 patients were evaluated by the R-HPTH program and compared to 46 controls. On univariate analysis, we noted in both groups that PTH levels of 800 pg/mL, traditionally used in KDIGO guidelines were more likely to be offered surgery at increased rates with rising PTH levels (OR 3.20 p = 0.038; >1000 pg/mL (OR 4.93 p = 0.0038), 1500 pg/mL (OR 6.11 p = 0.003) and > 2000 pg/mL (OR 14.5 p = 0.0037). However on multivariate analysis only high PTH>1500 were offered surgery in both groups (OR 98.5 [6.8-1,431] p<0.001). Participation in the program was an independent predictor of decreased likelihood of being recommended surgery (OR 0.04 p<0.05). Surgery was recommended in 87% of historical patients. After in depth discussion of patients' symptoms, medication compliance, and surgical risk, surgery was recommended in 59% of R-HPTH patients (OR 0.27p<0.05). Patients were more likely to be offered surgery if they had tertiary hyperparathyroidism (OR 4.1 p<0.05). Preoperative calcium and phosphate levels were not statistically significant (OR 0.73 p = 0.63, OR 1.35 p = 0.36, respectively).

Conclusions: Since starting the R-HPTH program, we were able to have group discussions considering symptoms, transplant status, as well as current medication optimization and compliance, prior to selecting surgical patients. Although patients were offered surgery in both groups for PTH levels >1500 regardless of program evaluation, fewer patients underwent surgery after multidisciplinary discussion. Further data regarding longitudinal patient outcomes is currently being gathered.

◆32. Price Variation for Parathyroidectomy: Exploring commercial and Medicare rates

Samuel Joseph Enumah¹, Jason Liu²

¹Mass General Brigham, ²Surgery, Brigham and Women's Hospital

Background: High prices contribute to the persistent rise in U.S. health care spending. The Hospital Price Transparency Rule (HPTR) in January 2021 instructed hospitals to publicly disclose the prices for their services. This legislation was designed to improve competition and lower health care prices. With the adoption of HPTR, novel commercial data provides a unique opportunity to enhance our understanding of negotiated prices. The aim of this study was to characterize commercial price variation for parathyroidectomy within and between hospitals and in relation to Medicare prices.

Methods: We performed a national cross-sectional study of commercial and Medicare prices for parathyroidectomy. Financial data was obtained from the Turquoise Health Database and extracted on 30 July 2023. We excluded non-acute care facilities and any negative price values. We included Current Procedural Terminology (CPT) codes for parathyroidectomy (60500), re-operative parathyroidectomy (60502), and intra-operative parathyroid hormone (PTH) monitoring (36500). We measured the commercial price as the median value among all commercial plans for a given hospital and CPT and compared this price to the Medicare rate. We quantified within-hospital variation by calculating the ratio between the 90th and 10th percentile commercial rates and between-hospital variation by calculating similar ratios within the hospital referral region.

Results: Price data was available for 1,073 facilities. There was notable variation between commercial and Medicare prices and among commercial prices within and between facilities. The median commercial prices for parathyroidectomy, re-operative parathyroidectomy, and intra-operative PTH monitoring were \$6,497 (IQR, \$2,881-\$11,032), \$6,912 (IQR, \$2,751-\$10,982), and \$621 (IQR, \$366-\$1,551). The commercial-to-Medicare ratios were 1.7 (IQR, 1.1-2.3), 1.8 (IQR, 1.2-2.4), and 1.6 (IQR, 1.0-3.4). Within facilities, the 90th percentile commercial prices were 2.5 (IQR, 1.5-4.3), 2.5 (IQR, 1.5-4.5), and 1.9 (IQR, 1.3-4.6) times the 10th percentile prices, respectively. Within hospital referral regions, the 90th percentile median facility commercial prices were 4.6 (IQR, 2.5-6.4), 3.8 (IQR, 2.2-6.3), and 4.6 (IQR, 1.6-11.7) times the 10th percentile prices, respectively.

Conclusions: Commercial prices for parathyroidectomy generally exceed Medicare prices. Notable variation exists both within and between hospitals signaling facilities have negotiated different payments from insurance companies for the same service. Further studies can explore modifiable factors to decrease price variation.

33. A Pilot Study of Real-Time Intraoperative Probe-Based Near Infrared Autofluorescence Parathyroid Gland Detection and Quantification of Vascularity

Parker Willmon¹, Colleen Kiernan², Naira Baregamian², Carmen Solórzano³, Anita Mahadevan-Jansen¹

¹Vanderbilt University, ²Surgical Oncology & Endocrine Surgery, Vanderbilt University Medical Center, ³Department of Surgery, Vanderbilt University Medical Center

Background: Hypoparathyroidism is the most common complication of total thyroidectomy – arising from incidental parathyroid gland (PG) removal or blood supply damage. In recent years, probe-based near infrared autofluorescence spectroscopy (NIRAF) and indocyanine green (ICG) angiography have arisen to address these problems, respectively. ICG angiography imaging is hampered by visual interpretation of near infrared (NIR) images being highly subjective. We aim to combine probe-based NIRAF with real-time quantification of vascularity with ICG. We hypothesized the fluorescence intensity of PGs would increase after injection of ICG when the PGs remain vascularized.

Methods: Twenty-one patients undergoing thyroidectomy or parathyroidectomy were recruited. The PTeye® was employed for PG identification and quantification of vascularity using ICG. Using the PTeye®, the fluorescence of PGs was quantified as the procedure progressed. Following thyroid removal or PG adenoma ligation, a 0.25 mg dose of ICG was injected, and PTeye® fluorescence measurements were recollected from identified PGs. Subsequently, NIR images were captured for each PG. Three surgeons scored the images to determine PG viability (0=nonperfused, 1=unclear, or 2=perfused). The ratio of after-ICG and pre-ICG measurements were calculated and compared to imaging scores to determine cutoffs for identifying well-perfused PGs.

Results: A PTeye ratio cutoff of 2.5 was chosen to separate glands with a score of zero from those with a one, and 4.4 was chosen to separate the ones and twos as well. In this way, 15 PGs were considered nonperfused, 14 as unclear, and 14 as perfused. Three of the PGs which the PTeye® considered nonperfused for lack of fluorescence had been scored as two by the surgical team. Similarly, three glands were classified as well-perfused for exhibiting roughly 10 times as much fluorescence as before despite being given a one by the surgical team.

Conclusions: Using a probe-based system with ICG to assess PG perfusion is feasible. Surgeons may misclassify PGs as perfused based on the subjective nature of NIR imaging when the gland is only receiving a small amount of blood/ICG. Further studies are needed to confirm the current findings. This work also demonstrated the ability to significantly reduce the traditional dosage of ICG used in thyroidectomies.

34. 596 Robotic Adrenalectomies: Analysis of different techniques and lessons learned

Tim Beck¹, Ege Akgun¹, Ali Gunduz Sarioglu¹, Melis Uysal¹, Melis Salman¹, Eren Berber¹
¹*Department of Endocrine Surgery, Cleveland Clinic*

Background: Interest in robotic adrenalectomy (RA) has been growing, with the 2016 National Inpatient Sample data indicating that 1/3 of adrenalectomies for benign adrenal disorders were done robotically. Most RA studies have reported using 3 robotic arms, with scant data on how different RA techniques compare. The aim of this study is to determine RA techniques associated with the best patient outcomes.

Methods: Retrospective IRB-approved analysis of prospectively collected data. Procedures were performed through lateral transabdominal (LT) or posterior retroperitoneal (PR) approaches. LT adrenalectomies from 2008-2017 were performed using 3-robotic arms and subsequent cases with 4. Data were analyzed using Student's t test and ANOVA.

Results: 596 RAs (461 LT and 135 PR) were performed. The median operative time was 141 mins (interquartile range (IQR) = 53.0), docking time 11 mins (IQR = 6.0), console time 60 mins (IQR = 30.25), estimated blood loss (EBL) 10 mL (IQR = 15.0), conversion to open was 1.7%, hospital stay was 1 day (IQR = 0) and morbidity was 3%. There was no mortality. Regarding LT adrenalectomies, 147 (32%) were done using 3 robotic arms and 308 (68%) with 4. 4-arm versus 3-arm technique, was superior in terms operative time (144 mins (IQR = 43.25) vs 171 mins (IQR = 43.25); $P < 0.0001$), EBL (14.21 mL (IQR = 8.75) vs 50.48 mL (IQR = 47.50); $P < 0.0001$), conversion to open (0% vs 3%; $P = 0.007$), despite patients having thicker perirenal fat (15.54 mm (IQR = 13.2) vs 11.92 mm (IQR = 9.0); $P = 0.0013$) and a higher incidence of tumors abutting critical vasculature (32% vs 19%; $P < 0.0001$). Docking time was not prolonged with use of 4 compared to 3 arms (11 mins (IQR = 5.0) vs 13 mins (IQR = 6.0); $P = 0.0014$).

Conclusions: To the best of our knowledge, this is the largest RA series reported to date. Overall, results of RA were favorable compared to those reported for laparoscopic adrenalectomy in the literature. The technique utilizing 4 robotic arms resulted in better perioperative outcomes compared to that using 3 robotic arms despite the higher complexity of cases.

◆35. Identifying Genomic Signatures of Recurrence in Adrenocortical Carcinoma: Analysis of the cancer genome atlas

Benjamin C Greenspun¹, Dawn Chirko¹, Rajbir Toor¹, Kyle Wierzbicki¹, Teagan Marshall¹, Abhinay Tumati¹, Rasa Zarnegar¹, Thomas J Fahey III¹, Brendan Finnerty¹
¹*Surgery, Weill Cornell Medicine*

Background: Adrenocortical carcinoma (ACC) is a rare and aggressive malignancy with limited treatment options. While there have been recent advancements revealing genomic drivers of these tumors, it remains unclear which genomic signatures are associated with recurrence, particularly following R0 resection.

Methods: ACC patients in The Cancer Genome Atlas with recurrence data were identified using cBioPortal. Clinicopathologic variables, genomics, treatment patterns, and outcomes were retrospectively analyzed, employing two-tailed hypothesis tests ($p < 0.05$ considered significant) and multivariate logistic regressions using Prism 9® and Stata 18.

Results: Among 92 ACC patients, 84 had recurrence data, with 52% experiencing tumor recurrence. Age and sex were not significantly different between recurrent and non-recurrent groups. Non-recurrent patients had significantly longer overall survival (54 months vs. 35 months, $p = 0.0036$). Adjuvant radiation was administered similarly in both groups (25.0% vs. 16.2%, $p = 0.4164$). There were no differences in capsular or venous invasion or median tumor size. R2 resections were significantly more frequent in the recurrent cohort (24.3% vs. 2.6%, $p = 0.0061$). The recurrent cohort exhibited a higher total mutation count (median 103 vs. 79, $p = 0.0007$) and significant pathway alterations in WNT (45.5% vs. 17.5%, $p = 0.0096$), PI3K (36% vs. 8.1%, $p < 0.0001$), Cell Cycle (50% vs. 17.5%, $p = 0.0026$), TP53 (54.6% vs. 20%, $p = 0.0015$), and RTK-RAS (50% vs. 27.5%, $p = 0.0451$). Additionally, combined TP53 and WNT alteration events were significantly greater in the recurrent cohort ($p = 0.0009$). Among R0 resection patients who recurred ($N = 25/62$, 40.3%), these pathways remained significantly altered, excluding RTK-RAS. However, multivariate logistic regression, when controlling for margins, revealed that only the WNT ($p = 0.034$) and Cell Cycle ($p = 0.001$) pathways were significantly associated with recurrence. The median time to recurrence was 7.9 months – early recurrence (< 7.9 months) was associated with more total mutations (median 123 vs. 90, $p = 0.0045$) and MYC pathway alterations (40.9% vs. 9.1%, $p = 0.0339$).

Conclusions: This study identified genomic signatures in the WNT and Cell Cycle pathways associated with ACC recurrence, including in those who underwent R0 resection. Investigations regarding the utility of these signatures as a prognostic tool to dictate adjuvant therapies or targeted treatment are warranted, particularly in the MYC pathway given its association with early recurrence.

◆36. Trends in Use of Outpatient Minimally Invasive Adrenalectomy: A population-based analysis

Caitlin B. Finn¹, James E. Sharpe², Jasmine Hwang², Lauren N. Krumeich³, Douglas Fraker², Heather Wachtel², Rachel R. Kelz²

¹NewYork-Presbyterian Hospital/Weill Cornell Medicine, ²University of Pennsylvania, ³University of Michigan

Background: Selective outpatient adrenalectomy can be performed safely with high patient satisfaction at specialized centers. Limited population-level data exists regarding the adoption of outpatient adrenalectomy. We aimed to evaluate the temporal trends, costs, and readmission rates in outpatient minimally invasive adrenalectomy in a population-based sample, comparing same-day discharge and overnight observation.

Methods: We included adult patients (≥18 years) who underwent minimally invasive adrenalectomy between 2016-2020 in 10 US states (FL, IA, KY, MD, MI, NC, NV, UT, VT, WI) using the Healthcare Cost and Utilization Project's State Inpatient Databases and State Ambulatory Surgery and Services Databases. Admission type was classified by length of stay (LOS) in days into same-day discharge (LOS=0), overnight observation (LOS=1), or inpatient admission (LOS≥2).

Trends in length of stay were evaluated using the Cochran-Armitage test of trend. Adjusting for patient and hospital factors, differences between same-day and overnight stays were compared using quantile regression for costs and logistic regression for 30-day readmission.

Results: Among 4,431 adrenalectomy patients, 100 (2.3%) were discharged same-day, 2,173 (49.0%) observed overnight, and 2,158 (48.7%) admitted as inpatients. Mean age was 55.5 years (SD 13.9), and 2,653 (59.9%) were female. The majority had non-functional benign neoplasms (n=2,465; 55.6%) or unspecified malignant neoplasms (n=1,116; 25.2%). A minority had benign functional neoplasms (n=446; 10.1%), adrenocortical carcinoma (n=31; 0.7%), pheochromocytoma (n=14; 0.3%), or adrenal metastasis (n=359; 8.1%). Laparoscopic approaches were used for 3,078 (69.5%) patients and robotic approaches for 1,353 (30.5%).

The proportion of patients who underwent outpatient adrenalectomy, including same-day and overnight stays, increased annually from 44.1% in 2016 to 59.2% in 2020 ($p < 0.01$). The majority were observed overnight with only 27 (2.7%) patients discharged same-day in 2020. Median same-day costs were \$9,565 (interquartile interval (IQR) \$7,355-12,890) compared to overnight costs of \$9,491 (IQR \$7,551-12,053) with a risk-adjusted marginal difference of \$179 (95%CI \$-1,658-1,300; $p = 0.81$). Odds of readmission were similar between same-day and overnight stays (OR 0.18; 95%CI 0.02-1.41; $p = 0.10$).

Conclusions: Minimally invasive adrenalectomy is increasingly shifting to outpatient settings with limited adoption of same-day discharge. Given similar costs and readmission rates, case selection and surgeon expertise should continue to guide decision-making on same-day discharge after adrenalectomy.

◆37. Single-Nuclei RNA Sequencing of Adrenocortical Carcinoma Identifies Replication Stress and ATR Dependency

Daniel M Chopyk¹, Liudmila V Popova¹, John E. Phay¹, Barbra S. Miller¹, Elizabeth A.R. Garfinkle², Elaine R. Mardis³, Katherine E. Miller³, Priya H Dedhia¹

¹Surgery, The Ohio State University, ²The Steve and Cindy Rasmussen Institute for Genomic Medicine, Nationwide Children's Hospital, ³Pediatrics, The Ohio State University

Background: Adrenocortical carcinoma (ACC) is an aggressive malignancy of the adrenal cortex. Due to lack of effective therapies, 5-year survival for advanced ACC is only 6%. Intratumoral heterogeneity is associated with poor outcomes, but targeting subpopulations that contribute to disease progression has improved treatment strategies in other malignancies. We performed single nuclei RNA sequencing (snRNAseq) to identify distinct ACC subpopulations and determine potential targeted treatment strategies in ACC.

Methods: Nuclei were isolated from frozen normal adrenal tissue (n = 1), adrenal adenoma (AA, n = 2), and ACC (n = 4 primary, n = 4 metastatic) and utilized in the 10x Genomics platform for snRNAseq. Downstream analyses were performed using Seurat v4 for R. The H295R ACC cell line was used for *in vitro* analyses of the replication stress response and DNA repair pathways. Immunofluorescence of γ -H2AX phosphorylation was used to detect replication stress and DNA damage. Viability studies in response to pharmacologic inhibition of the replication stress response and DNA repair pathways were conducted to identify potential therapeutic targets in ACC.

Results: Seven unique clusters of adrenal cortex cells (1-7) were identified by snRNAseq, 2 of which were enriched in ACC. Cluster 6 was enriched in ACC compared to AA and demonstrated a signature for proliferation and replication stress. In the H295R ACC cell line, γ -H2AX phosphorylation was present in ~25% of untreated cells and increased to >75% of cells with 100 μ M etoposide (common chemotherapeutic agent used as positive control). To determine dependency on replication stress response and DNA repair pathways, we then inhibited ataxia-telangiectasia-mutated and Rad3-related (ATR), ataxia-telangiectasia-mutated (ATM), Rad51, and poly [ADP-ribose] polymerase (PARP). H295R cells demonstrated notable sensitivity to the ATR inhibitors (elimusertib and VX-803 – IC50 < 0.1 μ M) but demonstrated minimal sensitivity to the ATM inhibitor (AZ32), Rad51 inhibitors (SAHA and RI-1), and PARP inhibitor (olaparib) – all IC50 > 1 μ M. Together, these findings suggest an ATR-dependent replication stress response in ACC.

Conclusions: Our findings demonstrate ATR-dependent replication stress in ACC indicating that ATR inhibition may prove to be a promising strategy in patients with aggressive ACC.

◆38. An In Silico Analysis of the Effect of Cortisol, c-MYC, and Ferroptosis in the Adrenocortical Cancer Microenvironment

Nicholas Michael¹, Maggie Cam², Naris Nilubol²

¹Walter Reed National Military Medical Center, ²National Cancer Institute, National Institutes of Health

Background: Cortisol-producing adrenocortical cancers (ACCs) carry a worse prognosis than non-producing tumors, partly due to steroid-induced immunosuppression in the tumor microenvironment (TME). Transcriptomics profiling analysis in The Cancer Genome Atlas (TCGA) identified six tumor immune subtypes that showed associations with prognosis and treatment response in some cancers. In this study, we aimed to determine the ACC immune landscape, prognostic relevance, and the correlated molecular signatures by cortisol-producing status by conducting an in-silico analysis of the ACC transcriptomics in TCGA database.

Methods: We compared the gene expression and relevant clinical data by immune subtype and cortisol-producing status. We estimated the overall survival using the Kaplan-Meier method with Log-rank test. The gene set enrichment (GSEA) and gene set variation analyses (GSVA) were performed using the NIH Integrated Data Analysis Platform) using R programs developed on the Foundry platform (Palantir Technologies).

Results: ACC samples clustered primarily in either “inflammatory” (C3) or “leukocyte-depleted” (C4) immune subtypes. Of 69 ACC samples with sufficient clinical and transcriptomics data, 21 were C3 (4 cortisol-producing, 17 non-cortisol-producing), 42 were C4 (23 cortisol-producing, 19 non-cortisol-producing). Only 6 samples were non-C3-C4 subtypes. Patients with C3 ACCs had longer overall survival ($p = 0.035$) than that of C4 and non-C3-C4 ACC. We identified 641 differentially expressed genes between C3 and C4 ACCs ($\log_{2}FC > 1.2$, adjusted p -value < 0.01). GSEA and GSVA using the MSigDB Hallmark Pathways database revealed decreased expression of pro-inflammatory pathways in C4 tumors, including the Inflammatory and Interferon Responses, IL6-Jak-Stat3 signaling, and Allograft rejection. The c-MYC pathway was upregulated in C4 ACCs. c-MYC target genes and ferroptosis-suppressors EGLN1, HELLS, SLC2A1, and FADS2 all had increased expression in C4 tumors. Further, c-MYC is up-regulated in cortisol-producing vs. non-cortisol-producing tumors, as well as in cortisol-producing C4 tumors vs. non-cortisol-producing C4 tumors.

Conclusions: Our study suggests downregulation of the c-MYC pathway leads to increased ferroptosis, creating an inflammatory TME in cortisol-producing and C3 tumors. Conversely, decreased ferroptosis may be contributing to immunoevasion in C4 and cortisol-producing tumors. This pathway warrants further investigation as a link between steroid production and immune activation through ferroptosis.

◆39. Safe Dissection in Retroperitoneoscopic Adrenalectomy: an AI-powered approach

Dan Moldoveanu¹, Haochi Zhang², Jaryd Hunter², Sergey Protserov², Pouria Mashouri², Caterina Masino², Jesse Pasternak¹, Michael Brudno², Amin Madani¹
¹Endocrine Surgery, University of Toronto, ²University Health Network

Background: Surgical adverse events are often preventable and due to errors in judgment, visual misperception and situation awareness. Artificial intelligence (AI) can be used for computer vision on surgical videos (e.g. identification of anatomy, instruments, events) and could provide surgeons with real-time or postoperative feedback to improve operative performance. This study aims to develop and evaluate the performance of novel AI algorithms that assess adequacy of retraction and identify planes of dissection during left retroperitoneoscopic adrenalectomy.

Methods: AI algorithms were trained to: 1) assess the adequacy of retraction during dissection (frame classification model), and 2) delineate safe ("Go") and dangerous ("No-Go") zones of dissection (semantic segmentation model). Two high-volume fellowship-trained endocrine surgeons reviewed videos of left retroperitoneoscopic adrenalectomy, manually annotating Go/No-Go zones and retraction quality on a previously validated 4-point ordinal scale (1=inadequate; 2=suboptimal; 3=optimal; 0=out of context). Algorithm predictions were evaluated using a training/validation/testing dataset split of 60%/20%/20% against annotations by surgeons.

Results: A total of 2,335 annotations were labelled on 35 prospectively-collected videos of left retroperitoneoscopic adrenalectomies from two institutions (3 surgeons). A retraction model was trained using EfficientNet architecture and a Go/No-Go model was trained using UNet architecture. Compared to surgeon annotators, the retraction model demonstrated a sensitivity of 0.68, specificity of 0.46. The Go/No-Go model had a pixel-wise sensitivity of 0.68, specificity of 0.70 and accuracy of 0.70 for predicting No-Go zones, and a sensitivity of 0.53, specificity of 0.72 and accuracy of 0.65 for predicting Go zones. Dice/F1 scores for the Go and NoGo classes were 0.15 and 0.24, respectively. Both models had lag-time <20 ms, compatible for real-time inference.

Conclusions: AI models can potentially identify planes of dissection and quality of retraction during retroperitoneoscopic adrenalectomy. While these proof-of-concept models had limited performance, iterative cycles of annotations and training, as well as a larger sample size from multiple sites are required to improve the performance of these tools, and eventually implement them for real-time decision support, postoperative feedback, or surgical coaching.

◆40. Robotic Adrenalectomy Training During Fellowship: How to maintain patient safety using a structural curriculum

Gustavo Romero-Velez¹, Anibal La Riva¹, Ege Akgun¹, Panagiotis Bletsis¹, Megan Parmer¹, Eren Berber¹

¹Cleveland Clinic

Background: Despite increasing interest and use of robotic adrenalectomy (RA), there are no recommendations on how to implement a safe training curriculum. The aim of this study was to critically analyze a RA training curriculum developed at a high-volume center in regards to trainee competency and patient outcomes.

Methods: A RA training curriculum was constructed over the years to incrementally advance fellows from bedside assistance to console participation in low and high-complexity cases. Competencies in standardized steps of the procedure and case complexity were assessed to decide on degree of participation in a given case. Case complexity was determined using diagnosis, tumor size, approach, proximity to major vessels, inflammation and perirenal fat thickness. Participation was measured using a commercial robotic data acquisition tool and classified as bedside, less than half (L50) or more than half (M50) console time. Data was compared using Chi-Square and Wilcoxon Rank Sum Test. The study was approved by the IRB.

Results: Two endocrine surgery fellows completed 34 RA each in a dedicated robotic operating room with dual consoles. 96% of procedures were done through a lateral transabdominal approach. There were no conversions to open. 65% of cases were classified as low-complexity and 35% high-complexity. Overall fellow participation was: bedside 28%, L50 37% and M50 35%. Bedside participation decreased during the second half of the year (to 24% from 32%) with a concomitant increase of M50 console time (to 50% from 21% , p=0.04). Console time was granted after an average of 2.5 cases and fellows were able to perform more than half of the adrenalectomies after 6.5 cases at the console for low-complexity and after 14 for high-complexity procedures. There was no difference in operative time (147 min [116-179] vs 144 min [110-168], p=0.62) or morbidity (0 vs 0%, p=0.99) between cases with fellow participation at the bedside versus console, respectively.

Conclusions: A structural curriculum for RA training can be established without compromising patient safety. The success of the curriculum depends on standardization of steps of the procedure and an incremental hands-on participation based on an active assessment of milestone competencies in a high-volume program.

41. Unlocking the Potential of Natural Language Processing for Adrenal Incidentalomas: A healthcare paradigm shift

Mohammad Murcy¹, Sanjana Balachandra¹, Lillie Grace Veazey¹, Tobias O'Leary², Haleigh Negrete¹, Srinu Tridandapani³, Steven Rothenberg³, Herbert Chen¹, Andrea Gillis¹, Jessica Fazendin¹, John Osborne², Brenessa Lindeman¹
¹*Department of Surgery, The University of Alabama at Birmingham*, ²*Department of Biomedical Informatics, The University of Alabama at Birmingham*, ³*Department of Radiology, The University of Alabama at Birmingham*

Background: Adrenal gland incidentalomas (AGI) are detected in 5% of cross-sectional abdominal images. Many patients are not recommended for indicated workup and follow-up care. Natural language processing (NLP) is a form of artificial intelligence that interprets and derives meaning from human language. This study assesses the implementation of an NLP algorithm to identify AGIs and improve rates of biochemical workup and imaging follow-up.

Methods: Radiology reports from a single academic medical center were queried using an NLP algorithm to identify AGIs. Patients seen in an AGI clinic from March 2022-February 2023 were included. The initial scan was defined as the scan where the nodule was first identified; the registry scan was the scan flagged by the NLP algorithm. Dates of the initial and registry scan, nodule characteristics, biochemical workup, imaging follow-up, and patient demographics were collected. Nodules were divided into small and large groups (< or ≥ 3cm, respectively) for analysis. Descriptive statistics summarized the data.

Results: The NLP algorithm flagged 2582 patients, 878 were contacted for an appointment, and 382 were seen in AGI clinic during the study period. Average patient age was 61 ± 13 years, 59.2% were female, and 56.0% were white. The registry scan was also the initial scan in 61.0% of patients. The majority (89.5%) were seen in the AGI clinic in less than 3 months of NLP identification. Nearly all (99.5%) patients underwent biochemical evaluation, and 60.5% of patients underwent follow-up imaging during the study period. There were no significant differences in patients undergoing biochemical and radiologic evaluation by age, gender, or race (p>0.05 for all). Abdominal pain was the most common indication for initial and registry scans (37.2% and 35.9%, respectively). Small nodules were most common (91.1%), and only 23.6% were functional. A total of 19 (5.0%) patients underwent adrenalectomy by October 2023, of which the majority (15/19, 78.9%) were functional lesions.

Conclusions: These findings demonstrate an NLP algorithm can successfully be utilized to identify AGIs, and when paired with a dedicated clinic, can result in high rates of guideline-concordant care for patients with AGIs, regardless of age, gender, or race.

42. Optimization of an Adrenal Organoid Protocol for High-Throughput Therapeutic Screening

Brianna L Wind¹, Alessandra L Moore¹

¹*Surgery Research, University of Rochester*

Background: Adrenocortical carcinoma is a rare, lethal malignancy with limited therapeutic options and limited preclinical modeling systems.¹ Existing modeling systems are heavily dependent on transgenic animals, which have limited application to human disease due to the penetrance of genetic perturbations.² Adrenal and adrenocortical carcinoma organoids represent preclinical modeling systems that can facilitate high throughput therapeutic screening. However, prior adrenal culturing techniques have had limited success.³ We hypothesized that applying 3-dimensional culture techniques would produce a robust adrenal organoid culturing platform.

Methods: Adrenal glands were harvested from five 12-week-old male C57BL/6J mice and minced before digesting for 20 minutes, quenching, and centrifuging. The supernatant was discarded, and the cell pellet was resuspended in 2ml of DMEM/F12 before passing through a 70um filter, achieving a single-cell suspension. Five thousand cells were plated on 96-well plates coated with 25uL Matrigel or 96-well v-bottom plates with hydrophobic F108 coating. The following media conditions were tested in DMEM/F12: 1%, 2%, 5%, and 10% embryonic stem cell grade FBS (eFBS), 10% standard FBS, and SATO. After 14 days in culture, cells were fixed using PFA and stained for StAR and Nestin.

Results: One million cells were derived on average per replicate. Nestin and StAR staining revealed that increasing concentrations of eFBS and FBS were detrimental to cell growth. Rather, adrenal cortical and adrenal medullary cells flourished in serum-free conditions ($p < 0.0001$). After 14 days, co-culture of adrenal cortical and medullary cells resulted in 3-dimensional organoids with evidence of organoid growth over time (average growth rate = 10.37% daily).

Conclusions: By optimizing existing techniques for isolating adrenal cells, we increased cell yield 100-fold compared to previous methodologies. Additionally, we optimized a successful culturing protocol for 3-dimensional adrenal organoids. Our results suggest that paracrine signaling between adrenal cortical and medullary cells is sufficient and necessary to support cell growth in culture. Over time, adrenal organoids form into a structure with cortical and medullary tissues co-localizing. In the future, we will transition our experience to human tissue, including adrenal cancers. In doing so, we can use microarray techniques to evaluate a variety of experimental therapeutics and their efficacy on adrenocortical cancers.

◆43. Hyperglycemia after Pancreatic Insulinoma Resection: Immediate post-operative trends

Sarah M Lund¹, Sergio M Navarro¹, Adrian Vella¹, Benzon Dy¹, Trenton Foster¹, Melanie L. Lyden¹, Pankaj Shah¹, Travis McKenzie¹

¹Mayo Clinic

Background: Following resection of insulinoma, patients may develop hyperglycemia. Predictors and trends of hyperglycemia following surgery are poorly understood.

Methods: We conducted a single-center retrospective study of patients who underwent segmental pancreatectomy, enucleation, or ethanol ablation for pancreatic insulinoma from 2010 to 2023. Patients with MEN1, malignant insulinoma, metastatic disease, or incomplete resection were excluded. Pre-operative characteristics and in-hospital post-operative glucose trends were analyzed.

Results: We identified 117 patients: 60 (51%) distal pancreatectomies, 49 (42%) enucleations, and 8 (7%) operative ethanol ablations. Median follow-up was 5 months (IQR=[0, 45]). Of 74 patients (63%) who had at least one month of follow-up, 8 patients (7%) developed new diabetes, diagnosed a mean of 16 months after surgery (range=[2 days, 49 months]). Post-operatively, 85 patients (73%) were hyperglycemic with eventual normalization prior to discharge, 28 patients (24%) had persistent hyperglycemia until discharge, and 4 patients (3%) had no hyperglycemia. Immediately post-operatively, 25 patients required insulin (daily dose: mean=2.6 units, SD=3.8). Of patients with glucose normalization, mean time to normalization was 35 hours (SD=6.6 hours). Patients with glucose normalization within 5 days of surgery had significantly smaller tumor dimension (mean=1.6 cm, SD=0.5, range=[0.7, 3]) than those without (mean=2.1 cm, SD=1.5, range=[0.9, 9], p=0.03). Pre-operative nadir glucose, insulin levels, c-peptide levels, and pro-insulin levels were not predictive of glucose normalization. The only significant predictors of glucose normalization within 5 days of surgery were smaller tumor size (OR=0.42, 95% CI=[0.19, 0.85]; p=0.03) and younger age (OR=0.97, 95% CI=[0.94, 0.99], p=0.04), while BMI, tumor location, operation type, and duration of symptoms prior to diagnosis were not. Older age (B=1.5, p<0.01) and male gender (B=44.3, p=0.02) were significantly associated with prolonged time to glucose normalization, while BMI, tumor location, operation type, tumor maximum dimension, and duration of symptoms prior to diagnosis were not.

Conclusions: Most patients develop transient hyperglycemia after insulinoma resection which resolves, on average, within 36 hours of surgery. Smaller tumor size is associated with glucose normalization while age is associated with prolonged hyperglycemia in the early post-operative period. These findings may enable both patients and surgeons to better anticipate glucose trends after surgical management of benign insulinoma.

◆44. Surgical Outcomes in Patients with Metastatic Neuroendocrine Tumors to Liver and Bone

Shadin Ghabra¹, Stephen G Andrews², Rivka Farrell², Erich P. Huang³, Jaydira Del Rivero⁴, Samira M. Sadowski²

¹*Surgical Oncology, NIH*, ²*Neuroendocrine Cancer Therapy Section, NIH*, ³*Biometric Research Program, NIH*, ⁴*Developmental Therapeutics Branch, NIH*

Background: Neuroendocrine tumors (NETs) are a heterogeneous group of malignancies originating from gastro-entero-pancreatic (GEP) and bronchopulmonary (BP) tracts. Although rare, incidence has increased in the last few decades. NETs exhibit a range of biological behaviors, metastasizing to liver and bone. Among metastatic sites, skeletal system involvement poses unique challenges with unknown treatment responses; therefore, we aim to determine patient outcomes in the setting of bone and/or liver metastases.

Methods: A single institution retrospective review of a prospectively collected database in patients with metastatic NETs was performed. Association with progression free survival (PFS), defined as diagnosis date to last follow up was analyzed using log-rank test and Mann-Whitney U test. An $\alpha=0.1$ was used with adjustment for multiple testing via the Benjamini-Hochberg Method.

Results: Seventy-two patients were diagnosed with metastatic NETs, majority female (n=41, 57%), with a mean follow up of 72 months. The primary site originated from the small bowel in 32 patients and pancreas in 22 patients (44% and 31% respectively), BP tract in 15 patients (20.8%), and unknown in 3 patients (4.2%). Most patients had well-differentiated histology (n=59, 81.9%). Twenty-three patients (31.9%) had both bone and liver metastases, 12 patients (16.7%) had bone metastases only, and 37 patients (51.4%) had liver metastases only. Primary tumor size was not associated with development of liver ($p=0.431$) nor bone metastases ($p=0.249$). Primary tumor was resected in 47 patients (65.3%), resulting in improved PFS (median PFS 120 months vs. 58.5 months, $p=0.008$) for the overall cohort. This was also shown in patients with liver metastases only ($p=0.016$), and with bone metastases only ($p=0.004$). Overall, patients with liver metastases had an improved PFS ($p=0.032$) compared to patients with both liver and bone metastases ($p=0.004$). The presence of somatic mutations (notably *MEN1* and *TP53*) was associated with improved PFS ($p=0.005$), especially in patients with liver metastases ($p=0.008$).

Conclusions: Patients with bone and liver metastases exhibited a worse PFS compared to patients with liver metastases alone. Surgical resection of the primary tumor remains a key treatment for prolonging PFS in patients with bone and liver metastases. Additionally, improved PFS was seen in patients harboring somatic mutations.

◆45. **Presentation at the AAES Annual Meeting Amplifies the Impact of Research Articles**

Elizabeth M Huffman Cooper¹, Don L Mai¹, Elisa L Marten¹, Alexander S Chiu¹, Dawn M Eifenbein¹, Kristin L Long¹, David F Schneider¹, Rebecca S Sippel¹, Courtney J Balentine¹
¹*University of Wisconsin*

Background: Research presented at the American Association of Endocrine Surgeons (AAES) Annual Meeting is published in a special edition of the journal *Surgery*, but it is unclear whether these articles garner more attention than other articles in *Surgery* that address endocrine research questions. The purpose of this study was to determine if studies published in the AAES issue of *Surgery* were more frequently cited and received more social media attention compared to endocrine articles published in other issues of *Surgery*.

Methods: We reviewed articles on thyroid, parathyroid, and adrenal disease published in the journal *Surgery* from January 2018 - December 2022 and measured how often they were cited and their Altmetric social media attention scores. We used Poisson regression to compare citations and Altmetric score between AAES papers and other endocrine papers in *Surgery*, adjusting for characteristics of the authors and institutions and the year of publication.

Results: Our study included 170 AAES papers and 146 other endocrine articles published in *Surgery*. After adjusting for characteristics of the senior authors, their institutions, and the year of publication, an AAES paper was cited an average of 6 times more than other endocrine papers published in *Surgery* (95% CI 2-10, $p < 0.003$). Additionally, AAES papers had a 70% increase in their social media attention score (95% CI 35%-105%, $p < 0.001$) relative to the other endocrine papers published in *Surgery*.

Conclusions: Research presented at the AAES is significantly more likely to be cited and promoted on social media than similar papers published in *Surgery* that are not associated with the AAES. Presentation at the AAES Annual Meeting helps to identify high quality research and also raises awareness of the work, both of which lead to an increase in citations. This highlights the ongoing value of presenting endocrine research at a national meeting.

◆46. Operating Upright: Assessing the role of a wearable posture device in protecting endocrine surgeons

Meghal Shah¹, Stephanie J. Chan², Elizabeth Vann², Phillip Chung², Grant Feuer², Karlie Gross³, Alex Vitrak³, Meghan Perez², Allison Lin², Michael Lahiff², Catherine M. McManus⁴, James A. Lee⁴, Eric J. Kuo⁴, Jennifer H. Kuo⁴

¹Department of Surgery, Columbia University, ²Vagelos College of Physicians and Surgeons, Columbia University, ³Programs in Physical Therapy, Columbia University, ⁴Section of Endocrine Surgery, Department of Surgery, Columbia University

Background: Endocrine surgeons are at risk for developing cervical and thoracic pain. The demand for solutions to enhance surgeon intraoperative ergonomics is increasing. We assessed the effectiveness of a commercially available wearable postural device providing real-time vibratory biofeedback to improve intraoperative posture.

Methods: Four endocrine surgeons participated in a prospective pre-post cohort pilot study of the UprightGO2 device at a single institution. Pre-intervention (vibratory feedback off) and post-intervention (vibratory feedback on) periods were compared. Outcome measures included posture and pain. Device-measured posture was defined as percent of time spent in upright posture (Upright%), while device-independent posture was assessed by physical therapists measuring rapid upper limb assessment (RULA) scores based on intraoperative photographs (scored out of seven, with higher scores reflecting higher risk posture). Presence of pain was reported via surveys. The Wilcoxon rank-sum test and Chi-square test were used to compare continuous and categorical outcomes, respectively. Pearson correlation coefficient was calculated to assess correlation between Upright% and RULA.

Results: One hundred operations were analyzed (41.1% parathyroidectomy, 31.8% thyroid lobectomy, 18.7% total thyroidectomy, 8.4% adrenalectomy; 54% pre-intervention, 46% post-intervention). Upright% improved with vibratory biofeedback (median 35.0% [IQR 23-46%] pre vs. 54.0% [IQR 45-73%] post, $p < 0.01$). RULA scores also improved with vibratory feedback (median 5.00 [IQR 4.70-5.20] pre vs. 4.60 [IQR 4.25-5.00] post, $p < 0.01$). Subjects reported pain following 15% and 5% of operative days in the pre- and post-intervention periods, respectively ($p = 0.29$). Upright% was not significantly correlated with RULA score ($p = 0.45$). On a scale of 1-5 from least to most, surgeons rated the UprightGO2 2.0 (IQR 2.0-3.0) for helpfulness in improving posture, 3.0 (IQR 2.0-3.0) for distracting, and 3.0 (IQR 2.0-3.0) for likelihood to recommend to other surgeons.

Conclusions: The UprightGO2 improves posture as measured by Upright% and RULA scores. However, its impact on pain is unclear in a cohort with minimal baseline pain. Subjectively, surgeons felt the UprightGO2 was moderately helpful yet distracting, and were neutral about recommending the device to other surgeons.

47. Implementation of Entrustable Professional Activities in Endocrine Surgery Fellowship

Panagiotis Bletsis¹, Megan Parmer¹, Gustavo Romero-Velez¹, Allan Siperstein¹

¹*Cleveland Clinic*

Background: Although entrustable professional activities (EPAs) are used to assess a trainee's potential to perform independent clinical activities, Accreditation Council for Graduate Medical Education (ACGME) regulation does not allow unsupervised clinical practice. We have developed a program to use EPA assessment to allow graded clinical independence in a non-ACGME endocrine surgery fellowship. Also not previously assessed is the fellow's perception of their ability to perform these activities.

Methods: This was a single center prospective study of an endocrine surgery fellowship in which 9 specific EPAs were created. These included: evaluation/management of thyroid nodule(s), hyperthyroidism, and hypercalcemia/hyperparathyroidism; performance of head/neck ultrasound, laryngoscopy, fine needle aspiration (FNA), thyroidectomy, and parathyroidectomy. Entrustment for each EPA progressed with demonstration of competency first with observation, performing under direct supervision with active/passive assistance, without any assistance, and finally culminating in unsupervised independent practice. Transition to unsupervised independent practice was assessed for each EPA.

Results: In a 1-year period, 2 fellows were assessed. Proficiency with ultrasound was required to progress through most EPAs. On average, 100 ultrasounds were assessed before each fellow achieved competency. Concurrently, FNA was performed independently after 10 procedures. Once this occurred, fellows were given a designated clinic to evaluate patients with thyroid nodules. After approximately 6 months of fellowship, additional pathologies based on the EPAs were added to their clinics. A similar step-wise approach was taken in the operating room. After performing on average 150 neck operations, the fellows were able to schedule operations and manage patients independently through their entire preoperative, intraoperative, and postoperative course. The fellows operated on average 11 cases (range 9-13) independently. Subjectively, they felt well-prepared, confident, and comfortable performing the tasks at each step in the progression through the 9 EPAs.

Conclusions: In our study, by creating a formalized, graduated autonomy model utilizing EPAs, endocrine surgery fellows demonstrated practice readiness before completion of fellowship. Preliminary results indicate this experience has subjectively eased the fellows' transition into independent practice.

48. Assessing the Success of the American Association of Endocrine Surgeons Research Award Program

Q. Lina Hu¹, Lauren N Krumeich², Priya H Dedhia³, Benjamin C James¹

¹*Surgery, Beth Israel Deaconess Medical Center, ²Surgery, University of Michigan, ³The Ohio State University*

Background: The American Association of Endocrine Surgeons awards two research grants to endocrine surgeons to support early research and career development. This study aims to determine the impact of the society funding to support research activity and to promote academic productivity in its junior members.

Methods: A survey was e-mailed to previous Paul LoGerfo (2010-) and Thyroid Cancer Survivors' Association (ThyCa; 2017-) research award recipients from the inception of the awards to 2022. Descriptive analyses were used to determine recipients' ability to complete project aims, to obtain additional funding, and other measures of academic productivity.

Results: Since inception, there have been 21 recipients of the Paul LoGerfo Research Award and 6 recipients of the ThyCa Award, with a total of 26 unique recipients surveyed. Of 21 (80.8%) respondents, 12 (57.1%) were male. All or some project aims were achieved by 11 (55.0%) and 9 (45.0%) recipients, respectively. 15 (71.4%) respondents stated that their research would not have been feasible without the AAES award but 16 (76.2%) still required additional funding to achieve their aims. 8 (38.1%) respondents published their findings in peer reviewed journals and 5 (23.8%) have submitted manuscripts pending review. 12 (57.1%) respondents stated that their AAES Award led to additional funding, totaling \$7.6 million with a median of \$375,000 (range \$15,000 to \$2 million) over a median of 3-year duration (range 1 to 8 years). The amount of additional funding obtained was inversely proportional to the number of years from the initial AAES Award ($r^2 = 0.29$, $p=0.02$). Finally, 20 (95.2%) respondents were currently engaged in clinical ($n=7$, 35%), basic or translational ($n=7$, 35%), or both types ($n=6$, 30%) of research.

Conclusions: The AAES societal funding was critical to the success of the majority of award recipients and led to a total of \$7.6 million additional research funding since award inception, amounting to a return on investment of 1730%. However, many recipients still required additional funding to fully achieve their aims, supporting the need to increase the AAES grant funding especially in an environment of increasing cost and resources to conduct meaningful scientific investigations.



IN MEMORIAM

IN MEMORIAM

Blake Cady, MD

1930-2023



Blake Clady, MD died July 15, 2023. Dr. Cady was born December 27, 1930 in Washington, DC. He was educated at Moses Brown School in Providence, RI, Amherst College, and Cornell University Medical College.

He served in the Navy before finishing surgical training at the New England Deaconess Hospital Harvard Surgical Service followed by a surgical oncology fellowship at Memorial Sloan Kettering Cancer Center. He joined the surgical staff of the Lahey Clinic Foundation and Harvard Medical School in 1967.

In 1982, he became Chief of Surgical Oncology and a full-time member of the Harvard surgical faculty at New England Deaconess Hospital. He was appointed Professor of Surgery, Harvard Medical School in 1991. He was also a Surgical Consultant at the Uganda Cancer Institute in Kampala. At retirement, he joined the surgical faculty of Brown University Medical School as Professor of Surgery.

He was the author of over 300 publications, book chapters, and other peer reviewed articles. He was a founding editor of the Surgical Oncology Clinics of North America. He has been honored by election as president of both national and significant regional organizations, including the Massachusetts Chapter of the American Cancer Society, the Boston Surgical Society, the New England Surgical Society, the New England Cancer Society (NECS), the American Association of Endocrine Surgeons, and the Society of Surgical Oncology.

Within the AAES, he helped create the building blocks of the organization we know today. He served our organization as Vice President (1982-1983), Local Arrangements Chair (Boston, MA 1988), Secretary-Treasurer (1991-1994), and President (1997-1998)

He was a mentor to and changed the life of many in the field of endocrine surgery, surgical oncology, and public health. Known for his urbane intellect, he constantly stimulated thoughtful analysis and challenged many conventional ideas.

Various awards included the Shattuck Medal of the MA Public Health Association, the Chadwick Medal of the MA Thoracic Society, the Annual Division award and the National Distinguished Service Award, both from the American Cancer Society, all related to efforts in tobacco control. Honorary lecture awards included the Haynes Martin Lecture of the Head and Neck Surgeons, the Annual Oncology lecture of the Commission on Cancer of the American College of Surgeons, the presidential Award of the NECS, the Annual Heritage Award of the Society of Surgical Society, the annual Inspiration Award of the National Consortium of Breast Centers and the annual "Make Smoking History" award of the MA Department of Public Health.

IN MEMORIAM

George L. Irvin III, M.D.

1931-2023



A distinguished figure in the field of endocrine surgery, Dr. Irvin's lifelong dedication to advancing medical knowledge, particularly in the surgical management of parathyroid disorders, has left an indelible mark on our specialty. Dr. Irvin, affectionately known as 'Bucky', faithfully served our organization as Recorder from 1993-1996, Vice President in 1996-1997, and was President in 1998-1999. In 2010, Dr. Irvin was awarded the Oliver Cope Meritorious Achievement Award which is given to a member of the AAES in recognition for their exceptional contributions to the field of endocrine surgery as an investigator, teacher, and clinical surgeon. He was a joy to

interact with at our national meetings, always upbeat and excited about advancing the science of our profession, and an influential and extremely active member until his health prevented him from attending.

Dr. Irvin attended the University of North Carolina for General Surgery Residency training and was heavily influenced and mentored by his dear friend Dr. Colin G. Thomas Jr., himself a past president of the AAES in 1989-1990. Dr. Irvin began his surgical career performing research at the NIH and then took a position as Assistant Professor of Surgery at the University of Miami Jackson Memorial Hospital and the Miami Veterans Affairs Medical Center. Dr. Irvin's legacy extends far beyond his surgical skills. He was known for his unwavering commitment to teaching and mentoring the next generation of surgeons and medical professionals. His kindness, compassion, positive attitude, patience, and profound wisdom inspired and guided many in their careers. Dr. Irvin created one of the first endocrine surgery fellowships in the nation at the University of Miami and had a lasting influence on all his trainees and partners. Dr. Irvin's contributions to the field of endocrine surgery, including popularizing the use of intraoperative PTH monitoring in the early 1990s for ambulatory parathyroidectomy, were unparalleled, and his expertise in parathyroid surgery not only forever changed the surgical management of hyperparathyroidism, but also transformed the lives of countless numbers of patients.

Throughout his illustrious career, Dr. Irvin received numerous accolades and awards for his groundbreaking research and clinical excellence. His passion for patient care was evident in every interaction, and he will be remembered for his compassion, excitement for innovation, and love of teaching endocrine surgery.

Dr. Irvin loved his family and cherished living in south Florida where he routinely went deep sea fishing with friends and family. George is survived by his wife, Mary Frances, and two children, Catherine and Lee Irvin. They will forever cherish his memory.

George L. Irvin III's legacy will live on through the knowledge he imparted and the lives he enriched. He will be deeply missed and fondly remembered by all who had the privilege of knowing him. His impact on the medical community and the lives he touched will continue to be felt for generations to come.

IN MEMORIAM

Virginia A. LiVolsi, MD

1943-2024



Dr. Virginia LiVolsi was a Professor of Pathology and Laboratory Medicine at University of Pennsylvania Perelman School of Medicine. The impact of Dr. LiVolsi's contributions to the field of thyroidology and endocrine pathology cannot be overstated. Dr. LiVolsi was incredibly important to the AAES, and as such, the honor of AAES Honorary Member was rightfully bestowed upon her.

Dr. LiVolsi received her B.S. in Chemistry from the College of Mount Saint Vincent in New York. She attended medical school at Columbia University College of Physicians and Surgeons.

Her academic career began in 1974 at Yale University, where she distinguished herself as an excellent surgical pathologist with particular expertise in thyroid pathology. She joined the University of Pennsylvania faculty in 1983 as the Director of Surgical Pathology. In addition to developing a strong Surgical Pathology service at Penn, she most importantly served as a dedicated and revered mentor to future academic anatomic pathologists around the world.

Dr. LiVolsi was an icon in the field of endocrine pathology - describing new subtypes of papillary thyroid carcinoma, delineating benign lesions mimicking thyroid neoplasms, and increasing the understanding of thyroid entities with clonality studies of thyroid proliferations. For decades, she was a leading expert in pathologic classification and management of thyroid neoplasms, serving on the pathology panel of the Chernobyl Tumor Bank for more than 20 years. She received numerous awards throughout her illustrious career, including the USCAP Mostofi Award, Maude Abbott Lecturer, University of Tokyo Medal of Honor, Scanno Prize in Medicine, ASCP Merit, Distinguished Service and Master Pathologist Award, and the Arthur Purdy Stout Society President's Medal. She served as President of the Arthur Purdy Society, Endocrine Pathology Society, ADASP, Pathology Society of Philadelphia and USCAP. Dr. LiVolsi was recently honored with the 2022 Endocrine Pathology Society Lifetime Achievement Award for her extraordinary contributions to pathology-based study of endocrine disease.

Dr. LiVolsi's insights into the field of endocrine pathology and her legacy of mentorship will continue to impact future generations for many years to come, and she will be remembered fondly by the members of the American Association of Endocrine Surgeons.

IN MEMORIAM

Thomas S. Reeve, AC CBE

1923-2023



Professor Reeve passed away in Sydney on August 20, 2023, just three months short of his 100th birthday. Dr. Reeve was born November 23, 1923 in Queanbeyan, New South Wales. He graduated MBBS from The University of Sydney in 1947 and spent a short time in general practice before taking the then unusual step of traveling to the United States to complete his training in General and Thoracic Surgery in New York. Professor Reeve was one of the first Australians to be board certified in the United States of America.

On his return to Australia he was appointed to a research post at the Royal North Shore Hospital and subsequently established The University of Sydney Endocrine Surgical Unit. His clinical interests were not confined to endocrine surgery however, as he made major contributions in the areas of diagnostic ultrasound, breast disease, and surgical oncology. He was appointed Professor of Surgery by the University of Sydney in 1974, served as Chair of the Department of Surgery, and was eventually appointed Chairman of the Northern Sydney Health Area including Royal North Shore Hospital.

Professor Reeve was instrumental in the development of modern endocrine surgery. He became the 4th President of the International Association of Endocrine Surgeons in 1985. Multiple AAES members had the good fortune to train under Professor Reeve, and his wisdom will live on through his trainees and publications. Despite retiring from primary surgical care in 1988, he continued to attend the operating room for two decades, scrubbing in and assisting with thyroid and parathyroid procedures. This provided him the opportunity to meet and teach all the surgical fellows appointed to the TS Reeve International Fellowship in Endocrine Surgery over that time, a most significant legacy. Given his significant contributions to the field of endocrine surgery, he was inducted as an Honorary member of the AAES.

Upon retirement, Professor Reeve became President of the Royal Australasian College of Surgeons and participated in Best Practice and Quality activities. In association with the Cancer Council of Australia, he was responsible for developing multiple evidence-based cancer care guidelines for the Australian Cancer Network. Professor Reeve's contributions to surgery were widely recognized internationally. He received many awards and was bestowed honorary Fellowships by multiple societies.

Professor Reeve will forever be revered by generations of surgeons not only for his teaching and mentoring, but also for his intellect, his innovative achievements, the exemplary care he gave his patients, and the very evident concern he had for their wellbeing, but, above all, for his friendship.

45TH ANNUAL MEETING

AMERICAN ASSOCIATION
OF ENDOCRINE SURGEONS

Milwaukee
WISCONSIN

SATURDAY, MAY 17 - MONDAY, MAY 19, 2025



2025 Local Arrangements Chair:
Sophie Dream, MD, MPH

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AMERICAN ASSOCIATION OF ENDOCRINE SURGEONS

201 EAST MAIN ST., SUITE 810, LEXINGTON, KY 40507

T: 859-402-9810 | F: 859-514-9166

INFO@ENDOCRINESURGERY.ORG

WWW.ENDOCRINESURGERY.ORG