Robotic Thymectomy for Myasthenia Gravis and Thymoma

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Sweetbreads: thymus gland of a calf or lamb
Disclosure Slide

• Consultant for Medtronic, Mallinkrodt and Quark Pharmaceuticals
• Research funding from Torax
Surgical Thymectomy: What is it?

- Sternotomy
- Transcervical
- Subxiphoid
- Transthoracic
  - VATS
  - Robotic
Surgical Thymectomy: Why do it?

Randomized Trial of Thymectomy in Myasthenia Gravis

- Level 1 evidence of benefit compared to medical therapy
- Transsternal surgical approach
- Non-thymomatous MG
Surgical Thymectomy: Why do it?
Robotic Extended Thymectomy for Myasthenia Gravis

Totally Endoscopic Robotic Thymectomy for Myasthenia Gravis

Robert C. Ashton, Jr, MD, Karen M. McGinnis, MD, Cliff P. Connery, MD, Daniel G. Swistel, MD, Douglas R. Ewing, MD, and Joseph J. DeRose, Jr, MD

• 24 y/o with non-thymomatous MG
• Required bilateral robotic assisted thoracoscopic approach

Fig 1. Specimen: thymus with pericardial fat.
Robotic Thymectomy for Thymoma

Thoracoscopic thymomectomy with the da Vinci computer-enhanced surgical system

Ichiro Yoshino, MD, a Makoto Hashizume, MD, FACS, b Mitsuo Shimada, MD, a Morimasa Tomikawa, MD, a Makiko Tomiyasu, MD, a Ryuichi Suemitsu, MD, a and Keizo Sugimachi, MD, FACS, b Fukuoka, Japan

- First report 2001 out of Japan
- Enlarging 3cm anterior mediastinal mass
- Started with a 4cm mini-thoracotomy…finished with the robot

Figure 1. Computed tomographic imaging of the mediastinal mass. An encapsulated solid mass measuring 3.5 cm in diameter is recognized in the anterior mediastinum.

J Thorac Cardiovasc Surg 2001;122:783-5
Robotic Thymectomy for Thymoma: When is it appropriate?

Standard Terms, Definitions, and Policies for Minimally Invasive Resection of Thymoma

Alper Toker, MD,* Joshua Sonett, MD,† Marcin Zielinski, MD,‡ Federico Rea, MD,§ Victor Tomulescu, MD,‖ and Frank C. Detterbeck, MD¶

- ITMIG reinforces importance of complete resection
- Complete thymectomy if no MG, extended thymectomy if MG present
- “No-touch” with no disruption of capsule
- All anterior and adjacent mediastinal nodes should be resected
Robotic Thymectomy for Thymoma: When is it appropriate?

• Size?
  – Some argue for 3-5 cm maximum for minimally invasive resection
  – In reality, ITMIG recommendations supercede

• Radiographic features
  – Anterior mediastinal location
  – Encapsulation
  – Maintenance of fat plane with surrounding structures
  – Laterality
  – Presence of normal thymic tissue

• Chest wall thickness

Robotic Thymectomy

• Unlike thymectomy for MG, when resecting thymoma laterality is more important and primarily depends upon laterality of mass
  – Left sided approach advantages include:
    • Identification of right phrenic from left easier than left phrenic from right.
    • Easier to harvest ectopic cephalad thymic tissue from left
    • Left thymic portion usually larger and extends to cardiophrenic area more
    • AP window may be site of ectopic tissue
  – Right sided approach advantages include:
    • Better visualization of the venous confluence
    • Perhaps easier and safer with increased working space
Robotic Thymectomy

- Which side? Data support both possibilities for MG
  - Left sided
    - 273 left sided thymectomies for MG, 57% complete remission rate and 0% thymoma recurrence rate
    - Ages 4 years to 86 years old
    - 2 left phrenic nerve injuries
  - Right sided
    - 30 right sided thymectomies for MG. No conversions.
Robotic Thymectomy

Multi-institutional European experience of robotic thymectomy for thymoma

Giuseppe Marulli¹, Jos Maessen², Franca Melfi³, Thomas A. Schmid⁴, Marlies Keijzers², Olivia Fanucchi³, Florian Augustin⁴, Giovanni M. Comacchio¹, Alfredo Mussi³, Monique Hochstenbag², Federico Rea¹

- 4 European centers, retrospective study with 134 patients
  - 38% left, 60% right, 2% bilateral, 52% with MG
  - 146 mins avg OR time
  - 9% Conversion rate
  - Mean diameter 4.4 cm. Range 1-10cm
  - 1 pleural recurrence
  - 5 year survival 97%
Patient Positioning

- Position patient on edge of table
- Insert roll sub-scapularly to allow patient shoulder to drop.
- Arm of patient positioned below table in a sling.
- Roll table to provide proper exposure of chest wall (Approximately 30°)
- Bring robot in from opposite side
Robotic Thymectomy

Port Placement

- Camera in 4\textsuperscript{th} or 5\textsuperscript{th} intercostal space, anterior to anterior axillary line
- Robot arm ports in 2\textsuperscript{nd}/3\textsuperscript{rd} IC space, 6\textsuperscript{th}/7\textsuperscript{th} IC space more anteriorly
  - Each handbreadth away from camera port
- Accessory port
  - 12 step in 5\textsuperscript{th}/6\textsuperscript{th}/7\textsuperscript{th} space more posteriorly
Robotic Thymectomy

Port Placement

- Xiphoid Process
- Sternal Notch
- 6th/7th IC S
- 4th/5th IC S
- 2nd/3rd IC S
- 2nd/3rd IC S
- MCL
- AAL

Instrument Ports
Robotic Thymectomy

Port Placement

Figure 3 Preoperative patient’s positioning and trocars’ placement. (A) Patient positioned at a 30-degree angle, with marked landmarks and ports’ insertion sites; (B) ports positioned: two ports for the robotic arms laterally and camera-port with CO₂-connecting line in the middle.
Robotic Thymectomy

Visualization

- Use 0 degree scope for most of case
- 6-15 mm Hg Insufflation
- Clearly identify contralateral phrenic nerve
  - Switch to 30 degree when looking for contralateral phrenic
  - Can utilize a 5mm port and camera on contralateral side if phrenic remains difficult to visualize
  - Injection with ICG and fluorescence scope may be beneficial
Robotic Thymectomy

Visualization
Robotic Thymectomy

Visualization
Robotic Thymectomy

Visualization
Robotic Thymectomy

Dissection

• Start at the pericardiophrenic angle
  – Dissection along the phrenic inferior to superiorly, laterally to medially
• Continue dissection into the neck
  – Tease out the upper poles of the cervical thymus
• Visualize inominate vein and thymic branches
  – Doubly clip and transect
• Take specimen out of the accessory port with a protective bag
Robotic Thymectomy

Case Scenario

- 21 y/o female with myasthenia gravis on chronic immunosuppression
- 2 cm inferior mediastinal mass
- “Fullness” to her thymic gland
Conclusions

- Robotic assisted minimally invasive approaches to the anterior mediastinum provide a safe and feasible option for resection.
- ITMIG published definitions and standards for resection should guide therapy regardless of surgical approach.
- We lack level 1 data to otherwise guide decision making data.
Thank You