THYMECTOMY

Michael C. Smith, M.D.
August 25, 2016
CASE PRESENTATION

- 23 year old female
- PMH: Obesity, Myasthenia Gravis
- PSH: Tracheostomy x 2
- All: NKDA
- Meds: Pyridostigmine, Prednisone
CASE PRESENTATION (CONT’D)
CASE PRESENTATION (CONT’D)

- Taken to OR for VATS/Thymectomy
- Supine Position
- Right Sided Approach
**PROCEDURE**

- Anesthesia induced without paralysis
- Single Lung Ventilation
- Right VATS, Thymectomy
- EBL 25
- 2 Chest Tubes (One transmediastinal into left pleural cavity)
- Taken to CTICU postoperatively
POSTOPERATIVE COURSE

- Extubated POD #0
- Chest tubes removed POD #2
- Discharged home POD #2
- Pathology: Thymus largely replaced by fibrofatty tissue, rare lymphoid follicles seen. Focal dystrophic calcification present. No evidence of hyperplasia or thymoma. Multiple small nodules (up to 6 mm) with no hyperplasia seen.
QUESTIONS?

Questions are guaranteed in life; Answers aren't.
OVERVIEW

- History
- Embryology
- Anatomy
- Physiology
- Perioperative Considerations
- Technique
**HISTORY**

- Name from Greek *thumos*: spiritedness
- Euthymia, dysthymia
- Rufus of Ephesus (1st Century AD)
- Emphasized anatomy in the study of medicine
- Treatise *Medical Questions* an early work on H&P
Felix Platter (1614) – described “mors thymica” in 5 month old

Oppenheim (1889) and Weigert (1901) suggest relationship between thymoma and myasthenia gravis
HISTORY

- First Thymectomy for MG – Ernst Ferdinand Sauerbruch (1911) in Zurich
  - Thymoma Diagnosed on Chest XR

- First Transsternal Thymectomy – Alfred Blalock (1936) in Nashville
HISTORY

- Sir Geoffrey Keynes – series of 281 thymectomies in 1956
  - Separated thymomatous and nonthymomatous
  - 4.2% mortality
  - 65% remission
- Transcervical thymectomy in 1960’s
**EMBRYOLOGY**

- Derived from 3\textsuperscript{rd} pharyngeal pouch
- Migrates caudal and medial
- Attaches to pericardium and descends into mediastinum
ANATOMY

- Grows until puberty
- Gradually involutes
- Located in anterior mediastinum
- Rarely symmetrical
- Arterial supply from inferior thyroid, internal mammary
- Venous drainage into innominate vein
ANATOMY

(B) Anterior view

- Vagus nerve
- Esophagus
- Left subclavian artery
- Phrenic nerve
- Left common carotid artery
- Cervical pleura
- Left brachiocephalic vein
- Left superior intercostal vein
- Arch of aorta
- Left recurrent laryngeal nerve
- Cardiac nerves
- Ligamentum arteriosum
- Left pulmonary nerve
- Anterior pulmonary plexus
- Phrenic nerve
- Ascending aorta
- Right common carotid artery
- Trachea
- Right subclavian artery
- Internal thoracic artery
- Right phrenic nerve
- Brachiocephalic trunk
- Right brachiocephalic vein
- 1st rib
- Superior vena cava
- Fibrous pericardium (cut edge)
- Mediastinal pleura
- Recurrent laryngeal nerves
THYMOMA

- Most Common tumor of anterior mediastinum (20% of mediastinal tumors)
- Common between ages 40-60
- No sex predilection
THYMOMA

- **Presentation**
  - Up to 50% incidental
  - 30% with compressive symptoms
  - 20-70% with autoimmune disorders
    - 28% of these not MG (Lupus, polymyositis)

- **5 year survival 90%**
  - 55% for thymic carcinoma
## STAGING

<table>
<thead>
<tr>
<th>Masaoka stage</th>
<th>Diagnostic criteria</th>
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<tbody>
<tr>
<td>Stage I</td>
<td>Macroscopically and microscopically completely encapsulated</td>
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</table>
| Stage II      | (A) Microscopic transcapsular invasion  
                | (B) Macroscopic invasion into surrounding fatty tissue or grossly adherent to but not through mediastinal pleura or pericardium |
| Stage III     | Macroscopic invasion into neighboring organs (ie, pericardium, great vessels, lung)  
                | (A) Without invasion of great vessels  
                | (B) With invasion of great vessels |
| Stage IV      | (A) Pleural or pericardial dissemination  
                | (B) Lymphogenous or hematogenous metastasis |
STAGING

Table 2. TNM Classification

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<tr>
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<th>Primary Tumor</th>
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<td>T0</td>
<td>No evidence of primary tumor</td>
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<td>T1</td>
<td>Tumor completely encapsulated</td>
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<td>T2</td>
<td>Tumor invades pericapsular connective tissue</td>
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<tr>
<td>T3</td>
<td>Tumor invades into neighboring structures, such as pericardium, mediastinal pleura, thoracic wall, great vessels and lung</td>
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<td>T4</td>
<td>Tumor with pleural or pericardial dissemination</td>
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<td>N0</td>
<td>No regional lymph node metastasis</td>
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<td>N1</td>
<td>Metastasis in anterior mediastinal lymph nodes</td>
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<td>N2</td>
<td>Metastasis in other intrathoracic lymph nodes</td>
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<td>N3</td>
<td>Metastasis in scalene and/or supraclavicular lymph nodes</td>
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<th>Stage Grouping</th>
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<td>Stage I</td>
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MYASTHENIA GRAVIS

- 1877 Wilks – Described a young woman who died of respiratory failure
- 1895 Jolly – Jolly’s test
- 3:2 Female prediliction
- ~50 per 1 million
- Weakness with repetitive motion, worse at end of day
MYASTHENIA GRAVIS

- 10 to 25% of patients with MG have thymoma
- 30 to 60% of patients with thymoma have MG
- Pathophysiology:
  - Antibodies to AchR
- Medical therapy
  - Acetylcholinesterase inhibitors
  - Corticosteroids
PERIOPERATIVE CONSIDERATIONS

- Disease should be well controlled
- Give pyridostigmine within 8 hours
- Avoid paralytics (unless difficult intubation)
- Beware myasthenic crisis
Randomized Trial of Thymectomy in Myasthenia Gravis

- Patients 18 to 65 years old
- MG for less than 5 years
- Class II to IV disease (scale I to V)
- Primary outcomes:
  - Quantitative Myasthenia Gravis Score
  - Time-weighted intake of prednisone
Randomized, controlled trial

- Compared transsternal thymectomy vs. prednisone
- Exclusion: Thymoma, immunotherapy other than prednisone
Figure A: Mean Total Score over Visit Month.

- Prednisone alone
- Thymectomy plus prednisone

Figure B: Prednisone Dose over Visit Month.

- Prednisone alone
- Thymectomy plus prednisone
Table 2. Primary and Subgroup Analyses of the Primary Outcomes

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<tr>
<th>Outcome</th>
<th>Prednisone Alone</th>
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<th>Prednisone plus Methylprednisolone</th>
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<th>Estimated Difference (95% CI)</th>
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<td>8.99±4.93</td>
<td>56</td>
<td>6.15±4.09</td>
<td>62</td>
<td>2.85 (0.47 to 5.22)</td>
<td>&lt;0.001</td>
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<td>Time-weighted average alternate-day prednisone dose over 3-yr period (mg)</td>
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<tr>
<td>60.27</td>
<td>56</td>
<td>44.21</td>
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<td>16 (7 to 25)</td>
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<td><strong>Subgroup analyses</strong></td>
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<td>Prednisone use at enrollment</td>
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<td>Female</td>
<td>9.73±5.16</td>
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<td>42±20</td>
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<tr>
<td>Female</td>
<td>59±25</td>
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<td>46±23</td>
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<tr>
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<td>61±32</td>
<td>19</td>
<td>38±15</td>
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<td>0.009</td>
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<td>45±22</td>
<td>41</td>
<td>16 (4 to 27)</td>
<td>0.007</td>
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<tr>
<td>≥40 yr</td>
<td>56±28</td>
<td>19</td>
<td>41±21</td>
<td>18</td>
<td>15 (-1 to 32)</td>
<td>0.07</td>
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TECHNIQUE

- Approach from right, left, or both
- Use insufflation (5-10 mmHg)
- Open pleura anterior to SVC or aorta
- Boundaries of dissection: phrenic nerves
- Excise pericardium if involved
- Pitfalls:
  - Injury to phrenic nerves
  - Injury to recurrent laryngeal nerves
TECHNIQUE

- Need to resect all thymic tissue
- Remove with Endocatch bag
- Leave chest tube in each pleural space (if both violated)
Monitor closely

Myasthenic Crisis

- Weakness of respiratory or facial muscles

Phrenic Nerve Injury
QUESTIONS?

If a dog wore pants would he wear them like this or like this?
A stage I thymoma has been diagnosed in a 41-year-old woman. Through which of the following surgical approaches should a thymectomy not be performed?

- Transcervical Collar Incision
- Median Sternotomy
- Partial Sternal Split
- VATS
- Posterolateral thoracotomy through the 6th intercostal space
All of the following mediastinal tumors are found in the anterior mediastinum except:
- Thymoma
- Thyroid Mass
- Lymphoma
- Teratoma
- Ganglioneuroma