Surgical aspects of thyroid cancer treatment

October 2007

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Learning objectives

• Initial surgery for thyroid cancer
  – Technical aspects of thyroidectomy
  – Role of minimally invasive techniques
• Extent of initial surgery
  – Lymph node dissection
• Subsequent surgery for thyroid cancer
  – Recurrent disease
  – Persistent disease
• Tips on recovery from surgery
Initial surgery for thyroid cancer

• Advantages of total thyroidectomy
  – Allows radioiodine ablation of any remaining (microscopic) normal or neoplastic thyroid tissue
  – Enables following of thyroglobulin (Tg) as a tumor marker
  – Deals with problem of tumor multifocality

• Total vs less than total thyroidectomy no longer a significant controversy in most cases
Bilimoria KY, Extent of surgery affects survival for papillary thyroid cancer, Ann Surg 2007
Thyroid: Posterior view
Anatomy of nerves
Technique of capsular dissection

Ligation of tertiary branches of vessels on capsule

Diagram showing:
- superior parathyroid gland
- inferior parathyroid gland
- inferior thyroid artery
- recurrent laryngeal nerve
RLN: Branches

3-I

3-II

LTG

ILN

CPICM

ESOPHAGUS

In 3 sides (2.5%)

In 4 sides (3.3%)

3-1

3-II
RLN: Anatomic variants
**External laryngeal nerve**

- 1970 – avoidance: the “neglected” nerve
general awareness of the nerve with attempts to avoid it but not routinely identified (seen in 22% of cases)

- 1990 - identification rate improved to 52%

- Now – routine identification
  
  Hisham et al demonstrated that the nerve could be identified in 95% of cases and that is now the benchmark

Anatomy: External branch superior laryngeal nerve

- Enters the sternothyroid-laryngeal triangle
  - medially – inferior constrictor and cricothyroid
  - anteriorly the sternothyroid
  - laterally – superior pole of thyroid
- enters surface of cricothyroid muscle
Opening of avascular space
“Hot zone” in thyroid surgery

- Superior parathyroid
- Tubercle of Zuckerkandl
- Inferior parathyroid
- Recurrent laryngeal nerve
- Inferior thyroid artery
Relationship to superior parathyroid gland

The Tubercle of Zuckerkandl maintains a very constant relationship to the superior parathyroid gland with which it shares a common embryological origin.
Parathyroid autotransplantation

Highly successful graft take
Ready autotransplantation of nonviable or questionable glands – assessment of perfusion

Parathyroid high on surface of thyroid
Pedicle ligated
Injection technique of parathyroid autotransplantation
Minimally invasive thyroid surgery

- Minimally invasive video-assisted thyroidectomy, Miccoli, University of Pisa

- 1.5-2.5 cm incision, compared to 3.5-4 cm open

- Applicable to selected patients – small nodule (<3.5 cm), small total thyroid volume (<15 mL by ultrasound), absence of thyroiditis (serology)

- Single study in PTC (33 pts)

- Demonstrates equivalency

Miccoli P, Minimally invasive video-assisted thyroidectomy for papillary carcinoma: A prospective study of its completeness, Surgery 2002
Scar appearance 3 months after open surgery for thyroid cancer
Initial management of lymph nodes in PTC

“The message is that there are known knowns - there are things that we know that we know.

There are known unknowns - that is to say, there are things that we now know we don't know.

But there are also unknown unknowns – there are things we do not know we don't know.

And each year we discover a few more of those unknown unknowns.”

Department of Defense news briefing 12/2/2002
Initial management of lymph nodes

- Palpable and sonographically detectable abnormal lymph nodes should be removed at initial surgery
- Is there a role for “prophylactic” lymph node dissection?
- The Japanese literature on this topic

Ito Y, Clinical significance of lymph node metastasis of thyroid papillary carcinoma located in one lobe, World J Surg, 2006
Thyroid cancer recurrence

PTC recurrence rates by tumor size

Bilimoria KY, Extent of surgery affects survival for papillary thyroid cancer, Ann Surg 2007
Prophylactic central (level 6) neck dissection

- May improve survival (1.6% vs 8.4-11.1% DSM)
- May reduce disease recurrence rates
- Probably reduces post-operative thyroglobulin levels
- May come with a small price: complications
  - Permanent recurrent laryngeal nerve injury
  - Permanent hypoparathyroidism
- Is probably better than having to go back for a second operation in the central neck
- Ipsilateral central neck dissection is probably a good balance of risk and benefit

White ML, Central lymph node dissection in differentiated thyroid cancer, World J Surg 2007
R27. Routine central-compartment (level VI) neck dissection should be considered for patients with papillary thyroid carcinoma and suspected Hürthle carcinoma. Near-total or total thyroidectomy without central node dissection may be appropriate for follicular cancer, and when followed by radioactive iodine therapy, may provide an alternative approach for papillary and Hürthle cell cancers—Recommendation B

2006 ATA guidelines
What can we conclude?

• Microscopic lymph node metastasis of PTC are the rule
• Only a small fraction (1/4-1/3) of these go on to become clinically significant
• Most micrometastases remain quiescent!
• Survival benefit from prophylactic LND is unlikely in low-risk PTC
• Possible benefit with respect to locoregional recurrence and thyroglobulin levels
• “No one ever died of thyroglobulininemia.”
• The central compartment is difficult to survey
• Prophylactic ipsilateral (level 6) LND likely has a role in the lifetime strategic management of PTC
Subsequent surgery for thyroid cancer

- Central neck dissection (lymph node recurrence)
- Modified radical neck dissection (lymph node recurrence)
- Radial re-excision central neck tumor (local recurrence)

- Thyroglobulin (+/- rhTSH) and neck ultrasound
- Small elevations in Tg usually indicate locoregional recurrence
- Larger elevations suggest distant disease
### TABLE 2. Serum Tg and sites of metastases

<table>
<thead>
<tr>
<th></th>
<th>All bone</th>
<th>Pure bone</th>
<th>All lung</th>
<th>Pure lung</th>
<th>All mediastinum</th>
<th>Pure mediastinum</th>
<th>All cervical</th>
<th>Pure cervical</th>
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<tbody>
<tr>
<td><strong>n</strong></td>
<td>38</td>
<td>7</td>
<td>91</td>
<td>15</td>
<td>74</td>
<td>5</td>
<td>104</td>
<td>31</td>
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<tr>
<td><strong>Age (yr)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Mean</strong></td>
<td>57.4</td>
<td>57.6</td>
<td>53.7</td>
<td>42.7</td>
<td>51.7</td>
<td>41.2</td>
<td>49.8</td>
<td>40.6</td>
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<tr>
<td><strong>SD</strong></td>
<td>11.2</td>
<td>4.8</td>
<td>17.7</td>
<td>19.1</td>
<td>19.4</td>
<td>19.7</td>
<td>17.8</td>
<td>11.5</td>
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<tr>
<td><strong>Prestimulated Tg (ng/ml)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Median</strong></td>
<td>687</td>
<td>48</td>
<td>34</td>
<td>8</td>
<td>25</td>
<td>4</td>
<td>10</td>
<td>2</td>
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<tr>
<td><strong>Minimum</strong></td>
<td>5</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>Maximum</strong></td>
<td>65,400</td>
<td>1,000</td>
<td>65,400</td>
<td>1,160</td>
<td>62,000</td>
<td>16</td>
<td>65,400</td>
<td>120</td>
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<td><strong>Poststimulated Tg (ng/ml)</strong></td>
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<tr>
<td><strong>Median</strong></td>
<td>2,030</td>
<td>416</td>
<td>246</td>
<td>72</td>
<td>180</td>
<td>16</td>
<td>43</td>
<td>8</td>
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<td><strong>Minimum</strong></td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<td><strong>Maximum</strong></td>
<td>97,400</td>
<td>3,000</td>
<td>88,000</td>
<td>2,060</td>
<td>97,400</td>
<td>82</td>
<td>97,400</td>
<td>1,760</td>
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<tr>
<td><strong>Fold increase</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Median</strong></td>
<td>2.5</td>
<td>2.4</td>
<td>3.3</td>
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<td>3.2</td>
<td>2.5</td>
<td>3.3</td>
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<td><strong>Minimum</strong></td>
<td>0.9</td>
<td>1.5</td>
<td>0.8</td>
<td>1.0</td>
<td>1.0</td>
<td>1.7</td>
<td>0.3</td>
<td>0.3</td>
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<td><strong>Maximum</strong></td>
<td>19.2</td>
<td>8.7</td>
<td>34.0</td>
<td>17.0</td>
<td>41.0</td>
<td>41.0</td>
<td>34.0</td>
<td>14.7</td>
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<tr>
<td><strong>Increment</strong></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Median</strong></td>
<td>1,032</td>
<td>368</td>
<td>130</td>
<td>42</td>
<td>80</td>
<td>12</td>
<td>17</td>
<td>4</td>
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<tr>
<td><strong>Minimum</strong></td>
<td>-9,720</td>
<td>4</td>
<td>-9,720</td>
<td>4</td>
<td>-600</td>
<td>0.4</td>
<td>-9,720</td>
<td>-1.4</td>
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<tr>
<td><strong>Maximum</strong></td>
<td>42,400</td>
<td>2,000</td>
<td>26,000</td>
<td>1,940</td>
<td>42,400</td>
<td>80</td>
<td>42,400</td>
<td>1,640</td>
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</tbody>
</table>

Robbins RJ, Factors influencing the basal and recombinant human thyrotropin-stimulated serum thyroglobulin in patients with metastatic thyroid carcinoma, J Clin Endo Metab 2004
• Up to 39% of re-operations for thyroid cancer are a direct result of incomplete initial surgery

• Ultrasound is an essential tool in the treatment of thyroid cancer

• Compartment-oriented lymph node dissection

• Re-operations carry increased surgical risk

Kouvaraki, Preventable reoperations for persistent and recurrent papillary thyroid carcinoma, Surgery 2004
Recovering from thyroid cancer surgery

• Stretching – it works!
• Myofascial release and other deep massage techniques
• Minimize trauma of surgery
Scar appearance 1 yr after radical surgery for metastatic thyroid cancer
Takamura Y, Stretching exercises to reduce symptoms of postoperative neck discomfort after thyroid surgery: Prospective randomized study, World J Surg 2005
“The patient does not care how much you know until s/he knows how much you care.”

- Unknown

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