Thyroid cancer seminar

Surgical approaches

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Nothing to disclose
Objectives:

- Discuss the indications and rationale for the surgical approach to thyroid cancer
- Recognize the surgical complications of thyroid surgery
- Discuss the recent guidelines for surgical therapy for thyroid cancer
Thyroid cancer

- Increasing incidence (PTC)
- Autopsy studies
- NYT article
- Increased ability to detect recurrence (tension between overtreatment and “fighting cancer”)
- Difficult terrain in which to practice/ counsel patients
- Evolving guidelines
Thyroid cancer is now the most rapidly increasing cancer in women
Survival rates for thyroid cancer remain excellent

Much of increased incidence attributed to PTC<1cm

(Davies L and Welch HG JAMA. 2006;295:2164)
April 14, 2016

Noninvasive follicular thyroid neoplasm with Papillary-like nuclear features (Niftp)
Papillary thyroid cancer: treatment

- **Surgery**
  - Thyroidectomy
  - +/- Lymph node dissection

- **Radioactive iodine**
  - High-risk patients

- **TSH suppression**
Case
39yo woman with 2cm right thyroid nodule found on physical exam

- Clinically and biochemically euthyroid
- No local symptoms in the neck
- No risk factors
- Solitary nodule on exam, moves with deglutition
- Normal thyroid function (TSH)
- FNA shows Bethesda VI
Thyroid nodule

39yo woman with newly diagnosed PTC in a 2cm left thyroid nodule

- Goals of treatment:
  - Improve survival
  - Prevent recurrence
  - Do no harm (minimize complications)
Thyroid nodule

39yo woman with newly diagnosed PTC in a 2cm left thyroid nodule

- Treatment options
  - Monitoring/observation
  - Thyroid lobectomy
  - Total thyroidectomy
  - Central neck dissection
Non-operative management

KEY POINTS

- Most low-risk PMCs do not grow or they grow very slowly, and immediate surgery for all PMCs may be an overtreatment.

- It is not too late to perform surgical treatment after the detection of progression signs such as size enlargement or novel appearance of lymph node metastasis during active observation.

- In contrast to clinical PTC, PMCs in older patients are less likely to progress than those in young or middle-aged patients.

- PMC in young patients is more likely to progress than PMCs in older patients, but since none of the patients who underwent surgery after the detection of progression signs showed recurrence, these patients can also be candidates for active observation.

- Whether TSH suppression with active observation is a better option than active observation alone remains an open question.
Lobectomy

- Removal of gross tumor
- Remaining lobe allows for patient’s native thyroid function
- If levothyroxine needed for TSH suppression usually small dose
- Hypoparathyroidism virtually non-existant

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**Thyroid lobectomy for treatment of well differentiated intrathyroid malignancy.**


889 pts with pT1T2, no difference in survival or recurrence with lobectomy vs total thyroidectomy
Total thyroidectomy

- Removal of gross tumor, other occult tumors
- Facilitate thyroglobulin monitoring
- Allow RAI
- Eliminates 7% risk of recurrence in thyroid tissue
- Risk of dedifferentiation to anaplastic cancer in decreased

**Extent of surgery affects survival for papillary thyroid cancer.**

Bilimoria KY¹, Bentrem DJ, Ko CY, Stewart AK, Winchester DP, Talamonti MS, Sturgeon C.

Total thyroidectomy results in lower recurrence rates and improved survival for PTC>1cm
ATA Recommendation 26 (Thyroidectomy)

- 2009
  - Thyroid lobectomy alone may be sufficient treatment for small <1cm, low-risk unifocal tumors
  - For patients with thyroid cancer >1cm, the initial surgical procedure should be near-total or total thyroidectomy unless there are contraindications to this surgery

(Cooper et al. Thyroid. 2009)
ATA Recommendation 26 (Thyroidectomy)

2015:

- If surgery is chosen for patients with thyroid cancer <1cm without ETE and cN0, the initial surgical procedure should be a thyroid lobectomy unless there are clear indications to remove the contralateral lobe.

- For patients with thyroid cancer between 1-4cm, without ETE and cN0, the initial surgical procedure can be either a bilateral (total or near-total thyroidectomy) or a unilateral procedure (thyroid lobectomy).

- For patients with thyroid cancer >4cm, or with gross ETE or cN1 or M1, the initial surgical procedure should be a total thyroidectomy.

(Haugen et al. Thyroid 2015)
Unsuspected disease was found by ultrasonography in 52 patients (34%) and altered the operative approach to include dissection of the central lymph nodes in 32 patients, ipsilateral nodes in 21 patients and contralateral nodes in 9 patients

(Kouvaraki et al, Surgery 134:946, 2003)
Surgical approach to lymph nodes

- Lymphatic flow in the thyroid is extensive, interconnected, can be sequential or “skip”
- High incidence of lymph node metastases in PTC

(Delbridge et al, 2003)
Memorial Sloan Kettering: Lateral neck

Central lymph node dissection

- Hyoid bone to brachiocephalic vein, between the carotid sheaths bilaterally

(Robbins et al, Arch OHNS 1991)
Lateral lymph node dissection

- Upper, middle and lower jugular lymph nodes (II, III, IV)
- Preservation of SCM muscle, spinal accessory nerve and jugular vein

(Robbins et al, Arch OHNS 1991)
ATA Recommendation 27 (Central LND)

2009

- Prophylactic central compartment neck dissection *may be performed* in patients with papillary thyroid cancer with clinically uninvolved lymph nodes, especially for advanced primary tumors

- Total thyroidectomy without prophylactic central neck dissection may be appropriate for T1 or T2 noninvasive clinically node-negative PTC and most follicular thyroid cancers

Cooper et al. Thyroid. 2009)
ATA Recommendation 36 (Central LND)

2015:

- Prophylactic central compartment neck dissection should be considered in patients with PTC with clinically uninvolved central neck lymph nodes who have advanced primary tumors.
- Total thyroidectomy without prophylactic central neck dissection may be appropriate for T1 or T2 noninvasive clinically node-negative PTC and most follicular thyroid cancers.

(Haugen et al. Thyroid 2015)
ATA Recommendation 28/37 (lateral LND)

- 2009:
- 2015

- Therapeutic lateral neck compartmental lymph node dissection should be performed for patients with biopsy-proven metastatic lateral cervical lymphadenopathy

(Cooper et al. Thyroid 2009)
(Haugen et al. Thyroid 2015)
Successful Localization of Recurrent Thyroid Cancer in Reoperative Neck Surgery Using Ultrasound-Guided Methylene Blue Dye Injection

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**BACKGROUND:**
Reoperation in the neck can be challenging and is associated with increased complication rates and operative times. Here we analyze our methylene blue dye injection method to localize reoperative neck pathology in patients with thyroid cancer and lymph node metastases.

**STUDY DESIGN:**
We retrospectively reviewed the records of all patients at a single university tertiary care center who had reoperative neck surgery for recurrent thyroid cancer between 2004 and 2009, and who also underwent intraoperative methylene blue dye injection. Outcomes measured were efficacy and safety of the injection technique as well as complication rates.

**RESULTS:**
Fifty-three operations were performed in 44 patients (average age, 51.2 years [range 16 to 83 years]). Ninety-one percent (48 of 53) of the operations resulted in successful resection of recurrent disease. Of these, 96% (46 of 48) were guided successfully by blue dye injection. Thyroglobulin became undetectable in 42% (11 of 26) of patients. Neck pathology included the following thyroid cancers: papillary (48 of 53), follicular (2 of 53), medullary (2 of 53), and tall cell variant (1 of 53). Among these patients, there were a total of 26 central and 38 lateral neck dissections. The average number of previous neck dissections was 2 (range 1 to 9). The mean intraoperative ultrasound/injection time was 21.3 min (n = 13). Median operative time was 90 minutes (range 40 to 300 minutes). Complications included 2 permanent vocal cord paralyses, 1 instance of permanent hypocalcemia, and 3 instances of temporary hypocalcemia. There were no complications related to the dye injection.

**CONCLUSIONS:**
visualizing a small amount of air coincidentally injected with the dye into the recurrence (Fig. 2B).

Typically only 1 injection was done, directly into the suspected recurrence. If there were a conglomerate of positive lymph nodes, the most superior and the most inferior nodes were injected to help guide the surgeon during the operation. Figure 3 shows an injected blue dye node in situ. Figure 4 shows an excised dye-injected lymph node.

Successful resection of recurrence was defined as a resection in which postoperative pathology identified malignancy and in which elimination of recurrence was seen in postoperative ultrasound (if imaging information was available). Patients were surveyed for recurrence from 2 months to 2 years postoperatively.

RESULTS

Fifty-three operations were performed in 44 patients (average age, 51.2 years [range 16 to 83 years]). Twenty of these operations were done in men (38%). Neck pathology included the following thyroid cancers: papillary (48 of 53), follicular (2 of 53), medullary (2 of 53), and tall cell variant of papillary (1 of 53). Maximum diameters of recurrences ranged from 5 mm to 2.9 cm in size on preoperative ultrasound imaging. Mean number of nodes resected at each reoperation was 6 (range 1 to 29).
Medullary thyroid cancer

- Total thyroidectomy
- Central lymph node dissection
  - bilateral, prophylactic
- Lateral lymph node dissection
  - selective
What are the complications of thyroid surgery?

- Recurrent laryngeal nerve injury
- Hypoparathyroidism
- Bleeding

“Complications in thyroid surgery are directly related to the extent of surgery and inversely proportional to surgeon experience”

Ashok Shaha in Textbook of Endocrine Surgery, 2016
“(thyroidectomy is) one of the most thankless, most perilous undertakings.”

Johann Dieffenback
1848
“If a surgeon should be so adventurous or foolhardy as to undertake thyroidectomy, every step he takes will be environed with difficulties, every stroke of his knife will be followed by a torrent of blood, and lucky will it be for him if his victim lives long enough to enable him to finish his horrid butchery... No honest and sensible surgeon, it seems to me, would ever engage in it.”

Samuel Gross
1866
Emil Theodor Kocher

- Swiss physician
- Awarded the Nobel prize in Physiology in 1909
  - Aseptic technique
  - Minimizing blood loss
  - Mortality >70% -> 1%
Recurrent laryngeal nerve injury

1% risk of permanent RLN dysfunction, 5% risk of temporary dysfunction
RLN monitoring

- Allows distinction between visually intact nerve and functional nerve
- Does not reliably reduce nerve injury rates (Dralle) except in reoperative settings
- Does allow avoidance of bilateral nerve injuries by predicting it on the first lobe
Fig. 1. Monitoring endotracheal tube in position. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]
Electrophysiologic Recurrent Laryngeal Nerve Monitoring During Thyroid and Parathyroid Surgery: International Standards Guideline Statement

Gregory W. Randolph, MD; Henning Dralle, MD, with the International Intraoperative Monitoring Study Group*: Hisham Abdullah, MD; Marcin Barczynski, MD; Rocco Bellantone, MD; Michael Brauckhoff, MD; Bruno Carnaille, MD; Sergii Cherenko, MD; Fen-Yu Chiang, MD; Gianlorenzo Dionigi, MD, FACS; Camille Finck, MD; Dana Hartl, MD; Dipti Kamani, MD; Kerstin Lorenz, MD; Paolo Miccoli, MD; Radu Mihai, MD, PhD, FRCS; Akira Miyauchi, MD, PhD; Lisa Orloff, MD, FACS; Nancy Perrier, MD, FACS; Manuel Duran Poveda, MD; Anatoly Romanchishen, MD; Jonathan Serpell, MD, FRACS, FACS; Antonio Sitges-Serra, MD; Tod Sloan, MD, MBA, PhD; Sam Van Slycke, MD; Samuel Snyder, MD, FACS; Hiroshi Takami, MD; Erivelto Volpi, MD; Gayle Woodson, MD

Intraoperative neural monitoring (IONM) during thyroid and parathyroid surgery has gained widespread acceptance as an adjunct to the gold standard of visual nerve identification. Despite the increasing use of IONM, review of the literature and clinical experience confirms there is little uniformity in application of and results from nerve monitoring across different centers. We provide a review of the literature and cumulative experience of the multidisciplinary International Neural Monitoring Study Group with IONM spanning nearly 15 years. The study group focused its initial work on formulation of standards in IONM as it relates to important areas: 1) standards of equipment setup/endotracheal tube placement and 2) standards of loss of signal evaluation/intraoperative problem-solving algorithm. The use of standardized methods and reporting will provide greater uniformity in application of IONM. In addition, this report clarifies the limitations of IONM and helps identify areas where additional research is necessary. This guideline is, at its forefront, quality driven; it is intended to improve the quality of neural monitoring, to translate the best available evidence into clinical practice to promote best practices. We hope this work will minimize inappropriate variations in monitoring rather than to dictate practice options.

Key Words: Recurrent laryngeal nerve, nerve monitoring, intraoperative neural monitoring, international standards, guidelines for intraoperative neural monitoring, thyroid surgery, parathyroid surgery, nerve injury, nerve monitoring equipment, neural mapping, nerve identification, anesthesia and nerve monitoring, loss of signal, laryngeal twitch, vagus nerve, electromyography characteristics, vocal cord mobility, latency, amplitude, superior laryngeal nerve.

Level of Evidence: 5.
External branch, superior laryngeal nerve: Cernea classification

- **TYPE 1**
- **TYPE 2A**
- **TYPE 2B**
Hypoparathyroidism

- Incidence varies
- Permanent hypoparathyroidism defined as hypocalcemia +/- symptoms >6 months after surgery

1% risk of permanent hypocalcemia, 5% risk of temporary
Hypoparathyroidism

- Post-operative order sets:
  - Serum calcium level 5 hrs after total thyroidectomy, completion thyroidectomy
  - Serum calcium on the morning following surgery
  - Patient routinely discharged with 1 gram of calcium carbonate twice daily, and prn
  - IOPTH level at the end of the operation
Hypoparathyroidism: IOPTH

IOPTH measured <24hrs after total tx or completion thyroidectomy in 1054. Low PTH defined as < 10pg/mL

- 189 (18%) had PTH <10
  - 132 (70%) resolved within 2 months
  - 9 (5%) resolved 6>12 months
  - 20 (1.9%) continued to have symptoms > 1 year

(Ritter K et al. J Surg Res 2015)
PTH levels

(Ritter K et al. J Surg Res 2015)
Hypoparathyroidism

- Retrospective review of 386 patients after thyroidectomy
  - 20% had inadvertent parathyroidectomy
  - Permanent hypoparathyroidism in 7 (2.7%)
  - 4 (6.7%) who had inadvertent parathyroidectomy
  - 3 (1.5%) without inadvertent parathyroidectomy
  - Central compartment LND was independent risk factor (odds ratio= 9.584, P=0.001)
Neck hematoma

1 in 200 risk of reoperation
Neck hematoma can be life-threatening

- **Signs/symptoms:**
  - Neck swelling
  - Difficulty swallowing
  - Change in voice (Mickey Mouse voice)
  - Airway compromise

1 in 200 risk of reoperation
Retrospective, case control 207 patients from 15 institutions who developed a neck hematoma requiring return to the operating room:

- 47\% of patients presented within 6 hours of operation
- 53\% of patients presented > 6 hours
- 79\% <24 hours

(Campbell, McCoy KL et al. Surgery 2013)
Neck hematoma

- Risk factors:
  - Older, male, smokers
  - Graves’ disease
  - Antiplatelet or anticoagulants
  - Use of percutaneous drains
  - Bilateral thyroid operations
  - Combined thyroid and parathyroid operation

(Campbell, McCoy KL et al. Surgery 2013)
Thank you.