Thyroid Surgery

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Nothing to Declare
Thyroid Surgery: How ancient?

- ~2100 BC, West Chu dynasty, tx goiter w/ seaweed
- ~937 AD, Sung dynasty, textbook
- ~1170 AD, School of Salerno, Roger Frugardi
“The supreme triumph of the surgeon’s art.”

William Halsted
Theodore Kocher

- Father of modern thyroid surgery
- Nobel prize 1909 for “works in the physiology, pathology and surgery of the thyroid”
- > 5000 thyroidectomy
- < 1% mortality
Thyroid Surgery

- Alternative approaches to thyroid surgery
  - “Minimally invasive”
  - Robotics
  - “Scarless”
- Papillary micro-carcinomas
  - “over-diagnosis” and “over-treatment”
- Changing extent of thyroidectomy
  - 2015 ATA guidelines
Evolution of “Minimally Invasive” Thyroidectomy

- Traditional → Short incision → No neck incision → No skin incision

- Kocher → Mini-Incision → MIVAT → Extra-Cervical Access → NOTES
Videoscopic Thyroidectomy
Cervical Approach

(a) Scope and Specimen
5mm 3mm 3mm
Gagner M (1)

(b) Scope and Specimen
5mm 5mm
Yeung HCG (18) Cougard P (6)
Chowbey PK (9)

(c) Split Strap Muscles
15-20mm
Miccoli P (3) Bellantone R (4)
Henry JF (5) Yeh TS (30mm)(10)

Yeung: Thyroid 12:703, 2002
Minimally Invasive Video Assisted Thyroidectomy (MIVAT)

- MIVAT – Pisa, Miccoli, 1998-2008
  - 421 lobe (32 min) 899 total (44 min)
  - regional anesthesia possible
  - 2.2% converted to standard operation
  - 2.6% temp and 1.1% perm RLN palsy
  - 4.2% temp, 0.2% perm hypopara

- Requires 3 surgeons

Transaxillary Thyroidectomy

Robot-Assisted Thyroidectomy
Transaxillary, Gasless

- Yonsei University, Seoul, Korea 10/07-3/08
- Gasless (lifting) trans-axillary
  - 4-arm Da Vinci, 8 mm ports
- 100 patients with papillary thyroid cancer
  - 16 total, 84 < total thyroidectomy
  - Level VI dissection
- Op time (total 136 min, console time 60 min)
- 1150 trans-axillary robotic thyroidectomy for micropapillary thyroid cancer, some with node dissection (2015 upto 3000)

Robotic (BABA) Thyroidectomy: Bilateral Axillo-Breast Approach

- 109 pts w/ papillary cancer
- Total thyroidectomy and central neck dissection
- Size 0.7 cm, op time 206 min
- RLN palsy (17,1 perm)
- Hypopara (21, 2 perm)
- Stim’d-Tg 1.8 (76% <1)

Robot-Assisted Thyroidectomy: Initial American Experience

- 31 patients (20 lobectomy, 11 total)
  - Age 38 (20-62), BMI 25 (18-34)
  - 8 prior breast augmentation, 1 rhinoplasty
  - 2 incisions for first 15

- Complications
  - Radial nerve palsy (resolved in 3 m)
  - Recurrent nerve palsy (transient)
  - 2 with >500 cc blood loss (anterior jugular)

- Discharge home with drain

Kuppersmith RB, Holsinger FC: Laryngoscope 121:521-6, 2010
“Facelift Thyroidectomy”

FIGURE 1. The incision resembles a facelift incision, beginning in the postauricular crease and crossing over to the occipital hairline under cover of the ear. The incision is placed approximately 1 cm within the hairline to ensure that it is invisible.

Transoral Endoscopic Minimally Invasive Thyroidectomy (eMIT)

- 3/18/09, Borna, Germany
- 4 total, 4 partial, for MNG
- 3 converted to open
- 1 perm RLN injury

Transoral Endoscopic Minimally Invasive Thyroidectomy (eMIT)

- “The authors encountered in their clinical application all above-cited difficulties and concerns, which are reflected in their presented results, such as paresthesia of the mental nerve in varying degrees in six of eight cases (75%), conversion to open surgery due to specimen size in three of eight cases (37.5%), palsy of the recurrent laryngeal nerve in two of eight cases (25%), and one permanent (12.5%) and local streptococci infection at the vestibular incision site necessitating incision and irrigation in one case (12.5%).

Trans-Oral Video-Assisted Neck Surgery (TOVANS)

- 8 patients, 3 contralateral neck dissection.
- All numbness around the chin
- 1 permanent RLN injury

TOETVA
Trans-Oral Endoscopic Thyroidectomy Vestibular Approach

- 60 thyroidectomy
- Op time 115 min, EBL 30 mL
- 2 had transient hoarseness, 1 hematoma conservatively treated, 2 transient hypoparathyroidism
- No mental nerve injury
- No infection

Angkoon Anuwong, Police General Hospital, August 18, 2016.
TOETVA

- Angkoon Anuwong, Police General Hospital, Bangkok, April 2014 – August 2016
- 413 TOETVA (141 R, 104 L, 158 Bilateral)
- Nodules, MNG, Graves, Pap Ca
- 15 TOEPVA (parathyroidectomy)
Complications of 403 TOETVA

- Hoarseness: transient 20, permanent 0
- Hypopara: transient 45, permanent 0
- Lower lip paresthesia: 3 (resolved by 4 wks)
- Infection: 0
- Hemetoma: 1 (3 days)
Fewer Robotic Thyroidectomy
Robotic Thyroidectomy: Concerns

- Between July 2009 and October 2011, Intuitive Surgical received 13 complaints and filed 5 MDRs related to thyroidectomies performed with the da Vinci system.
- On 10/13/2011, Intuitive Surgical, Inc. sent out a letter notifying da Vinci clients that the da Vinci surgical systems are not cleared for thyroidectomy indication.
- May 30, 2013 Warning from FDA inspectors
Da Vinci Robot Complications News: Surgeons Say Intuitive Surgical Needs Better Training On Da Vinci Surgical Robot

Posted on August 14, 2013 by Editor

While federal health officials begin to take a longer look at the safety and efficacy of robotic surgery, namely using the da Vinci Surgical Robot, one surgeon believes that until everyone is properly trained on how to use the robot, more people are likely to suffer serious and sometimes life-threatening Da Vinci robot complications or injuries.
ATA Statement on Remote Access Thyroid Surgery

“The limited data in the literature suggest long operative times, a steep learning curve, and higher costs with remote-access thyroid surgery compared with conventional thyroidectomy. Nevertheless, a consensus was reached that, in appropriate hands, it can be a viable option for patients with unilateral small nodules who wish to avoid a neck incision”.

Evolution of MIS Thyroidectomy

- Traditional → Short incision → No neck incision → No skin incision

- Kocher → Mini-Incision → MIVAT → Extra-Cervical Access → NOTES
What Makes MIS Thyroidectomy Possible

- Scope
- Energy devices
- Modified laparoscopic instruments
- Robotics

Skills learned and ideas generated from other minimally invasive surgery
Concerns about MIS Thyroidectomy

- **Safety**
  - Complications: RLN injury, hypoparathyroidism
  - Other access specific complications
- **Effectiveness**
  - Completeness of lobectomy/total thyroidectomy: especially for unilateral approach
  - Ability to perform lymphadenectomy?
“Scar-free” Thyroidectomy

- Popular in Asia: cultural, financial influences
- For small tumor, minimally nodal involvement
- Trans-axillary, bilateral-axillo-breast-approach (BABA), without or with robot
- “Face lift” thyroidectomy less common
- Trans-oral (NOTES) thyroidectomy
Who had a thyroidectomy for cancer?
Cosmetic Outcome of Thyroidectomy

- Length of incision
- Placement of incision
  - Skin line, height, symmetry
- Trauma to the incision
- Patient
  - Wound healing, Keloid, BMI, fold
- Societal
  - Beauty
Length of Incision for Thyroidectomy

- Total thyroidectomy: 5.5 cm (n=73)
- Lobectomy: 4.6 cm (n=60)
- Parathyroidectomy: 3.5 cm (n=67)

* P < .0001

Skin Crease Incision
2 weeks after total thyroidectomy & level VI dissection
13 years post total thyroidectomy
Good Cosmetic Results:
Neck Incision

- Incision in a natural crease
- Minimize trauma to skin/tissue
- Skin closure without tension (glue)

- Lateral vs central incision?
- Length of incision less important
Small Papillary Thyroid Cancers
Most Increases are from Papillary Cancer ≤ 2cm

Davies L, Welch HG. JAMA 295:2164 2006
### Increasing Incidence of Differentiated Thyroid Cancer

1988-2005, SEER, percent change per year

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
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<tbody>
<tr>
<td>Micro ca (&lt;1.0 cm)</td>
<td>9.9%</td>
<td>8.6%</td>
</tr>
<tr>
<td>T3 (Tumors ≥ 4 cm)</td>
<td>3.7%</td>
<td>5.7%</td>
</tr>
<tr>
<td>M1 (Distant met)</td>
<td>3.7%</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Doubling time 10% = 8 yr, 5% = 14 yr, 3% = 24 yr

Nilubol N, Kebebew E. Cancer 121:1017-1024, 2015
Concerns about Over-Diagnosis and Over-Treatment of Thyroid Cancer
Korea’s Thyroid Cancer “Epidemic” Screenings and Over-Diagnosis

- Starting in 1999, national screening program for cancers – breast, cervical, colon, stomach, liver
- Ultrasound screening routine for thyroid, > 19 yo
- Most common cancer in Korea, 40,000 in 2011
- More than half < 1 cm, more than 25% < 0.5 cm
- 2/3 total thyroidectomy
- 11% hopopara, 2% vocal cord paralysis

Ahn HS, Kim HJ, Welch HG. NEJM 371:1765-7, 2014
Korea’s Thyroid Cancer “Epidemic” Screening and Over-Diagnosis

Ahn HS, Kim HJ, Welch HG. NEJM 371:1765-7, 2014

Thyroid-Cancer Incidence and Related Mortality in South Korea, 1993–2011.
Data on incidence are from the Cancer Incidence Database, Korean Central Cancer Registry; data on mortality are from the Cause of Death Database, Statistics Korea. All data are age-adjusted to the South Korean standard population.

Penetration of Thyroid-Cancer Screening (2008–2009) and Incidence of Thyroid Cancer (2009) in the 16 Administrative Regions of South Korea.
Figure 1. Trend in the Number of Operations for Thyroid Cancer in South Korea, 2001–2015.

Data are from the Health Insurance Review and Assessment Service, South Korea.
Papillary Thyroid Microcarcinoma is rarely deadly
Papillary Thyroid Microcarcinoma: mortality rare and can be predicted

- SEER database 1988-2007
- 18,455 patients with PTMC, 49 cancer death
- 10-, 15- years overall survival 94.6% 90.7%
- 10-, 15- years DSS 99.5% 99.3%
- Risks of death (higher if ≥ 2 risk factors)
  - >45 yo, male, African America or minority race
  - Extrathyroid extension, nodal mets, distant mets

“Symptomatic” vs “Asymptomatic” Papillary Thyroid Microcarcinoma

- “We retrospectively reviewed …outcome of 178 patients with PMC”
- “cause-specific 10-year survival rate was 96%.”
- “All distant metastases and cancer-specific deaths occurred in the 30 patients with symptomatic PMC who had either cervical lymphadenopathy, recurrent laryngeal nerve palsy or both.”

“Symptomatic” vs “Asymptomatic” Papillary Thyroid Microcarcinoma

Fig. 3 Comparison of cause-specific survival curves between patients with extrathyroidal or extranodal invasion (Ex) or large nodal metastasis ≥2 cm (LN) and patients without those features

Observation for Microcarcinoma

- Miyauchi of Kuma Hospital in 1993 suggested observation (US follow up) only for low risk microcarcinoma, if no:
  - Lymph node metastases or distant metastases
  - Extrathyroid extension
  - Located near the RLN or attached to the trachea
  - High grade cytology
- Operate only if growth > 3 mm or new nodes

Observation for Microcarcinoma

- Only 186 (of 1235 observed) patients underwent thyroid surgery for various reasons.
- No cancer death.
- No recurrence, except one patient developed microcancer in the contralateral lobe.

Observation for Microcarcinoma

3 mm growth (8% in 10 years)

**FIG. 1.** Proportion of patients in our entire series whose papillary thyroid microcarcinoma (PTMC) showed enlargement by 3 mm or more.

Observation for Microcarcinoma new lymph nodes (3.8% in 10 years)

FIG. 2. Proportion of patients in the entire series whose PTMC showed novel appearance of lymph-node metastasis.
Observation for Microcarcinoma became clinical disease (6.8% in 10 yrs)

FIG. 3. Proportion of patients in the entire series whose PTMC developed into clinical disease.

Observation for Microcarcinoma
less growth in age > 60 yo

\[ p = 0.0329 \text{ (} > 60 \text{ years vs. } 40-59 \text{ years)} \]
\[ p = 0.0315 \text{ (} 40-59 \text{ years vs. } < 40 \text{ years)} \]

Observation for Microcarcinoma
more new nodes in patients < 40 yo

Changing Management of Papillary Thyroid Microcarcinoma

- Increasing incidence
- Excellent prognosis
- Extent of operation is debated, and is becoming more conservative
  - Lobectomy becoming acceptable in USA
  - Routine node dissection not recommended
- Observation may be acceptable
  - Especially for older patients
ATA 2015 Recommendations  
Papillary Thyroid Cancer

- No routine FNA for nodule on US < 1 cm
- FNA based on US features, 1-2 cm
- Cytology based on Bethesda System
- For < 1 cm ca lobectomy (or observation?), 1-4 cm lobectomy or total thyroidectomy
- No prophylactic lateral node dissection
- Prophylactic central neck node dissection optional

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 35 (thyroidectomy)

- (A) For patients with thyroid cancer >4 cm (T3), or with gross extrathyroidal extension (clinical T4), or clinically apparent metastatic disease to nodes (clinical N1) or distant sites (clinical M1), the initial surgical procedure should include a near-total or total thyroidectomy and gross removal of all primary tumor unless there are contraindications to this procedure. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 35 (thyroidectomy)

- B) For patients with thyroid cancer >1 cm and <4 cm without extrathyroidal extension and without clinical evidence of any lymph node metastases (cN0), the initial surgical procedure can be either a bilateral procedure (near-total or total thyroidectomy) or a unilateral procedure (lobectomy). Thyroid lobectomy alone may be sufficient initial treatment for low risk papillary and follicular carcinomas; however, the treatment team may choose total thyroidectomy to enable RAI therapy or to enhance follow-up based upon disease features and/or patient preferences. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 35 (thyroidectomy)

- C) If surgery is chosen for patients with thyroid cancer <1 cm without extrathyroidal extension and cN0, the initial surgical procedure should be a thyroid lobectomy unless there are clear indications to remove the contralateral lobe. Thyroid lobectomy alone is sufficient treatment for small, unifocal, intrathyroidal carcinomas in the absence of prior head and neck irradiation, familial thyroid carcinoma, or clinically detectable cervical nodal metastases. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 36 (central nodes)

- A) Therapeutic central-compartment (level VI) neck dissection for patients with clinically involved central nodes should accompany total thyroidectomy to provide clearance of disease from the central neck. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 36 (central nodes)

- B) Prophylactic central-compartment neck dissection (ipsilateral or bilateral) should be considered in patients with papillary thyroid carcinoma with clinically uninvolved central neck lymph nodes (cN0) who have advanced primary tumors (T3 or T4), clinically involved lateral neck nodes (cN1b), or if the information will be used to plan further steps in therapy. (Weak Recommendation, Low-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 36 (central nodes)

- C) Thyroidectomy without prophylactic central neck dissection may be appropriate for small (T1 or T2), noninvasive, clinically node-negative PTC (cN0) and for most follicular cancer. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Recommendation 37 (lateral nodes)

- Therapeutic lateral neck compartmental lymph node dissection should be performed for patients with biopsy-proven metastatic lateral cervical lymphadenopathy. (Strong Recommendation, Moderate-quality evidence)

Haugen BR, et al. Thyroid 26:1-133, 2016
Lobectomy only if:
- Rad, -FHx, cN0M0, T1-2, -margin, -contralateral
Is lobectomy for 1-4 cm low- and medium-risk cancer too conservative? How often would completion total thyroidectomy be needed?
Preoperatively Unanticipated High Risk Characteristics for 1-4 cm Thyroid Cancer

- Aggressive histology (3%)
- Vascular invasion (12%)
- Extrathyroidal extension (17%)
- Positive tumor margin (18%)
- Positive lymph nodes (17%)
- Ipsilateral multifocality (25%)

Kluijfhout WP, et al. Thyroid (submitted), 2016
Thyroid Surgery

- Alternative approaches to thyroid surgery
  - “Minimally invasive”,
  - Robotics
  - “Scarless”
- Papillary micro-carcinomas
  - “over-diagnosis” and “over-treatment”
- Changing extent of thyroidectomy
  - 2015 ATA guidelines
Thyroid Surgery

- Alternative approaches to thyroid surgery
  - “Minimally invasive”, Robotics, “Scarless”
  - Cosmetic issues of neck incision
- Papillary micro-carcinomas
  - “over-diagnosis” and “over-treatment”
  - OK to watch for low risk older patients
- Changing extent of thyroidectomy
  - 2015 ATA guidelines, more conservative
Thank You