Thyroid Surgery

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University of California, San Francisco

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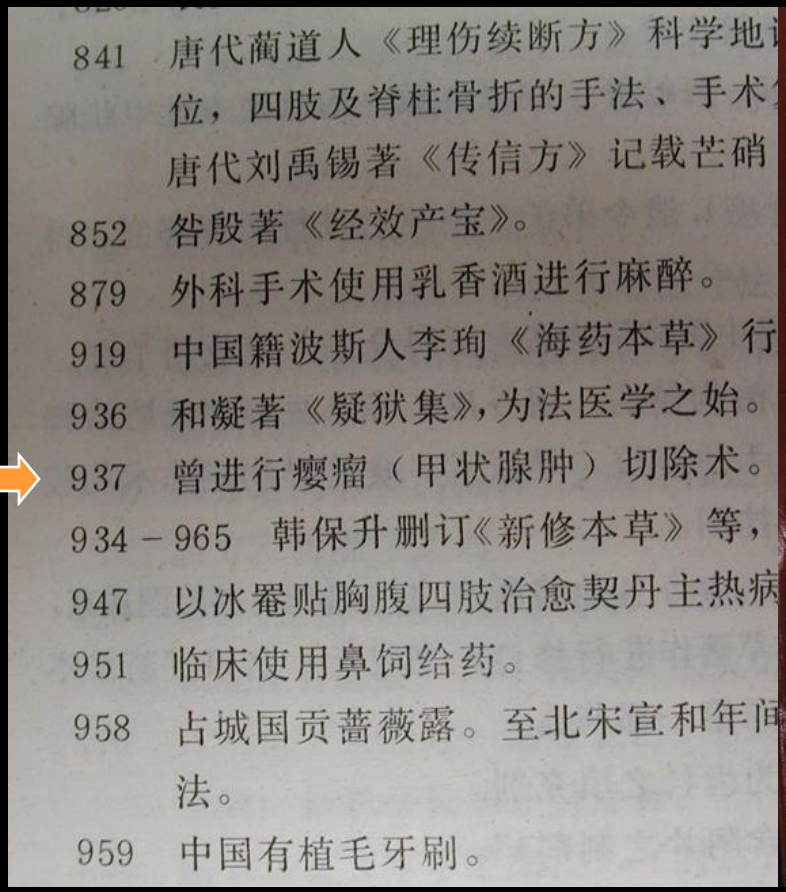
San Francisco, Oct 8, 2016

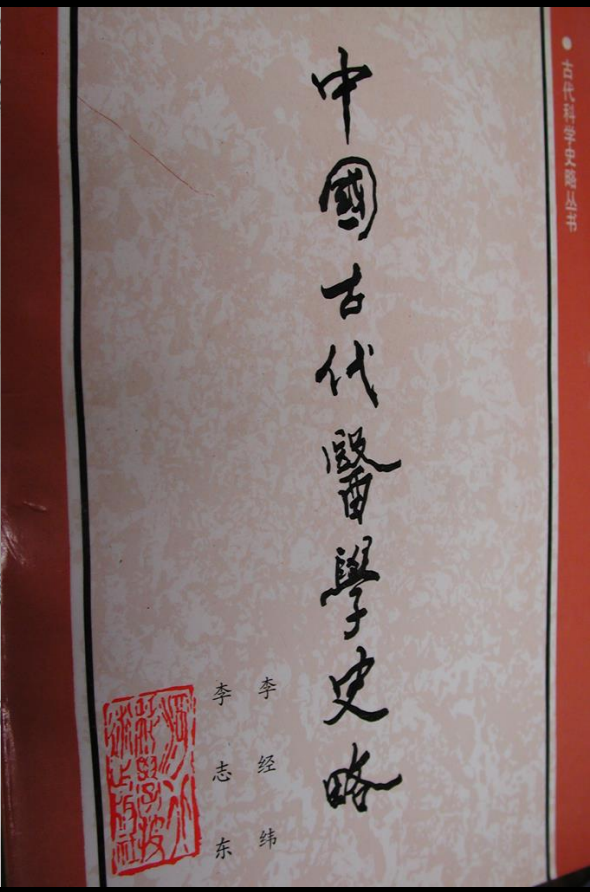
Nothing to Declare

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



841 唐代蔺道人《理伤续断方》科学地
位，四肢及脊柱骨折的手法、手术
唐代刘禹锡著《传信方》记载芒硝
852 咎殷著《经效产宝》。
879 外科手术使用乳香酒进行麻醉。
919 中国籍波斯人李珣《海药本草》行
936 和凝著《疑狱集》，为法医学之始。
937 曾进行瘿瘤（甲状腺肿）切除术。
934－965 韩保升删订《新修本草》等，
947 以冰罨贴胸腹四肢治愈契丹主热病
951 临床使用鼻饲给药。
958 占城国贡蔷薇露。至北宋宣和年间
法。
959 中国有植毛牙刷。



The History of Ancient Chinese Medicine by Lee, Hopei, China 1990. ISBN 7-5375-0294-3/R.58

The History of Endocrine Surgery by RB Webourn, Praeger, New York, 1990. ISBN 0-275-92586-2c

"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

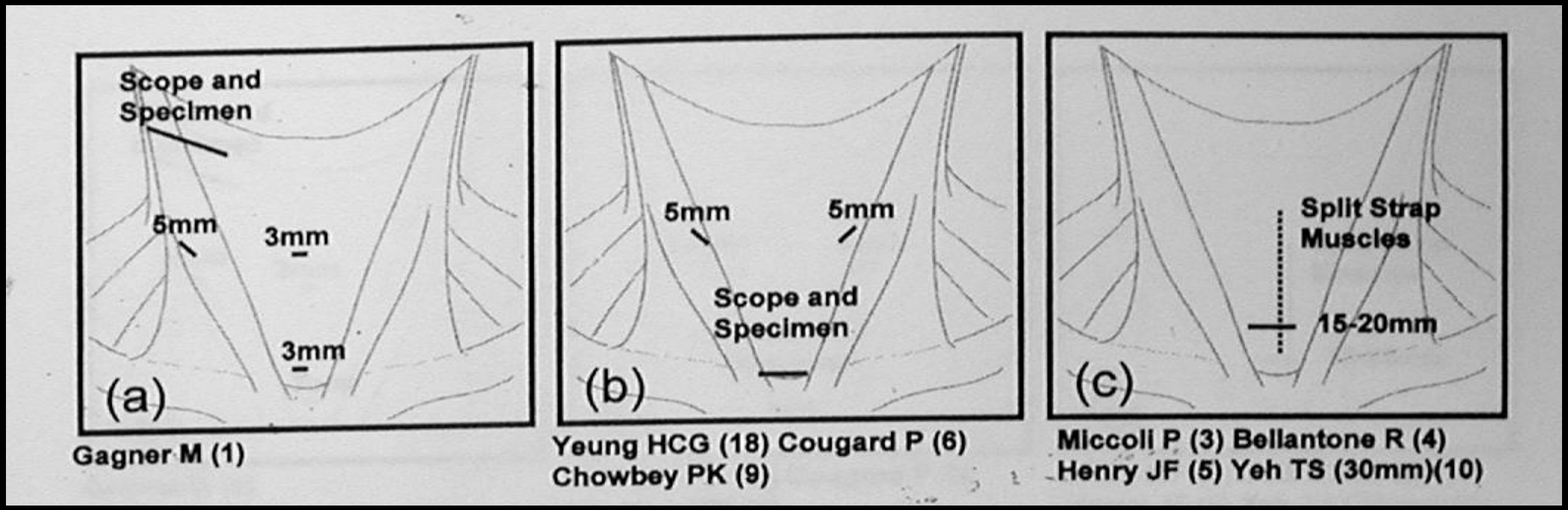
- Alternative approaches to thyroid surgery
  - “Minimally invasive”
  - Robotics
  - “Scarless”
- Papillary micro-carcinomas
  - “over-diagnosis” and “over-treatment”
- Changing extent of thyroidectomy
  - 2015 ATA guidelines

Evolution of "Minimally Invasive" Thyroidectomy

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

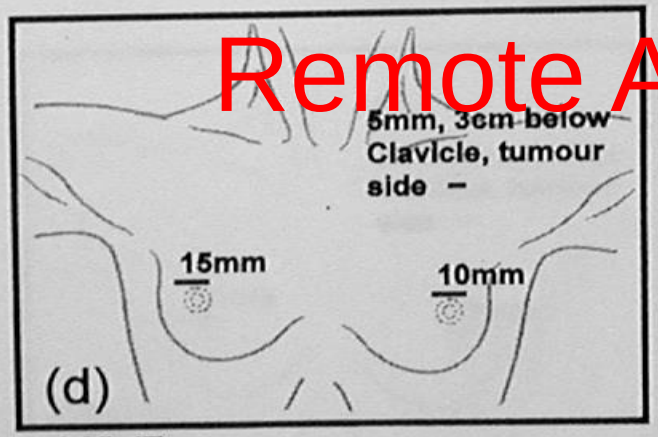
- Kocher → Mini-Incision → MIVAT → Extra-Cervical Access → NOTES

Videoscopic Thyroidectomy
Cervical Approach

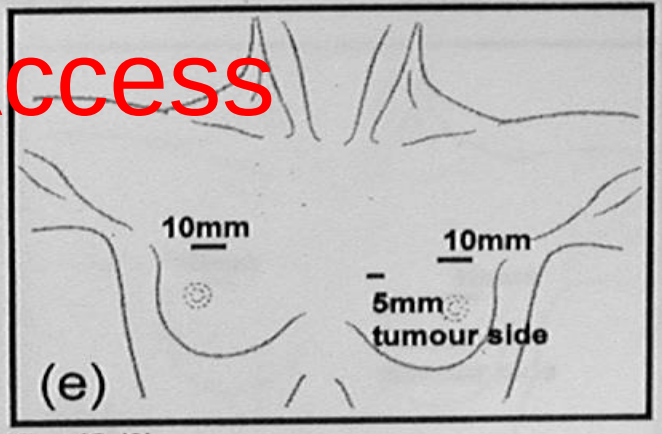


Yeung: Thyroid 12:703, 2002

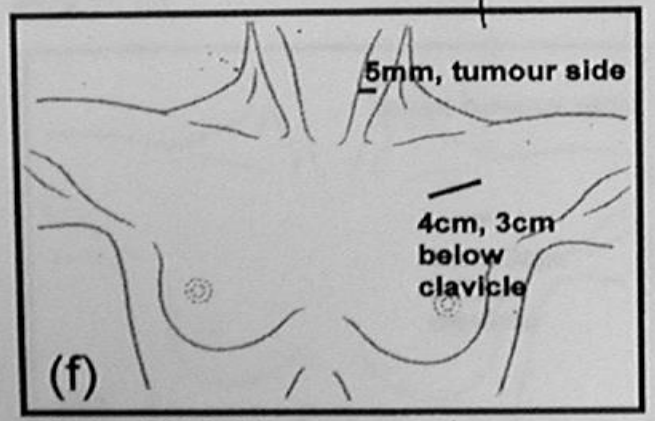
Remote Access



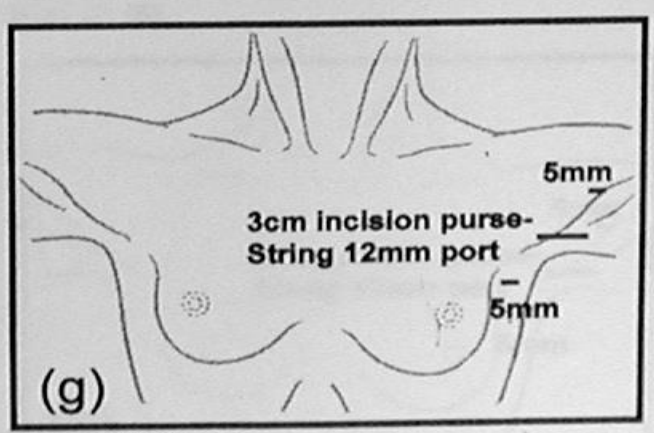
Park YL (7)



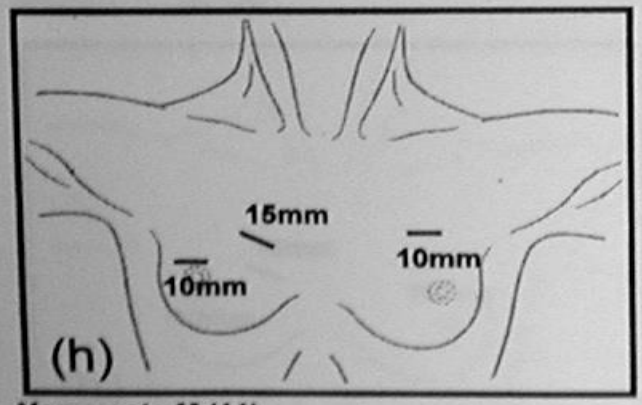
Kim JS (8)



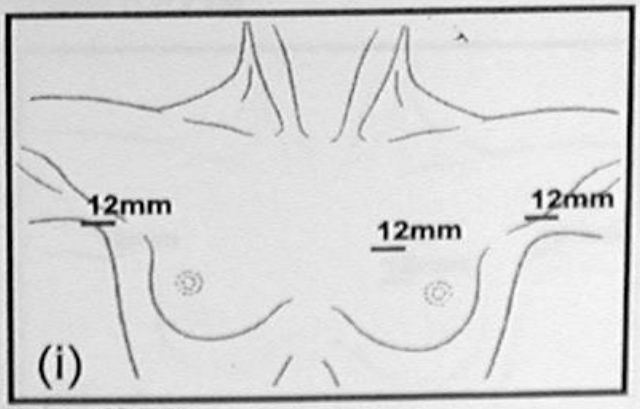
Shimizu K (15, 16)



Takami H (12,13)



Yamamoto M (11)



Kitano H (23)

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

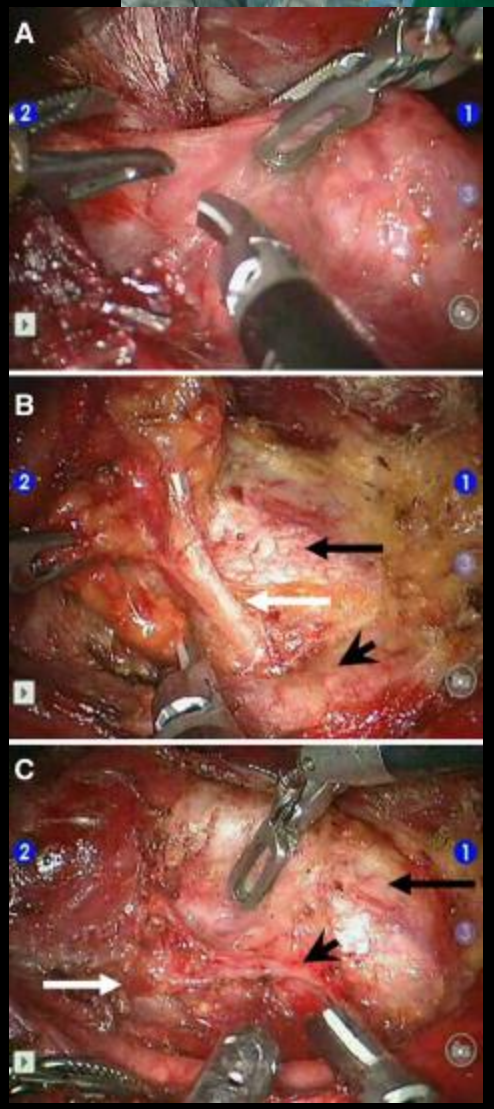
Miccoli P, et al. World J Surg. 2008 Jul;32(7):1333-40.

Transaxillary Thyroidectomy

Shimizu K, et al. J Surg Onc 69:178, 1998. also Takami H, Kitano H

Robot-Assisted Thyroidectomy Transaxillary, Gasless

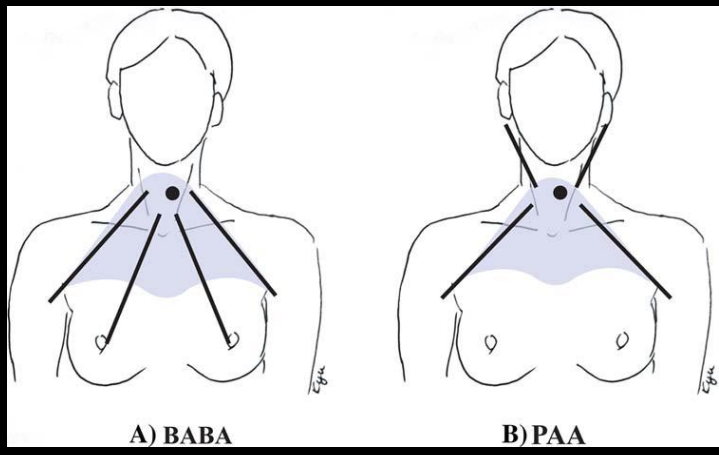
- Yonsei University, Seoul, Korea 10/07-3/08
- Gasless (lifting) trans-axillary
  - 4-arm Da Vinci, 8 mm ports
- 100 patients with papillary thyroid cancer
  - 16 total, 84 < total thyroidectomy
  - Level VI dissection
- Op time (total 136 min, console time 60 min)
- 1150 trans-axillary robotic thyroidectomy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



Kang WS, et al: Surg Endosc 23:2399-2406, 2009
Lee S, et al: Ann Surg 253:1060-1066, 2011
Lee S, et al: Surgery 151: 724-30, 2012
Lee J, et al: JCEM 98:2701-8, 2013

Robotic (BABA) Thyroidectomy: Bilateral Axillo-Breast Approach

- 109 pts w/ papillary cancer
- Total thyroidecyomy 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)



Lee KE, et al: World J Surg 33:767-772, 2009
Lee KE, et al: Surgery 148:1207-13, 2010

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”

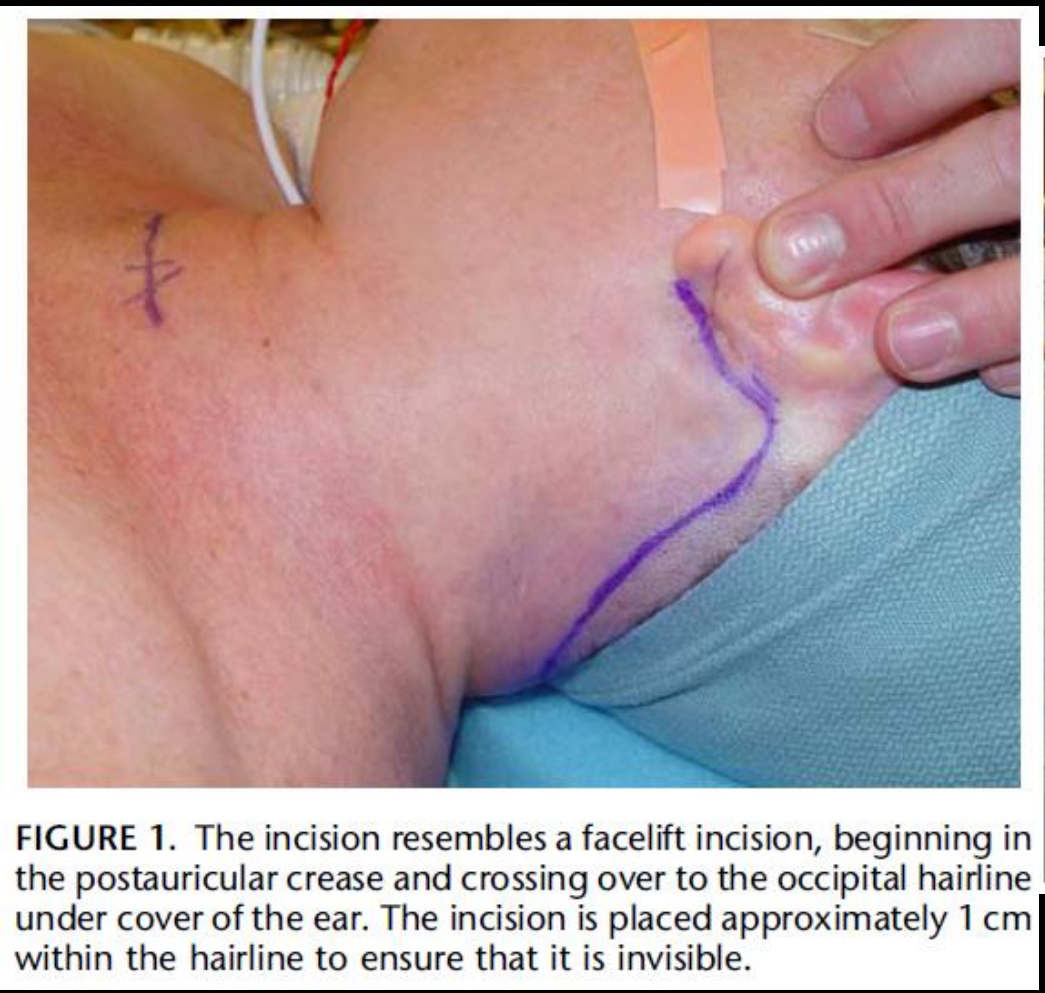
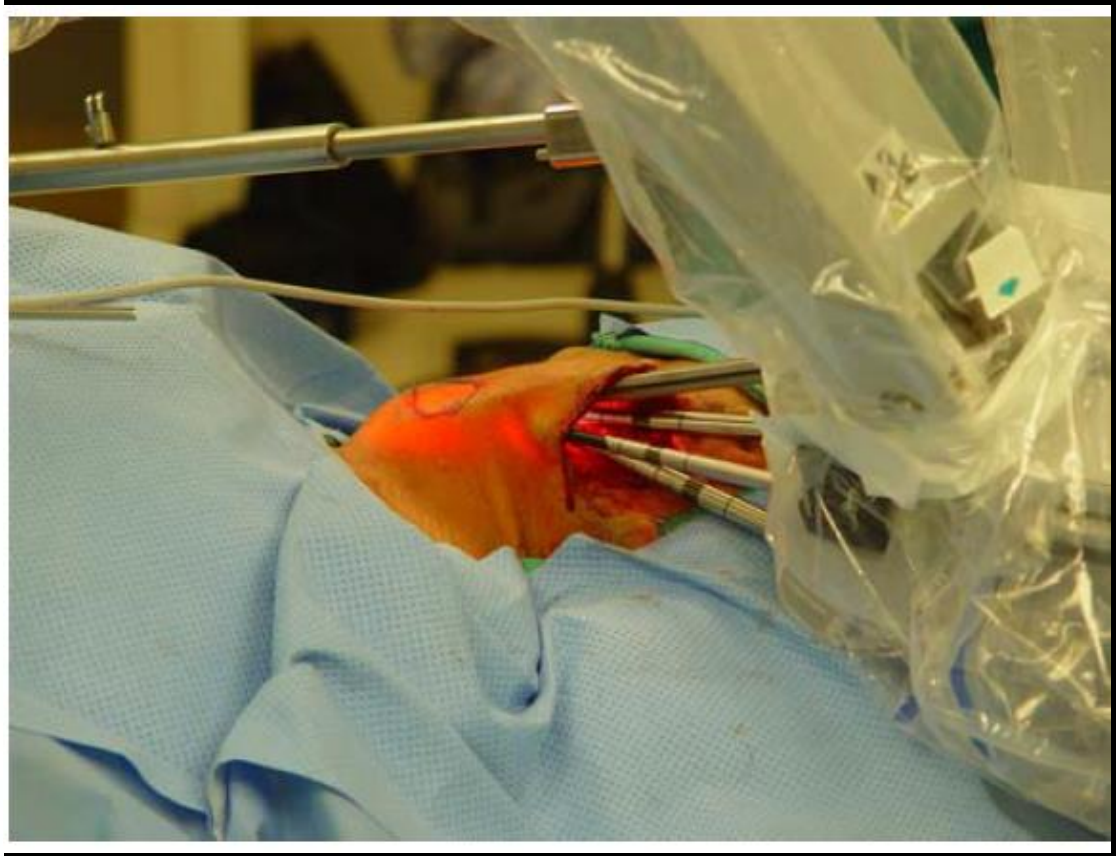


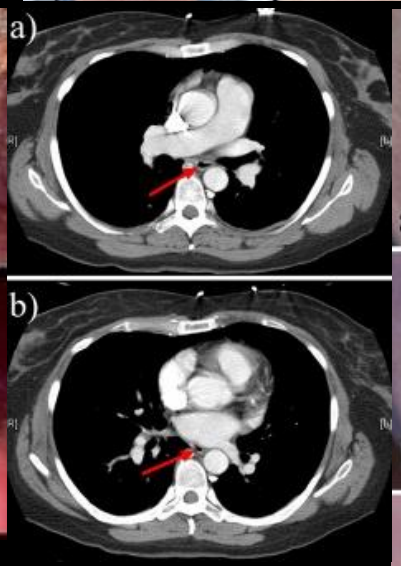
FIGURE 1. The incision resembles a facelift incision, beginning in the postauricular crease and crossing over to the occipital hairline under cover of the ear. The incision is placed approximately 1 cm within the hairline to ensure that it is invisible.

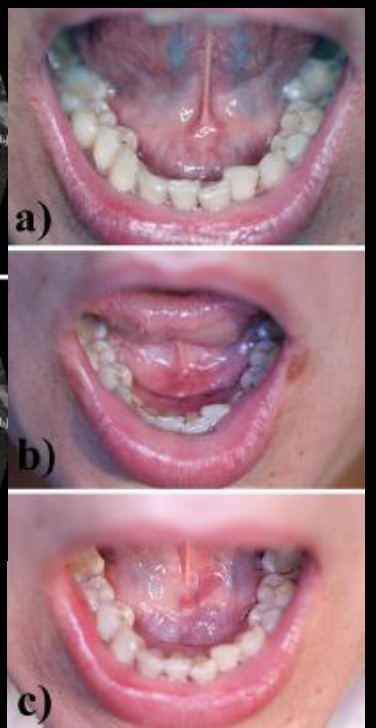


Terris D, et al. Surg Laparosc Endosc Percutan Tech 21:237-42, 2011

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





Wilhelm T, Metzig A. World J Surg 35:543-51, 2011

Transoral Endoscopic Minimally Invasive Thyroidectomy (eMIT)

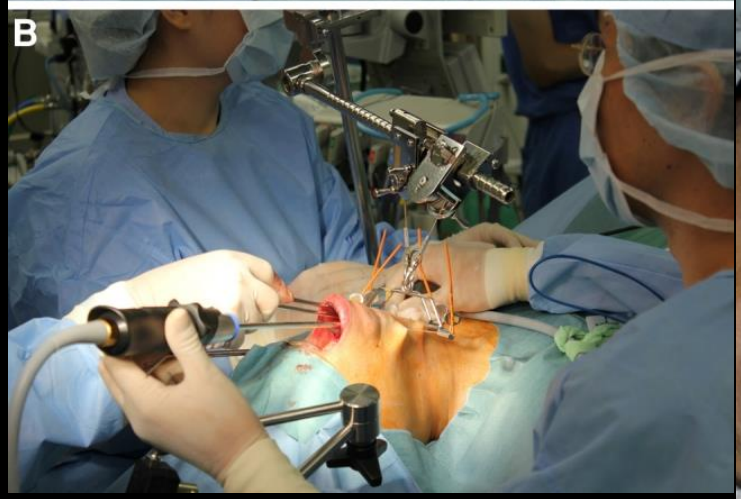
- “The authors encountered in their clinical application all above-cited difficulties and concerns, which are reflected in their presented results, such as paresthesia of the mental nerve in varying degrees in six of eight cases (75%), conversion to open surgery due to specimen size in three of eight 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%).

Wilhelm T, Metzig A. World J Surg 35:543-51, 2011

Benhidjeb H, Stark M, World J Surg 35:1936-7, 2011

Trans-Oral Video-Assisted Neck Surgery (TOVANS)

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



Nakajo A, et al: Surg Endosc 27:1105-1110, 2013

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 hypopara
- No mental nerve injury
- No infection

Anuwong A: World J Surg 40:491-497, 2016.

TOETVA

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)

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

TOETVA

- 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)

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

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

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Da Vinci Lawsuit

ROBOTIC SURGERY COMPLICATIONS

Da Vinci Robotic Surgery Complications

The Da Vinci Robotic surgery system has been linked to serious complications and severe injuries.

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- Da Vinci Robot Lawsuit News: Lawsuit in New Jersey Claims Arcing During Da Vinci Surgical Robot Procedure Caused Bowl Injuries
- CNN Report Talks About The Benefits Of The Da Vinci Robot, Very Little About Da Vinci Robot Lawsuits And Complications Linked to Da Vinci Surgical

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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.

Da Vinci Robot Complications News: A report from ArgonautNews.com speaks directly with two surgeons who have used the da Vinci

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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".

Berber E, et al: Thyroid 26:331-337, 2016

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

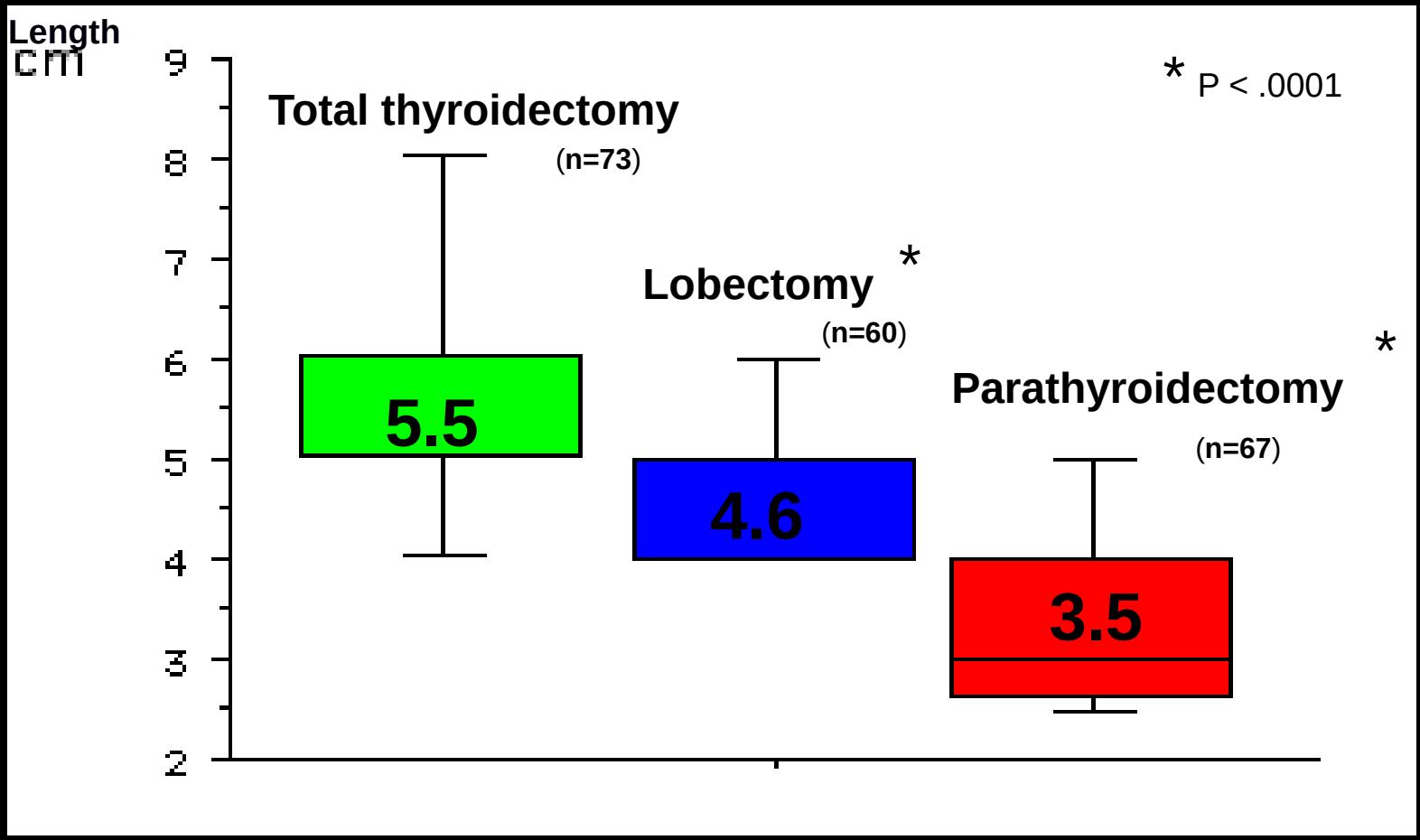
Who had a thyroidectomy for cancer?

Joke: President Cristina Fernandez makes light of her recent health scare as she shows off a deep wound on her neck

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



Brunaud et al: Arch Surg. 2003 Oct;138(10):1140-3.

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)

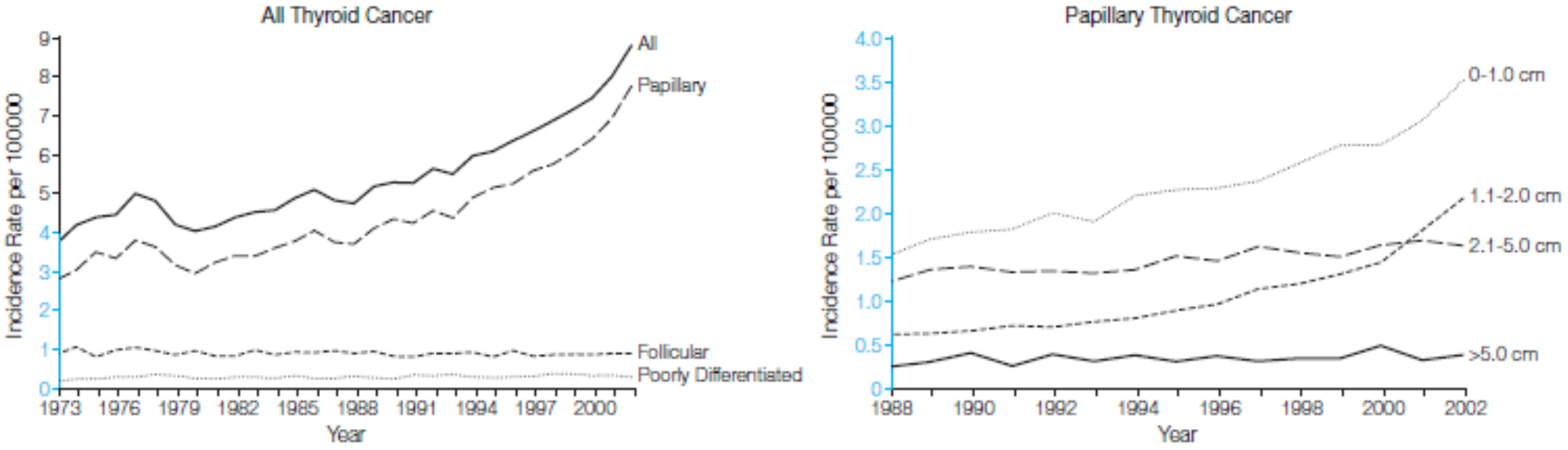
- Lateral vs central incision?

- Length of incision less important

Small Papillary Thyroid Cancers

Most Increases are from Papillary Cancer ≤ 2cm

Figure 1. Trends in Incidence of Thyroid Cancer (1973-2002) and Papillary Tumors by Size (1988-2002) in the United States



Poorly differentiated indicates anaplastic and medullary cancers.

Davies L, Welch HG. JAMA 295:2164 2006

Increasing Incidence of Differentiated Thyroid Cancer

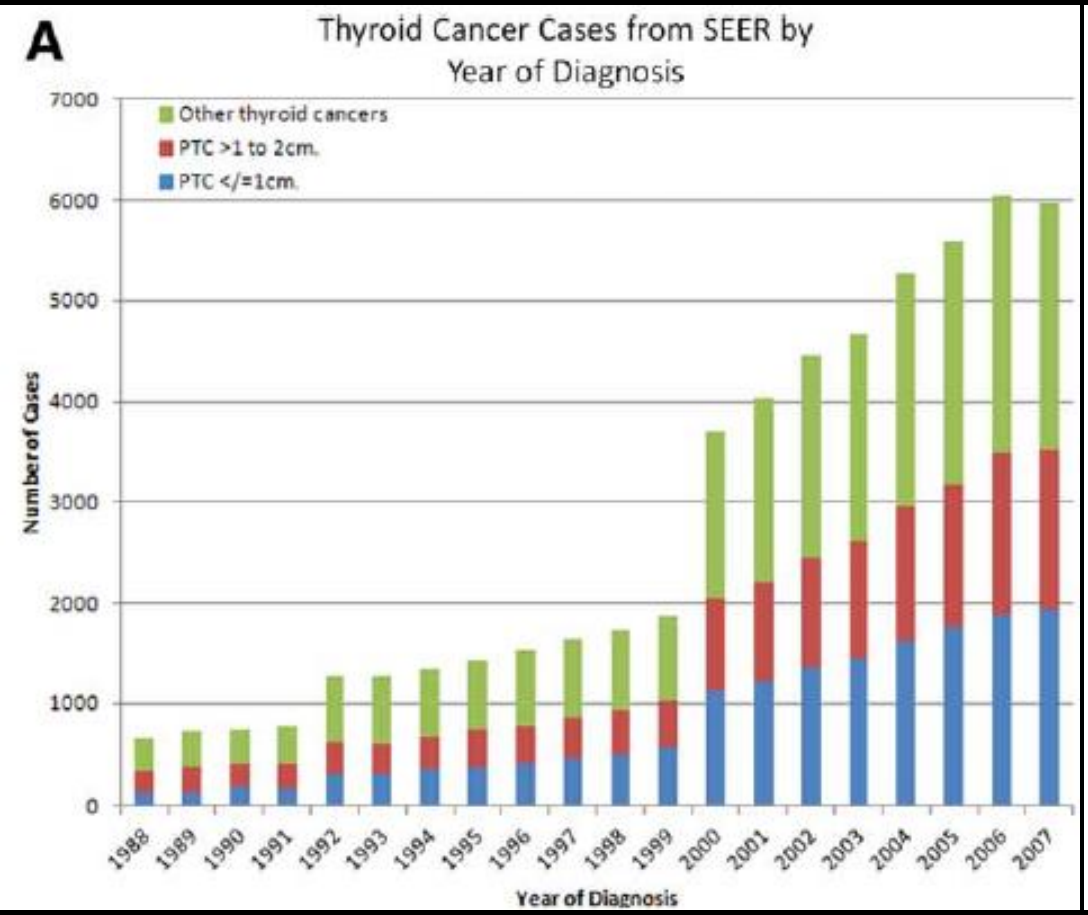
1988-2005, SEER, percent change per year

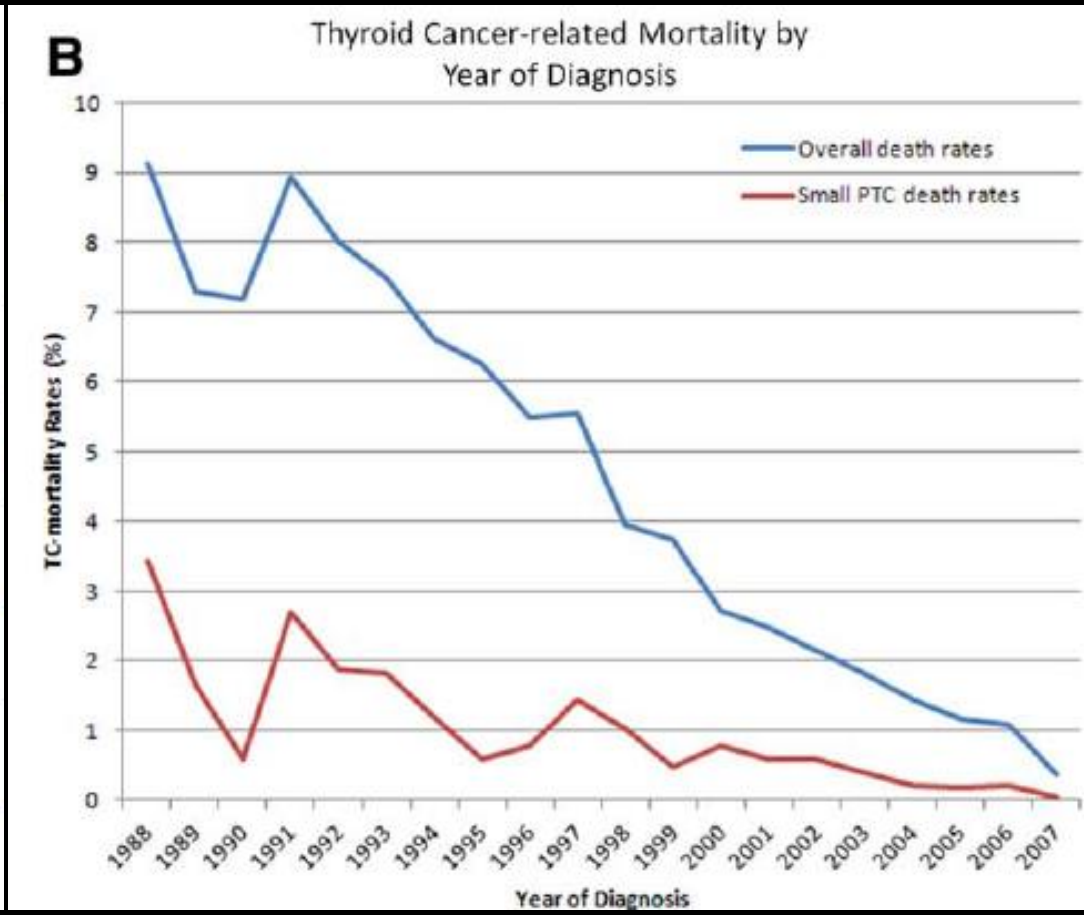
	Men	Women
Micro ca (<1.0 cm)	9.9%	8.6%
T3 (Tumors ≥ 4 cm)	3.7%	5.7%
M1 (Distant met)	3.7%	2.3%

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

Chen AY, et al. Cancer 2009 Aug 15;115(16):3801-7.

Papillary Thyroid Cancer: Population-Based Study





Nilubol N, Kebebew E. Cancer 121:1017-1024, 2015

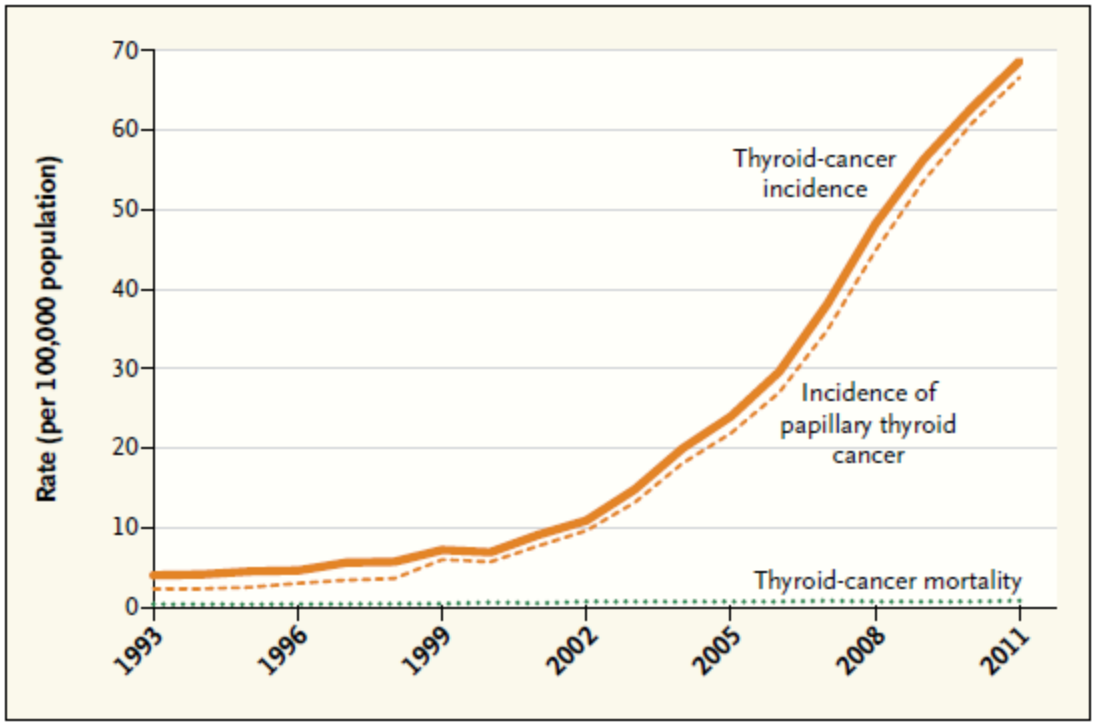
Concerns about Over-Diagnosis and Over-Treatment of Thyroid Cancer

Korea's Thyroid Cancer "Epidemic" Screening 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

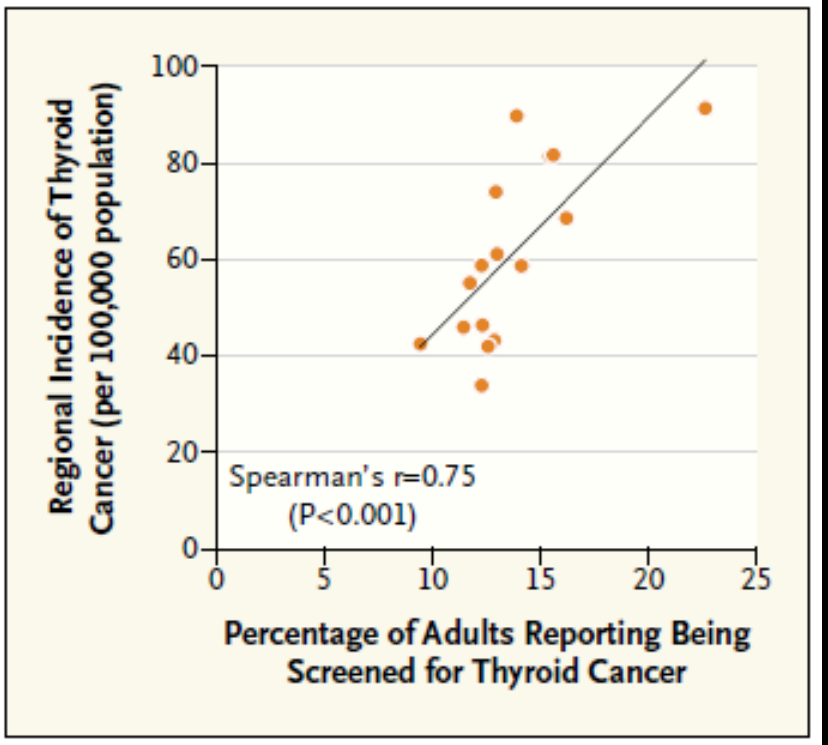
Ahn HS, Kim HJ, Welch HG. NEJM 371:1765-7, 2014

Korea's Thyroid Cancer "Epidemic" Screening and Over-Diagnosis



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.

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

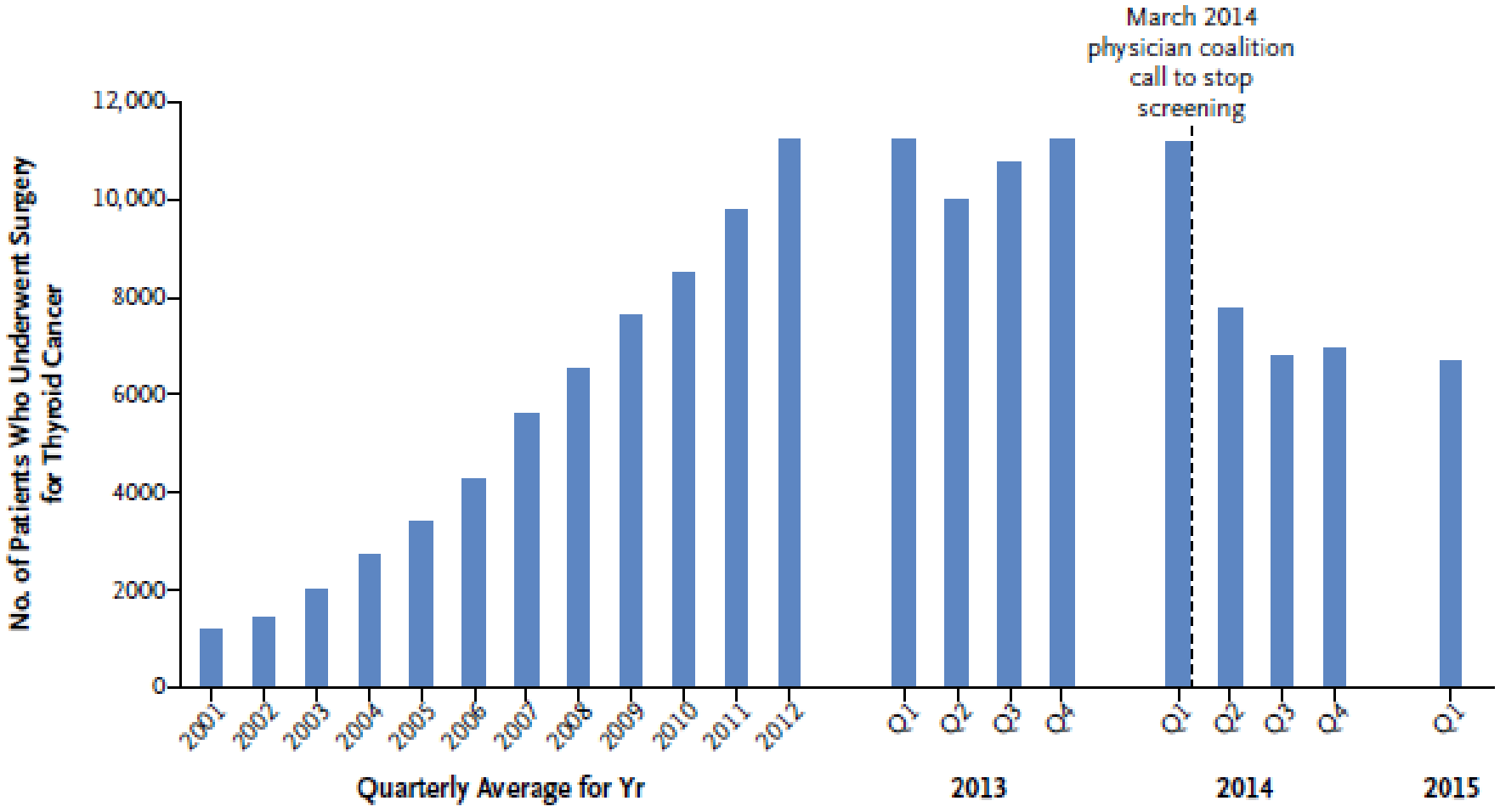


Figure 1. Trend in the Number of Operations for Thyroid Cancer in South Korea, 2001–2015.

Data are from the Health Insurance Review and Assessment Service, South Korea.

Ahn HS, Welch HG: NEJM 373:2389-90, 2015

Papillary Thyroid Microcarcinoma
is rarely deadly

Papillary Thyroid Microcarcinoma: mortality rare and can be predicted

- SEER database1988-2007
- 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

Yu XM (Chen H), et al. Ann Surg 254:653, 2011

"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."

Sugitani I, Fujimoto Y. Endor J 46:209-216, 1999

“Symptomatic” vs “Asymptomatic” Papillary Thyroid Microcarcinoma

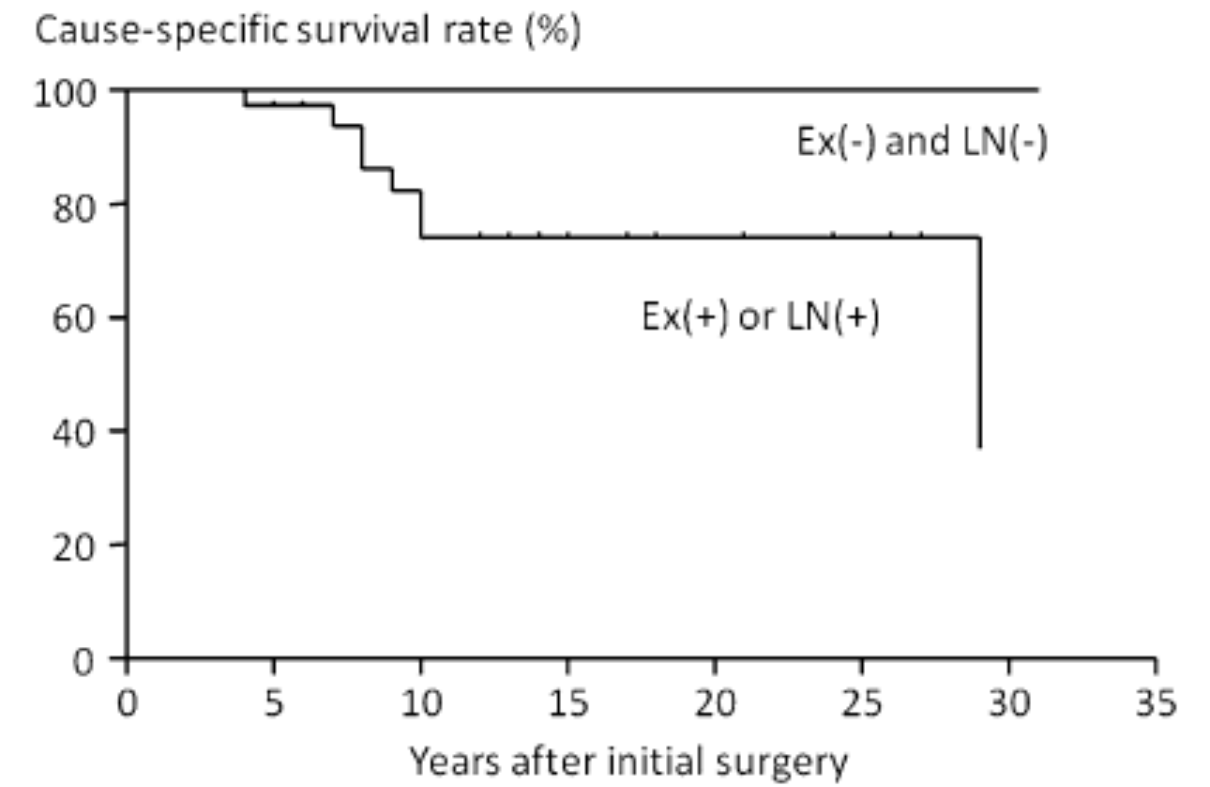


Fig. 3 Comparison of cause-specific survival curves between patients with extrathyroidal or extranodal invasion (Ex) or large nodal metastasis ≥2 cm (LN) and patients without those features

Sugitani I, Fujimoto Y. Endor J 46:209-216, 1999

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

Ito A, et al. Thyroid 24:27-34, 2014

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.

Ito A, et al. Thyroid 24:27-34, 2014

Observation for Microcarcinoma 3 mm growth (8% in 10 years)

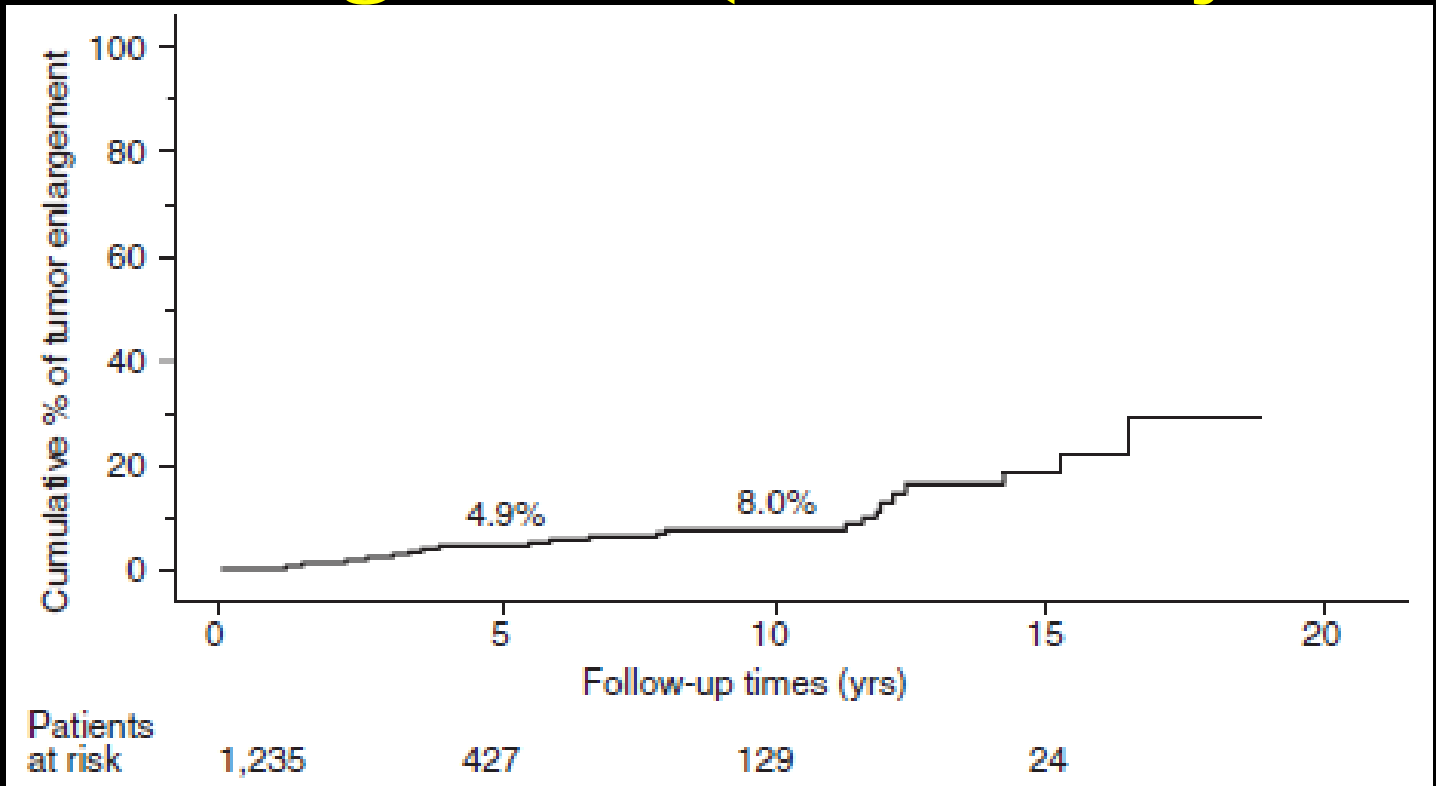


FIG. 1. Proportion of patients in our entire series whose papillary thyroid microcarcinoma (PTMC) showed enlargement by 3 mm or more.

Ito A, et al. Thyroid 24:27-34, 2014

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

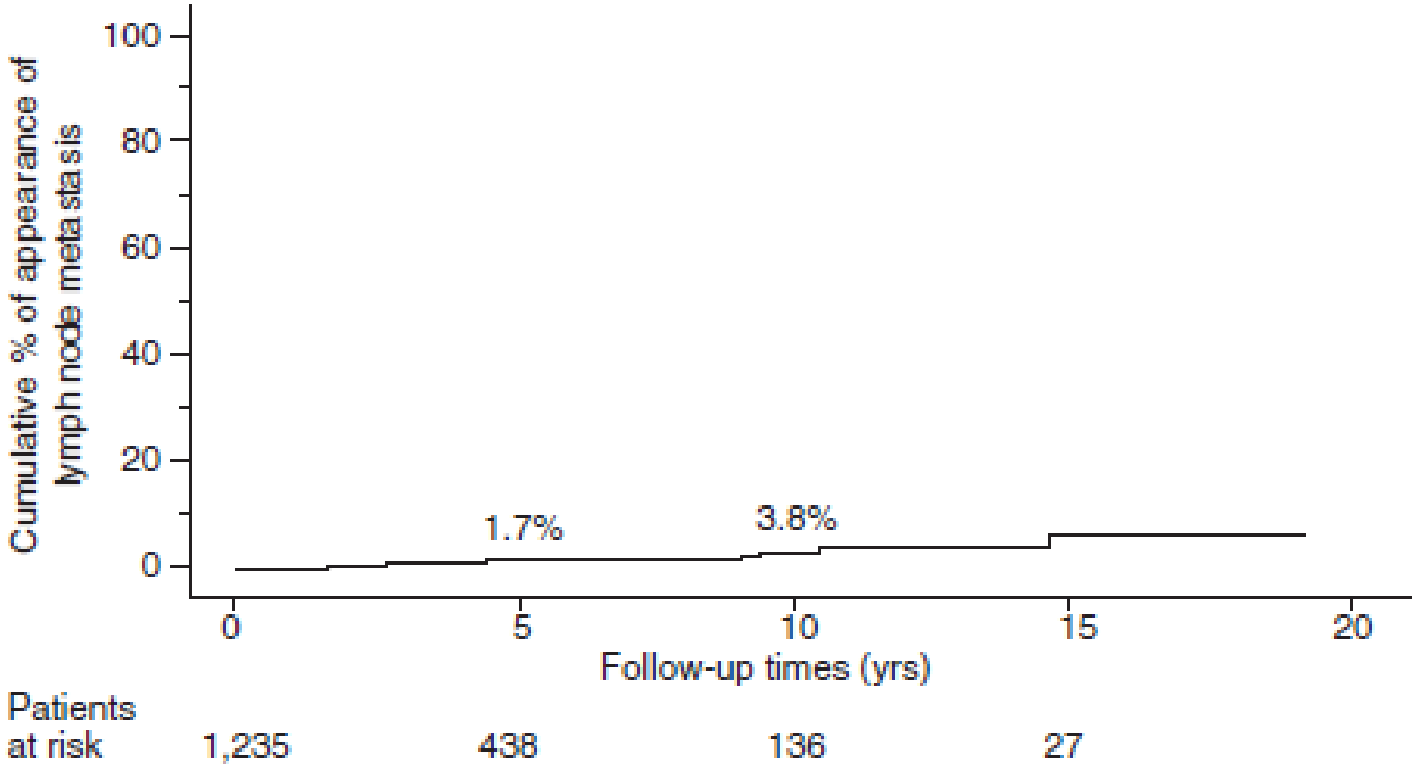


FIG. 2. Proportion of patients in the entire series whose PTMC showed novel appearance of lymph-node metastasis.

Ito A, et al. Thyroid 24:27-34, 2014

Observation for Microcarcinoma became clinical disease (6.8% in 10 yrs)

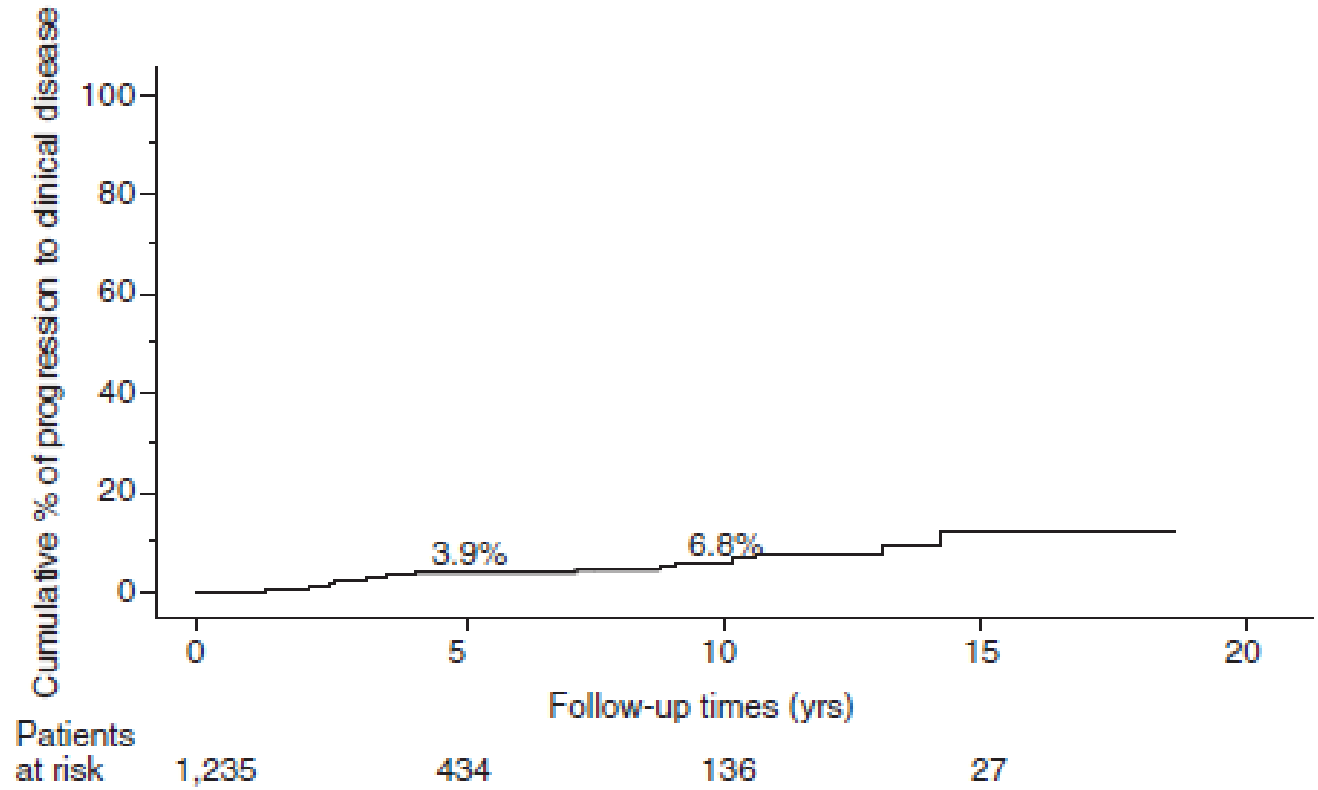
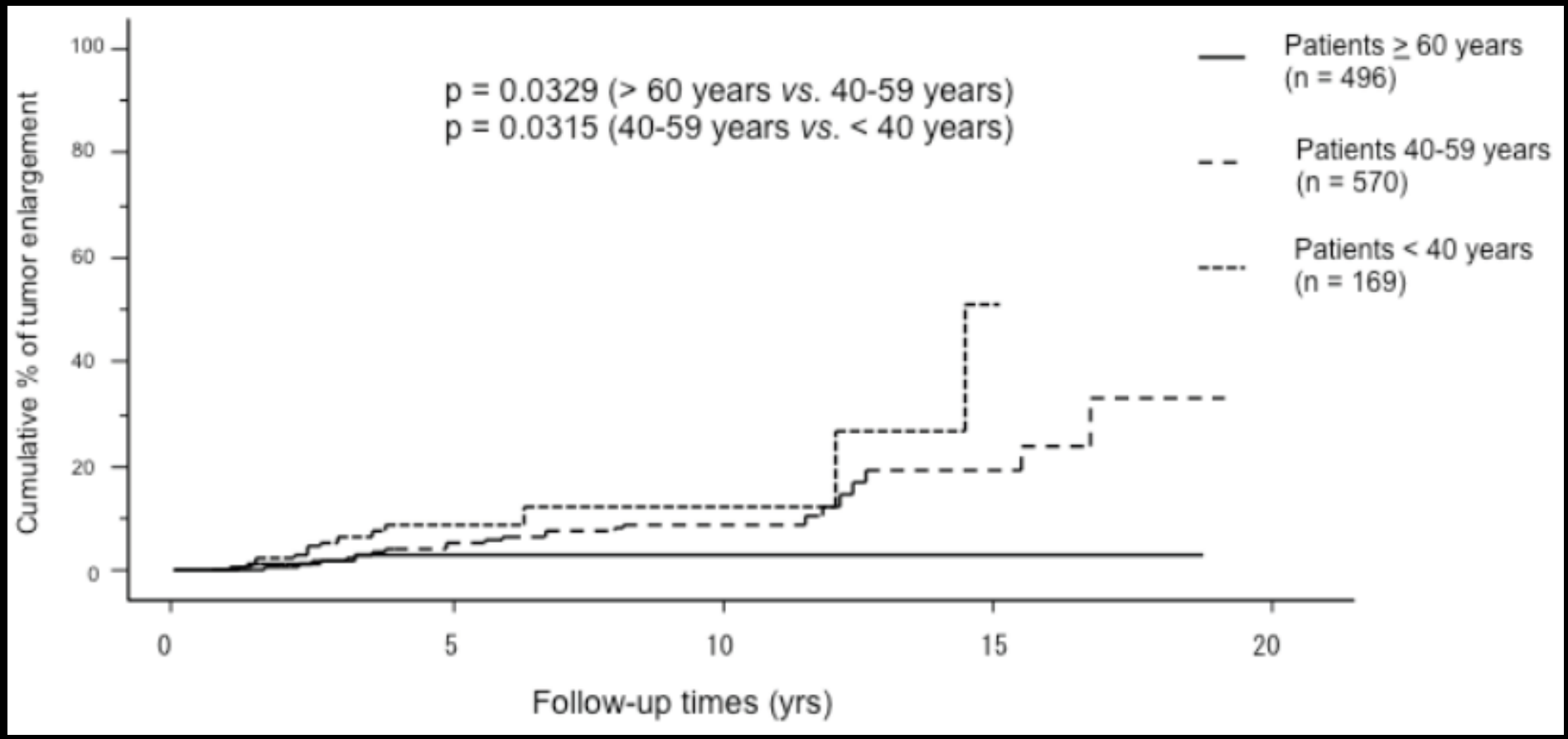


FIG. 3. Proportion of patients in the entire series whose PTMC developed into clinical disease.

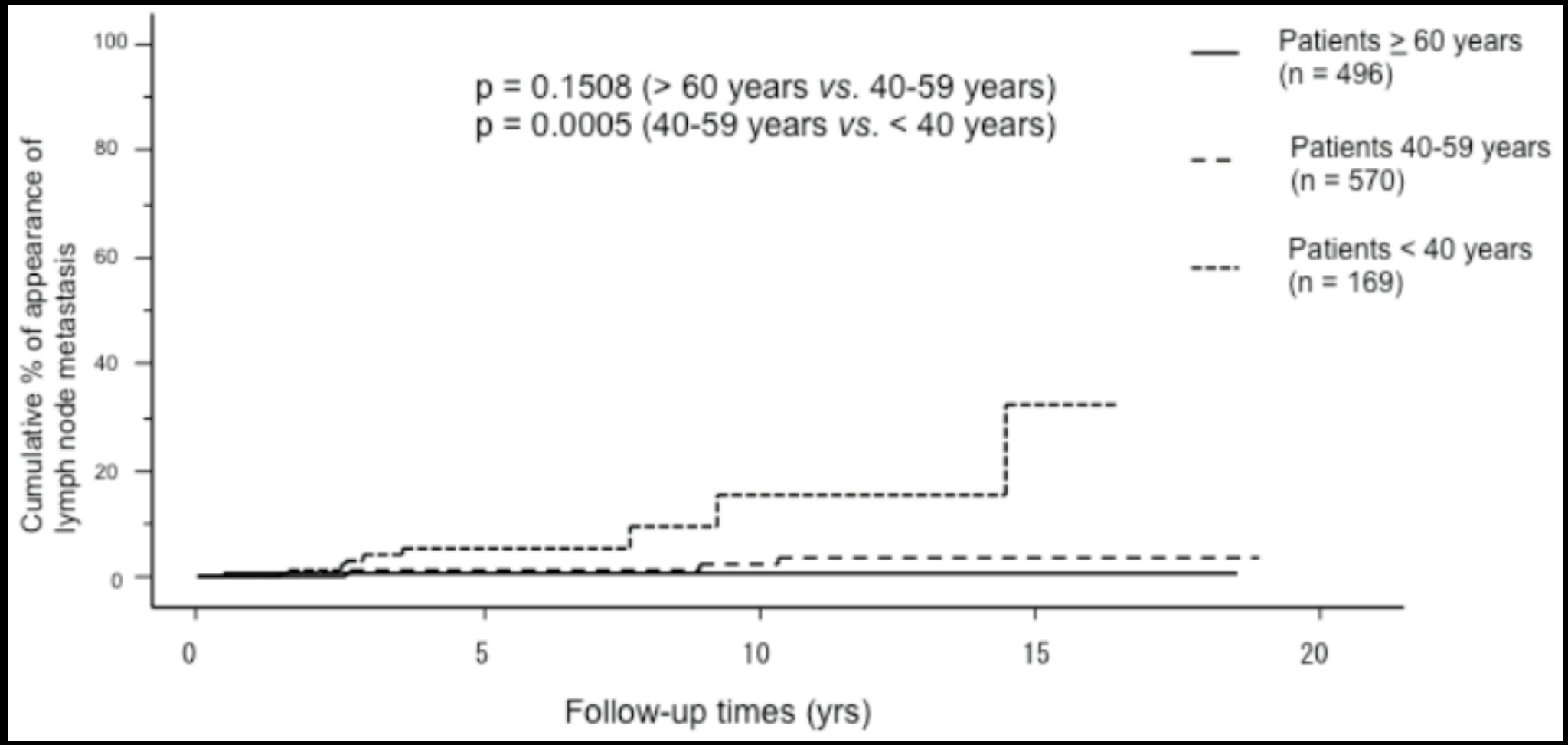
Ito A, et al. Thyroid 24:27-34, 2014

Observation for Microcarcinoma less growth in age > 60 yo



Ito A, et al. Thyroid 24:27-34, 2014

Observation for Microcarcinoma more new nodes in patients < 40 yo



Ito A, et al. Thyroid 24:27-34, 2014

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

National Comprehensive Cancer Network®

NCCN Guidelines Version 2.2014
Thyroid Carcinoma – Papillary Carcinoma

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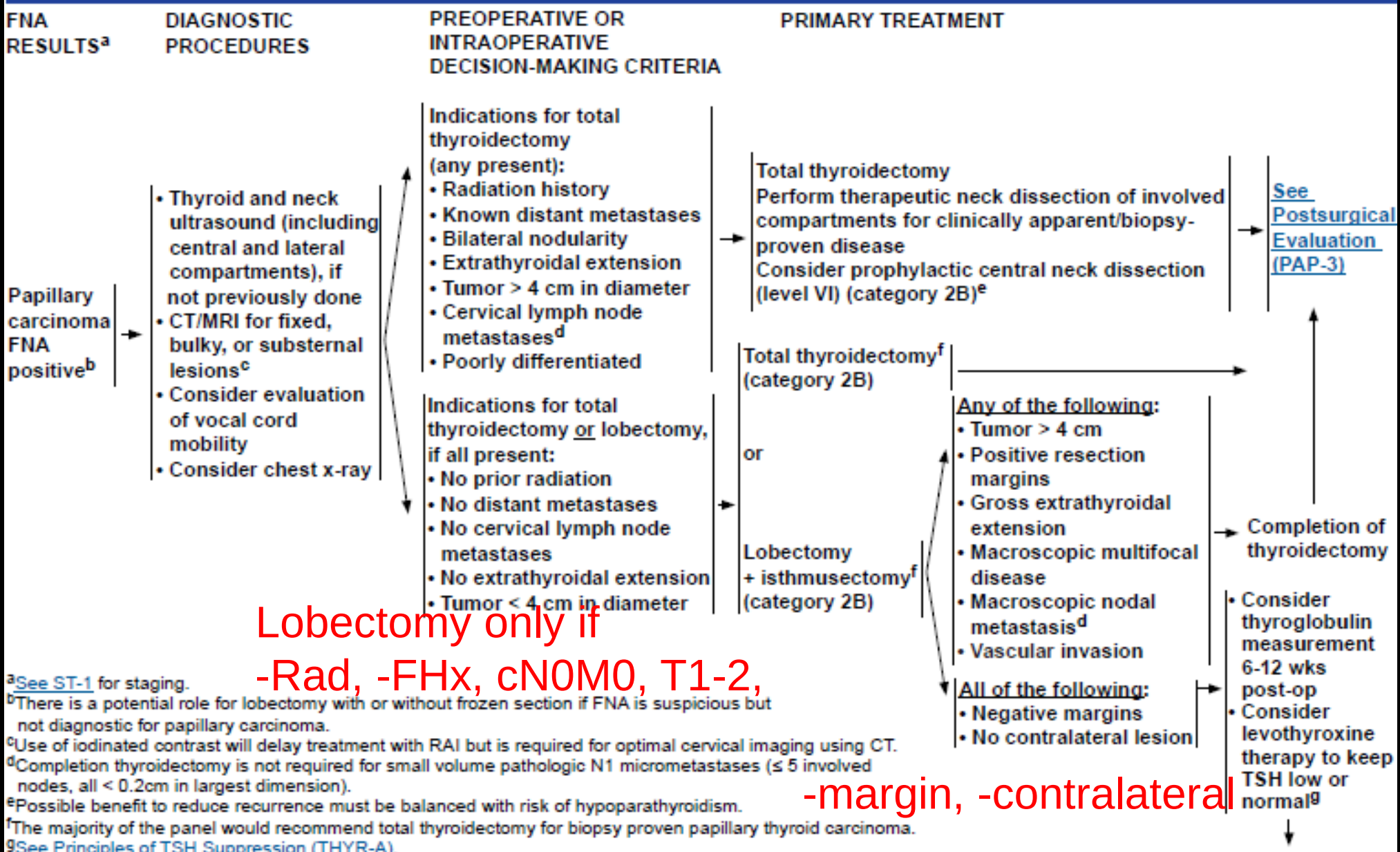
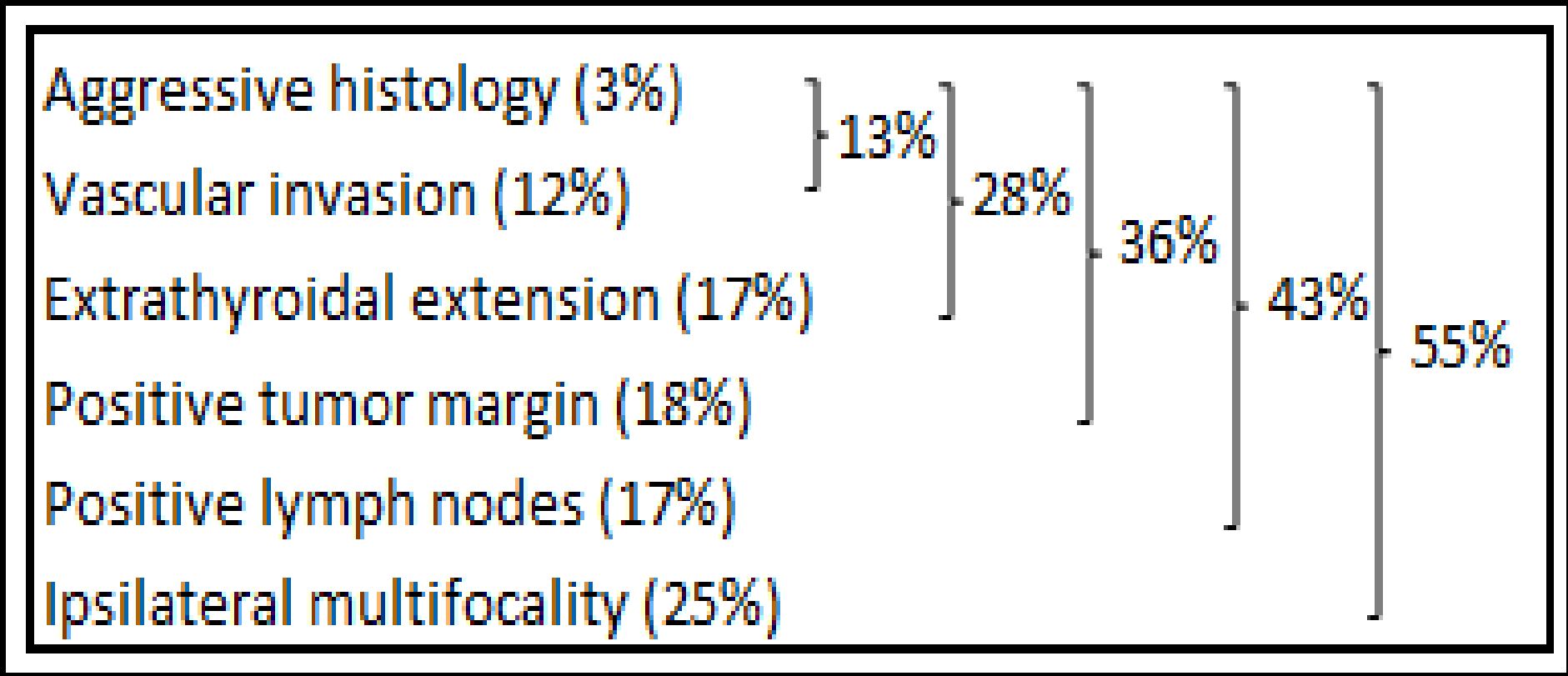


Lobectomy only if
-Rad, -FHx, cN0M0, T1-2,
-margin, -contralateral

[a] See ST-1 for staging.
[b] There is a potential role for lobectomy with or without frozen section if FNA is suspicious but not diagnostic for papillary carcinoma.
[c] Use of iodinated contrast will delay treatment with RAI but is required for optimal cervical imaging using CT.
[d] Completion thyroidectomy is not required for small volume pathologic N1 micrometastases (≤ 5 involved nodes, all < 0.2cm in largest dimension).
[e] Possible benefit to reduce recurrence must be balanced with risk of hypoparathyroidism.
[f] The majority of the panel would recommend total thyroidectomy for biopsy proven papillary thyroid carcinoma.
[g] See Principles of TSH Suppression (THYR-A).

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



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