New technologies in Endocrine Surgery

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Post graduate course in General Surgery
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1. Nerve monitoring
2. Robotic surgery

Recurrent laryngeal nerve monitoring

Why? How? Does it help?

Recurrent laryngeal nerve monitoring

- Injury to the recurrent laryngeal nerve
  - Temporary injury: 5 in 100 patients
  - Permanent injury: 1 in 100 patients
- A significant cause of disability
  - Paralytic dysphonia
  - Dysphagia
  - Paroxysmal coughing
  - Aspiration
  - Airway obstruction
- One of the most highly litigated injuries in Endocrine Surgery
- A visually intact nerve does not always correlate with a functional nerve
Anatomy of the RLN

- The RLN is a component of the Vagus nerve
- Traveling inferiorly, fibers of the RLN separate
- On the right: RLN loops, “recurs” behind the subclavian, approaches the TE groove behind the carotid artery (length 6cm)
- On the left: RLN loops medially under the aortic arch, ascends within the TE groove (length 12cm)

(From Thompson NW et al. Debates in Clinical Surgery, 1990)

Recurrent laryngeal nerve monitoring

- “adjunct” to RLN identification
- Can aid in dissection
- Can help predict postoperative nerve function
- Useful for RLN mapping

(For review: Dralle H et al, Surgery 2004;136:1310)

Review of literature regarding rates of injury with and without nerve monitoring have shown divergent results.
Nerve monitoring: How

- ET intubation, set-up, testing
- 4 important values:
  - N1: RLN before dissection
  - N2: RLN after dissection
  - V1: Vagus before dissection
  - V2: Vagus after dissection

An intact V2 at the conclusion of the operation is highly predictive of a functioning nerve and vocal cord.

(Randolph et al, Laryngoscope 2011;211 Supl 1:S1-16)

Nerve monitoring is not better than identifying the nerve

- 16, 448 patients, with 29,998 nerves “at risk”
  - 3 groups: no identification of RLN, identification of RLN, identification and monitor of RLN
- Odds ratio for permanent RLN injury
  - cancer primary operation x2
  - reoperation benign x 4.7, cancer x 6.7
  - No nerve identified x 1.4
  - low or medium volume hospital x 1.3
  - low volume surgeon x 1.2

Dralle H et al, Surgery 2004;136:1310

Case: nerve monitoring

- 95yo woman with large retrosternal goiter
- Symptoms of local compression including dysphagia, difficulty breathing with raising her arms, long history of asthma
- On exam, minimal visible thyroid enlargement, unable to palpate inferior border, -Pemberton’s sign
- TSH 2.1, neck ultrasound showed large right thyroid nodule with extension below the clavicle. She also had several nodules in the left thyroid lobe

Case: RLN nerve monitoring
Case: nerve monitoring

- Intra-operatively, the vagus nerve was functioning at the beginning of the case (V1), as was the RLN (N1)
- During mobilization of the right thyroid lobe out of the superior mediastinum, the RLN was identified- stretched over the tubercle of Zuckerkandl
- Following the operation the RLN was visually intact but had no signal with the nerve monitor (-N2). The vagus nerve also had no signal (-V2)

Left thyroid lobectomy deferred. Laryngoscopy 2 months post-operatively showed normal bilateral vocal cord function. The patient then underwent an uneventful completion thyroidectomy.

APS (automatic periodic stimulation)

- newest model
- small silastic cuff is place around the nerve
- smaller stimulus to the nerve every 6 seconds during the dissection
- Separate stimulus probe can also be used
- Provides continuous feedback for decreasing function, alarm if drops <50% of baseline

Intraoperative recurrent laryngeal nerve monitoring

- does not appear to lower the overall rate of RLN injury
- additional time and cost
- associated with both false positives and false negatives- multiple system issues to resolve
- DOES lower the rate of RLN injury in re-operative cases
- can predict those patients at-risk for a bilateral vocal cord paralysis
- an excellent teaching tool for residents
- newer models may be able to better provide “real-time” feedback

Robots in Endocrine Surgery

Why? How? Is it better?


Verdicts on malpractice claims after thyroid surgery: Emerging trends and future directions.

Dralle H, Lorenz K, Machens A.
Robotic surgery - Why?

- Access in tight surgical fields
- Improved dexterity, ergonomics, precision
- High resolution 3-D operative view

Outcomes?
- Incision
  - Cosmesis
  - Cultural issues

Robotic surgery - history

- 1985: 1st documented surgical procedure with a robotic arm (PUMA 560 system, neurosurgical biopsy)
- 1987: robotic cholecystectomy
- 1988: PUMA transurethral resection
- 1990: AESOP system approved by FDA for endoscopic procedures
- 2000: DaVinci system approved by FDA for general surgery, laparoscopic use
- 2001: 1st robotic adrenalectomy

Robotic surgery

- Thyroid
  - Axillary (“RATS robot-assisted transaxillary surgery”)
  - Trans-mammary
  - “facelift” thyroidectomy
- Adrenal
  - Retroperitoneal

Robotic surgery

- Thyroid-transaxillary approach
  - Developed by Dr. Woong Chung
  - Initially limited to:
    - Pts with small thyroids
    - Pts with small (unilateral) nodules
    - Benign disease
    - Non-obese
  - Now includes patients with small cancers, suspected lymph nodes
Robotic surgery

- Thyroid
  - Yonsei University, Seoul, Korea
  - Gasless transaxillary
    - 4-arm Da Vinci, 8mm ports
    - 100 patients with papillary thyroid cancer
    - 16 total tx, 84< total tx
    - level IV central neck dissection
  - Operative time total 136 min, console time 60 min

  Kang et al. Surg Endosc 2009
  Lee et al. Surgery 2012 Jan 16 epub

Robotic surgery

- Adrenal
  - Laparoscopic adrenalectomy preferred approach
    - Transperitoneal, retroperitoneal
  - Robotics
    - “extend the capabilities” of laparoscopic surgery (eg when adrenal above 12th rib, on the surface of the kidney, at the renal hilum)
    - allow more precision for sub-total (partial) adrenalectomy

Robotic surgery

- Adrenal
  - Cleveland Clinic 2011
  - 50 robotic vs 50 laparoscopic adrenalectomy (transabdominal and retroperitoneal)
    - operative times were similar (168 and 159 mins)
    - morbidity for 10% for laparoscopic, 2% for robotic
    - hospital stay shorter for robotic group
    - Less pain in robotic group

Robotic Transaxillary Thyroidectomy: An Examination of the First One Hundred Cases.
Kandil EH, Noureldine SI, Yao L, Slakey DP
Source
Department of Surgery, Division of Endocrine and Oncological Surgery, Tulane University School of Medicine, New Orleans, LA.

- 100 cases
  - 69 lobectomies, 22 total or near-total, 9 completion thyroidectomies
- Mean OR time 108 minutes
  - Improvement in length of time > 45cases
- 2 conversions to open cervical operations
- No permanent vocal cord paralysis

(JACS 2012 epub Feb 21)

Karabulut et al. Surgery 2011. Dec 3 [epub]
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1. Nerve monitoring  Yes  No
2. Robotic surgery