10 Top Tips in Thyroid Surgery

Ricard Simo FRCS (ORL-HNS) PhD
Consultant Otorhinolaryngologist Head, Neck and Thyroid Surgeon
Guy’s and St Thomas’ Hospital NHS Foundation Trust
London
United Kingdom
Conflicts of Interest
None to declare
Claudius Galen
Historical Background

Abu Al-Qasim (El-Zahra 936-1013) in Al-Tasrif 952 AD
“First goitre excision”
Historical Background

• Diffenbach 19th Century – “One of the most thankless, most perilous undertakings which if not altogether prohibited, should at least be restricted”

• Gross US - Thyroid surgery is a “horrid butchery...deserving of rebuke and condemnation, and that “no honest and sensible surgeon ever engage in it”
The European Masters

Theodor Billroth (1829-1894)
- Tetany and no myxoedema -

Theodor Kocher (1841-1917)
- Myxoedema but no tetany -
The continuing development of the technique of thyroidectomy

Tip 1

Know your anatomy and your embriology!
Embriology
Surgical Anatomy

- Skin
- Subcutaneous fat
- Investing cervical fascia
- Strap muscles
- Thyroid gland
- Vascular structures
- RLN/SLN
- Parathyroids
- Trachea
- Thyroid cartilages
Surgical Anatomy

Fascial Neck Spaces

• Superficial Fascia
• Deep Cervical Fascia
  – Investing fascia
  – Pre-vertebral fascia
  – Pre-tracheal Fascia
  – Carotid Sheath
Surgical Anatomy

• Vascular supply
  – STA from ECA
  – ITA from TCT
  – STV
  – MTV
  – ITV

• Neural structures
  – Recurrent Laryngeal Nerve
  – External Branch Superior Laryngeal Nerve
Tip 2

Know your indications and be precise on the extent
Aim of thyroid surgery

• Resolution of the pathology
  – Total thyroidectomy
  – Near-total thyroidectomy
  – Thyroid lobectomy with isthmusectomy
  – Subtotal thyroidectomy!!!!

• Minimal complications
  – RLN and EBSL
  – Parathyroid glands
Management Principles

• Adequate excision of gross tumour
• Preservation of functioning structures – allowing breathing, swallowing and phonation
• Preservation of vital structures
• Use of adjuvant therapies

*Patel and Shaha 2005, British Thyroid Association 2014, ATA Guidelines 2012*
Does the patient need the surgery?

Will the patient benefit from the surgery?

Which would be the optimal extent of the surgery?
Surgery for thyroid nodules

Thy 3f: Bethesda 3 and 4 - Follicular Thyroid Neoplasm

- 29% of Thy 3 are cancers
- “Diagnostic” Total lobectomy with isthmusectomy
- Level VI exploration
- Identification & preservation of RLN
- Identification & preservation Parathyroid glands
- The diagnostic lobectomy should be therapeutic.

Tysome et al BJS 2009
Solitary Thyroid Nodule

Thy 4: Bethesda 5 - Suspected Malignancy

- **Lobectomy** – STN less than 3 cm in low risk patients and negative USS of contralateral lobe
- **Lobectomy with frozen section and proceed** – Sensitivity 20%
- **Total thyroidectomy** – Multinodular goitres with compression symptoms and high risk patients

*Pang et al Sub to Clin Oto*
Multinodular Goitre

- MNG
  - Benign FNAC
    - Unilateral Growth
      - Lobectomy with isthmusectomy
    - Bilateral Growth
      - Total thyroidectomy
Thyroid Carcinoma

Differentiated Thyroid Carcinoma
- T1 and T2 Low Risk Lobectomy
- T3 and T4 High Risk Total Thyroidectomy

Medullary Thyroid Carcinoma
- Total thyroidectomy
Thyrotoxicosis

- Subtotal Thyroidectomy
  - Difficult to judge remnant
  - Risk of recurrence
  - Risk of malignancy

- Total thyroidectomy
  - Complete resolution
  - Same rate of complications in experience hands
  - Deals with malignancy and dysthyroid eye disease
Tip 3

Accurate Preoperative Planning
Preoperative Check List

- Thyroid function test and antibodies
- Cytology/Histology
- Imaging
- Seen patient yourself
- Informed consent
Preoperative Evaluation

Essential

- TFT, Thyroid antibodies
- USS guided FNAC/CNB
- CT Scan
- Magnetic Resonance Scan
- PET-CT

*Patel and Shaha 2005, Czaja McCaffrey 2006, Seo et al 2010*
Preoperative Evaluation

**Pre-operative fibreoptic laryngoscopy**

- Essential
- Provides a dynamic view
- Essential medico-legal investigation
- Direct laryngoscopy if laryngo-tracheal invasion is suspected

*Jeannon and Simo 2009, Czaja McCaffrey 2006*
Ultrasound Guided FNAC Evaluation

Cross Sectional Imaging – CT or MRI

- Staging investigations
- Thyroid cancer
- MNG with compression symptoms and intrathoracic extension
Multiplanar CT

- **CT with multiplanar views** – Tri-dimentional views
- **With contrast except when patients have allergy to iodine contrast**
- **Predictor of surgical approach**

*Pollard et al Am J Neuroradiol 2005,*  
*Grainger et al ORL H&N Surg 2005*
Preoperative Evaluation

- Multidisciplinary Team approach essential
- Dedicated and experienced surgical team
- Thoracic, Plastics and UGI teams available

Simo and Jeannon 2009, Czaja McCaffrey 2006, Patel and Shaha 2005
Tip 4

Have up to date Surgical aids available and use them regularly
Surgical Aids

- Use of neuromonitoring
- Surgical Loopes
- Micro-instruments
- Powered Instruments – Haemostatatic devices and microdebrider
Surgical Aids

• Don’t start using them with the difficult case
• Ensure that you have received adequate training
• Troubleshooting
• Use them all the time
Tip 5

Plan carefully and be precise in your incisions as you will be remembered for it
Thyroidectomy

- **Incision**

- Kocher incision. Transverse incision halfway through sternal notch and cricoid cartilage

- Follow the tension lines
No excuse for a bad scar?
Spot the difference!

- MIT – 2.5 cm
- 23h stay
- TTO’s CP and Paracetamol
- Scar satisfaction: Excellent

- Conventional 4 - 5 cm
- 23h stay
- TTO’s CP and Paracetamol
- Scar satisfaction: Excellent
Patient Expectation 2019
Patient Expectation 2019
Tip 6

Don’t be conservative with your approach
Thyroidectomy

**Approach**

- Subplatysmal flaps elevated
- Incision cervical fascia
- Strap muscles identified, retracted or divided in the superior third

Space and view is essential
Don’t forget the Pyramidal Lobe!

• Common pitfall

• May need chasing to hyoid bone

• Beware of subclinical thyroglossal duct cysts
Tip 7

Be systematic with the Superior Vascular Pedicle and EBSLN
Thyroidectomy

Division Vascular Pedicles

- Superior thyroid arteries and veins
- Mid thyroid veins
- Inferior Thyroid veins
- Individual vessels identified and mass ligations avoided

Decrease risk of post-operative haemorrhage
Decrease risk of EBSLN injury
Decrease risk of leaving a thyroid remnant
Superior Thyroid Pedicle
EBSLN Injury

- The Nerve of Amelita Galli-Curci
- Failure to produce high pitches
Cernea’s Classification

- **Type 1**: Nerve crossing 1 cm or above horizontal plane superior thyroid pole
- **Type 2a**: Nerve crossing less than 1 cm above plane
- **Type 2b**: Nerve below plane

*Cernea et al Head and Neck 1992*
EBSLN

Type I: 60 to 68%
Type II: 20%
Type IIb: 14-20 %
Tip 8

Be critical with the identification and the dissection of the Recurrent Laryngeal Nerve
Clinical Practice Guideline: Improving Voice Outcomes after Thyroid Surgery

Sujana S. Chandrasekhar, MD, Gregory W. Randolph, MD, Michael D. Seidman, MD, Richard M. Rosenfeld, MD, MPH, Peter Angelos, MD, PhD, Julie Barkmeier-Kraemer, PhD, CCC-SLP, Michael S. Benninger, MD, Joel H. Blumin, MD, Gregory Dennis, MD,
Clinical Practice Guideline

Aim: To minimize risk and optimize outcome

<table>
<thead>
<tr>
<th>Voice Assessment</th>
<th>Laryngeal Examination</th>
<th>Nerve Management</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validated quality of life instrument (VHI)</td>
<td>Flexible fiberoptic</td>
<td>Intraoperative neural monitoring</td>
<td>Medical (steroids)</td>
</tr>
<tr>
<td>Auditory perceptual assessment (GRBAS, CAPE-V)</td>
<td>Rigid telescopic</td>
<td>Surgical techniques for nerve preservation-RLN and external branch of the SLN</td>
<td>Voice therapy</td>
</tr>
<tr>
<td>Laryngeal function studies</td>
<td>High speed exam</td>
<td>Nerve adherence and invasion management</td>
<td>Primary versus revision surgery</td>
</tr>
<tr>
<td>Pre- and postoperative voice recordings (tape recorder, smartphone recording, laryngeal function study)</td>
<td>Stroboscopy</td>
<td>Management of loss of neural signal</td>
<td>(as a modifying factor)</td>
</tr>
<tr>
<td></td>
<td>Indirect mirror exam</td>
<td>Intraoperative repair procedures (techniques for nerve repair; primary anastomosis, grafting)</td>
<td>Nerve re-anastomosis</td>
</tr>
<tr>
<td></td>
<td>Operative (direct) laryngoscopy</td>
<td>Management of blunt/ nontranssection nerve trauma</td>
<td>Ansa hypoglossi—RLN reinnervation</td>
</tr>
<tr>
<td></td>
<td>Intraoperative EMG</td>
<td></td>
<td>Framework laryngoplasty</td>
</tr>
<tr>
<td></td>
<td>Surface EMG</td>
<td></td>
<td>Injection laryngoplasty</td>
</tr>
<tr>
<td></td>
<td>Needle EMG</td>
<td></td>
<td>Patient education</td>
</tr>
<tr>
<td></td>
<td>Perioperative EMG</td>
<td></td>
<td>Shared decision making</td>
</tr>
</tbody>
</table>

Table 1. Topics considered in the scoping phase of guideline development.
### Table 4. Summary of evidence-based statements.

<table>
<thead>
<tr>
<th>Evidence-Based Statement</th>
<th>Statement strength</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preoperative</strong></td>
<td></td>
</tr>
<tr>
<td>Baseline voice assessment (Statement 1)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Preoperative laryngeal assessment of the impaired voice (Statement 2A)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Preoperative laryngeal assessment of the nonimpaired voice (Statement 2B)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Patient education on voice outcomes (Statement 3)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Communication with anesthesiologist (Statement 4)</td>
<td>Recommendation</td>
</tr>
<tr>
<td><strong>Intraoperative</strong></td>
<td></td>
</tr>
<tr>
<td>Identifying recurrent laryngeal nerve (Statement 5)</td>
<td>Strong recommendation</td>
</tr>
<tr>
<td>Protection of superior laryngeal nerve (Statement 6)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Intraoperative electromyography (EMG) monitoring (Statement 7)</td>
<td>Option</td>
</tr>
<tr>
<td>Intraoperative corticosteroids (Statement 8)</td>
<td>No recommendation</td>
</tr>
<tr>
<td><strong>Postoperative</strong></td>
<td></td>
</tr>
<tr>
<td>Postoperative voice assessment (Statement 9)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Postoperative laryngeal exam (Statement 10)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Otolaryngology referral (Statement 11)</td>
<td>Recommendation</td>
</tr>
<tr>
<td>Voice rehabilitation (Statement 12)</td>
<td>Recommendation</td>
</tr>
</tbody>
</table>
Recurrent Laryngeal Nerve

• The nerve should always be identified

• The identification of the nerve may vary depending on the case

• Beware of individual nerve anatomy especially its relationship with the Inferior Thyroid artery
## Identification of RLN

<table>
<thead>
<tr>
<th>Approach</th>
<th>Indications</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Approach</td>
<td>Uncomplicated cases</td>
<td>Protection vascular supply Parathyroid Glands</td>
<td>Not available in cases of large goitres or revision surgery</td>
</tr>
<tr>
<td>Inferior Approach</td>
<td>Revision or large goitres</td>
<td>Identifies the nerve in a virgin site</td>
<td>Long segment dissected may lead to neuropraxia</td>
</tr>
<tr>
<td>Superior Approach</td>
<td>Revision, large goitres, when considering non-RLN Failure of other approaches</td>
<td>RLN most constant</td>
<td>Ligament of Berry may bleed</td>
</tr>
</tbody>
</table>

*Randolph G et al World J Surg 2004*
RLN – Lateral Approach
RLN - Inferior Approach
RLN - Superior Approach
RLN Superior Approach
Recurrent Laryngeal Nerve

- Extra-laryngeal branching - 30%
- Non-recurrent laryngeal nerve - 1%
Tip 8

Identify and preserve the parathyroid glands – at least 2!
Thyroidectomy – Parathyroid Glands

- The PT glands should be identified whenever possible
- 25% the PT glands are not in the normal location
- Whenever the vascular supply is lost, do a frozen section and re-implant the gland in the SCM
- Autotransplantation?

*Importance of in situ preservation of parathyroid glands during total thyroidectomy*

L. Lorente-Poch\(^{1,2}\), J. J. Sancho\(^{1,2}\), S. Ruiz\(^1\) and A. Sitges-Serra\(^{1,2}\)

\(^{1}\)Endocrine Surgery Unit, Hospital del Mar, and \(^{2}\)Department of Surgery, Universitat Autònoma de Barcelona, Barcelona, Spain

Correspondence to: Professor A. Sitges-Serra, Endocrine Surgery Unit, Hospital del Mar, Passeig Marítim 25-29, 08003, Barcelona, Spain (e-mail: astiges@hospitaldelmar.cat)
Parathyroid Glands and RLN
Tip 9

Don’t forget the Berry’s Ligament
Berry Ligament
Thyroidectomy

**Berry’s Ligament**

- Very careful dissection
- Bipolar diathermy at low voltage 8 to 10 volts
- Use knife – 15 size blade
- Avoid mass ligations
- You may need to leave a remnant to protect the nerve especially if the crico-tracheal groove is deep.
Tip 10

And finally don’t forget to close properly!
Total Thyroidectomy with CND

Jeannon and Simo 2009, Patel and Shaha 2005
Thyroidectomy

Closure

- Haemostasis (Valsalva)
- Saline wash
- Check RLN and PT glands
- Drain?
- Closure in layers
Summary

• **Thyroidectomy** is not an easy operation

• **Surgeons** should be highly trained and capable to deal with any variations of the disease process and apply adequate surgical procedures.

• **Preoperative planning** should never be underestimated

• The technique requires **meticulous attention to detail** and the identification and preservation of RLN, EBSLN and parathyroid glands
Summary

- **Thyroid lobectomy** is the minimum “diagnostic” and therapeutic procedure.

- **Total thyroidectomy** is still the definitive procedure for the majority of thyroid disorders and specially cancer.

- Use current technology to aid your surgery.

- New minimally invasive techniques should be addressed with caution.