Intraoperative and Postoperative Management of Complications

Ashok R. Shaha, M.D., F.A.C.S.

Professor of Surgery
Jatin P. Shah Chair in Head and Neck Surgery
Head and Neck Service
Memorial Sloan-Kettering Cancer Center
New York, New York
Thyroid surgery: ‘Horrid butchery’

“No honest and sensible surgeon would ever engage in thyroid surgery”
Figure 1. Theodor Kocher (1841–1917) in a photograph dating from 1912. Courtesy of the University of Bern, Switzerland, Institute for the History of Medicine (biographic archives).
The extirpation of thyroid gland typifies perhaps better than any operation the supreme triumph of the surgeon’s art.

Halsted
Postoperative Complications

- Postoperative complications infrequent in experienced hands.
- Early recognition and prompt initial management crucial for successful outcome.
- Best prevented by meticulous surgical technique.
Thyroid Literature

Medline

Thyroid disease  136,053
Thyroid tumors   33,554

• New Paper on Thyroid Disease – Every 3 Hours
• New Paper on Thyroid Cancer – Every 8 Hours

Thyroid Google search  36 million
Thyroid Cancer Google search  21 million
Complications of Thyroidectomy in 200 Patients

- RLN injury
  - Permanent: 0
  - Temporary: 1
- Hypoparathyroidism
  - Permanent: 0
  - Temporary: 1
- SLN injury: 1
- Wound hematoma – reexploration: 3
- Laryngeal edema – arytenoid trauma: 1
- Wound infection: 2
- Minor wound problems – seromas: 6%
Complications of Thyroidectomy

- Wound hematoma – airway obstruction
  - Seroma – collection
  - Infection
  - Hypertrophic scar
  - Keloid
- Recurrent laryngeal nerve injury – unilateral
  - Bilateral – rare
- Hypoparathyroidism – temporary
  - Permanent
- Recurrent hyperthyroidism
- Hypothyroidism
- Superior laryngeal nerve injury
- Chyle leak
- Horner’s syndrome – injury to sympathetic trunk – very rare

Iyer NG, Shaha AR. Minerva Chir
Complications in Thyroid Surgery

Increased incidence with
- Extent of disease (size)
- Extent of surgery
- Reoperative surgery
- Extrathyroid extension and malignancy
- Paratracheal dissection
- Neck dissection
- Substernal thyroid
- Reoperation for hematoma
- Less experienced surgeon

Bigger the operation, bigger the complications
The risk of parathyroid injury is directly proportional to the extent of thyroidectomy and inversely proportional to the surgeon’s experience.
UNADJUSTED AND ADJUSTED CLINICAL OUTCOMES FROM THYROIDECTOMY BY SURGEON VOLUME GROUP

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Surgeon Volume Groups</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A 1-9 cases</td>
<td>B10-29 cases</td>
<td>C30-100 cases</td>
<td>D&gt;100 cases</td>
</tr>
<tr>
<td>Complication rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted (%)</td>
<td>10.1†</td>
<td>6.7†</td>
<td>6.9†</td>
<td>5.9</td>
</tr>
<tr>
<td>Adjusted (%)</td>
<td>8.6†</td>
<td>6.1†</td>
<td>6.1†</td>
<td>5.1</td>
</tr>
<tr>
<td>Length of stay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted (days)</td>
<td>2.8‡</td>
<td>2.1‡</td>
<td>2.2‡</td>
<td>1.7</td>
</tr>
<tr>
<td>Adjusted (days)*</td>
<td>1.9‡</td>
<td>1.7‡</td>
<td>1.7‡</td>
<td>1.4</td>
</tr>
</tbody>
</table>

*Adjusted for patient age, race, comorbidities, diagnosis, procedure, surgeon and hospital volume
† p<0.001 compared to Group D
‡ p<0.05 compared to Group D

Sosa et al, 19
Medical malpractice and the thyroid gland

- Jury verdict reviews from 1987-2000 were obtained from a computerized database
- 30 suits from 9 states occurred
- Plaintiffs were women in 80% of the cases, with a mean age of 41
- 50% of pts (15 of 30) had a bad outcome, (9 of 30 dead, 4 of 30 with neurologic deficits, 1 blind & 1 alive w/ cancer)
- 30% alleged surgical complications, most RLN injury, and 75% of cancer pts alleged a delay, either through falsely negative biopsies or no biopsy taken
- Respiratory events occurred in 43% and frequently resulted in large awards
How to Avoid or Predict?

- Fixed mass to the central compartment
- Preop vocal cords evaluation
- Older patient
- FNA – Poorly differentiated cancer
- CT scan (Imaging)
- Preop endoscopy
Thyroidectomy

Imaging studies

- Ultrasound – Nodes - Superior Mediastinal - Lateral - Retropharyngeal
- CT scan without contrast
- MRI
- Arteria lusoria

How I Do It
Thyroidectomy

Anesthesia considerations

- Pre-operative evaluation for intubation
- Pre-operative laryngoscopy intubation without any trauma
- Small endotracheal tube
- Cuff of endotracheal tube below the vocal cords
- Smooth induction and smooth extubation (Be Present)
- Post-operative observation in Recovery Room
Thyroidectomy

Position

- 3 flat sheets under shoulder
- Head on the head board
- Both hands tucked in
- $30^\circ$ reverse trendelenberg
- Transparent drape
Thyroidectomy

Incision

- Plan line of incision pre-op sitting or standing
- Skin crease/ necklace line
- Higher incision in women
- Generous incision in large, fixed or substernal tumors
- Incision for thyroidectomy & neck dissections
  - Avoid J shaped incision
Thyroidectomy

Incision

- **Bold** surgeons make *small* incisions
- **Timid** surgeons make *big* incisions
- **Good** surgeons make *adequate* incisions
Thyroidectomy

Neck Release

• Open the “gift wrap”

• Separate fascia from the muscles
• Separate strap muscles
• Separate sternomastoid muscle

Moraitis, Shaha. JSO 2006
The sternohyoid muscle is retracted laterally and the sternothyroid muscle is carefully lifted off the thyroid gland and transected superiorly for full exposure of the superior thyroid vessels.

Moraitis D, Shaha AR. JSO 2006
The sternothyroid muscle is peeled off the thyroid gland and the superior thyroid vessels and nerve are exposed. The superior thyroid pedicle is ligated close to the thyroid parenchyma.

Moraitis D, Shaha AR. JSO 2006
Thyroidectomy

RLN Injury

- In the TE groove (nodal dissection)
- At the crossing of the inferior thyroid artery
- Near the ligament of Berry – small vessels

Traversing: Bipolar cautery
Risk Factors for RLN Injury

- Locally aggressive thyroid cancer
- Extensive nodal disease and dissection
  - Central Compartment
- Multiple RLN branches
- Massive goiter
- Substernal goiters
- Reoperations
- Surgeon Experience (Skill, Patience)
- Non-recurrent RLN
TYPICAL RESPONSES RECORDED WITH ENDOTRACHEAL TUBE ELECTRODES

A

stimulator probe 1 mm. lateral to nerve (1.0 ma)

B

stimulator probe directly on nerve (1.0 ma)
Management of RLN Invaded by Cancer

- Pre-op palsy - sacrifice nerve
- Dissect the nerve off the tumor
  - No gross tumor left behind
- Primary Anastomosis of RLN
- Nerve grafting
- Decision about other side
- Nerve monitor
Intra-Op Management of RLN Injury

- Transaction of the nerve
  - Primary anastomoses
- Nerve graft
  - Ansa
  - Greater auricular
  - Sural
- Find the proximal end near cricoid by dissection through the cricopharyngeus muscle.
Sternothyrolaryngeal (Joll’s) Triangle

- Superior thyroid vessels
- Upper pole
- Cricothyroid
- SLN
Dissection of the superior thyroid vessels parallel to the vessels on surface of thyroid & exposure of SLN

Guidelines to Parathyroid Preservation

- Good exposure, light, hemostasis
- Recognition of parathyroids - color, size, location
- Meticulous dissection
- Identify and protect the blood supply to parathyroids
- Ligate inferior thyroid artery close to thyroid
Parathyroid Preservation

Dissect on the capsule; ligate vessels distal to parathyroid
• Technical considerations
  • Ligation of branches of inferior thyroid artery close to thyroid
  • Avoid parathyroid hematoma
  • Avoid excessive irrigation and suction
• Post-op close follow-up & management
• Autotransplantation
• Total thyroidectomy is really a parathyroid preservation operation
• 6 hours – postop PTH assay

AVOID HYPERCALCEMIA
# Management of Post-thyroidectomy Hypocalcemia

<table>
<thead>
<tr>
<th>Serum Total Calcium 12-24 hours post op</th>
<th>&lt; 7.0*</th>
<th>7.0 - 7.4</th>
<th>7.5 - 8.0</th>
<th>&gt; 8.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etiology</td>
<td>Near total lack of PTH</td>
<td>Mild PTH deficiency</td>
<td>Mostly dilutional or parathyroid trauma</td>
<td>None</td>
</tr>
<tr>
<td>IV calcium</td>
<td>As needed for acute symptoms+</td>
<td>As needed for acute symptoms+</td>
<td>As needed for acute symptoms+</td>
<td>As needed for acute symptoms+</td>
</tr>
<tr>
<td>Oral Calcium</td>
<td>Tums Ultra (400 mg) 3 tabs po TID</td>
<td>Tums Ultra (400 mg) 3 tabs po TID</td>
<td>Tums Ultra (400 mg) 3 tabs po TID</td>
<td>Not needed Tums Ultra (400 mg) 1-2 tabs BID until postop visit</td>
</tr>
<tr>
<td>Vitamin D therapy</td>
<td>calcitriol 0.5 mg BID</td>
<td>calcitriol 0.25 mcg qd</td>
<td>Not needed</td>
<td>Not needed</td>
</tr>
<tr>
<td>In House Monitoring</td>
<td>Serum calcium BID until trending upward</td>
<td>Serum calcium BID until trending upward</td>
<td>Serum calcium BID until stable</td>
<td>Not needed</td>
</tr>
<tr>
<td>Monitoring after DC</td>
<td>Serum calcium 48-72 hours after DC</td>
<td>Serum Calcium 7-10 days after DC</td>
<td>Serum Calcium 7-10 days after DC</td>
<td>Not needed</td>
</tr>
</tbody>
</table>

These guidelines assume a near normal serum albumin.

* Check PTH if calcium below 7.0 in follow up
  No discharge if calcium is below 7.0
+ IV solution – calcium gluconate 10 – 20 mL diluted in 200 mL of saline over 20 minutes
First postop visit –
  If serum calcium is above 8.5, reduce one tablet weekly starting vit D.
  If calcium is below 8, continue calcium and vit D and revisit in 3-4 weeks
Thyroidectomy

Indications for drains in thyroidectomy

- Large & substernal goiter
- Subtotal thyroidectomy
- Surgery for Graves disease
- Type of drain
Hemorrhage and Hematoma

- Reported to occur in < 1% of the cases
- Most commonly occur within 6 hours after surgery (5 min-5 days)
- Close monitoring for at least 6 hours after surgery
- Prevention:
  - Identification & ligation of blood vessels during surgery
  - Meticulous hemostasis before wound closure
  - Normalize blood pressure before wound closure
  - Valsalva maneuver to identify potential venous bleeders
- Bedside evacuation of hematoma
Complications Associated with Thyroidectomy and Neck Dissection

Hypoparathyroidism
• Transient
• Permanent

Chyle leak/chyloma

Bleeding and hematoma

Seroma

Wound infection

Nerve injuries
• Accessory nerve
• Hypoglossal nerve
• Ramus mandibularis
• Sympathetic chain (Horner’s syndrome)
• Brachial plexus
• Phrenic nerve
• Cutaneous cervical plexus

Iyer NG, Shaha AR. Minerva Chir
Prospective Functional Voice Assessment in Patients Undergoing Thyroid Surgery

Stojadinovic/Shaha, et al.

- To analyze voice before & after thyroid surgery
- Prospective study of 50 pts – functional voice testing
- Acoustic/aerodynamic/glottographic/videostroboscopic testing
- 30% pts reported early subjective voice changes
- 14% reported late subjective voice changes
- 84% had significant objective change in at least one voice parameter
- 12% had significant alterations in more than 3 voice measures
Post Thyroidectomy Central Compartment Syndrome

- Submental anesthesia/paresthesia
- Vague voice changes
- Chronic throat discomfort
- Swallowing difficulties
- Feeling of choking

(Shaha)
Special Clinical Issues

- Superior laryngeal nerve
- Intraoperative nerve stimulation & monitoring
- Drains
- Management of substernal goiter
- Management of post-op hypocalcemia
- Tracheomalacia
- Harmonic/ Ligasure
How I Do It

Thyroid Surgery

- Brain
- Hands
- Loops
- Bipolar cautery
- Micro-clamps
- Good exposure
- Patience & meticulous dissection
- Good assistance, retraction & exposure
- Avoid excessive irrigation and suction
- Harmonic scalpel
Technology in Thyroid Surgery

- Harmonic / Ligasure
- Nerve Monitor
- Endoscopic Thyroidectomy
- Robotic Thyroidectomy
**Thyroidectomy**

- Nodulectomy
- Lobectomy / Isthmusectomy
- **Subtotal Thyroidectomy**
- Local anesthesia / regional block
- Outpatient Surgery
- 23 hr discharge
- Small incision surgery – 3-5 cm
- Endoscopic - Video assisted
  - Cervical
  - Chest approach
  - Submammary
  - Transaxillary
- **Robotic Transaxillary**
- Bilateral Axillary Breast Approach (BABA)
- **Transoral thyroidectomy**
“The good physician treats the disease; the great physician treats the patient who has the disease.”

- Sir William Osler