Minimally-Invasive Thyroid Surgery

Ashok R. Shaha
Samuel D. Gross - 1866
Philadelphia

A System of Surgery

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.
Surgical Procedure

- Anatomically and Biologically Sound
- Reproducible
- Least Complications
- Short Learning Curve
- Easy to Teach, Learn, and Practice
- Cost Effective
- Best Cosmetic and Function Results
The fact that a new technique is available does not necessarily mean its implementation is appropriate.

– Leigh Delbridge, MD, FRACS
### Endocrine Procedures by U.S. Residents 1993-1994

<table>
<thead>
<tr>
<th></th>
<th>% Programs</th>
<th>Mean</th>
<th>Mode</th>
<th>With 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroid</td>
<td>12.6</td>
<td>7-10</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Parathyroid</td>
<td>5.6</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Adrenal</td>
<td>0.98</td>
<td>0</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>0.15</td>
<td>0</td>
<td>85</td>
<td></td>
</tr>
</tbody>
</table>

Harness et al
Minimally Invasive Thyroidectomy

- ‘PURE’ Endoscopic Approach Completely closed technique with continuous gas insufflation
- Neck Approach
- Anterior Chest Approach
- Axillary Approach
- Breast (Submammary Approach)
- Video assisted Technique
- Video assisted Neck Dissection
- Video assisted under LA
Clamp on purse string  
Insufflation tube  
Laparoscope being inserted into trocar A
Minimally Invasive Thyroidectomy

- ‘PURE’ Endoscopic Approach Completely closed technique with continuous gas insufflation
- Neck Approach
- Anterior Chest Approach
- Axillary Approach
- Breast (Submammary Approach)
- Video assisted Technique
- Video assisted Neck Dissection
- Video assisted under LA
Endoscopic Surgery

Minimally Invasive Surgery

Maximally Expensive Surgery
Minimally Invasive Thyroidectomy

- Minimally Invasive ‘Open’ Surgery
- Mini-incision
- Smaller Incision
- Lateral Incision
- Harmonic Scalpel
- Ligasure
- Local Anesthesia/Regional
- 23 Hour Discharge
In cosmetic terms, the quality of the scar is more important than the actual length.
Minimal incision may cause excessive skin stretching, bruising, forcible retraction, or inadvertent cauterization of the skin edges
Advantages of Minimally Invasive Thyroid Surgery

- Smaller Incision
- Better Cosmesis
- Less Pain
- Early Discharge
Minimally Invasive Thyroid Surgery

- Majority of thyroid surgery in the U.S. is performed for proven or suspected malignancy
- Paratracheal and nodal evaluation are difficult
- 20% of patients with thyroid cancer have extrathyroidal extension, which requires adequate exposure and excision
- Ultrasound detecting bilateral thyroid nodules requires total thyroidectomy
Minimally Invasive Thyroid Surgery

• First Principle of Surgery:
  • Adequate Exposure
  • Adequate Retraction
  • Adequate Lighting
• Learning curve
• Difficult to gain expertise
• Medicolegalities of minimally invasive thyroid surgery
Classification

Minimally invasive Thyroidectomy

- Robotic
  - Trans-Axillary
  - Face-Lift

- Mini incision

- True endoscopic
  1. Anterior chest
  2. Axillary
  3. Areolar

- Endoscopy assisted
  - Cervical
Mini Incision

• Ikeda
• 3cm incision
• Isthmusotomy
• Use ligasure LS1200 or harmonic scalpel (focus) to divide superior pole vessels
• Use ligasure LS1200 or harmonic scalpel (focus) to divide isthmus

Ikeda et al. Direct mini incision thyroidectomy. Biomed Pharmacother 2002;56:60s-63s
Ligasure Precise
Harmonic Focus Scalpel
<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Access Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>Shimizu</td>
<td>subclavicular access</td>
</tr>
<tr>
<td>2000</td>
<td>Ikeda</td>
<td>axillary access</td>
</tr>
<tr>
<td>2000</td>
<td>Ohgami</td>
<td>breast access</td>
</tr>
<tr>
<td>2001</td>
<td>Gagner</td>
<td>supraclavicular access</td>
</tr>
<tr>
<td>2007</td>
<td>Chung</td>
<td>robotic via axillary access</td>
</tr>
</tbody>
</table>
**Gagner**

- CO$_2$ (8 mm Hg) insufflation
- Central incision (5 mm trocar)
- 3 additional Trocars: mid line
  - mid border SCM
  - sup border SCM

**Shimizu**

- External retraction (Kirschner)
- Lateral incision (SCM border)
- 5 cm subclavicular incision
30 mm skin incision in the axilla
CO₂ insufflation (4 mm Hg)
Flexible endoscope
1 additional trocar near the main incision

Three incisions: 1 presternal
2 periareolar
CO₂ insufflation
Endoscopic Assisted

1999 Miccoli

- Central neck access

- Minimally invasive video assisted thyroidectomy
- Single 1.5cm incision - midline skin crease
- MIVAT
MIVAT

Minimally Invasive Video-assisted Thyroidectomy

INDICATIONS

Nodule < 3.5 cm
Thyroid volume < 25 ml

Benign disease
multinodular follicular Toxic adenoma Graves

Malignant disease
Low risk Pap Cr RET gene carriers
MIVAT: Contraindications

**ABSOLUTE**
- Large goiters
- Previous neck surgery
- Thyroiditis
- Presence of suspicious lymph nodes
- Local advanced carcinoma

**RELATIVE**
- Previous neck irradiation
- Graves’ disease
- Short neck in obese patients
MIVAT: 5 steps

1. Incision and access to the operative space
2. Section of the upper pedicle
3. Identification of recurrent laryngeal nerve and parathyroids
4. Extraction and resection of the lobe
5. Closure
Da Vinci Robot

- Two components
  - Surgeon console
  - Surgical arm cart
Minimally Invasive Thyroid Surgery

- Majority of thyroid surgery in the U.S. is performed for proven or suspected malignancy
- Paratracheal and nodal evaluation are difficult
- 20% of patients with thyroid cancer have extrathyroidal extension, which requires adequate exposure and excision
- Ultrasound detecting bilateral thyroid nodules requires total thyroidectomy
Minimally Invasive Thyroid Surgery

- First Principle of Surgery:
  - Adequate Exposure
  - Adequate Retraction
  - Adequate Lighting

- Learning curve

- Difficult to gain expertise

- Medicolegalities of minimally invasive thyroid surgery
Da Vinci Robot

- Surgical arm cart holds
  - 3D camera
  - Instruments (2 or 3 arms)
    - Grasping forceps
    - Scissors
    - bipolar bovie
    - harmonic scalpel

7 degrees of freedom using an endo-wrist system
Approach

- 2 incisions
- Axillary incision
  - Camera
  - Harmonic scalpel
  - Dissecting forceps
- Substernal incision
  - Grasping forceps
Axillary Incision

- 6cm axillary incision
- Dissect subcutaneous tunnel over pectoralis major muscle
Exposure of Thyroid Gland
Position of Camera and Instrument Arms
Dissection of Thyroid Gland
Advantages & Disadvantages

- Avoids a central neck incision
- Increased magnification of RLN and parathyroids
- No tremor

**BUT**

- 6cm axillary incision
- Significant soft tissue dissection
- Lose sensory feedback
- Long OR time 2-4hrs
- Need postop drains
- Not suitable for day surgery
- Difficult to remove the contralateral lobe
Minimally Invasive Thyroid Surgery

- Majority of thyroid surgery in the U.S. is performed for proven or suspected malignancy
- Paratracheal and nodal evaluation are difficult
- 20% of patients with thyroid cancer have extrathyroidal extension, which requires adequate exposure and excision
- Ultrasound detecting bilateral thyroid nodules requires total thyroidectomy
“Commonplace clinical problems in surgery are approached in diametrically opposite ways - by surgeons with similar training backgrounds, having read the literature but interpreting the available information differently, based on unique personal experience, vision or surgical prejudice.”

-- Richard Simmons
Good judgment comes from experience; but experience comes from bad judgment!
“The best interest of the patient is the only interest to be considered”

William J. Mayo, 1910