Tonsillotomy versus Tonsillectomy

Michael J. Cunningham, M.D.
Department of Otolaryngology & Communication Enhancement
Children’s Hospital Boston

Introduction

• Historical perspective
• Techniques and instrumentation
• Effectiveness relative to procedure facilitation, intraoperative and postoperative complication risks, and patient recovery

Historical Perspective

• Pare (1564) and Scultetus (1655) – string strangulation techniques for uvula & tonsil removal
• Philip Syng Physick (1828) – forerunner of the guillotine-like tonsillotomes (tonsillotomy procedure)
• William Thomas Green Morton (1846) – introduction of ether anesthesia in the Bullfinch amphitheatre of the MGH for the excision of a left neck vascular lesion by John Collins Warren
• George Ernest Waugh of Great Ormond Street Hospital in London, England (1909) – originally given credit for the surgical concept of tonsillectomy versus tonsillotomy
Historical Perspective

- Ovidus Arthur Griffin (1906/1907) – described in a paper published verbatim in three different journals the use of a knife and a specially-designed pair of scissors to remove both tonsils in extracapsular fashion at a single operative setting
- W.E. Casselberry (1906) – “the advancing popularity of the newer term tonsillectomy, rather than tonsillotomy, is indicative of a general attitude favorable to total excision of the faucial tonsils”

Tonsillectomy

**Cold Sharp Steel Dissection**

- The historical mainstay of tonsil surgery
- Foundation set by Samuel J. Crowe (1917) – introduced the Crowe-Davis mouth gag, the use of gauze packs, sharp dissection for tonsil removal, and the clamping and ligation of bleeding points with silk ligatures
- Still used by a substantial proportion of otolaryngologists, although the classic cold dissection technique today is typically performed with “touch up” monopolar or bipolar electrocoagulation for hemostasis.

Historical Perspective

- The advantages and disadvantages of total versus partial tonsillectomy were debated through the first quarter of the 20th century
- Portman (1925) recommended partial removal “when obstruction was the chief difficulty” and complete removal for “diseased types”
- Fowler’s Tonsil Surgery textbook (1930) advocated removing “the tonsil, the whole tonsil and nothing but the tonsil” regardless of operative indication
- The concept of partial removal of tonsil tissue (tonsillotomy) was essentially abandoned, not to be reintroduced again until the late 1990’s

Tonsillectomy

**Cold Sharp Steel Dissection**

- Instrumentation
- Surgical Technique
Tonsillectomy
*Monopolar & Bipolar Electrosurgery*

- William T. Bovie – Harvard physicist who in 1926 developed the original electrosurgical device to aid in the removal of tumors
- Soon thereafter first used in ORL at the MEEI by Harris P. Mosher to control nasal epistaxis
- Electrosurgery is currently used for many ORL procedures including both tonsillectomy and tonsillotomy

Tonsillectomy
*Monopolar Electrosurgery*

- Monopolar electrosurgery is currently the most common instrument utilized for total tonsillectomy
- Hand-held active electrode options include monopolar blades, needles and suction tips
- The procedure is typically performed under direct visualization or with loupe magnification
- The technique is similar to that of cold steel dissection except that the hand-held electrode allows for simultaneous tonsil removal and hemostasis by variations in operational modalities
- These modalities are cut, coagulate, or cutting with coagulation (the so-called blend mode); the newer electrosurgical devices are designed to maintain a high level of hemostasis with efficient dissection while in the blend mode

Tonsillectomy
*Bipolar Electrosurgery*

- Bipolar electrosurgery typically incorporates the use of forceps, scissors or a vessel sealing instrument
- Loupe or microscopic magnification may be employed to aid the capsular dissection, particularly with forceps use
- Bipolar electrosurgical scissors are modified Metzenbaum scissors which can be used for both dissection and hemostasis
- The bipolar vessel sealing instrument is a newer hemostatic dissection tool
- Advocates of bipolar electrosurgery argue that the more precise means of energy delivery lessens thermal injury to the lateral pharyngeal wall musculature

Tonsillectomy
*Bipolar Radiofrequency Ablation (Coblation)*

- Like electrosurgery, bipolar radiofrequency employs an oscillating electrical current to disrupt tissue
- Electrodes at the instrument’s tip serve as the source of radiofrequency energy
- Unlike electrosurgery, the energy is not conducted directly through the tissue but rather through a conductive medium (saline solution)
- Since there is a steady flow of saline, the system works at comparatively lower temperatures than conventional electrosurgery, hence the term cold ablation or coblation
- Like monopolar electrosurgery, bipolar radiofrequency ablation allows for hemostasis via a coagulation mode option
Tonsillectomy

Bipolar Radiofrequency Ablation

- Concerns regarding an increased incidence of secondary hemorrhage arose from the NHS National Prospective Tonsillectomy Audit
- This audit revealed elevated secondary (delayed) hemorrhage rates for all “hot” compared to “cold” tonsillectomy techniques
- These rates were highest for monopolar diathermy, followed by bipolar diathermy scissors, bipolar diathermy forceps and coblation

Tonsillectomy

Harmonic Scalpel

- The harmonic scalpel denatures protein by using ultrasonic vibration to transfer mechanical energy
- There is both mechanical cutting and cavitations due to blade vibration
- The hook-spatula blade used for tonsillectomy surgery has a sharp inner beveled radius for cutting, a blunt outer radius for contact coagulation, and a flat side for broad surface coagulation
- The cutting speed and extent of coagulation are controlled by both power adjustment and how the blade is handled
- The theoretical benefit of the HS is that the resultant temperature caused by the friction process is relatively low, minimizing thermal damage

Surgical Techniques and Primary and Secondary Postoperative Tonsillar Hemorrhage Rates:
Results of the National Prospective Tonsillectomy Audit

<table>
<thead>
<tr>
<th>Surgical technique</th>
<th>Before Guidance Primary Tonsillar Hemorrhage Rate (%)</th>
<th>After Guidance Primary Tonsillar Hemorrhage Rate (%)</th>
<th>Before Guidance Secondary Tonsillar Hemorrhage Rate (%)</th>
<th>After Guidance Secondary Tonsillar Hemorrhage Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold steel and ties/packs</td>
<td>1.1</td>
<td>0.6</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Cold steel and monopolar diathermy</td>
<td>0.6</td>
<td>0.2</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Cold steel and bipolar diathermy</td>
<td>0.5</td>
<td>0.5</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Monopolar diathermy forceps</td>
<td>0.6</td>
<td>3.4</td>
<td>5.9</td>
<td>4.7</td>
</tr>
<tr>
<td>Bipolar diathermy forceps</td>
<td>0.4</td>
<td>0.4</td>
<td>4.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Bipolar diathermy scissors</td>
<td>0.7</td>
<td>0.5</td>
<td>5.2</td>
<td>3.9</td>
</tr>
<tr>
<td>Coblation</td>
<td>1.0</td>
<td>0.5</td>
<td>4.2</td>
<td>3.1</td>
</tr>
<tr>
<td>Other</td>
<td>0.5</td>
<td>0.9</td>
<td>3.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Overall (all techniques)</td>
<td>0.6</td>
<td>0.5</td>
<td>3.5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Tonsillotomy

- Also known as partial tonsillectomy, intracapsular tonsillectomy, subcapsular tonsillectomy, inside out tonsillectomy
- Concept is the removal of lymphoid tissue medial to the tonsillar capsule avoids (lessens) direct surgical (thermal) trauma to the pharyngeal musculature
- The intact capsule may also provide a biologic barrier to bacteria-laden pharyngeal secretions, lessening the risk of postoperative inflammation
The performance of tonsillotomy was resurrected by Swedish ORL colleagues in two articles published in the IJPORL in 1999 (carbon dioxide laser technique).

Dr. Peter Koltaï and colleagues at the Cleveland Clinic reintroduced tonsillotomy in the U.S. in two articles published in the Laryngoscope in 2002 and in Otolaryngology - Head & Neck Surgery in 2003 (powered microdebrider technique).

An angled, convex or concave, 15 degree microdebrider blade is used to remove tonsil tissue, beginning medially and proceeding laterally.

Originally taken to within the confines of the tonsillar pillars / presently taken to the medial aspect of the tonsillar capsule itself.

Remaining lymphoid remnants are monopolar electrodessicated to form a mature eschar over the intact tonsillar capsule.

This technique has become increasingly popular as a preferred treatment of obstructive tonsillar hypertrophy.

There are, however, some potential disadvantages:
- Its performance does take longer than monopolar electro surgical and bipolar radiofrequency tonsillectomy, with a slightly higher intraoperative blood loss.
- Bleeding during the microdebrider tonsil tissue resection can obscure the operative field, increasing the risk of leaving lymphoid remnants or breaching the tonsillar capsule.
- Concern of regrowth of residual tonsillar tissue and the need for subsequent reoperation for obstructive or infectious indications (not mutually inclusive).

Residual lymphoid tissue has been noted in the tonsillar fossa at the one month follow-up visit five times more frequently in children status post microdebrider tonsillotomy than electro surgical tonsillectomy (Derkay et al Otolaryngol Head Neck Surg 2006).

The incidence of symptomatic residual / recurrent tonsil requiring revision surgery has been quite low:
- 0.46% in 870 children followed over a mean of 1.2 years (Solares et al IJPORL 2005)
- 0.64% in 1731 children followed over a mean of 1.8 years (Schmidt et al Arch Otolaryngol 2007).
**Tonsillotomy**

**Bipolar Radiofrequency Ablation**

- The bipolar radiofrequency ablation (Coblation) wand can also be used to perform tonsillotomy in addition to its established role for the performance of tonsillectomy
- A higher ablation setting is necessary for this application

**Monopolar Radiofrequency Ablation Somnoplasty**

- Monopolar radiofrequency ablation is essentially a tonsil volume reduction technique
- A specific amount of low temperature, low voltage radiofrequency energy is delivered directly into the tonsil via a needle electrode probe
- The dual-pronged probe designed for palate surgery has typically been used for tonsil surgery
- Initial inflammatory edema, followed by necrosis and fibrotic contraction is the expected result
- Tonsillar tissue obviously remains, the clinical significance of which has not been defined

<table>
<thead>
<tr>
<th>Comparison of Risks and Benefits of Tonsillectomy Techniques</th>
<th>Comparative Benefits</th>
<th>Comparative Risks</th>
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<tbody>
<tr>
<td>Cold steel dissection with ligatures</td>
<td>Decreased postoperative pain and associated morbidity</td>
<td>Somewhat longer operative time</td>
</tr>
<tr>
<td>Cold steel dissection with electrocautery</td>
<td>Decreased secondary hemorrhage rates</td>
<td>Slightly higher intraoperative blood loss</td>
</tr>
<tr>
<td>Monopolar electrosurgery</td>
<td>Decreased readmission rates for dehydration</td>
<td>Residual/recurrent tonsil tissue concerns</td>
</tr>
<tr>
<td>Bipolar electrosurgery</td>
<td>Decreased postoperative pain and associated morbidity</td>
<td>Residual/recurrent tonsil tissue concerns</td>
</tr>
<tr>
<td>Bipolar radiofrequency ablation (coblation)</td>
<td>Decreased postoperative pain and associated morbidity</td>
<td>Definite residual/recurrent tonsil tissue concerns</td>
</tr>
<tr>
<td>Harmonic scalpel</td>
<td>Decreased postoperative pain and associated morbidity</td>
<td>Instrumentation no longer available for purchase in the U.S.</td>
</tr>
</tbody>
</table>
Summary

- Tonsil surgery consists of two general techniques – extracapsular tonsillectomy and intracapsular tonsillotomy
- Multiple instruments exist for the performance of these two procedures
- Randomized controlled trials are infrequent, and studies comparing two tonsillotomy techniques or the same instrumentation for tonsillotomy versus tonsillectomy are rare
- The specific choice of technique and instrumentation in each clinical situation eventually depends on the expertise and comfort level of the surgeon
**Tonsillotomy versus Tonsillectomy**


