Comparative study between tonsillectomy done by bipolar diathermy and cold steel method

A prospective thesis study for partial fulfillment of master degree in Otorhinolaryngology

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FIRST, and for most thanks to **ALLAH**, the most merciful, gracious and compassionate, to **ALLAH** everything is resumed.

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Mahmoud Ead Sawan

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List of abbreviations

Abbreviation	Word
BC	Before Christ
CBC	Complete blood count
CO2	Carbon dioxide
GP	General practitioner
HS	Highly significant
INR	International normalized ratio
KTP	Potassium Titanyl Phosphate
mg	Milligram
MHz	Mega Hertz
ml	Milliliter
n	Number
NS	Non-significant
NSAIDs	Non-steroidal anti-inflammatory drugs
P value	Predictive value
PT	Prothrombin time
PTT	Partial thromboplastin time
RCT	Randomized controlled trial
RFVR	Radiofrequency volumetric reduction
S	Significant
SD	Standard deviation
SPSS	Statistical package for the social sciences
US	United states
VPI	Velopharyngeal insufficiency

Abstract

Background: There are many methods described for doing tonsillectomy, but the most common two methods for tonsillectomy are dissection by the cold steel method and by bipolar diathermy. Each method has its advantages and disadvantages.

Objectives: To compare between cold steel tonsillectomy and bipolar tonsillectomy, and to find the advantages and disadvantages of each method over the other.

Patients and methods: Forty patients ranged between 4 and 10 years have prepared for tonsillectomy under strict inclusion criteria. Twenty patients underwent tonsillectomy by cold steel method and the other twenty underwent tonsillectomy by bipolar method. The two groups are assessed according to intra-operative blood loss, operative time, post-operative pain, post-operative hemorrhage, post-operative fever and time of healing.

Results: The findings are summarized in tables and statistical analysis was done for the data. The results showed that the mean intra-operative blood loss was 11.35 ml in cold steel group and it was 7.9 ml in bipolar group. The mean operative time was 16.25 minutes for the cold steel group but it was 13.3 minutes for the bipolar group. The mean post-operative pain score (according to Wong-Baker FACES® Pain Rating Scale) was 4.78/10 for the cold steel group and it was 5.59/10 for the bipolar group. The mean healing time of cold steel group was 12 days while it was 13.35 days in bipolar group. Both groups show no statistically difference for the post-operative hemorrhage and for the post-operative fever.

Conclusion: Bipolar technique of tonsillectomy has some advantages in the form of reducing intra-operative blood loss, and operative time which indirectly impacts the cost-effectiveness of this procedure. But there are some disadvantages related to the bipolar technique including delayed post-operative pain, and prolonged time for healing. The study results demonstrated the advantages of cold steel technique in the form of less post-operative pain and shorter time required for healing. The resulted disadvantage of cold steel technique was the higher intra-operative blood loss and the more operative time required. In our study, we couldn't approve a significant difference between two methods regarding post-operative hemorrhage and fever.

Keywords: tonsillectomy-cold steel-blunt dissection-bipolar cautery-diathermy-hot dissection.

Review of literature

Introduction

A large proportion of childhood and pediatric illness is related to infections and inflammatory diseases of pharynx, tonsils and adenoids. Therefore, tonsillectomy and adenoidectomy are two of the most common surgical procedures established in child population ***(Wiatrak and Woolley, 2005).***

Tonsillectomy operation was the most widespread procedure in previous century for treating various respiratory diseases and systemic diseases and reached its peak about 65 of years ago. Then its popularity declined with the use of antibiotics ***(Kornblut, 1987).*** In the 60^{th} and 70^{th} of the previous century, 1 to 2 million of adenoid surgery, tonsil surgery, or combined procedures were performed every year in the US ***(Shaikh et al, 1976).***

In recent decades, these surgeries are performed with a rate which is half than their rate 4 decades ago. However, no considerable change in the indications of tonsillectomy or the complications of the surgery ***(Bluestone, 1985).***

Among the years, many techniques described as cold steel method which is the most common technique of tonsil removal in the United Kingdom, electro-cautery method, suction diathermy dissection, cryosurgery, ultrasonic surgery, laser, monopolar dissection and bipolar dissection ***(Saleh et al, 1999).*** Cold steel technique is considered the gold standard method, but, bipolar technique for tonsillectomy dissection is one of the electro-cauterization methods, and its use for tonsillectomy had been established by some surgeons and so popularized in many places ***(Pang et al, 1994; Brodsky et al, 1996).***

Anatomical considerations

Waldeyer's tonsillar ring:

"Waldeyer's tonsillar ring" is a ring of lymphoid tissue at the upper end of the pharynx and formed anteriorly by the lingual tonsils, laterally by the palatine tonsils and postero-superiorly by the adenoids (pharyngeal tonsils). All the structures of *Waldeyer's tonsillar ring* are histologically similar and have same functions ***(Wiatrak & Woolley, 2005).***

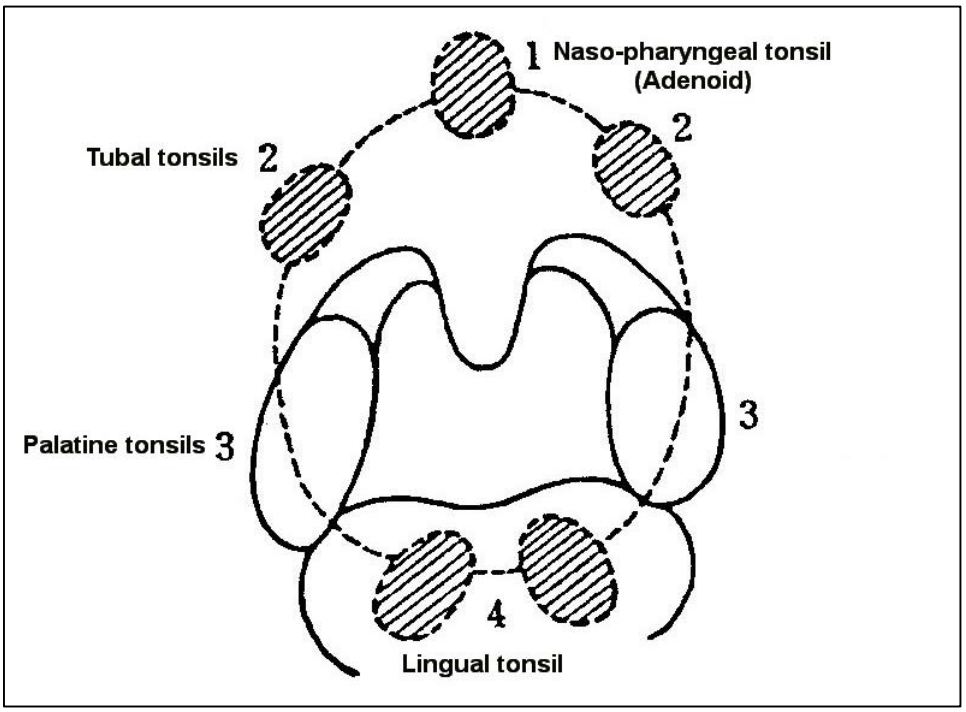

Figure 1. ***Waldeyer's tonsillar ring.***

Palatine tonsil:

They are the largest lymphoid tissues in "*Waldeyer's tonsillar ring"*. On the contrary to the pharyngeal and lingual tonsils, it constitutes a compact body and has a definite slim capsule on the deep surface. The crypts of tonsil are blind tubules which originate from the epithelial side of tonsil and continue deep to the tissues. The capsule of tonsil is a special part of the "pharyngobasilar fascia" that overlay the tonsillar surface and continues into its tissue to make septa that

transmit vessels and nerves, so tonsil separation from capsule can't be done easily, but the capsule is united by loose connective tissue to the muscles of pharynx. So the dissection of tonsil can be done easily by separating its capsule form the pharynx through the loose connective tissue. The tonsillar fossa is formed of 3 muscles; the palatoglossus (arch) which is the anterior pillar, the palatopharyngeus (arch) which makes the posterior pillar, and the superior constrictor of the pharynx, which makes the larger part of the bed of the tonsil ***(Kenna and Amin, 2009).***

The muscular wall is slim, and the "glossopharyngeal nerve" is immediately in front of it on the outer pharyngeal side. So the glossopharyngeal nerve can be easily cut if the tonsillar bed wasn't handled gently, and the nerve could be affected by edema for temporary after tonsillectomy that produces referred earache and a transient loss of taste sensation on posterior 1/3 of tongue ***(Wiatrak and Woolley, 2005).***

The tonsillar mass does not fill the space between the two pillars completely, so, a small depression presents at the upper end of the space known as *"supratonsillar fossa"*. Under cover of the glossopalatine arch, the palatine tonsil extends for a considerable portion, and here is overlaid by a double layer of mucous membrane; the higher portion of this fold reaches through the supratonsillar fossa, between the two pillars, as a thin fold called the *"plica-semilunaris";* the remainder is termed the *"plica-triangularis"*. Between the tonsillar surface and the *plica-triangularis* there is a gap called *"tonsillar sinus";* but, occasionally, the sinus is obliterated by adherence of its walls. The tonsils of children are relatively larger in the size than that in the adult, and about 1/3 of the tonsillar tissue is imbedded. The imbedded part diminishes in size after the puberty and the tonsil would have a disk-like shape, flattened from side

to side, but the shape and size of the tonsil vary among different individuals**.** The medial side of tonsil is free except anterior part, where it is covered by the *plica-triangularis;* there is about 12 to 15 orifices in the medial side of the tonsil making small crypts or recesses that multiple follicles branch to the tonsillar tissue ***(Susan et al, 2005; Robb, 2008; Kenna and Amin, 2009).***

The arterial blood supply of the Palatine tonsils is extremely variable, but generally, the tonsils are supplied by the *"ascending palatine"*, "*ascending pharyngeal"*, and branches from the *"facial artery"* and "*lingual* artery*"*, they are all coming from *external carotid* artery. *External carotid* artery may give branches directly ***(Brodsky, 2006).***

The arteries come to the tonsil through the lower pole, and branches also at upper pole. There are 3 arteries at lower tonsillar pole; the *ascending palatine* artery from posterior, the tonsillar branch of the *dorsal lingual* artery from anterior, and the tonsillar branch of the *facial* artery between both that enters the lower aspect of the bed of the tonsil. ascending pharyngeal artery enters through posterior aspect of the upper pole of the tonsil, and the *lesser palatine* artery enters anteriorly. The facial artery gives the largest supply through its tonsillar branch. The internal carotid artery presents two cm approximately postero-lateral to the deep aspect of the tonsil; therefore, in tonsillectomy, we have to stay in the proper plane of dissection and avoid injury to the internal carotid ***(Brodsky, 2006).***

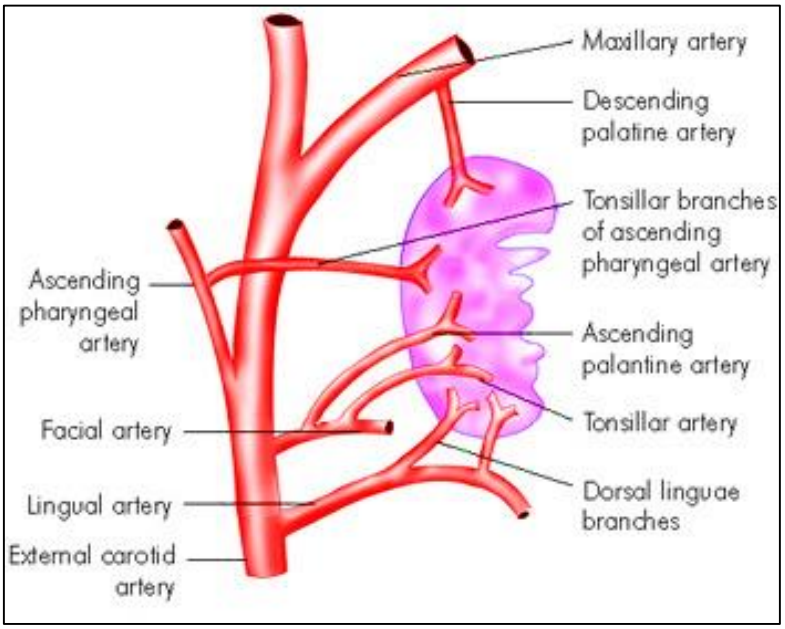

Figure 2. ***Arterial blood supply of the tonsil.***

Venous blood drainage is through "*peritonsillar plexus"* at the capsule. The plexus drains into the *pharyngeal* vein and *lingual* vein, which drain to *internal jugular* vein ***(Wiatrak and Woolley, 2005).***

The tonsillar lymphatic drainage is primarily drain through superior deep cervical *(jugulo digastric)* and *jugular* lymph nodes; therefore, the diseases of tonsillitis is a considerable cause of cervical adenitis and cervical abscess in child population ***(Brodsky, 2006).***

The nerve supply of the tonsils is from the tonsillar branches of the 9^{th} cranial nerve through lower tonsillar pole and from descending branches of the *"lesser palatine"* nerves, which come through the *"pterygopalatine"* ganglion. tonsillitis is associated with referred earache that is caused by the tympanic branch of the 9^{th} *cranial* nerve ***(Susan et al, 2005).***