
Ligation versus Diathermy in Tonsillectomy Haemostasis

Saad Shammās
FICMS

Muhammad Al-Baldawi
FICMS

Abstract

Objectives: A comparative prospective study of 400 patients to evaluate the ligation and diathermy techniques as methods of haemostasis in tonsillectomy.

Methods: Four hundred patients were divided into two equal groups, calculating the haemostasis time, primary and secondary haemorrhage in addition to pain in both the ligation and diathermy groups.

Results: Ligation technique had a high incidence of primary haemorrhage (5%) and less postoperative pain, while diathermy had increased incidence of secondary haemorrhage (5.5%), and more pain but with 40% reduction of haemostasis time.

Conclusion: It is recommended to use the conventional ligation method especially in teaching centers for its safety, easily done by the juniors and less intensity of pain.

Key words: Tonsillectomy; Ligation; Diathermy

Introduction

Tonsillectomy remains one of the most surgical procedures performed in the world. It was first described in India in 1000BC. The procedure increased in popularity in the 1800s when partial removal of the tonsil was performed. By the early period of the 20th century, the necessity of complete tonsillectomy was appreciated.

Tonsillectomy is the commonest surgical procedure in the specialty of otolaryngology and its most frequent morbidity is haemorrhage.

Post tonsillectomy haemorrhage maybe primary (appearing within the first 24 hours post operatively) or secondary (after 24 hours) whether they were managed conservatively or surgically. The risk of bleeding is present even when the operation is done by the best surgeons in spite of using the most meticulous haemostasis techniques [1, 2].

Various techniques have evolved over the years to control the bleeding including surgical ligation, diathermy, laser surgery and cryosurgery.

The most consistent applicable methods are surgical ligation and diathermy (electro coagulation). The last seemed to be as effective as ligation [1, 2, 3, 4]. These trials did not show any increase in morbidity due to the use of diathermy.

The use of ligation technique dates back to the time of old method of mask anesthesia when open mask technique and explosive anesthetics gases were used. When endotracheal intubations and non-explosive gases were introduced, it became possible to apply the diathermy method to control bleeding [1].

The study is ultimately directed to exhibit the advantages and disadvantages of diathermy haemostasis regarding the differences in the incidence of either primary or secondary haemorrhage, the duration of the operation, in addition to post operative pain as well.

Patients & Methods

We conducted a prospective study involving 400 patients who underwent tonsillectomy under general anesthesia. This large number of cases is needed to ascertain if there was a significant difference between ligation and diathermy. The only operations registered were those done by the consultants and well trained residents.

The patients were divided equally divided between two groups; the ligation and diathermy groups. Identical number of patients was taken for each age decade for accurate comparison. Finally, history, physical examination and investigations were conducted for all the patients prior to surgery with at least 2-3 weeks free from tonsil or respiratory tract infection.

The 1st group underwent the classical tonsillectomy by dissection and haemostasis by ligation of which the number of ligatures was counted.

The 2nd group had the same method of dissection with ligation of the lower poles (not included in the number of ligatures), however, haemostasis was secured by bipolar diathermy technique (spot cautery) with a power of 60-70 Joules applied by Remington-Hobbs insulated diathermy forceps picking up the bleeding vessels with mild traction to avoid coagulation of the surrounding tissues. The number of diathermy spots was counted.

For both procedures, dissection and haemostasis times were recorded exactly.

Any patient who did not need haemostasis or who required both types of techniques or did not show up for follow up were excluded from the research.

All the patients were kept under strict observation in the hospital for 24 hours, all of whom received parenteral antibiotic during the 1st 24 hours and analgesics as well in addition to instructing them about eating ice cream and ice cold water during the 1st 24 hours then shifting to warm fluid diet and back to normal diet gradually within three days.

Primary hemorrhages occurring within the 1st 24 hours or secondary bleedings after 24 hours no matter what way of management was followed, were recorded.

The patients were asked about their postoperative pain during the day of the operation and day one, two, five and eight, which was then classified according to Keel's scale^[5], falling into four grades:

- G0: No pain
- G1: Mild pain
- G2: Moderate pain
- G3: Severe pain

The following tests were used In statistical analysis:

- 1-t-test for two independent groups for differences between two means.
 - 2-Analysis of variance (ANOVA) for differences among more than two means
 - 3-Chi-square test for differences between qualitative groups and percentages
- P value equal or less than 0.05 was considered as the level of significance.

Results:

This prospective study included 400 patients who underwent tonsillectomy under general anesthesia and who were divided into two equal groups; ligation and diathermy group. The data obtained were categorized and analyzed.

The ligation group consisted of 127 males and 73 females, with a ratio of 1.7:1, while diathermy group had 110 males and 90 females (1.2:1), both with age range between 2-45 (mean 15.5±11.35) years.

The same number of patients was included in each age decade

It was the same dissection time (Table1) between the two groups, about 5 minutes [4.8±0.87 (3-7)] owing to the same technique used.

However, it is the haemostasis time which is the matter of concern. The mean haemostasis time (Table1) was significantly less in the diathermy (P value= 0.0001), about 6minutes[6.1±1.07(4-8.3)] in comparison to the ligation group which was about 10 minutes [9.9±1.68(7-14)] with a mean difference of about four minutes (40%).

Table (1): Mean dissection and haemostasis time and number of ligatures and diathermy spots.

	Dissection time (minutes) Mean±SD (Range)	Haemostasis time (minutes) Mean±SD (Range)	Number of ligatures or diathermy spots Mean±SD (Range)
Ligation	4.8±0.87 (3-7)	9.9±1.68 (7-14)	4.1±0.92 (2-6)
Diathermy	4.8±0.87 (3-7)	6.1±1.07 (4-8.3)	5.6±0.88 (4-8)
P value	-	0.0001*	0.0001*

* Significant difference (t-test)

The mean number of ligatures (Table 2C) and diathermy spots differed according to age groups. The mean number of ligatures ranged between 3.4-5.5 which differs significantly (P value= 0.0001), from the diathermy spots whose mean range was 5-7.

Tables 2A, 2B& 2C show the data of dissection time, haemostasis time, in addition to the number of ligatures and diathermy spots in relation to age decades. All these figures get significantly higher (P=0.0001) with older age groups.

Table (2A): The mean dissection time according to age group.

Age groups (years)	Ligation	Diathermy	P VALUE
	Mean±SD (Range)	Mean±SD (Range)	
1-9	4.0±0.45 (3.0-5.0)	4.0±0.45 (3.0-5.0)	-
10-19	5.0±0.25 (4.3-5.3)	5.0±0.25 (4.3-5.3)	-
20-29	5.4±0.34 (5.0-6.0)	5.4±0.34 (5.0-6.0)	-
30-39	5.9±0.41 (5.3-6.3)	5.9±0.41 (5.3-6.3)	-
40-49	6.5±0.40 (6.0-7.0)	6.5±0.40 (6.0-7.0)	-
P VALUE	0.0001*	0.0001*	

* Significant differences (ANOVA)

Table (2B): The mean haemostasis time according to age group.

Age groups (years)	Ligation	Diathermy	P VALUE
	Mean±SD (Range)	Mean±SD (Range)	
0-9	8.3±0.45 (7.0-9.3)	5.0±0.55 (4.0-6.0)	0.0001*
10-19	9.9±0.69 (9.3-11.3)	6.4±0.38 (6.0-7.0)	0.0001*
20-29	11.4±0.37 (11.0-12.3)	6.9±0.39 (6.0-7.3)	0.0001*
30-39	12.4±0.38 (12.0-13.3)	7.2±0.72 (4.3-8.0)	0.0001*
40-49	13.3±0.47 (12.3-14.0)	7.9±0.42 (7.3-8.3)	0.0001*
P VALUE	0.0001*	0.0001*	

* Significant difference (t-test)

Table (2C): The mean number of ligatures and diathermy spots according to age group.

Age groups (years)	Ligation	Diathermy	P VALUE
	Mean±SD (Range)	Mean±SD (Range)	
0-9	3.4±0.69 (2.0-5.0)	5.0±0.60 (4.0-6.0)	0.0001*
10-19	4.1±0.50 (3.0-5.0)	5.5±0.50 (5.0-6.0)	0.0001*
20-29	4.9±0.55 (4.0-6.0)	6.5±0.63 (5.0-7.0)	0.0001*
30-39	5.0±0.56 (4.0-6.0)	6.5±0.51 (6.0-7.0)	0.0001*
40-49	5.5±0.53 (5.0-6.0)	7.0±0.67 (6.0-8.0)	0.0001*
P VALUE	0.0001*	0.0001*	

* Significant differences (t-test)

Discussion:

The first report of the use of diathermy as a haemostasis in tonsillectomy came from Haase and Noguera ^[4] in 1962 who reported an incidence of secondary bleeding of 7%. This was advocated later by other reports.

The principle of diathermy is passing a high frequency electric current between two electrodes other than heat production. This destructive drying effect is known as electro coagulation. The use of bipolar forceps will localize the effect of superficial coagulum^[3], that's why grasping the bleeding vessel should be precise and lifted away from the tonsil bed, moreover, the length of time of passing the current is very essential to minimize the spread of coagulation and destructive effect.

The study emphasized on comparing the results of haemostasis time and incidence of primary and secondary haemorrhage, in addition to the severity of postoperative pain between the ligation versus the diathermy group.

The mean haemostasis time dropped from 10 minutes in the ligation to six minutes in the diathermy group, i.e. a mean time difference of 40%, in other words, a mean total time reduction of 27%; hence diathermy is obviously a fast method which is comparable with other results of 23-50% reduction of operative time ^[1, 6].

The incidence of postoperative bleeding remains the main worry of tonsillectomy bleeding. Primary haemorrhage was remarkably high (5%) in the ligation group in comparison to 0.5% in the diathermy group. Other series had equivalent results of primary haemorrhage (1-2%) in the ligation against 0.3-0.8% in the

diathermy group with increased frequency in adults than in children ^[1, 2, 6, 7, 8].

On the contrary, secondary haemorrhage was just the opposite. It was only reported in the diathermy group (5.5%) which coincides well with other research works which revealed 1.8-12% incidence ^[2, 3, 4, 7, 8, 9]. This is due to the fact that electrocoagulation causes tissue inflammation and necrosis, hence, the tonsillar bed becomes more prone to infection, moreover, its incidence is parallel to increasing age groups due to the chronicity of the infection and increased fibrosis as well as poor postoperative habits.

The intensity of postoperative pain was remarkable in the diathermy group. This could be explained due to increased number of diathermy spots and thermal injury with subsequent tissue necrosis and /or infection. This is supported by Linden et al ^[10] who found patients with diathermy required more analgesics, while Phillips et al ^[11] found no difference between ligation and diathermy.

Conclusion:

Electrocoagulation and ligation haemostasis were evaluated among 400 patients and were compared with other series. It is still debatable which technique is to be advocated. Both have their own advantages and disadvantages.

The ligation method is much safer for the junior doctors, however, ligatures are suitable for the large blood vessels because they also retract and occlude nearby small vessels, and thus the required number of ligatures is reduced. On the other hand, diathermy reduces the operating time but it needs more skill and experience, however,

it requires more spots because heat dissemination might open new bleeding vessels, yet its application to the pillar is less traumatic than the ligature which might lacerate them.

Finally, it is recommended to use the ligation technique in teaching centers due to its safety and results, though it is worth trying a combination of both methods in the same patient if needed and to have statistics in future.

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Al-Yarmouk Teaching Hospital
Dept. of Surgery/college of Medicine
Al-Mustansiriyah University