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Research Article

A COMPARATIVE STUDY OF BIPOLAR DIATHERMY AND LIGATION IN THE CONTROL OF HEMORRHAGE IN TONSILLECTOMY

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ABSTRACT
Introduction: Tonsillectomy is one of the commonest procedures performed in Otohinolaryngology. Hemorrhage still remains one of the dreaded complications of the procedure.
Materials & Methods: We report a prospective study, conducted on 75 patients who underwent tonsillectomy at our institute. Dissection tonsillectomy was performed in all cases. Ligation was used to control hemorrhage on the left tonsillar fossa while bipolar diathermy was used to arrest hemorrhage in the right tonsillar fossa. Blood loss, time spent in surgery, post operative pain were the parameters considered.
Observations & Results: 43 (57.3%) females and 32 (42.7%) males participated in the study. Majority patients were in 10-20 age group. Mean blood loss was 57.62 ml on the cautery side and 76.64 ml on the ligation side (p value < 0.0001) and was found to be statistically significant. Mean time taken was 27.73 minutes on the cautery side and 31.33 minutes on the ligation side (p value < 0.0001). Primary haemorrhage occurred in 5 (6.7%) cases on the cautery side and 2 (2.7%) cases on the ligation side. Secondary haemorrhage occurred in 2 (2.7%) on the cautery side and 1 (1.3%) on the ligation side. These were statistically insignificant. Post-operative pain was found to be less in ligation side than on the cautery side on all follow up days.
Conclusion: Bipolar diathermy was found to be a quicker method, with less intra-operative blood loss, comparable post-operative pain and statistically insignificant post-operative hemorrhage.

Keywords*: Ligation, Bipolar Diathermy, Hemostasis, Tonsillectomy, Post-Operative Pain*

INTRODUCTION
Celsus, the first person who reported excision of tonsils described the technique as “the tonsils are loosened by scraping around them and then torn out”. Subsequently, various other surgical techniques were described by Paul of Aegina (sixth century), and Physick recorded a forceps to facilitate excision of the tonsil, which later on became the forerunner of the guillotine (Young and Bennett, 2004; Feldmann, 1997) Tonsillectomy is one of the most commonly performed surgeries (more so in pediatric age) all over the world. Modern methodologies like, use of bipolar scissor dissection, bipolar radio frequency ablation, harmonic scalpel, micro-debrider-endoscopic tonsillectomy, radio frequency excision with probes, laser tonsillectomy and the like have revolutionized tonsillectomy procedure (Wiatrak and Willging, 2002). The surgical procedure, whichever used, even in the face of modern technology, hemorrhage is and always has been a significant complication during tonsillectomy and about 5 % of patients may face such a problem at any time from the first 24 hours to the day 10 post-operatively. Identification of bleeding vessels within tonsillar fossa and tying them was considered extremely difficult and was first performed on a regular basis by Cohen (1909). Diathermy to control hemorrhage was first described by Hasse & Noguera (1962), also Johnson (1962) as a suitable alternative for haemostasis (Haase *et al.*, 1962; Johnson *et al.*, 1962). The use of diathermy to attain hemostasis in tonsillectomy still remains controversial in U. K. (Murty *et al.*, 1990), 44% of U. K. Otorhinolaryngologists use diathermy where as 56% do not, due to increased postoperative hemorrhage rates and patient morbidity (Murty *et al.*, 1990).

This study was undertaken to compare the morbidities in terms of postoperative pain and hemorrhage in two different methods of hemostasis in tonsillectomy, bipolar diathermy and ligation .With unipolar diathermy, it is difficult to control depth of heat coagulation & subsequent devitalization since this will depend on the power released at the site of application and a small variation in tissue depth in the tonsillar fossa can involve adjacent vital structures resulting in variable post-operative pain.

MATERIALS AND METHODS

This was a prospective study, conducted at the Department of Otorhinolaryngology at Adichunchanagiri Institute of Medical Sciences, Mandya district. After obtaining written informed consent, data were collected from 75 patients who underwent tonsillectomy from November 2014 to May 2016.

Inclusion criteria:

- Patients of all age groups and sexes
- Patients undergoing tonsillectomy for
  - Chronic tonsillitis
  - Recurrent episodes of acute tonsillitis
  - Hypertrophic obstructive tonsils with apnea, snoring or odynophagia as symptoms

Exclusion criteria:

- Patients undergoing tonsillectomy(unilateral) for
  - Styloid process removal
  - Glossopharyngeal neurectomy
- Patients with chronic illnesses like diabetes mellitus, symptomatic heart disease, bleeding and clotting disorders, immunodeficiency and malignancy.

All patients underwent routine and special investigations. Tonsillectomy was performed by the dissection and snare method on both sides. Bipolar diathermy was used for hemostasis of bleeders on the right (bipolar) tonsillar fossa and ligation for hemostasis on the left (ligation) tonsillar fossa respectively in each patient, thus eliminating the physiological bias. Intra-operative blood loss was estimated by weighing the swabs used before and after surgery (1 gm = 1ml) and adding it to the total volume of blood collected in respective suction bottles. Intra-operative time taken was also recorded from the point of incision to the end of achieving total hemostasis. Visual analogue scale was used to assess post-operative pain. Patients were followed up on 4^{th}, 7^{th} and 10^{th} post-operative day. Occurrence of post-operative bleeding and post-operative pain were noted and recorded. Statistical analysis was done using mean, standard deviation, frequency, percentage, Chi square, ANOVA and graphs.

RESULTS

The most common age group was 10-20 years. 43(57.3%) of the study subjects were females and 32(42.7%) were males. The grading was done according to Brodsky (1989) grading scale, maximum cases (42.7%) had grade 2 tonsillar hypertrophy.

Table 1: Age-Sex Cross Tabulation

	Sex		Total
	Female	Male	
< 10 Years	6	6	12
10-20 Years	8	15	23
21-30 Years	18	2	20
30-40 Years	9	4	13
> 40 Years	2	5	7
Total	43	32	75

The blood loss on the cautery side was found to be less than 70 ml in all cases while on the ligation side, majority (89.3%) had more than 70 ml blood loss. Mean blood loss was 57.62 ml on the cautery side and 76.64 ml on the ligation side. P value was calculated to be <0.0001, thus statistically proving significance.

Table 2: Mean amount of blood loss

Mean amount of blood loss in ml	Right (cautery) side	Left (ligation) side
	57.62 (**SD**: 5.30)	76.64 (**SD**: 5.15)

The time taken for complete hemostasis on the cautery side for majority of cases (41.3%) were in the interval 26 – 30 minutes while on the ligation side, majority of the cases (61.3%) took more than 30 minutes for complete hemostasis. The mean operative time taken was 27.73 minutes on the cautery side and 31.33 minutes on the ligation side. P value was <0.0001 and hence statistically significant.

Table 3: Mean time taken

Mean time taken in minutes	Right (cautery)	Left (ligation)
	27.73 (**SD**:4.42)	31.33 (**SD**: 3.46)

Primary hemorrhage occurred in 5(6.7%) cases on the cautery side and 2(2.7%) on the ligation side. Secondary hemorrhage occurred in 2(2.7%) cases on the cautery side and 1(1.3%) cases on the ligation side. These were statistically insignificant.

Table 4: Primary hemorrhage

	Right (cautery) Side		**Left (ligation) Side**	
Primary Hemorrhage	**No. of Patients**	**Percent**	**No. of Patients**	**Percent**
Present	5	6.7	2	2.7
Absent	70	93.3	73	97.3
Total	75	100.0	75	100.0

Table 5: Secondary Hemorrhage

Secondary Hemorrhage	**Right (cautery) Side**		**Left (ligation) Side**	
	No. of Patients	**Percent**	**No. of Patients**	**Percent**
Present	2	2.7	1	1.3
Absent	73	97.3	74	98.7
Total	75	100.0	75	100.0

Pain was recorded on the 4th, 7th and 10th post-operative days. The score was found to be high on the cautery side as compared to the ligation side. P value was found to be <0.001 between both methods on all three follow up days and hence statistically significant.

Table 6: Post – operative pain scoring

Visual Analogue Scale (Mean Value)	POD 4		POD 7		POD 10	
	Cautery	Ligation	Cautery	Ligation	Cautery	Ligation
	3.79	2.2	2.84	1.9	1.6	0.95
SD	0.41	0.44	0.47	0.49	0.79	0.57

DISCUSSION

The aim of this study was to compare the parameters of tonsillectomy based on intra operative bleeding volume, time taken for hemostasis, incidence of primary and secondary hemorrhage and post-operative pain.

Time Spent on Surgery

In our study, the time spent on the cautery side averaged at 27.73 minutes. This was accordance with other studies on the same method. In the study conducted by Sharma and Kumar (2011) the time taken to control hemorrhage on the cautery side was significantly less than on the ligation side. The results obtained by Moonka (2002), shows time taken for complete hemostasis on the cautery side as 15.5 minutes. Ahmed *et al.* (2000) also determined the time taken for cautery side as 15.7 minutes from their study. The study by Adel Sahib Al (2010) established a time of 20 minutes which was taken for bipolar cautery hemostasis. The usage of bipolar cautery can thus reduce the intraoperative time and hence reduces the amount of time the patient has to be under general anesthesia.

On the ligation side, the time spent in our study averaged at 31.33 minutes. In a study conducted by Moonka (2002), the time for the ligation side averaged at 22.8 minutes. In other studies, namely the ones by Muneeb Ahmed[10] et al the time taken on the ligation side was around 26.9 minutes. The difference in the amount of time taken by the ligation side was statistically significant and it resulted in increased duration of general anesthesia for the patient.

Amount of Blood Loss

In our study, on the cautery side, the blood loss was seen to be less than 65 mL in majority of the cases reflecting the effectiveness of the bipolar cautery in controlling the hemorrhage quickly leading to lesser amount of loss. On the other hand, the ligation side, the amount of blood loss was found to be more than 70 mL in majority of the cases (89.3%). This reflected the fact that ligation needs more time to attain hemostasis and hence leads to more blood loss.

Primary Hemorrhage

In our study, primary hemorrhage occurred in 5 (6.7%) cases on the cautery side and in 2 (2.7%) cases on the ligation side. These were statistically not significant. In the study conducted by Moonka (2002), the cautery side had primary hemorrhage in 6 cases on the bipolar side and 9 cases on the ligation side. In the study conducted by Khurshid Anwar (2015), primary hemorrhage was 3.4% on the cautery side and 1.1% on the ligation side. No study could conclusively prove that occurrence of primary hemorrhage depended on either of the hemostatic techniques. Data obtained in other studies were also statistically insignificant.

Secondary Hemorrhage

In the present study, secondary hemorrhage was 2.7% on the cautery side and 1.3% on the ligation side. These were statistically insignificant to comment on the efficacy of either method in controlling hemorrhage. In the study by Moonka (2002), secondary hemorrhage occurred in 3 cases which underwent cautery for hemostasis and 2 cases which underwent ligation for hemostasis. Arif Raza Khan *et al.*,

(2007) had 8 cases of secondary hemorrhage on the cautery group and 5 cases on the ligation group. However in the study conducted by Adel Sahib Al (2010) at University of Kufa, Iraq, secondary hemorrhage appeared in 6 cases where cautery was used and in 7 cases where ligation was used as a method of hemostasis. Pinder *et al.,* (2011) analyzed two studies for Cochrane Database of Systematic Reviews came to the conclusion that there was no difference in the secondary hemorrhage overall.

Post – Operative Pain

We used a visual analogue scale for evaluating postoperative pain levels in each method. Pain was evaluated on day 4th, 7th and 10th postoperative day. The pain was found to be more on the cautery side than on the ligation side on all three days. The pain was found to progressively decrease over the time period of the follow – up. The data we obtained was consistent with data achieved by other studies. Moonka (2002) obtained similar results, in which the cautery side had more pain on the first day than the ligation side. In the study by Sharma and Kumar (2011), there wasn't any significant difference in the pain between the two sides on the 4th day, but on the 7th day the visual analogue scale was higher in the cautery side as compared to the ligation side. Pinder *et al.,* (2011) after analysis of two studies for Cochrane Database of Systemic Reviews states that the diathermy side has increased pain than the ligation side. The study conducted by ArifRaza Khan *et al.* (2007) did not find any significant difference in pain between the two methods of hemostasis.

CONCLUSION

Bipolar diathermy was found to be a quicker method, with less intra-operative blood loss, comparable post-operative pain and statistically insignificant post-operative hemorrhage. Ligation of bleeders not only takes more time resulting in more intra-operative blood loss but also leads to increase in duration of general anesthesia needed. Ligation is a necessary technique to be mastered as it does not depend on electricity or any specialized equipment and it is useful in cases where there may be profuse bleeding from a deep vessel. As bipolar diathermy has the advantage of being faster, with no comparable post-operative bleeding and with minimal intra-operative blood loss, we conclude that it is the better method for hemostasis in tonsillectomy according to our study.

REFERENCES

Ahmed M, Khan AA, Siddiqi T, Ikram M, Mian MY (2000). A Comparison of Dissection-method and Diathermy Tonsillectomies. *Journal of the Pakistan Medical Association*, **97**(7) 215-6.

Al AS Ahmed HS (2010). Haemostasis During Tonsillectomy Silk Ligation Versus Bipolar Diathermy. Med J Babylon; **7**(1) 1–7.

Anwar K, Ahmad R, Khan M (2015). Control of bleeding by silk ligation and diathermy coagulation during tonsillectomy: A comparison of efficacy of the two techniques in the first 24 hours after surgery. *Pakistan Journal of Medical Sciences* **31**(4) 961–4.

Brodsky L (1989). Modern assessment of tonsils and adenoids. *Pediatric Clinics of North America* **36**(6) 1551-69.

Feldmann H (1997). 200 year history of tonsillectomy. Images from the history of otorhinolaryngology, highlighted by instruments from the collection of the German Medical History Museum in Ingolstadt. *Laryngorhinootologie* 76(12) 751-60.

Haase FR, Noguera JT, Gross WA, Kelly JD, Niedelman ML, Silvers LJG *et al.* (1962). Hemostasis in Tonsillectomy by Electrocautery. *Archives of Otolaryngology - Head Neck Surgery* 75(2) 125–6.

Johnson F, Bokwin H, Singleton A and, Works R, McLemone CS, Griffith HR *et al.* (1962). Electrocautery in Tonsil and Adenoid Surgery. Arch Otolaryngol - Head Neck Surg; 75(2) 127–9.

Khan AR, Khan A, Ali F, Din S and Khan NS (2007). Comparison between silk ligation and bipolar cautery in tonsillectomy. *Gomal Journal of Medical Sciences* **5**(1) 13–16.

Moonka PK and Ligation Vs (2002). Bipolar diathermy for hemostasis in tonsillectomy – A comparative study. *Indian Journal of Otolaryngology Head Neck Surgery* **54**(1) 35-8.

Murty GE, Watson MG, Gardner JF, Haase FR, Noguera JT, Jackson C *et al.* (1990). Diathermy haemostasis at tonsillectomy: Current practice—A survey of U.K. otolaryngologists. *The Journal of Laryngology & Otology* **104**(7) 549–52.

Pinder DK, Wilson H, Hilton MP (2011). Dissection versus diathermy for tonsillectomy. *Cochrane Database Systematic Review* **16**(3) CD002211. doi: 10.1002/14651858.CD002211.pub2.

Sharma K and Kumar D (2011). Ligation Versus Bipolar Diathermy for Hemostasis in Tonsillectomy: A Comparative Study. *Indian Journal of Otolaryngology Head Neck Surgery* **63**(1) 15-9.

Wiatrak BJ and Willging JP (2002). Harmonic scalpel for tonsillectomy. Laryngoscope; 112 (suppl 100):14-6.

Young JR and Bennett J (2004). History of Tonsillectomy. *ENT News* **13** 34-5.