

## Comparative Study between Cold Dissection and Bipolar Diathermy Dissection Methods of Tonsillectomy

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### Abstract

A comparative study between two methods of tonsillectomy - Cold Dissection and Bipolar Diathermy Dissection was conducted in 60 patients. The parameters for comparison were duration of the surgical technique, tonsillectomy associated haemorrhage and post-operative local pain. Duration of the surgical technique was significantly lesser in the Bipolar Diathermy Dissection method than that in the Cold Dissection method. Intra-operative haemorrhage was also significantly reduced in the Bipolar Diathermy Dissection method. In the Cold Dissection method, there were three cases of reactionary haemorrhage, but there was no case of post-operative haemorrhage in the Bipolar Diathermy Dissection method. The post-operative pain levels were the same in the day of surgery, but from post-operative day one onwards, pain was more on the side operated with bipolar diathermy dissection. The side on which cold dissection was done showed quicker reduction of pain as well as lesser intensity of pain.

**Key words:** Chronic tonsillitis; tonsillectomy, cold steel dissection, bipolar diathermy dissection, tonsil hypertrophy

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### Introduction

Tonsillectomy is one of the most frequently performed surgical procedures in otorhinolaryngology. Various techniques are available for performing this surgery.

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Owing to this, an understanding of the pros and cons of each technique is important. Cold steel dissection technique is one of the oldest technique of tonsillectomy whereby the tonsil is grasped medially while incising open the anterior pillar and dissecting off the tonsil from the superior pole till its inferior pole where it is ligated. Bipolar electrocautery has become the most popular technique in the last two or three decades. It follows the same steps as in cold steel dissection except being done by means of cautery. In this prospective study, we are presenting an in-depth comparison between the two methods of tonsillectomy

in regards to blood loss, post-operative local pain and duration of operative procedures, which are the most important parameters of this surgical procedures.

#### Objectives

1. To compare the intra-operative blood loss between cold steel dissection and bipolar cautery method.
2. To compare the post-operative local pain between cold steel dissection and bipolar cautery method.
3. To compare the duration of surgery between cold steel dissection and bipolar cautery method.

#### Materials

This prospective study which was carried out in the department of Otorhinolaryngology, Regional Institute of Medical Sciences, Imphal, Manipur from March 2018 to February 2020. Prior to starting the study, necessary permission and approval from the ethics committee and authority, was taken. Informed written consents were obtained from the patients involved in the study, according to the protocol approved by the ethics committee of our institution. The study comprises of patients who are diagnosed with chronic tonsillitis and/or airway obstruction due to tonsillar hypertrophy from all age groups and either sex.

#### Inclusion Criteria

1. All age groups
2. Either sex
3. Chronic Tonsillitis
4. Airway obstruction due to tonsillar hypertrophy

#### Exclusion Criteria

1. Acute tonsillitis
2. Quinsy
3. Patients with bleeding disorders

4. Systemic medical conditions that contraindicate general anaesthesia

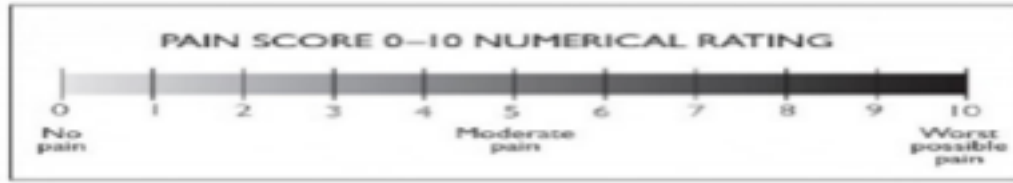
#### Method

All the patients were admitted to the ward prior to surgery for better assessment. A detailed clinical history regarding the duration, onset, frequency and any predisposing factors or co existing systemic disease was taken. Each patient was subjected to a detailed examination of ear, nose, throat and neck. Tonsillar hypertrophy was graded. Routine investigations including bleeding time, clotting time and prothrombin time done. All the procedures were performed under general anaesthesia. Cold steel dissection tonsillectomy was done on one side, either right or left, while the other tonsil was removed by bipolar cauterization method. Patients were discharged on the next day unless indicated otherwise. Intra-operative blood loss, duration of surgery, post-operative pain and any complications that occurred were recorded. Intra-operative blood loss was measured by adding the amount of blood collected in the suction bag and the number of cotton balls used in mopping the surgical field. The blood loss will be taken as 1ml if the cotton ball is fully soaked and 0.5 ml if partially soaked. Post operative pain was graded by means of FLACC scoring system<sup>1</sup> for young children upto 9 years of age. Children older than 9 years and adults were graded using the Numerical Rating Scale system. FLACC scoring system is an acronym that includes five indicators, each scored as a 0, 1 or 2 that forms a ten point composite scale with a range from 0(no pain) to 10(worst pain)

**Table 1:Score at different levels**

Score	0	1	2
Face	No expression	Occasional action	Frequent action
Legs	Normal	Restless/tense	Kicking, legs withdrawn
Activity	Quiet	Shifting/tense	Rigid, arched, jerking
Cry	None	Moan, whimper	Steady crying, screaming, sobbing or frequent complaints
Consolability	Content	Consolable	Inconsolable

In Numerical Rating Scale (NRS) scoring system, older children and teenagers are asked to rate their pain on a scale of 0(no pain) to 10(worst pain).



Regular follow-ups were done with recordings of the required parameters till slough in the tonsillar fossa was cleared.

**Results**

**Duration of surgery :** The mean duration of surgery for Cold Steel Dissection surgical technique was 21.75±6.23 min whereas that for Bipolar Cautery surgical technique was 11.75±6.76 min.

**Table 1: Comparison of operative time between the two techniques (in minutes)**

Duration (in minutes)	Surgical Technique used				Total
	Cold Steel Dissection		Bipolar Cautery		
	n	%	N	%	
<15	6	10.00	43	71.67	49
15-30	52	86.67	17	28.33	69
30-60	2	3.33	0	0.00	2
Total	60	100.00	60	100.00	120

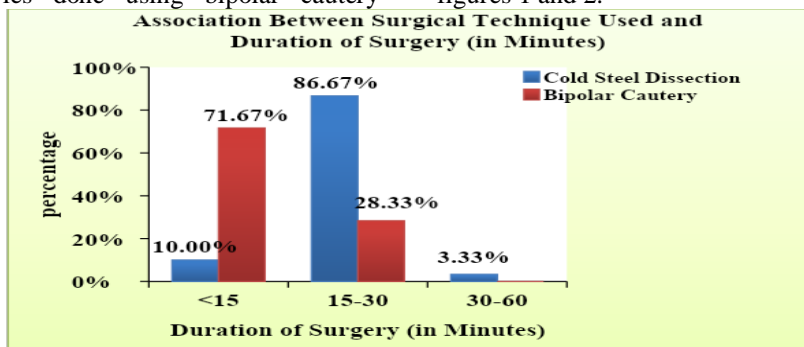
*Chi-square( $\chi^2$ ) =47.692, df=2, p <.001, Significant at 1% level of significance*

Table 1 shows the comparison between the two surgical techniques used in terms of the intra operative time (in minutes). The association was tested using Chi-square test for association between attributes.

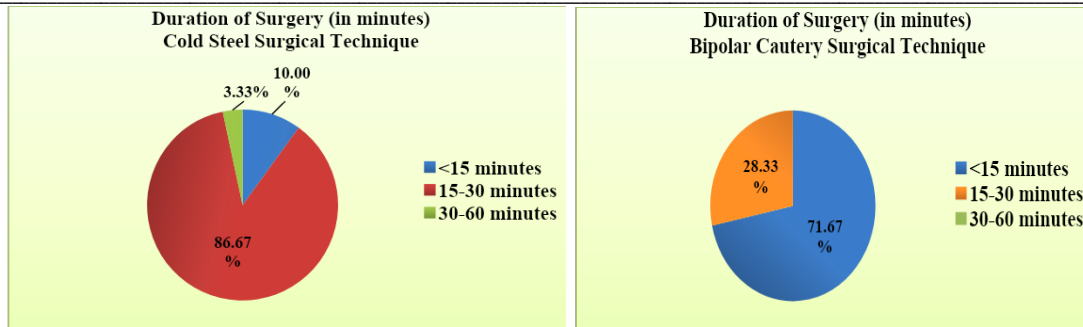
Out of 60 surgeries done using cold steel dissection surgical technique, 6 (10%) had less than 15 minutes duration, 52 (86.67%) had duration of surgery between 15 minutes and 30 minutes, and 2 (3.33%) had duration of surgery between 30 minutes to 60 minutes. Out of 60 surgeries done using bipolar cautery

technique, 43 (71.67%) had less than 15 minutes duration of surgery, 17 (28.33%) had duration of surgery between 15 minutes and 30 minutes.

The chi-square test statistic suggests that, the duration of surgery is significantly associated with the surgical technique used, i.e., significantly less in the bipolar diathermy dissection method than in the cold dissection method ( $\chi^2=47.692, p <.01$ , significant at 1% level of significance). The results were also shown in the figures 1 and 2. ‘



**Fig 1: Association between surgical technique used and duration of surgery**



**Fig 2: Association between surgical technique used and duration of surgery**

**Intra-operative blood loss :** The mean intra operative blood loss (in ml) for Cold Steel Dissection surgical technique was 16.33±3.40 ml whereas the mean intra operative blood loss for Bipolar Cautery surgical technique was 6.5±3.57 ml.

**Table 2: Comparison of intra-operative blood loss between the two techniques (in ml)**

Blood loss (in ml)	Surgical Technique used				Total
	Cold Steel Dissection		Bipolar Cautery		
	n	%	N	%	
<=10	0	0.00	51	85.00	49
10-20	52	86.67	9	15.00	69
20-30	8	13.33	0	0.00	2
Total	60	100.00	60	100.00	120

*Chi-square = 89.311, df=2, p <.001, Significant at 1% level of significance*

Table 2 shows association between the surgical technique used and the blood loss (in ml). The association was tested using Chi-square test for association between attributes.

Out of 60 surgeries done using cold steel dissection surgical technique, none (0%) had less than 10 ml blood loss, 52 (86.67%) had between 10-20 ml blood loss, and 8 (13.33%) had between 20-30 ml blood loss. Out of 60 surgeries done using bipolar Cautery technique, 51 (85.00%) had less than 10 ml blood loss,

9 (15.00%) had between 10-20 ml blood loss and none (0.00%) had more than 20 ml blood loss.

The chi-square test statistic suggests that, the quantity of blood loss (in ml) is significantly associated with the surgical technique used, i.e., significantly less in the bipolar diathermy dissection method than in the cold dissection method ( $\chi^2=89.311, p <.01$ , significant at 1% level of significance). The results were also shown in the figures 3 and 4 below.

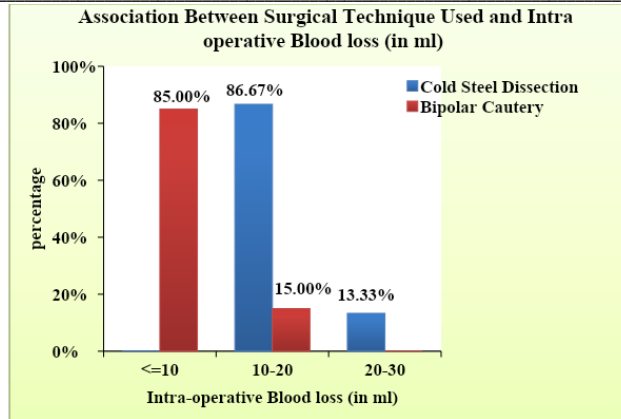


Fig 3: Comparison of intra-operative blood loss between the two techniques (in ml)

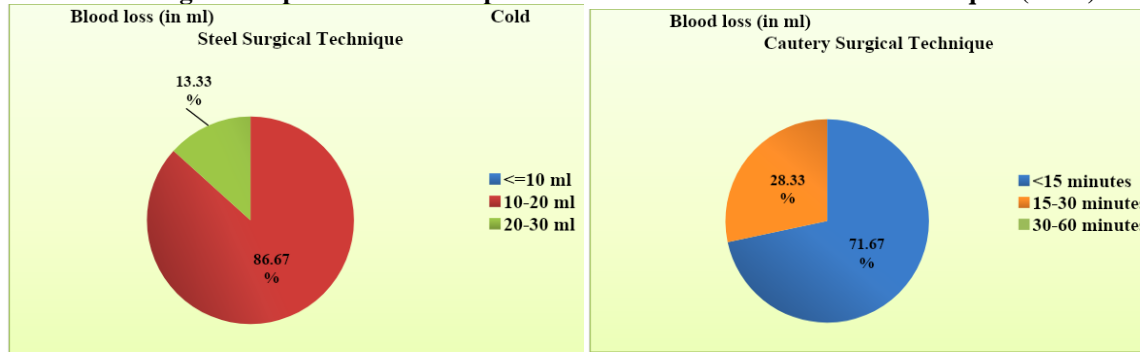


Fig 4: Comparison of intra-operative blood loss between the two techniques (in ml)

Postoperative haemorrhage :Table 3 and Figures 5 - 10 show the postoperative haemorrhage of the two techniques of tonsillectomy performed at different time intervals.

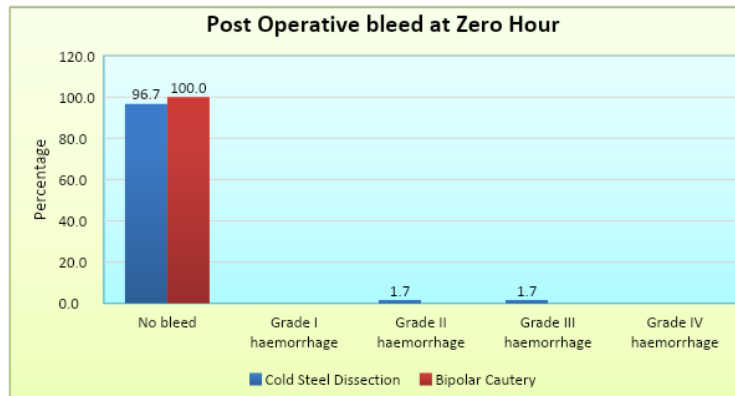
Table 3: Post Operative Haemorrhage

Post Operative Bleed	Zero Hour		Two Hours		Six Hours		Morning next day		Mid-day next day		Evening next day	
	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery
No bleeding	58 (96.67%)	60 (100%)	59 (98.33%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)	60 (100%)
Grade I haemorrhage	0 (0.00%)	0 (0.00%)	1 (1.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Grade II haemorrhage	1 (1.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

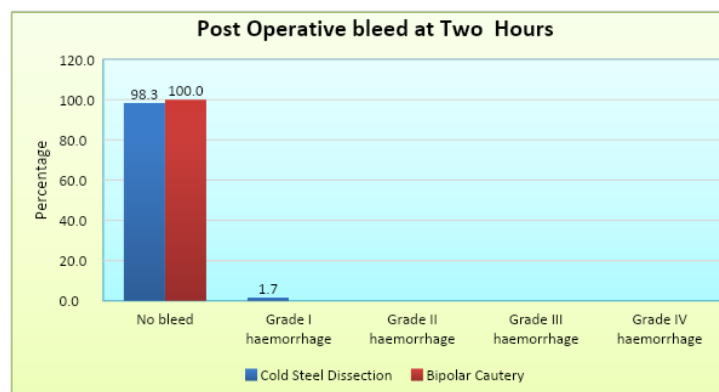
<b>Grade III haemorrhage</b>	1 (1.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<b>Grade IV haemorrhage</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<b>Total</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>	<b>60(100%)</b>

At zero hour, in cold dissection technique, 58 (96.67%) had no bleeding; 1 (1.67%) had grade II haemorrhage and 1 (1.67%) had grade III haemorrhage. Whereas in bipolar cautery technique, all 60 (100%) had no bleeding. At two hours, in cold steel dissection, 59

(98.33%) had no bleed while 1 (1.67%) had grade I haemorrhage. Whereas in bipolar cautery technique, all 60 (100%) had no bleeding. At six hours, morning next day, mid-day next day and evening next day in both groups; no patients had postoperative bleeding.



**Fig 5: Postoperative bleeding at zero hour**



**Fig 6: Postoperative bleeding at two hours**

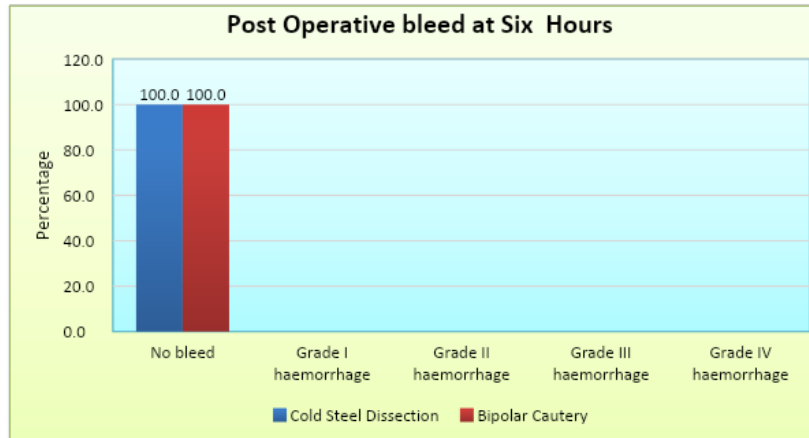


Fig 7:Postoperative bleeding at six hours

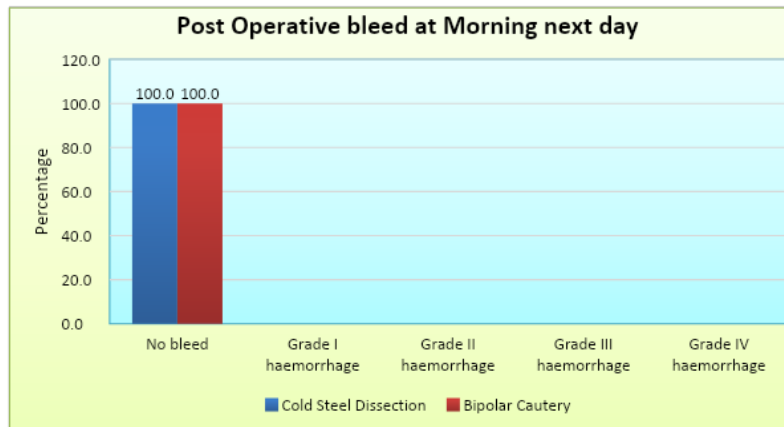


Fig 8:Postoperative bleeding at Morning next day

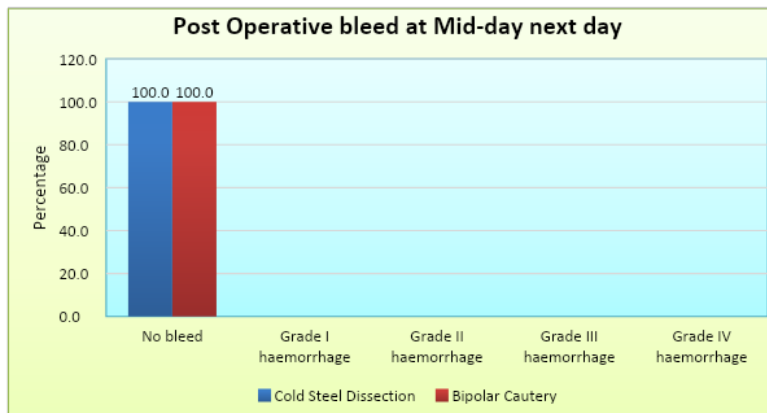


Fig 9:Postoperative bleeding at Mid-day next day

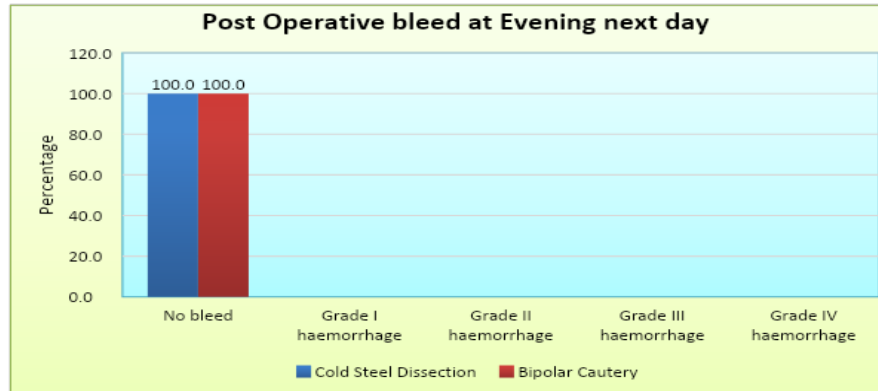


Fig 10: Postoperative bleeding at Evening next day

**Postoperative Pain :** Table 4 and figures 11 - 16 show the local postoperative pain comparison between the two techniques used.

Table 4: Post Operative Pain

Post Operative Bleed	Zero Hour		Two Hours		Six Hours		Morning next day		Mid-day next day		Evening next day	
	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery	Cold Steel Dissection	Bipolar Cautery
<b>No Pain</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<b>Mild Pain</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	54 (90.00%)	51 (85.00%)	54 (90.00%)	51 (85.00%)	60 (100.00%)	53 (88.00%)
<b>Moderate Pain</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	60 (100.00%)	60 (100.00%)	6 (10.00%)	9 (15.00%)	6 (10.00%)	9 (15.00%)	0 (0.00%)	7 (12.00%)
<b>Severe Pain</b>	60 (100.00%)	60 (100.00%)	60 (100.00%)	60 (100.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<b>Total</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>	<b>60</b> <b>(100%)</b>



At zero hour and two hours later, both techniques produced severe pain. At six hours after surgery, both groups of patients had moderate pain. At morning and mid day next day, in cold steel dissection method, out

of 60 patients; 54 (90%) had mild pain and 6 (10%) had moderate pain. Whereas in the bipolar method, 51 (85%) had mild pain and 9 (15%) had moderate pain.

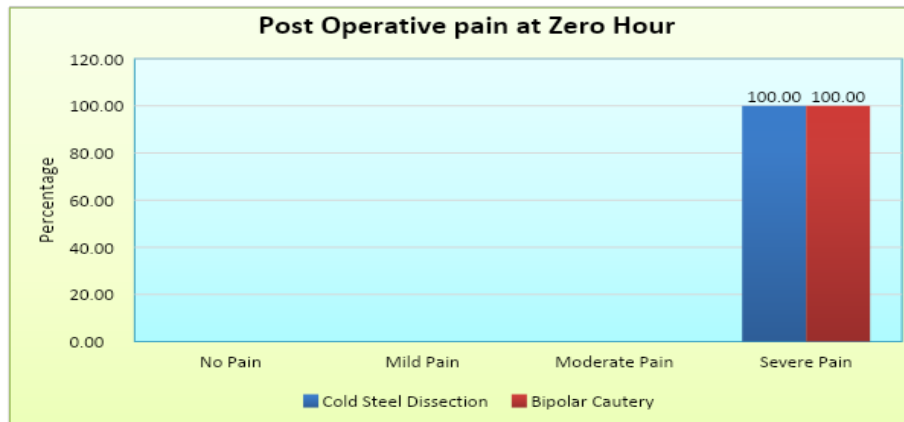


Fig 11: Postoperative pain at Zero hour

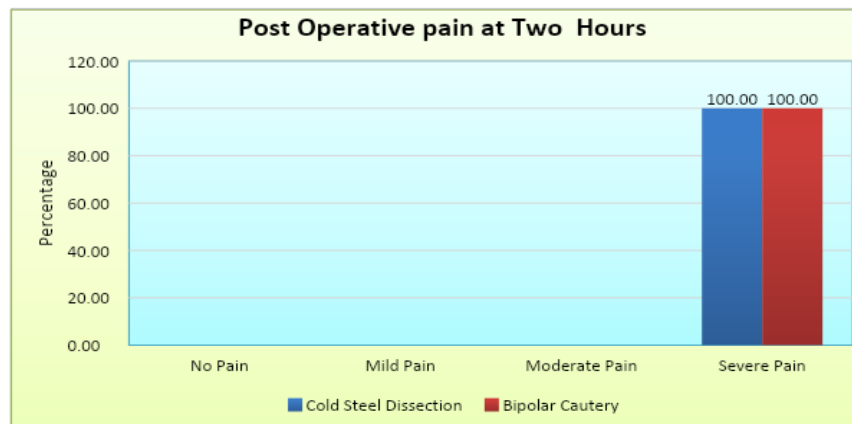


Fig 12: Postoperative pain at Two hours

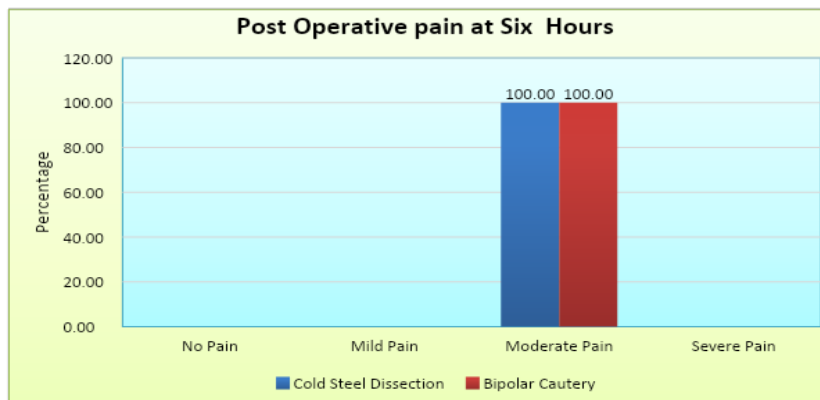
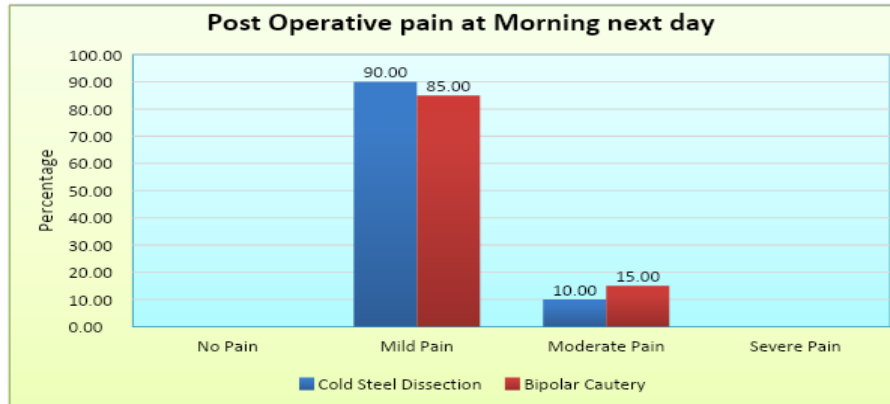
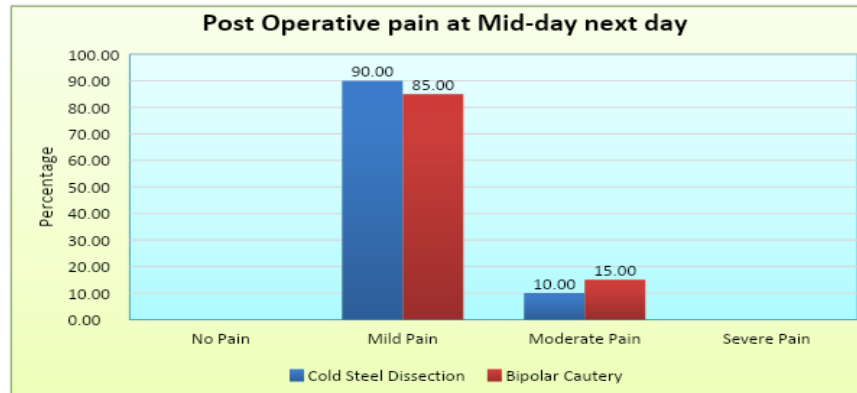


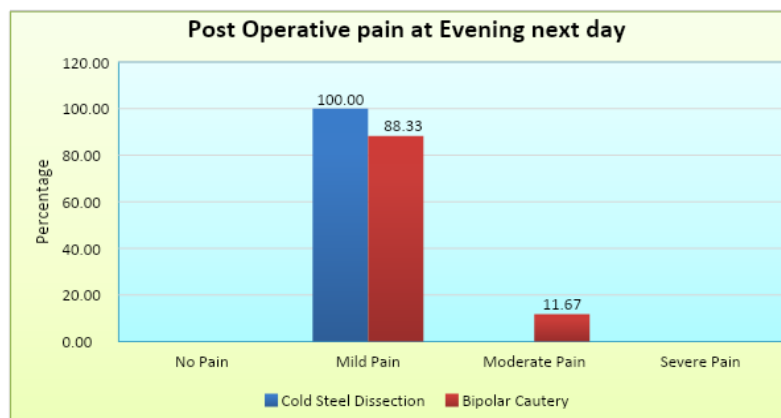
Fig 13: Postoperative pain at Six hours



**Fig 14: Postoperative pain at Morning next day**



**Fig 15: Postoperative pain at Mid-day next day**



**Fig 16: Postoperative pain at Evening next day**

**Discussion**

In the present study, we found that cold steel dissection method took longer time. During cold dissection

method, cotton balls were used to pack the tonsillar fossa to control haemorrhage and the significant bleeders were ligated which took more time. Whereas

in the bipolar diathermy dissection, the blood vessels were cauterised while dissecting the tonsil. This explains the less significant reduction in the intra-operative time in case of the diathermy dissection method. This has been collaborated by studies done by GucluKaanBeriati et al[2], K LShivkumar et al[2]. Pang YT et al[4] showed a significantly shorter operating time for the diathermy method with an average duration of 11.2 minutes. Raut V et al[5] found that bipolar cautery dissection tonsillectomy took an average of 13 minutes while cold steel dissection tonsillectomy lasted an average of 20 minutes. P K Moonka[6] in its review of numerous tonsillectomy studies found that the bipolar diathermy technique took a shorter duration with an average duration of 15.5 minutes while cold steel dissection technique took 28.8 minutes on an average. In our study, the intra-operative blood loss was found to be more in cold steel dissection with an average of 10 – 20 ml blood loss. Whereas the bipolar cautery method had very minimal blood loss with 85% losing less than 10ml. This could be due to the cauterisation of the blood vessels while dissecting by the bipolar diathermy technique while the blood vessels were cut during the dissection method. A study done by Desmond A. Nunez et al[7] found that hot dissection tonsillectomy halved the amount of blood loss. Pang YT et al[4]. And Mac Gregor FB et al8 both demonstrated reduced blood loss with hot dissection tonsillectomy in their respective studies. H L Tay et al9 showed no difference in intra-operative blood loss between electrodissection and blunt dissection done on either side of the same patients. Raut V et al[5] showed 5 ml blood loss on an average for bipolar diathermy method while cold steel dissection technique had an average of 115 ml. Mohammad Reza Mofatteh et al[10] and GucluKaanBeriati et al[2] found that intra-operative blood loss was significantly lower in the bipolar method. Post-operative haemorrhage was classified into five grades.

#### **Grade Treatment employed**

- I No manipulation required (spontaneous cessation)
- II Required manipulation under infiltration anaesthesia
- III Treatment under general anaesthesia
- IV Ligation of external carotid artery
- V Lethal outcome

In our study, there was no post-operative haemorrhage seen in bipolar cautery method. Whereas three episodes of reactionary haemorrhage were seen in the cold steel dissection method, one of which required taking the patient back into the operating room and re-

ligating the vessels. All the three cases of reactionary haemorrhage were due to slippage of ligature. K LShivkumar et al[3] concluded that both techniques had the same reactionary haemorrhage incidence of 4%. Muhammad Ahmed Khan et al11, P K Moonka6, Pang Y T4, Raut V5 found no significant difference in the incidence of post-operative haemorrhage between the two techniques.

Post-operative pain was graded by means of FLACC scoring system for young children upto 9 years of age. Children older than 9 years and adults were graded using the Numerical Rating Scale system. In our study, although the post-operative pain levels were the same in the day of surgery, by the next day, there was a perceptible difference between the two sides. And this difference only got more pronounced as the days went by. This could be due to more local inflammation caused by the cautery than that caused by the cold dissection method. The side on which cold dissection was done showed quicker reduction of pain as lesser intensity of pain. Muhammad Ahmed Khan et al[11], GucluKaanBeriati et al[2], P K Moonka[6], Mohammed Reza Mofatteh et al[10], Desmond A Nunez et al[7], Mac Gregor et al8 found that post-operative pain was more with bipolar diathermy method. Pang Y T et al[4] found no difference in the intensity and duration of post-operative pain between these two techniques.

K L Shivkumar et al[3] found that post-operative pain was significantly less in the case of hot dissection technique. Although Abdullah R Y Alkhalil et al[12] found no difference in the pain levels between the two techniques on the day of the surgery and the day after surgery, bipolar diathermy showed significantly increased pain levels from the second day after surgery onwards. H L Tay et al[9] found that electrodissection technique showed less pharyngeal pain on the day after surgery which increased in intensity by the end of the first week. Gendyet al[12], Silveria et al[13], Chettri et al[14], Adoga et al[15], Bukhari et al[16] reported higher pain intensity scores with bipolar electrocautery dissection technique. Ali et al[17] in his study found the initial post operative pain between the two techniques to be statistically the same but later on at 7<sup>th</sup> and 14<sup>th</sup> post operative days, the severity of pain was higher in patients who underwent bipolar electrocautery tonsillectomy.

#### **Conclusion**

Three parameters - duration of the surgical technique, tonsillectomy associated haemorrhage and post-operative local pain were compared between two surgical methods of tonsillectomy. Both the duration

of the surgical technique and the intra-operative haemorrhage were significantly lesser in the bipolar diathermy dissection method than that in the cold dissection method. Post-operative haemorrhage risk was higher in the cold dissection method. However it was not found to be significant. Although the post-operative pain levels were the same in the day of surgery, by the next day, there was a perceptible difference between the two sides. The side on which cold dissection was done showed quicker reduction of pain as well as lesser intensity of pain. In regards to the intra-operative time and haemorrhage, bipolar diathermy technique was found to be better than the cold dissection method. However, postoperative pain was more in the former method.

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