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Original Article

Comparison of Bipolar Diathermy with Thunder-beat Device in Surgical Outcome of Tonsillectomy

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Abstract

Background:. To compare the thunder-beat device with bipolar diathermy in surgical outcome of tonsillectomy.

Methods: In this prospective study 75 patients who underwent tonsillectomy on one side using thunder beat device and on the other side using bipolar diathermy, were included . The intra-operative blood loss, operative time, post-operative pain and post-operative haemorrhage were taken for analysis in both the surgical procedures.

Results: Among the seventy five patients, the age groups ranged from 19-36 years with mean age 25.36+/-5.54 years. Out of 75 patients, 21 were male and 54 were female.The comparison of operation time and intra-operative blood loss between thunder- beat and bipolar diathermy showed statistically significant differences. The comparison of pain score showed statistically significant result with better pain results in bipolar diathermy whereas the secondary haemorrhage was common in thunder beat device.

Conclusion: The thunder-beat use in tonsillectomies is less time consuming with decreased intra-operative blood loss. But, the post-operative pain is more as compared to bipolar diathermy. Though, it is safe and effective in performing tonsillectomy but its cost is the main drawback for its regular use.

Key words: Bipolar diathermy, Cold dissection, Harmonic scalpel, Thunder-beat, Tonsillectomy.

Introduction

Tonsillectomy is the most common surgical procedure performed by otorhinolaryngologists for the different indications like chronic tonsillitis, recurrent tonsillitis, obstruction of the airway, suspected malignancy or as an approach to other surgery.[1] Tonsillectomy is still performed by conventional cold surgical dissection. But, nowadays, bipolar electrocautry is commonly used because it is easy to perform, and helps good control of bleeding.[1,2]

The new instruments like harmonic scalpel, light amplification by stimulated emission of radiation (LASER), coblation device has also been used to perform tonsillectomy. The main purpose of these instruments is to reduce surgical time, bleeding and pain. However, there is not any such instrument causing total reduction of bleeding and pain.[3,4] Certainly, otolaryngologists would want to investigate the feasibility of any new instrumentation that would decrease the morbidity of tonsillectomy, even if it were relatively expensive.[5]

There are different studies in literature comparing bipolar diathermy with either harmonic scalpel or cold dissection[6,7] The thunder- beat compared with bipolar dithermy had been studied by the same author but with small sample size.[8]

Thunder-beat is the integration of ultrasonic and advanced bipolar energies delivered through a single multifunctional instrument, causing simultaneously seal and cut vessels up to 7 mm in size with minimal thermal spread. The patented jaw design provides precise, controlled dissection and always available bipolar coagulation without sacrificing grasping ability.[9]

Patients and Methods

This was a prospective, longitudinal and comparative study performed in the department of Otorhinolaryngology of Kathmandu University Hospital, Dhulikel from April 2017 to April 2018. Seventy five patients age >/= 18 years, both gender with chronic tonsillitis, recurrent tonsillitis, obstructive sleep apnoea syndrome, second attack of quinsy, suspected malignancy of tonsil were included. The patients with bleeding disorders, haemoglobin level<10gm%, any chronic illness affecting recovery were excluded. Patients underwent tonsillectomy on one side using thunder-beat device and on the other side using bipolar diathermy. For the determination of site during tonsillectomy, the lottery system was used just prior to surgery as B for bipolar and T for Thunder beat. If B came 1st then we used bipolar on right side whereas if T came first then we used thunder-beat on

right side (Figure 1). For the assessment of blood loss, the fully soaked gauge piece weighing 1gram was taken as 5cc of blood loss. During intra-operative period, the operation time was noted in both procedures from incision up to delivery of tonsils. Blood loss was measured with counting and weighing the gauge pieces in both procedures. In post-operative period, the degree of pain was measured on both sides on rest and during swallowing using visual analogue scale (VAS) at 4 hours, 8 hours, 12 hours, 24hours, 2nd day, 3rd day, 4th day, 5th day, 6th day and 7th day after surgery. For the analysis of continuous variables like post-operative pain (0 -10 score), operative time (in minutes) and intra-operative bleeding (in milliliter), student "t" test was used and p value of </=0.05 was taken as statistically significant. For the study of post-operative complications, frequency and percentage was used.

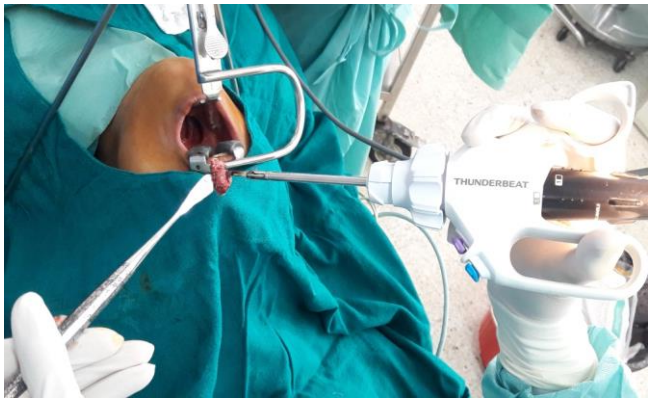

Figure 1: Small jaw thunderbeat forceps performing tonsillectomy.

Results

Age groups ranged from 19-36 years with mean age 25.36+/-5.54 years . Out of 75 patients, 21 were male and 54 were female. The comparison of operation time and intra-operative blood loss between bipolar diathermy and thunder-beat showed statistically significant differences (Table 1). The comparison of pain score between bipolar diathermy and thunder-beat at rest showed statistically significant result at 24 hours and beyond (Table 2). The comparison of pain score between bipolar diathermy and thunder-beat on swallowing showed statistically significant result with less pain score in bipolar diathermy (Table 3). Regarding the post-operative complications, the reactionary haemorrhage is common in bipolar diathermy whereas the secondary haemorrhage is common in thunder beat device(Table 4).

Table 1. Comparison of operation time and intra-operative blood loss

Operation time and blood loss comparison between bipolar and thunderbeat (n=75)				
	Mean	N	Std. Deviation	P value
Operation Time Bipolar Diathermy (minutes)	12.12	75	5.41978	.000
Operation time Thunder-beat (minutes)	6.08	75	3.70084	
Blood Loss (milliliter) intra-operative Bipolar Diathermy	13.44	75	23.88980	.000
Blood loss (milliliter) intra-operative Thunderbeat	2.56	75	5.01541	

Table 2. Comparison of pain score between thunder-beat and bipolar diathermy at rest

	Mean	SD	P value
Pain Score at 4 hours Bipolar Diathermy at rest	5.2400	2.59854	.237
Pain Score at 4 hours Thunderbeat at rest	5.4000	2.44949	
Pain Score at 8 hours Bipolar Diathermy at rest	4.6400	2.51289	.066
Pain Score at 8 hours Thunderbeat at rest	4.8800	2.45478	
Pain Score at 12 hours Bipolar Diathermy at rest	3.9200	2.16708	.189
Pain Score at 12 hours Thunder-beat at rest	4.1600	2.44419	
Pain Score at 24 hours Bipolar Diathermy at rest	3.2800	2.15958	.006
Pain Score at 24 hours Thunder-beat at rest	3.7200	2.25149	
Pain Score at day 2 Bipolar Diathermy at rest	2.2400	1.76176	.001
Pain Score at day 2 Thunder-beat at rest	2.8400	1.72454	
Pain Score at day 3 Bipolar Diathermy at rest	1.7600	1.97853	.000
Pain Score at day 3 Thunder-beat at rest	2.7200	1.87847	
Pain Score at day 4 Bipolar Diathermy at rest	1.6400	1.86461	.000
Pain Score at day 4 Thunderbeat at rest	2.4800	1.82594	
Pain Score at day 5 Bipolar Diathermy at rest	1.0800	1.27088	.000
Pain Score at day 5 Thunderbeat at rest	1.7600	1.45973	
Pain Score at day 6 Bipolar Diathermy at rest	.5200	.75980	.000
Pain Score at day 6 Thunderbeat at rest	.9600	.96479	
Pain Score at day 7 Bipolar Diathermy at rest	.2000	.56949	.008
Pain Score at day7 Thunderbeat at rest	.4000	.49320	

Table 3. Comparison of pain score between thunderbeat and bipolar diathermy on swallowing

	Mean	SD	P value
Pain Score at 4 hours Bipolar Diathermy on swallowing	6.3200	2.68207	.000
Pain Score at 4 hours Thunderbeat on swallowing	6.8000	2.48237	
Pain Score at 8 hours Bipolar Diathermy on swallowing	5.9200	2.63941	.029
Pain Score at 8 hours Thunderbeat on swallowing	6.3200	2.42821	
Pain Score at 12 hours Bipolar Diathermy on swallowing	4.8800	2.40473	.002
Pain Score at 12 hours Thunderbeat on swallowing	5.5200	2.56462	
Pain Score at 24 hours Bipolar Diathermy on swallowing	4.1200	2.30135	.003
Pain Score at 24 hours Thunderbeat on swallowing	4.8000	2.51482	
Pain Score at day 2 Bipolar Diathermy on swallowing	3.3200	2.21884	.000
Pain Score at day 2 Thunderbeat on swallowing	4.1600	1.94547	
Pain Score at day 3 Bipolar Diathermy on swallowing	3.0000	2.74600	.000
Pain Score at day 3 Thunderbeat on swallowing	3.9200	2.14829	
Pain Score at day 4 Bipolar Diathermy on swallowing	2.4400	2.17007	.000
Pain Score at day4 Thunderbeat on swallowing	3.3600	2.09013	
Pain Score at day 5 Bipolar Diathermy on swallowing	1.4800	1.63872	.006
Pain Score at day5 Thunderbeat on swallowing	2.0800	1.65839	
Pain Score at day 6 Bipolar Diathermy on swallowing	.8400	1.05318	.000
Pain Score at day6 Thunderbeat on swallowing	1.6000	1.33558	
Pain Score at day 7 Bipolar Diathermy on swallowing	.4000	.63671	.000
Pain Score at day7 Thunderbeat on swallowing	.7600	.76829	

Table 4. showing comparison of post-operative complications

Complications post tonsillectomy (n=75)	Reactionary haemorrhage	Secondary haemorrhage
Bipolar Diathermy	2 (2.67%)	2 (2.67%)
Thunderbeat	0	7 (9.33%)

Discussion

The thunder-beat is the device which is mainly used in the laparoscopic surgeries but the small jaw forceps can be used in the tonsillectomy.[8] This device has both features of ultrasonic as well as bipolar effect.[8] In our study, we have compared thunder-beat with bipolar diathermy in surgical outcomes like intra-operative time, per-operative bleeding, post-operative pain and post-operative haemorrhage. Bipolar diathermy is now commonly used technique as it simultaneously cut and coagulate the tissues causing relatively quick and bloodless dissection and works by heating from 150 and 400 degree centigrade.[10]

In case of thunder-beat device, the integration of ultrasonic and advanced bipolar energies are delivered through a single multifunctional instrument, causing simultaneously seal and cut vessels up to 7 mm in size with minimal thermal spread. The patented jaw design provides precise, controlled dissection and always available bipolar coagulation without sacrificing grasping ability. It leads to less thermal and secondary tissue injury, and, consequently, less post-operative pain and faster healing.[9]

In our study we did the tonsillectomy on one side by thunder-beat and other side by bipolar diathermy. By this, every patient served as his own control and thus reduced the confounding variable as individual perception pain has wide range of confounding variables like age, sex, race, anxiety and individual tolerance to pain.[11] The intra-operative time and blood loss is significantly less in thunder-beat as compared to bipolar diathermy. [8] Studies registered less intra-operative time and less blood loss in ultrasonic scalpel method.[12-16]

The comparison of post-operative pain score between thunder-beat and bipolar diathermy on swallowing showed statistically significant decrease at 4 hours and beyond in bipolar diathermy as compared to thunder-beat.The reason behind this result could be with bipolar diathermy, area of tissue coagulation is localized between the fine tips of diathermy forceps causing less tissue damage in a more controlled and precise fashion resulting in less variable post-operative pain and slow healing of tissues after the both ultrasonic and bipolar diathermy effect leads more post-operative pain in thunder-beat.[17] Secondary haemorrhage is common in thunder-beat as compared to bipolar diathermy. It can be attributed to slow tissue healing in thunder-beat leading chance of secondary infection. Though it is safe and efficacious technique but its cost and complications is the major barrier in performing tonsillectomy.

Conclusion

1.The thunder-beat device is modern and innovative device in performing general laparoscopic surgeries. Its use in tonsillectomies is also less time consuming and has less intra-operative blood loss.

2.Post-operative pain and secondary haemorrhage is more in thunder-beat, as compared to bipolar

diathermy. It is safe and effective in performing tonsillectomy but its cost and complications is the main drawback for its regular use.

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