

## Original Research Article

# Thunderbeat versus bipolar diathermy in surgical outcome of tonsillectomy

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**Received:** 14 December 2017

**Accepted:** 09 January 2018

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### ABSTRACT

**Background:** Tonsillectomy is one of the most common surgical procedures performed worldwide by otorhinolaryngologists for the different indications. There are different studies in literature comparing bipolar diathermy with either harmonic scalpel or cold dissection but the thunderbeat is still not used in tonsillectomy. The thunderbeat device which is the integration of ultrasonic and advanced bipolar energies used exclusively in laparoscopic surgery but still not used in tonsillectomy. So, the main aim of this study is to compare the thunderbeat device with bipolar diathermy in surgical outcome of tonsillectomy.

**Methods:** This was the prospective study performed in total 25 patients. The patients included in the study underwent tonsillectomy on one side using thunderbeat device and on the other side using bipolar diathermy. The intra-operative blood loss, operative time and post-operative pain were taken for analysis in both the surgical procedures. All the data were analyzed with the statistical package for the social sciences (SPSS) software version 20.

**Results:** Among the twenty five patients, the age groups range from 19-36 years with mean age  $25.36 \pm 5.62$  years. Out of 25 patients, 7 were male and 18 were female. The comparison of operation time and intra-operative blood loss between thunderbeat and bipolar diathermy showed statistically significant differences. The comparison of pain score showed statistically significant result with better pain results in bipolar diathermy.

**Conclusions:** The thunderbeat uses in tonsillectomies is less time consuming and decrease 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.

**Keywords:** Bipolar diathermy, Cold dissection, Harmonic scalpel, Thunderbeat, Tonsillectomy

### INTRODUCTION

Tonsillectomy is one of the most common surgical procedures performed worldwide by otorhinolaryngologists for the different indications like recurrent tonsillitis, obstruction of the airway, suspected malignancy or as an approach to other surgery.<sup>1</sup> Until the late 1960s and also till now, tonsillectomy is still performed by cold surgical dissection. But, nowadays, bipolar electrocautry is one of the most commonest procedure as it is easy to perform, and helps good control

of bleeding.<sup>1,2</sup> Apart from that, the new instruments like harmonic scalpel, light amplification by stimulated emission of radiation (LASER) has also been used to perform tonsillectomy. The main aim of the tonsillectomy with these instruments is to reduce bleeding and pain. However, there is not any such instrument causing total reduction of bleeding and pain.<sup>3,4</sup> 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.<sup>5</sup>

There are different studies in literature comparing bipolar diathermy with either harmonic scalpel or cold dissection but the thunderbeat is still not used in tonsillectomy and also there is not any study comparing thunderbeat with bipolar diathermy in tonsillectomy.<sup>6,7</sup>

Regarding thunderbeat, it 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. This instrument is made by Olympus Company (Japan).<sup>8</sup>

The thunderbeat is used exclusively in laparoscopic surgery but still not used in tonsillectomy. We do not have any literature till now. So, we are doing this study to know the efficacy of the device in tonsillectomy.

## METHODS

This was the prospective and comparative study performed in the department of Otorhinolaryngology of Kathmandu University Hospital, Dhulikel from 1<sup>st</sup> August 2017 to 1<sup>st</sup> December 2017. The study was approved by the institutional review board of Kathmandu University Hospital, Kavre.

There were total 25 patients enrolled in the study. All the patients age  $\geq 18$  years, both gender with recurrent tonsillitis, obstructive sleep apnoea syndrome, second attack of quinsy, suspected malignancy of tonsil were included in the study. The patients with bleeding disorders, hemoglobin level  $< 10$  gm%, any chronic illness affecting recovery were excluded. The informed consent was taken from the patients prior surgery.

The patients included in the study underwent tonsillectomy on one side using thunderbeat 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 thunderbeat. If B came 1<sup>st</sup> then we used bipolar on right side whereas if T came first then we used thunderbeat on right side.

For the assessment of blood loss, the fully soaked gauge piece weighing 1gram was taken as 5 cc of blood loss. All cases were performed by a single surgeon to avoid the bias.

During intra-operative period, the operation time was noted in both procedures from incision up to delivery of tonsils. Likewise, 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, 48 hours, 72 hours, 4<sup>th</sup> day, 5<sup>th</sup> day, 6<sup>th</sup> day and 7<sup>th</sup> day after surgery.

All the patients were discharged on same antibiotics, analgesics and provided with standard instructions of diet.

All the data were collected and entered in the statistical package for the social sciences (SPSS) software version 20. 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  $\leq 0.05$  was taken as statistically significant.

## RESULTS

Among the twenty five patients, the age groups range from 19-36 years with mean age  $25.36 \pm 5.62$  years. Out of 25 patients, 7 were male and 18 were female.

The comparison of operation time and intra-operative blood loss between thunderbeat and bipolar diathermy showed statistically significant differences (Table 1).

The comparison of pain score between thunderbeat and bipolar diathermy at rest showed statistically significant result at 72 hours, day 4, day 5 and day 6 (Table 2).

The comparison of pain score between thunderbeat and bipolar diathermy on swallowing showed statistically significant result at 4 hours, 48 hours, 72 hours, on day 4, day 6 and day 7 (Table 3).

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

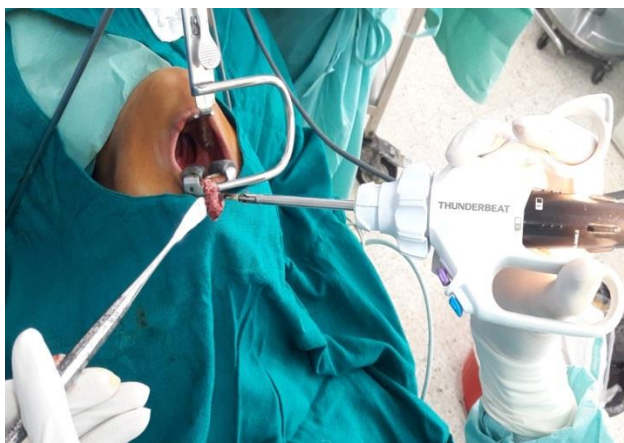
Paired samples statistics					
	Mean	N	Std. deviation	Std. error mean	P value
Operation time (minute) thunderbeat	8.0800	25	3.75189	0.75038	0.000
Operation time (minute) bipolar diathermy	14.2400	25	5.49454	1.09891	
Blood loss (milliliter) intra-operative thunderbeat	3.4160	25	5.08459	1.01692	0.032
Blood loss (milliliter) intra-operative bipolar diathermy	12.2640	25	24.21933	4.84387	

**Table 2: Comparison of pain score between thunderbeat and bipolar diathermy at rest.**

Paired samples statistics					
	Mean	N	Std. deviation	Std. error mean	P value
Pain score at 4 hours thunderbeat at rest	5.4000	25	2.48328	0.49666	0.504
Pain score at 4 hours bipolar diathermy at rest	5.2400	25	2.63439	0.52688	
Pain score at 8 hours thunderbeat at rest	4.8800	25	2.48864	0.49773	0.298
Pain score at 8 hours bipolar diathermy at rest	4.6400	25	2.54755	0.50951	
Pain score at 12 hours thunderbeat at rest	4.1600	25	2.47790	0.49558	0.457
Pain score at 12 hours bipolar diathermy at rest	3.9200	25	2.19697	0.43939	
Pain score at 24 hours thunderbeat at rest	3.7200	25	2.28254	0.45651	0.118
Pain score at 24 hours bipolar diathermy at rest	3.2800	25	2.18937	0.43787	
Pain score at 48 hours thunderbeat at rest	2.8400	25	1.74833	0.34967	0.053
Pain score at 48 hours bipolar diathermy at rest	2.2400	25	1.78606	0.35721	
Pain score at 72 hours thunderbeat at rest	2.7200	25	1.90438	0.38088	0.019
Pain score at 72 hours bipolar diathermy at rest	1.7600	25	2.00582	0.40116	
Pain score on day 4 thunderbeat at rest	2.4800	25	1.85113	0.37023	0.032
Pain score on day 4 bipolar diathermy at rest	1.6400	25	1.89033	0.37807	
Pain score on day 5 thunderbeat at rest	1.7600	25	1.47986	0.29597	0.021
Pain score on day 5 bipolar diathermy at rest	1.0800	25	1.28841	0.25768	
Pain score on day 6 thunderbeat at rest	0.9600	25	0.97809	0.19562	0.046
Pain score on day 6 bipolar diathermy at rest	0.5200	25	0.77028	0.15406	
Pain score on day 7 thunderbeat at rest	0.4000	25	0.50000	0.10000	0.134
Pain score on day 7 bipolar diathermy at rest	0.2000	25	0.57735	0.11547	

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

Paired samples statistics					
	Mean	N	Std. deviation	Std. error mean	P value
Pain score at 4 hours thunderbeat on swallowing	6.8000	25	2.51661	0.50332	0.031
Pain score at 4 hours bipolar diathermy on swallowing	6.3200	25	2.71907	0.54381	
Pain score at 8 hours thunderbeat on swallowing	6.3200	25	2.46171	0.49234	0.218
Pain score at 8 hours bipolar diathermy on swallowing	5.9200	25	2.67582	0.53516	
Pain score at 12 hours thunderbeat on swallowing	5.5200	25	2.60000	0.52000	0.073
Pain score at 12 hours bipolar diathermy on swallowing	4.8800	25	2.43790	0.48758	
Pain score at 24 hours thunderbeat on swallowing	4.8000	25	2.54951	0.50990	0.094
Pain score at 24 hours bipolar diathermy on swallowing	4.1200	25	2.33310	0.46662	
Pain score at 48 hours thunderbeat on swallowing	4.1600	25	1.97231	0.39446	0.044
Pain score at 48 hours bipolar diathermy on swallowing	3.3200	25	2.24944	0.44989	
Pain score at 72 hours thunderbeat on swallowing	3.9200	25	2.17792	0.43558	0.034
Pain score at 72 hours bipolar diathermy on swallowing	3.0000	25	2.78388	0.55678	
Pain score at day4 thunderbeat on swallowing	3.3600	25	2.11896	0.42379	0.024
Pain score at day 4 bipolar diathermy on swallowing	2.4400	25	2.20000	0.44000	
Pain score at day5 thunderbeat on swallowing	2.0800	25	1.68127	0.33625	0.118
Pain score at day 5 bipolar diathermy on swallowing	1.4800	25	1.66132	0.33226	
Pain score at day6 thunderbeat on swallowing	1.6000	25	1.35401	0.27080	0.015
Pain score at day 6 bipolar diathermy on swallowing	0.8400	25	1.06771	0.21354	
Pain score at day7 thunderbeat on swallowing	0.7600	25	0.77889	0.15578	0.047
Pain score at day 7 bipolar diathermy on swallowing	0.4000	25	0.64550	0.12910	



**Figure 1: Showing the tonsillectomy with thunderbeat.**

## DISCUSSION

The thunder beat is the new technique for doing the tonsillectomy as it has both features of ultrasonic as well as bipolar effect. Since this is the relatively new technique, so there is not any literature so far mentioning the effect of thunderbeat in tonsillectomy outcome.

In our study, we have compared thunderbeat with bipolar diathermy in surgical outcomes like intra-operative time, per-operative bleeding and post-operative pain. The reason behind is bipolar diathermy is now commonly used for performing the tonsillectomy, it simultaneously cut and coagulate the tissues causing relatively quick and bloodless dissection. It also works by heating from 150 and 400 degree centigrade.<sup>9</sup> In case of thunderbeat 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. So under this guidance, we thought that it will lead to less thermal and secondary tissue injury, and, consequently, less post-operative pain and faster healing.<sup>8</sup>

In our study we did the tonsillectomy on one side by thunderbeat and other side by bipolar diathermy. By this, every patient serve as his own control and thus reduce the confounding variable as individual perception pain has wide range of confounding variables like age, sex, race, anxiety and individual tolerance to pain.<sup>10</sup>

The intra-operative time and blood loss is significantly less in thunderbeat as compared to bipolar diathermy. Since there is no literature comparing above procedure, however, the ultrasonic scalpel study with bipolar diathermy in different literature also mentioned less intra-operative time and less blood loss in ultrasonic scalpel method.<sup>11-15</sup>

Regarding the pain score, our study showed that the post-operative pain score at rest is significantly less on day 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> post-operatively in bipolar diathermy as compared to thunderbeat. Similarly, the comparison of post-operative pain score between thunderbeat and bipolar diathermy on swallowing showed statistically significant decrease at 4 hours, 48 hours, 72 hours, on day 4<sup>th</sup>, day 6<sup>th</sup> and day 7<sup>th</sup> in bipolar diathermy as compared to thunderbeat.

The reason behind this result could be small sample size and slow healing of tissues after the both ultrasonic and bipolar diathermy effect rather than only bipolar.<sup>16</sup>

So, the main advantage of this thunderbeat device is in less per-operative time and less intra-operative blood loss because of good homeostasis whereas there are also disadvantages like, expensive device, no advantages over bipolar diathermy in post-operative pain. Thus, though it is safe and efficacious technique but its cost is the major barrier in performing tonsillectomy.

## CONCLUSION

Though, the thunderbeat is modern and innovative device in performing general laparoscopic surgeries, its use in tonsillectomies is less time consuming and decrease intra-operative blood loss. But, the post-operative pain is more as compared to bipolar diathermy. So, it is safe and effective in performing tonsillectomy but its cost is the main drawback for its regular use.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

## REFERENCES

1. Scott A. Hot techniques for tonsillectomy. *Issues Emerg health Technol.* 2006;93:1-6.
2. Tariq M, Khan AM. Assessment of secondary haemorrhage following tonsillectomy. *Ann King Edward Med Coll.* 2004;10:391-3.
3. Ishlah LW, Fahmi AM, Srinovianti N. Laser versus dissection technique of tonsillectomy. *Med J Malaysia* 2005;60:76-80.
4. Parsons SP, Cordes SR, Comer B. Comparison of posttonsillectomy pain using the ultrasonic scalpel, coblator, and electrocautery. *Otolaryngol Head Neck Surg.* 2006;134:106-13.
5. Ahmad MM, Bassiouny A. Harmonic Scalpel Tonsillectomy Versus Bipolar Electrocautery and Cold Dissection. *Med J Cairo Univ.* 2009;77(3):141-5.
6. Kurzniski M, Szalaniec J, Skiadien J. Harmonic scalpel tonsillectomy-personal experience and review of literature. *Otolaryngol. Pol.* 2008;62(5):561-6.

7. Roth JA, Pincock T, Sacks R, Forer M, Boustred N, Johnston W, et al. Harmonic scalpel tonsillectomy versus monopolar diathermy tonsillectomy: a prospective study. *Ear Nose Throat J.* 2008;87(6):346-9.
8. Obonna GC, Mishra RK. Differences between thunderbeat, ligasure and harmonic scalpel energy system in minimal invasive surgery. *World J Laparoscopic Surg.* 2014;7(1):41-4.
9. McCarus SD. Physiological mechanism of the ultrasonically activated scalpel. *J Am Assoc Gynaecol Laparosc.* 1996;3:601-8.
10. Sheahan P, Miller I, Colreavy M, Sheahan JN, McShane D, Curran A. The ultrasonically activated scalpel versus bipolar diathermy for tonsillectomy: a prospective randomized trial. *Clin Otolaryngol Allied Sci.* 2004;29(5):530-4.
11. Walker RA, Syed ZA. Harmonic scalpel tonsillectomy versus electrocautery tonsillectomy: a comparative pilot study. *Otolaryngol Head Neck Surg.* 2001;125:449-55.
12. Ochi K, Ohashi T, Sugiura N. Tonsillectomy using an ultrasonically activated scalpel. *Laryngoscope.* 2000;110:1237-8.
13. Wiatrak BJ, Willging JP. Harmonic scalpel for tonsillectomy. *Laryngoscope.* 2002;112:14-6.
14. Pizzuto MP, Brodsky L, Duffy L. A comparison of microbipolar cautery dissection to hot knife and cold knife cautery tonsillectomy. *Int J Pediatr Otorhinolaryngol.* 2000;52:239-46.
15. Laycock WS, Trus TL, Hunter JG. New technology for the division of short gastric vessels during laparoscopic Nissen funduplication. A prospective randomized trial. *Surg Endosc.* 1996;10:71-3.
16. Akural EI, Koivunen PT, Teppo H. Post tonsillectomy pain: a prospective, randomised and double blinded study to compare an ultrasonically activated scalpel technique with the blunt dissection technique. *Anaesthesia* 2001;65:1045-50.

**Cite this article as:** Shrestha BL, Karmacharya S, Rajbhandari P. Thunderbeat versus bipolar diathermy in surgical outcome of tonsillectomy. *Int J Sci Rep* 2018;4(2):31-5.