

## Harmonic versus Cold Steel Dissection Tonsillectomy, A Comparative Study

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### ABSTRACT

**Background:** Tonsillectomy is one of the most common operations performed in otolaryngology departments, various techniques used for this purpose including dissection method and powered instrumentation like electrocautery, harmonic scalpel, radiofrequency techniques, laser technique and coblation technique.

**Objective:** This study aimed to compare the intraoperative time, intraoperative bleeding and post. Operative pain among patients underwent harmonic and cold steel dissection techniques.

**Patients and Method:** This was prospective randomized study performed in AL-Hilla Teaching Hospital. It included fifty patients scheduled for tonsillectomy for chronic tonsillitis from July 2016 to October 2017. Harmonic tonsillectomy (HT) was done on right side and traditional tonsillectomy on left side by same surgical team.

**Results:** Patients reported significantly less intraoperative bleeding (HT mean was 4.8 ml, while CDT mean was 64.7), less operative time (HT mean was 4.76 min., while CDT mean was 10.1 min) and less postoperative pain (from 0,3,7 and 14 postoperative days HT means pain score were 1.68, 3.6, 1.64 and 0.65 respectively and CDT means pain score were 5.8, 4.5, 2.4 and 0.78 respectively) on the harmonic scalpel tonsillectomy side compared with the Cold steel dissection tonsillectomy side. In the day 11 to 14 pain difference disappeared and reached plateau phase. There was no post tonsillectomy bleeding among the 50 patients.

**Conclusions:** Harmonic scalpel tonsillectomy reduces discomfort, intraoperative hemorrhage, and postoperative morbidity. Harmonic scalpel tonsillectomy is effective, although the handpiece is disposable.

**Keywords:** Harmonic, Cold steel, Dissection, Tonsillectomy, Comparative study.

### INTRODUCTION

Infectious and inflammatory diseases of the pharynx, tonsils, and adenoids are a major cause of illness and medical costs in children. Tonsillectomy and adenoidectomy are common surgeries done on children. Clinical research has shed light on many parts of paediatric otolaryngology, such as the effects of adenotonsillar hypertrophy on obstructive sleep apnea and its effects, the microbiologic flora of the tonsils and adenoids and their role in chronic adenotonsillar hypertrophy, and the relationship between adenotonsillar hypertrophy and craniofacial growth<sup>(1)</sup>. Tonsillectomy is a common head-and-neck treatment.

Surgery helps children with persistent sore throats. Fewer get tonsillectomy with adenoidectomy for airway congestion<sup>(2)</sup>. Celsus wrote in *De Medicina* that tonsil 'induration' may be eliminated with a fingernail. If this wasn't practicable, they may be hooked and dragged out using a "bistoury." Once Morrel McKenzie's snares and 'guillotines' popularised the operation in Victorian England. Sir Felix Semon (1849-1921) removed the tonsils of numerous of Queen Victoria's grandchildren<sup>(3-5)</sup>. Tonsillectomy may prevent recurring acute tonsillitis, but not other sore throats. Before tonsillectomy, history and clinical exam should confirm recurrent tonsillitis and, if possible, differentiate it from widespread pharyngitis. The British Association of Otolaryngologists Head and

Neck Surgeons developed SIGN recommendations that advocate tonsillectomy in children and adults based on current information, clinical observation, and clinical audit. Tonsillitis causing painful throats, a year of symptoms and sore throats that inhibit proper functioning<sup>(6-8)</sup>. The risks and benefits of surgery must be weighed. The frequency of episodes should be considered. US health insurance companies recognize AAO HNS guidelines. Guidelines propose tonsillectomy for children with 'three or more tonsil and/or adenoid infections per year despite acceptable medical care'<sup>(9)</sup>, tonsillectomy procedures constantly evolve. Before about ten years ago, the most common surgery was a dissection tonsillectomy, which was first described by Edwin Pynchon in 1890. To stop bleeding, ties or diathermy were used. Since then, there have been a lot of new ideas about how to use dissection tools to reduce pain and bleeding after surgery. The basic ideas behind a tonsillectomy haven't changed.

Current trials don't show that any of these procedures is clinically better than the others, so we definitely need a large multicenter trial. Before these procedures are extensively used, cost-effectiveness must be addressed<sup>(10)</sup>.

Post-tonsillectomy analgesia lacks evidence. In multiple trials, 70% of children given postoperative analgesics suffered pain. Two hours preoperatively, they

shifted to oral paracetamol (20 mg/kg) and diclofenac (1 mg/kg), except for asthmatics, they were prescribed up to 100 mg/kg of paracetamol and 3 mg/kg of diclofenac in 24 hours as rescue analgesia. Preprinted prescriptions, nursing staff education in this standard policy, and following the pain rating technique reduced pain levels while not administering all permitted analgesic doses. Audit adult tonsillectomy. A recent study indicated that ketoprofen, paracetamol, and codeine were sufficient for most adults at home after tonsillectomy. Pain alleviation lasted 11 (3-24) days and analgesia 12 (5-25) days. Pain alleviation from drinking lasted 7 (1-18) and 11 days (1-20). Seven (0-18) days after surgery, patients returned to normal daily activities and sleep.

**Robinson et al.** (11) observed that cryotherapy patients had less pain, fewer time off work, and less analgesic use than control patients, with no additional complications. The aim of study was to compare the intraoperative time and intraoperative bleeding and postoperative pain among patients underwent harmonic and cold dissection techniques.

## METHODS

This was a prospective randomized study hold on Otolaryngology Department in Al-Hilla General Hospital from July 2016 to October 2017. Fifty patients with age range from 6-22 years were included in controlled study that underwent tonsillectomy for chronic tonsillitis, the question are formula (as shown in page 27) used for those patients was including general history and full ENT examination.

**Inclusion criteria:** Recurrent acute tonsillitis.

**Exclusion criteria:** personal or family history of bleeding disorder, child less than 6 years, any child would have difficulty in communicating their pain level (e.g., cerebral palsy and mental retardation), any history consistence with obstructive sleep apnea syndrome, and those refuse the technique.

. superior constrictor muscle. The left tonsil was held with a denis browne holder, the mucosa was incised with metzenbaum scissors, the capsule was identified with a retractor, and dissection began from upper to lower poles. Hemostasis was achieved by packing and ligation. Same surgical team performed both sides. Intraoperatively, we recorded operative time and blood loss. Blood loss was monitored by suction bottle capacity and bloody swab weight (to the closest 0.5 mL). timer-recorded operational time (stopwatch).

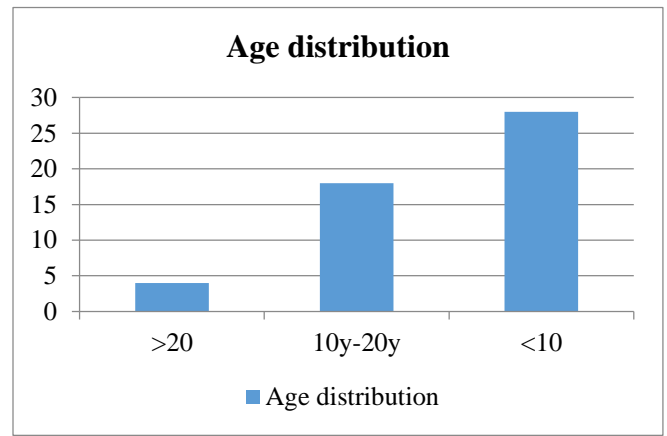
**Statistical analysis** for **mean, standard deviation** and **paired t test** are calculated by using SPSS version 24, windows 10.

## Ethical consent:

The research followed the ethical guidelines laid out in the Declaration of Helsinki. Before any samples were obtained, we made sure to get the patients' verbal and analytical consent. Document 122 (containing the number and the date in 4/4/2016) indicates that the study protocol, subject information, and permission form were evaluated and approved by The Local Ethics Committee.

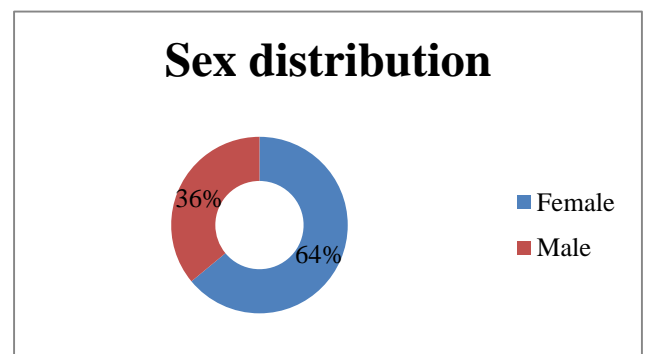
## RESULTS

A total of fifty Patients were between 6 and 22 years of age; the mean of age was  $10.68 \pm 4.6$  years (Figure 1).



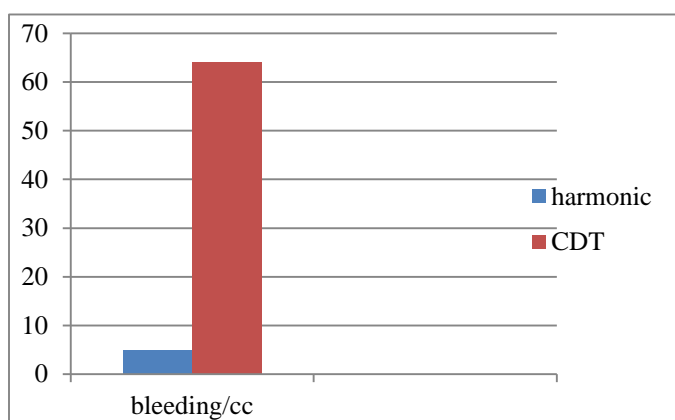
**Figure (1):** Age distribution of study patients (mean age 10.68 years; range 6-22 years).

18 patients were male (36%) and 32 patients were female (64%) making female to male ratio of 1.7:1 as shown in figure (2).



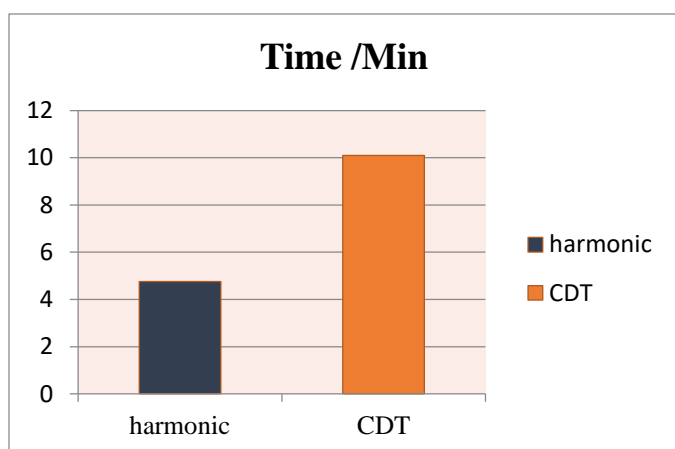
**Figure (2):** gender distribution.

The mean amount of intraoperative blood loss was  $4.8 \pm 1.9$  ml in right side harmonic tonsillectomy and  $64.7 \pm 11.3$  ml in left side Cold steel dissection tonsillectomy. Paired t-test was  $< .0001$  which is highly significant



**Figure (3):** Intraoperative blood loss.

The surgical time was  $4.76 \pm 1.27$  min in right side harmonic tonsillectomy and  $10.1 \pm 3.4$  min in left side Cold steel dissection tonsillectomy after complete haemostasis by cautery and ligation for left side only. Paired t-test was  $< .0001$  which is highly significant.



**Figure (4):** Surgical time.

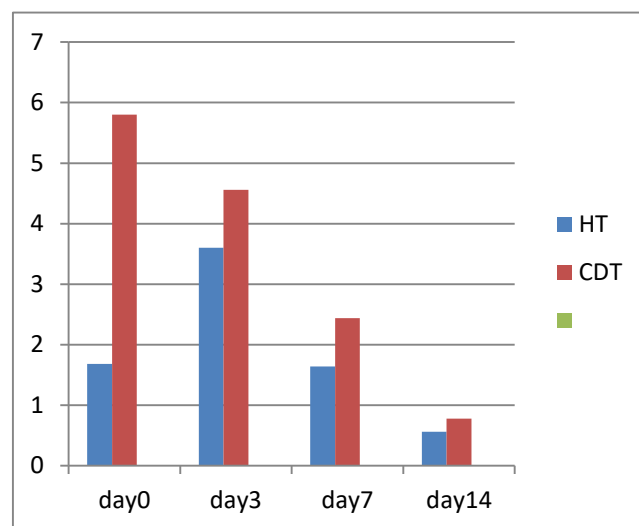
Wong-Baker FACES Pain Rating Scale (4-12 years) and The Numeric Pain Rating Scale pain scores for the HT (harmonic tonsillectomy) and CDT (Cold steel dissection tonsillectomy) sides ranged from 0 to 10. The mean and standard deviations of Wong-Baker FACES Pain Rating Scale on harmonic side ranged from 1.6 at day zero to .56 at day 14 with standard deviations between 1.2 for day zero to .54 at day 14. the mean of traditional tonsillectomy ranged from 5.8 at day zero to .78 at day 14, HT was significantly less painful than CDT, with differences between the means of both sides 4.2 at day zero to 0.22 at day 14 (paired t test, as in table 3.2 & figure 5). Thereafter, the difference resolved. Data on both HT and CDT sides showed a steady decline in pain over the first 14 days except at day 3 there was significant increase in mean pain (mean 3.6) but still less than the mean of CDT at same postoperative day 3 (mean 4.56). at day 14

the differences were declined between both sides and the mean difference between both sides were only 0.22, which indicate no significant difference at day 14.

**Table 3.2** Wong–Baker Faces Pain Rating Scale (WBFPRS), for HT and CDT Sides by Postoperative Day.

Postoperative day	HT Mean Score	CDT Mean Score	P Value (Paired t-Test)
zero	$1.68 \pm 1.2$	$5.8 \pm 1.2$	$<0.0001$
3rd	$3.6 \pm 1.4$	$4.5 \pm 1.2$	$<0.0001$
7th	$1.64 \pm 1.2$	$2.4 \pm 1.1$	$0.003$
14th	$0.65 \pm 0.54$	$0.78 \pm 0.18$	0.07

P-value  $\leq 0.05$  (significant).



**Figure (5):** Mean Wong–Baker Faces Pain Rating Scale (WBFPRS) by postoperative day comparing matched tonsillar surgeries in 50 individuals showed pain differences till 14 days postoperatively. HT stands for Harmonic Tonsillectomy.

In all patients of study, no primary haemorrhage was observed, no secondary haemorrhage in all 50 patients.

## DISCUSSION

Tonsillectomy is one of the most commonly performed procedures worldwide, otolaryngologists around the world frequently choose different modalities of procedures to reduce perioperative morbidity to the patients. Recently harmonic tonsillectomy attained popularity among otolaryngologists because of its reputation regarding less morbidity. In our study the harmonic side tonsillectomy has less intraoperative bleeding (mean was, 4.8ml) as compared with CDT side (mean 64.7ml). This is due to the fact that harmonic has the ability to cut and seal blood vessel at the same time by denatured proteins resulting from sound wave (it coagulates when it is cut), while in cold steel method

hemostasis were achieved by one or more of the following (packing or ligation). A study by **Akural *et al.***<sup>(12)</sup> (mean HT bleeding 0 ml while CDT mean bleeding 21ml), **Lachanas *et al.***<sup>(13)</sup> (HT mean bleeding was 5 ml while CDT mean bleeding was 73 ml) and **Alexiou *et al.***<sup>(14)</sup> (mean difference was 37.71ml) these differences were significant. In **Leaper's *et al.*** study in 2006<sup>(15)</sup> there was no significant difference in bleeding rate during surgery between harmonic and electrocautery methods<sup>(16, 17)</sup>.

In our results the time of harmonic procedure much less than that of traditional tonsillectomy (HT mean time 4.7 min while CDT mean time 10.1 min) the reason for that is much more time required for haemostasis in CDT. In **Lachanas's *et al.***<sup>(13)</sup>, the mean time of harmonic tonsillectomy was less than CDT time (mean 14.8 min. for harmonic side and mean time of CDT was 21min.). This is in agreement with the study of **Kamal *et al.***<sup>(18)</sup> who showed that the time of harmonic procedure was 14.9 min and CDT mean time was 26.16 min., which also agrees with our study, while **Alexiou *et al.***<sup>(14)</sup> study showed no significant difference in operation time between the CDT and HT. The postoperative pain, the pain is subjected to individual variation between patients because of different pain thresholds, so we compare two side of same patient to exclude different thresholds of pain, by using Wong Baker FACES pain rating scale and numeric pain rating scale each score from (0-10). The result was much less pain from day zero to seven (mean is 1.68, 3.6, 1.64 and 0.65 in day 0, 3, 7 and 14 respectively) as compare to CDT (mean is 5.8, 4.5, 2.4 and 0.78 at 0, 3, 7 and 14 days respectively). There was increase in pain score of harmonic side at day 3 but still less than the corresponding day of CDT side. This is probably due to intense inflammation and thick fibrin biofilm of tonsillar bed then settled down at day 7. The cause of decreased pain at harmonic side is that the less thermal energy generated by harmonic (50-100c) and less collateral damage to the adjacent structure. In the study of **Alexiou *et al.***<sup>(14)</sup> and **Kamal SA *et al.***<sup>(15)</sup> there was no significant difference between postoperative pain of the two procedures. In the study of **Oko *et al.***<sup>(19)</sup> the clinically significant postoperative pain was questionable.

From the previous discussion there is a wide debate regarding pain and intraoperative time but a wide agreement regarding less intraoperative bleeding. This debate may be attributed to different hand skills of surgeons and different hand pieces available for harmonic devices, different settings used in the device (whether high setting or low setting) also different inflammatory response of patients to this relatively new method.

## CONCLUSION

Harmonic scalpel tonsillectomy significantly reduced postoperative pain. Harmonic tonsillectomy reduced

intraoperative blood loss and procedure time. HT's high cost (if done in a private facility) and single-use hand piece are disadvantages.

## REFERENCES

1. **Bansal M (2016):** Pharyngitis and adenotonsillar disease. In Essentials of Ear, Nose and Throat, P: 303–303). Jaypee Brothers Medical Publishers (P) Ltd. [https://doi.org/10.5005/jp/books/12739\\_37](https://doi.org/10.5005/jp/books/12739_37)
2. **Faris C (2011):** Scott-Brown's Otorhinolaryngology, Head and Neck Surgery, 7th edn. Annals of The Royal College of Surgeons of England, 93 (7): 559. <https://doi.org/10.1308/147870811X598605b>
3. **Karimi E, Safaee A, Bastaninejad S *et al.* (2017):** A Comparison between Cold Dissection Tonsillectomy and Harmonic Scalpel Tonsillectomy. Iranian journal of otorhinolaryngology, 29 (95): 313–317. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5785110/>
4. **Feng X, Huang Z, Zhu X *et al.* (2013):** [Application of harmonic scalpel in Han-uvalopalatopharyngoplasty]. Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi = Journal of Clinical Otorhinolaryngology, Head, and Neck Surgery, 27 (12): 633–636.
5. **Arbin L, Enlund M, Knutsson J (2017):** Post-tonsillectomy pain after using bipolar diathermy scissors or the harmonic scalpel: a randomised blinded study. European archives of oto-rhino-laryngology: official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery, 274 (5): 2281–2285. <https://doi.org/10.1007/s00405-017-4451-9>
6. **Mehanna H (2002):** National audit of the management of peritonsillar abscess. Postgraduate Medical Journal, 78 (923): 545–548. <https://doi.org/10.1136/pmj.78.923.545>
7. **Ahmad M, Wardak A, Hampton T *et al.* (2020):** Coblation versus cold dissection in paediatric tonsillectomy: a systematic review and meta-analysis. The Journal of laryngology and otology, 134 (3): 197–204. <https://doi.org/10.1017/S0022215120000377>
8. **Bond J, Wilson J, Eccles M *et al.* (2006):** Protocol for north of England and Scotland study of tonsillectomy and adeno-tonsillectomy in children (NESSTAC). A pragmatic randomised controlled trial comparing surgical intervention with conventional medical treatment in children with recurrent sore throats. BMC ear, nose, and throat disorders, 6: 13. <https://doi.org/10.1186/1472-6815-6-13>
9. **Schmalbach C, Breerton J, Bowman C *et al.* (2021):** 3rd. American Academy of Otolaryngology-Head and Neck Surgery/Foundation Reg-ent Registry: Purpose, Properties, and Priorities. Otolaryngol Head Neck Surg., 164 (5): 964-971. doi:10.1177/0194599820984135
10. **Clarke R (2008):** Scott-Brown's Otorhinolaryngology: Head and Neck Surgery 7Ed, Pp: 3 volume set (7th ed.). CRC Press. <https://doi.org/10.1201/b15118>
11. **Basu S, Sengupta A, Dubey A *et al.* (2019):** Harmonic Scalpel Versus Coblation Tonsillectomy a Comparative Study. Indian journal of otolaryngology and head and neck

- surgery: official publication of the Association of Otolaryngologists of India, 71 (4), 498–503. <https://doi.org/10.1007/s12070-019-01679-x>
12. **Akural E, Koivunen P, Teppo H *et al.* (2001):** Post-tonsillectomy pain: a prospective, randomised and double-blinded study to compare an ultrasonically activated scalpel technique with the blunt dissection technique. *Anesthesia*, 56: 1045-1050. <https://doi.org/10.1111/j.1365-2044.2001.02275.x>
  13. **Lachanas V, Hajjiannou J, Karatzias G *et al.* (2007):** Comparison of LigaSure vessel sealing system, harmonic scalpel, and cold knife tonsillectomy. *Otolaryngology--head and neck surgery: official journal of American Academy of Otolaryngology-Head and Neck Surgery*, 137 (3): 385–389. <https://doi.org/10.1016/j.otohns.2007.05.012>
  14. **Alexiou V, Salazar-Salvia M, Jervis P *et al.* (2011):** Modern technology-assisted vs conventional tonsillectomy: a meta-analysis of randomized controlled trials. *Archives of otolaryngology--head & neck surgery*, 137(6), 558–570. <https://doi.org/10.1001/archoto.2011.93>
  15. **Leaper M, Mahadevan M, Vokes D *et al.* (2006):** A prospective randomised single blinded study comparing harmonic scalpel tonsillectomy with bipolar tonsillectomy. *International journal of pediatric otorhinolaryngology*, 70 (8): 1389–1396. <https://doi.org/10.1016/j.ijporl.2006.02.004>
  16. **Walker R, Syed Z (2001).** Harmonic scalpel tonsillectomy versus electrocautery tonsillectomy: a comparative pilot study. *Otolaryngology--head and neck surgery: official journal of American Academy of Otolaryngology-Head and Neck Surgery*, 125 (5): 449–455. <https://doi.org/10.1067/mhn.2001.119325>
  17. **Morgenstein S, Jacobs H, Brusca P *et al.* (2002):** A comparison of tonsillectomy with the harmonic scalpel versus electrocautery. *Otolaryngology--head and neck surgery: official journal of American Academy of Otolaryngology-Head and Neck Surgery*, 127 (4): 333–338. <https://doi.org/10.1067/mhn.2002.128346>
  18. **Kamal S, Basu S, Kapoor L *et al.* (2006):** Harmonic scalpel tonsillectomy: a prospective study. *European archives of oto-rhino-laryngology: official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS): affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*, 263 (5): 449–454. <https://doi.org/10.1007/s00405-005-1022-2>.
  19. **Oko M, Ganly I, Loughran S *et al.* (2005):** A prospective randomized single-blind trial comparing ultrasonic scalpel tonsillectomy with tonsillectomy by blunt dissection in a pediatric age group. *Otolaryngology--head and neck surgery: official journal of American Academy of Otolaryngology-Head and Neck Surgery*, 133 (4): 579–584. <https://doi.org/10.1016/j.otohns.2005.08.002>.