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Original Article

Analysis of Post-Tonsillectomy Pain in Patients Treated with Unipolar and Bipolar Diathermy, a Comparative Study

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ABSTRACT

Objective: To compare 24-hours post-operative pain in tonsillectomy performed using unipolar versus bipolar diathermy.
Study Design: Quasi-experimental study.
Place and Duration of Study: Pak-Emirates Military Hospital, Rawalpindi Pakistan from Nov 2023 to Nov 2024.
Methodology: Fifty-four patients who underwent tonsillectomy with unipolar (Group A) or bipolar (Group B) diathermy were included. After twenty-four hours of surgery, post-operative pain score and presence of mild, moderate and severe degree of pain were assessed and compared between Groups. Data was analyzed by statistical package for social sciences 22.
Results: Median age was 22.00 (30.00 – 15.00) years. There were 35(64.81%) male and 19(35.19%) female patients. Median number of tonsillitis episodes in last one year was 10.00 (18.00 – 7.00) episodes. Median 24-hour post-operative pain VAS score was 6.00 (9.00 – 1.00) in Group-A while in Group-B it was 3.00 (7.00 – 1.00), (p = 0.014). In Group-A, frequency of mild pain was 8(29.63%), moderate pain 8(29.63%) and severe pain 11(40.74%) while in Group-B, frequency of mild pain was 16(59.26%), moderate pain 6(22.22%) and severe pain 5(18.52%), respectively; (p = 0.074).
Conclusion: Bipolar diathermy significantly reduces the pain score after 24-hours of tonsillectomy in comparison to unipolar diathermy making it a significantly better operative modality.

Keywords: Diathermy, Pain, Postoperative, Tonsillectomy, Tonsils, Visual Analogue Scale.

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INTRODUCTION

Tonsillectomy is a widely performed surgical procedure that involves removal of the palatine tonsils, and is often indicated for recurrent tonsillitis, tonsillar hypertrophy and pediatric obstructive sleep apnea (OSA).[1,2] Recent evidence suggests that tonsillectomy can significantly decrease the frequency of throat infections, reduce antibiotic use and improve quality of life in affected individuals.[3] Surgical techniques for tonsillectomy have advanced significantly, with newer modalities such as coblation, electrocautery, cold dissection, cryosurgery and microdebrider-assisted tonsillectomy gaining popularity.[4,5]

Perioperative complications that are most common after tonsillectomy are nausea and vomiting after the surgery and post-operative pain for which several medications are used, such as dexamethasone, acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids.[6,7] Another important factor that has been reported to impact the rate of post-operative complications and the outcomes after tonsillectomy, is the surgical technique and the instrument being used for performance of the surgery.[8]

Post-operative pain is a bothersome complication that significantly impacts the life quality of the patients as well as the overall patient satisfaction towards the surgeon, and thus, it is essential to adopt every measure that can help in reducing the suffering of patients during the post-operative period. It has been hypothesized that diathermy technique can have the impact on the pain during initial period after tonsillectomy.[9] When it comes to comparison of unipolar diathermy versus bipolar diathermy being used for performing tonsillectomy, it has been observed that in terms of intraoperative parameters and post-operative complications, it is still not established that which amongst unipolar versus bipolar diathermy is superior.[8,9] Therefore, in order to address this research question, present study is being conducted with the aim to compare post-operative pain after tonsillectomy performed using unipolar versus bipolar diathermy.

METHODOLOGY

This quasi-experimental study was conducted at Pak-Emirates Military Hospital, Rawalpindi Pakistan

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from November 2023 to November 2024 after obtaining approval from the ethical review committee (ERC # 30136; dated: 18 March 2025). For calculation of sample size the formula was used.

$$n = \frac{\left\{ z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)} \right\}^2}{\left(P_1 - P_2\right)^2}$$

Sample size was calculated using WHO sample size calculator taking level of significance as 5%, power as 95%, anticipated frequency of severe pain in unipolar diathermy Group as 36/66 (54.55%) and anticipated frequency of severe pain in bipolar diathermy Group as 7/66 (10.6%)[10]. The estimated sample size came out to be 54 patients (27 in each Group).

Inclusion Criteria: Adults having an age 15 years or above, both male and female, who fulfilled the paradise criteria for recurrent tonsillitis and underwent tonsillectomy were included in the study.

Exclusion Criteria: Patients who had obstructive sleep apnea, history of smoking, presence of acutely inflamed tonsils, those having diabetes mellitus (HbA1C% ≥ 6.5%), quinsy, severe co-morbidities (like hypertension, chronic renal failure, chronic liver disease or chronic respiratory conditions) making patients unfit for anesthesia, those having tonsillar mass and pregnant women were excluded from the study.

After patient selection through non-probability consecutive sampling, baseline characteristics of patients including age (in years), gender and number of tonsillitis episodes in last one year were documented. This comparative observational study was a two phase study. During the former phase extending over first six months of study period, 27 patients (Group-A) underwent tonsillectomy with unipolar diathermy with voltage set at 30 watts. In the latter phase extending over remaining six months of study period, remaining 27 patients (Group-B) underwent tonsillectomy with bipolar diathermy with voltage set at 30 watts.

All surgeries were conducted by an expert team of specialists (with minimum three years of experience made up of one consultant, two senior registrars and three senior residents). Surgeries were performed under general anesthesia and maintenance of strict aseptic environment was ensured. After surgery, all the patients were given same medication as per standard hospital protocol with injection co-amoxiclav (Augmentin ®) at 30mg/kg/day twice daily and injection ketorolac (Toradol ®) twelve hourly for a period of three days; with day one post-operative doses given in hospital while remaining to be administered on daily walk-in visits. Mechanism of patients selection to outcome analysis is given in Figure showing patient flow diagram.

All the patents were assessed at twenty four hours after the surgery for presence of pain using visual analogue scale (VAS). Based on VAS score, patients were labelled to have mild (VAS 1-3), moderate (VAS 4-6) and severe (VAS 7-10) pain. Additional analgesic support was provided to the patients who complained of pain.

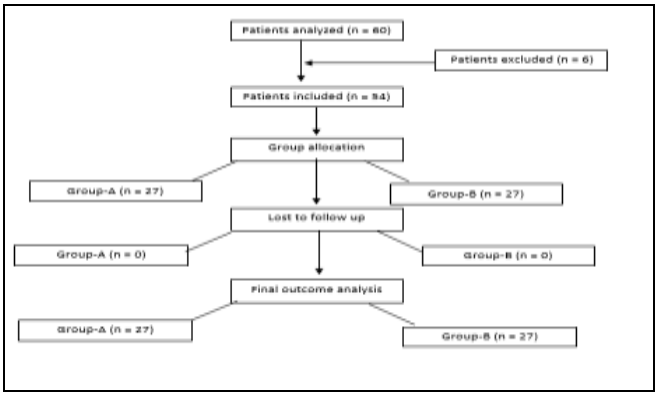

Figure: CONSORT Patient Flow Diagram

The statistical package for social sciences (SPSS) version 22 software was used for statistical analysis of the data. Normality of data was checked by Shapiro-Wilk test and it was found that age, number of tonsillitis episodes in last one year and VAS were not normally distributed and were thus represented using median interquartile range (IQR). Categorical variables was expressed as frequency and percentages. Median VAS was compared between Groups using Mann-Whittney U-test. Frequency of mild, moderate and severe was compared between Groups using chi-square test. The *p*-value of ≤ 0.05 was considered significant.

RESULTS

In present study, median age of the patients was 22.00 (30.00 – 15.00) years. There were 35(64.81%) male and 19(35.19%) female patients. Median B number of tonsillitis episodes in last one year was 10.00 (18.00 –

7.00) episodes. Comparison of baseline characteristics between study Groups is given in Table-I.

In Group-A (n = 27), median 24-hour post-operative pain VAS score was 6.00 (9.00 – 1.00) while in Group-B (n = 27), median 24-hour post-operative pain VAS score was 3.00 (7.00 – 1.00), (p = 0.014). Comparison of median 24-hour post-operative pain VAS score between Groups is given in Table-II. In Group-A (n = 27), frequency of mild pain was 8(29.63%), moderate pain 8(29.63%) and severe pain 11(40.74%) while in Group-B (n = 27), frequency of mild pain was 16(59.26%), moderate pain 6(22.22%) and severe pain 5(18.52%); (p = 0.074). This comparison is given in Table-III:

Table-I: Comparison of baseline Characteristics between Study Groups (n = 54)

Parameter	"Unipolar diathermy" Group (n = 27)	"Bipolar diathermy" Group (n = 27)	*p*-value
Median age	22.00 (30.00 – 16.00) years	24.00 (30.00 – 15.00) years	0.278
Gender Male Female	17(62.96%) 10(37.04%)	18(66.67%) 9(33.33%)	0.776
Median number of tonsillitis episodes in last one year	10.00 (18.00 –7.00) episodes	11.00 (18.00 – 7.00) episodes	0.256

Table-II: Comparison of median 24-Hour Post-Operative Visual Analogue Scale Score between Groups (n = 54)

	"Unipolar diathermy" Group (n = 27)	"Bipolar diathermy" Group (n = 27)	*p*-value
Median 24-hour post-operative pain Visual Analogue Scale score	6.00(9.00 – 1.00)	3.00(7.00 – 1.00)	0.014

Table-III: Comparison of Severity of 24-hours Post-Operative Pain between Study Groups (n = 54)

24-hour post-operative pain severity	"Unipolar Diathermy" Group (n = 27)	"Bipolar Diathermy" Group (n = 27)	*p*-value
Mild	8(29.63%)	16(59.26%)	0.074
Moderate	8(29.63%)	6(22.22%)	
Severe	11(40.74%)	5 (18.52%)	

DISCUSSION

Pain is one of the most commonly encountered complication after any surgical procedure and managing the pain is quite a challenging task both for the patients as well as the treating healthcare professionals.[11,12] According to a study, in more than half of the patients who develop post-operative pain, failure to achieve the optimal pain control despite use of multiple pain management modalities is observed.[13] For this purpose, a better approach is to adopt measures that can reduce the chances of patients to develop severe pain after the surgical procedures since pain medications have the potential to cause serious adverse effects.[14] Present study thus focused on determining the impact of two different diathermy techniques on the immediate post-operative pain.

In present study, it was observed that average age of the patients who underwent tonsillectomy was only twenty two years. Similar trend was observed in multiple previous studies showing younger patients to be more affected by tonsillitis as compared to the older patients.[15,16] One possible reason behind this trend can be the difference in the level of maturation of the immune system with younger patients have relatively less mature as compared to the older population. In present study, majority of patients who had diseased tonsils requiring tonsillectomy were males. In coherence with the findings of present study, multiple studies have shown that majority of patients who had recurrent tonsillitis were males.[16,17] This gender discrepancy can be explained by lack of access to healthcare for women in underdeveloped societies like Pakistan and a general reluctance to undergo surgery in women. For making decision regarding tonsillectomy, paradise criteria was used which is a highly reliable tool in this regard.[18,19]

In terms of twenty four hours post-operative pain VAS score, it was observed that bipolar diathermy was associated with significantly less median 24-hour post-operative pain VAS score as compare to unipolar diathermy Group (p = 0.014). Unipolar diathermy has been reported by Yun *et al*.[20] to reduce the duration of operation for which it is considered to be associated with lesser chances of complications and pain but in present study, it was found to be associated with higher degree of pain as compared to bipolar diathermy. This inconsistency compared to previous literature may be attributed to the lower power settings of unipolar diathermy being used by Yun *et al*.[20] In present study, median pain VAS score in bipolar diathermy Group was three which was similar to the average 24-hour post-operative pain score reported by Usman *et al*.[21] among patients who underwent tonsillectomy with bipolar diathermy. This

similarity is likely due to the same power setting of 30 watts being used in present study as well as by Usman *et al*.[21]

In terms of distribution of severity of pain between Groups, no statistically significant difference was observed between unipolar versus bipolar diathermy Groups (p = 0.074). This finding was not in line with the results of a study conducted by Khan *et al*.[10] who reported that the frequency of patients who suffered from severe pain was significantly higher among patients who underwent tonsillectomy with unipolar as compared to those who underwent tonsillectomy with bipolar diathermy (p < 0.05). One of the possible reason behind the higher proportion of patients with severe pain operated through unipolar diathermy may be attributed to the lack of selectiveness of the cauterization area by the unipolar diathermy. On the other hand, Neeraj *et al*.[22] found that in terms of distribution of severity of pain between Groups, no statistically significant difference was observed between unipolar versus bipolar diathermy Groups (p = 0.153) which was similar to the results of present study. This similarity of the finding between the two studies is likely due to multiple reasons including the similar pain assessment period, similar pain assessment scale and relatively similar post-operative management medications being used in both the studies.

Based on the results of present study, it is evident that use of bipolar diathermy in tonsillectomy can significantly improve the patient outcomes by reducing the twenty four hours median pain VAS scores and thus should be preferred over unipolar diathermy. Therefore, preferential use of bipolar diathermy in tonsillectomy is recommended. This will help in improving the post-surgical care of the patients among which pain is one of the most common and difficult to manage complication that adversely impacts the patient satisfaction level towards the surgery and their life quality.

CONCLUSION

In conclusion, "bipolar diathermy" is associated with significantly less twenty four hours post-tonsillectomy pain score as compared to "unipolar diathermy" and thus should be preferred over the use of "unipolar diathermy".

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FA & SAN: Data acquisition, data analysis, critical review, approval of the final version to be published.

TA & SA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

ZB & IK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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