



ORIGINAL ARTICLE

## Comparison of Post-Tonsillectomy Hemorrhage rate in patients undergoing two commonly used Tonsillectomy Methods.

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**ABSTRACT... Objective:** To compare the cold steel method and bipolar diathermy in tonsillectomies in terms of post-tonsillectomy hemorrhage. **Study Design:** Randomized Controlled Trial. **Setting:** Department of ENT, Head & Neck Surgery, Ayub Teaching Hospital, Abbottabad. **Period:** 29<sup>th</sup> October 2020 to 1<sup>st</sup> June 2022. **Methods:** A total of 102 patients of both genders with ages 3 to 59 years undergoing tonsillectomy were included. Patients undergoing antiplatelet therapy, experiencing bleeding diathesis, possessing a high anesthetic risk, having uncontrolled medical conditions, suffering from anemia, or currently dealing with acute infections were not included in the study. Patients were divided into two groups A & B. Group A patients were operated by the Cold steel method and Group B were operated by Bipolar diathermy. All the surgeries were performed by the same surgical team. Both tonsils were fully exposed by Boyl Devi's mouth gag under general anesthesia. Complete removal of both tonsils was done with the Cold steel method in group A and by using Bipolar diathermy in group B. Post-operative hemorrhage (occurring 24 hours after surgery) without the necessity to return to the operation theatre for intervention was assessed. **Results:** The mean age of patients in group A was  $20.0 \pm 13.83$  years and in group B was  $19.12 \pm 13.17$  years. The majority of the patients 79 (77.45%) were between 3 to 30 years of age. Out of 102 patients, 63 (61.76%) were males and 39 (38.24%) were females with male to female ratio of 1.6:1. Frequency of secondary hemorrhage in Group A (cold steel method) was found in 01 (1.96%) while in Group B (bipolar diathermy) was 06 (11.76%) ( $p$ -value = 0.050). **Conclusion:** This study concluded that the frequency of post-tonsillectomy hemorrhage is higher in patients operated by bipolar diathermy as compared to the cold steel method.

**Key words:** Cold Steel Method, Diathermy, Hemorrhage, Tonsillectomy.

### INTRODUCTION

Chronic tonsillitis may arise as a complication following an episode of acute tonsillitis. Pathologically, the tonsils may exhibit micro abscesses enclosed by fibrous tissue within their lymphoid follicles. Subclinical tonsil infections, occurring without overt acute attacks, are also possible. This condition is predominantly observed in children and young adults.<sup>1</sup> In cases where tonsillitis is caused by Group A streptococcus, the primary antibiotics of choice are penicillin or amoxicillin.<sup>2</sup>

Tonsillectomy stands as one of the oldest and most commonly conducted surgical procedures by otorhinolaryngologists globally.<sup>1</sup> Defined

as the complete removal of palatine tonsils through dissection in the peritonsillar space<sup>2</sup>, this procedure addresses issues related to the palatine tonsils situated at the entrance of the upper aerodigestive tract on the lateral wall of the oropharynx.<sup>3</sup> These tonsils serve as a crucial immune defense against pathogens ingested and inhaled.<sup>4</sup> In the UK between 2008-2009, 27,400 tonsillectomies were performed on children, with 25% attributed to upper airway obstruction, including obstructive sleep apnea, while the remaining were conducted for infections.<sup>5</sup>

Despite being generally considered a low-risk procedure, tonsillectomy carries the potential for serious post-tonsillectomy hemorrhage (PTH),

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which can be categorized as primary (within 24 hours) and secondary (occurring after 24 hours). Some authors use the term reactionary hemorrhage (RH) for primary PTH.<sup>6</sup> The overall post-operative hemorrhage rate associated with tonsillectomy is 3.5%, and this risk is particularly heightened in small children.<sup>7</sup> While there is no universally accepted 'gold standard' technique for tonsillectomy, cold steel tonsillectomy has maintained its status as the standard procedure for decades.<sup>8</sup>

Earlier studies on the subject have yielded varying conclusions regarding the impact of the surgical technique used for tonsillectomy on the postoperative hemorrhage rate. Some studies indicate higher hemorrhage rates with hot techniques/electrocautery, while others report elevated rates with cold steel dissection. Additionally, some studies found no significant effect of the surgical technique on the hemorrhage rate.<sup>9</sup> In 2016, a study conducted at the University of Oviedo, Spain, focused on the histological analysis of tonsils. The findings revealed that cold dissection tonsillectomy resulted in less tissue damage, minimal cauterization of tissue structures, a lower incidence of complications, and consequently fewer emergency department visits compared to electrocautery dissection tonsillectomy. The study suggests that cold dissection may be the preferred tonsillectomy technique based on these observed benefits.<sup>10</sup>

In 2016, a double-blind randomized clinical trial carried out at Shahid Sadoughi University of Medical Sciences in Yazd, Iran, determined that utilizing bipolar electrocautery for tonsillectomy is a secure and efficient option compared to cold dissection tonsillectomy. The research indicated a noteworthy decrease in both the duration of the operation and intraoperative blood loss with bipolar electrocautery tonsillectomy. According to the results, bipolar electrocautery emerges as a preferred alternative technique for tonsillectomy, particularly in pediatric cases.<sup>11</sup> Similarly, in a separate investigation conducted by Motta S et al, it was determined that the occurrence of secondary hemorrhage in the bipolar diathermy technique was 14%, whereas in the cold steel

technique, it remained at 0%.<sup>12</sup>

The study's rationale lies in the conflicting literature on post-tonsillectomy hemorrhage rates for the cold steel method and bipolar diathermy. It addresses the lack of local data, emphasizing the need to understand these rates in the context of the specific population.

## METHODS

This research employed a randomized controlled trial design, conducted at the Department of ENT, HEAD & NECK, Ayub Teaching Hospital, Abbottabad. The study spanned from October 29, 2020, to June 1, 2022.

The sample size was a total of 102 patients participated, with 51 in each group. The sample size calculation utilized the WHIO software, applying a significance level of 5% and a statistical power of 80%. Anticipated proportions of bleeding were set at 0% for the Cold steel method and 14% for Bipolar diathermy based on previous studies. Non-probability consecutive sampling was employed for participant selection.

Inclusion criteria encompassed patients of both genders aged 3 to 59 years, while exclusion criteria excluded those on antiplatelet therapy, with bleeding disorders, poor anesthetic risk, uncontrolled medical illness, anemia, or acute infection.

Ethical approval was obtained (Ref No: CPSP/REU/ENT-2019-010-1110), and eligible patients were counseled and provided with detailed study information. Written informed consent and a comprehensive medical history were obtained. Patients were randomly assigned to either Group A (Cold steel method) or Group B (Bipolar diathermy) using blocked randomization. Surgeries were performed by the same team, and post-operative hemorrhage was assessed based on the operational definition. Data, including demographic details, were recorded in a pro forma.

Data analysis was conducted using SPSS 20.0. Frequencies and percentages described

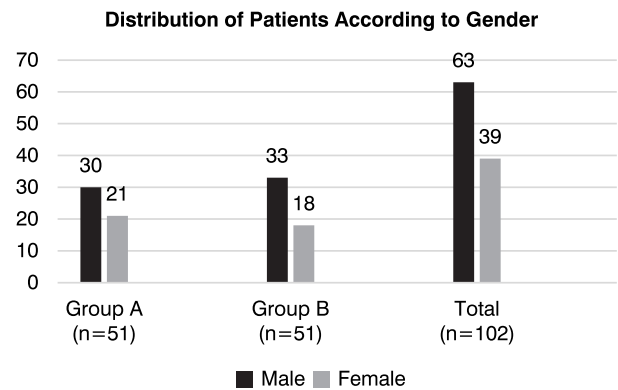
categorical variables, while mean ± SD described quantitative variables. The chi-square test at a 5% significance level compared hemorrhage between groups, and post-stratification chi-square tests were performed for age and gender.

**RESULTS**

The research encompassed individuals aged between 3 and 59 years, with an average age of 19.34 ± 13.44 years. The mean age in Group A (Cold steel method) was 20.0 ± 13.83 years, while in Group B (Bipolar diathermy), it was 19.12 ± 13.17 years. A significant proportion of participants (77.45%) fell within the age range of 3 to 30 years (see Table-I).

The distribution of gender revealed that among the 102 patients, 63 (61.76%) were males and 39 (38.24%) were females, yielding a male-to-female ratio of 1.6:1. (Figure-1)

Post-tonsillectomy hemorrhage occurred in 1.96% of cases in Group A and 11.76% in Group B, with a statistically significant p-value of 0.050. (Table-II) Stratification of hemorrhage by age groups revealed a significant difference in the 3-30 age group (p = 0.026) but not in the 31-59 age group (p = 0.846).



**Figure-1. Distribution of patients according to gender**

Likewise, the stratification based on gender revealed a notable difference in males (p = 0.026), while no significant difference was observed in females (p = 0.911). These findings suggest variations in hemorrhage rates based on age and gender, emphasizing the impact of surgical technique on post-tonsillectomy outcomes.

**DISCUSSION**

Various techniques and instruments have been employed for tonsil removal and hemostasis, but none have been universally deemed satisfactory.

Age (Years)	Group A (n=51)		Group B (n=51)		Total (n=102)	
	n	%	n	%	n	%
3-30	38	74.51	41	80.39	79	77.45
31-59	13	25.49	10	19.61	23	22.55
Mean ± SD	20.0 ± 13.83		19.12 ± 13.17		19.34 ± 13.44	

**Table-I. Age distribution for both groups**

		Group A (n=51)		Group B (n=51)		P-Value
		n	%	n	%	
Hemorrhage	Yes	01	1.96	06	11.76	0.050
	No	50	98.04	45	88.24	

**Table-II. Comparison of Cold Steel Method and Bipolar Diathermy in Tonsillectomies in terms of the Post-tonsillectomy Hemorrhage**

		Group A (n=51)		Group B (n=51)		P-Value
		Hemorrhage		Hemorrhage		
		Yes	No	Yes	No	
Age of Patients (Years)	3-30	0 (0.0%)	38 (100.0%)	05 (12.20%)	36 (87.80%)	0.026
	31-59	01 (7.69%)	12 (92.31%)	01 (10.0%)	09 (90.0%)	0.846
Gender	Male	00 (0.0%)	30 (100.0%)	05 (15.15%)	28 (84.85%)	0.026
	Female	01 (4.76%)	20 (95.24%)	01 (5.56%)	17 (94.44%)	0.911

**Table-III. Stratification of hemorrhage for age groups and gender**

Currently, tonsillectomy with a Guillotine is still practiced at certain centers in Europe and the UK.<sup>13</sup> Contemporary approaches, including the utilization of a harmonic scalpel, bipolar scissor dissection, radiofrequency excision with probes, microdebrider endoscopic tonsillectomy, laser tonsillectomy, and bipolar radiofrequency ablation techniques, have transformed the landscape of tonsillectomy surgery.<sup>14</sup> It is thought that these modern approaches contribute to a reduction in tonsil size, a shortened procedure duration, effective management and swift control of bleeding during surgery, as well as decreased postoperative pain. This enables patients to promptly return to their regular daily activities.<sup>15</sup>

In comparing post-tonsillectomy hemorrhage rates between the cold steel method and bipolar diathermy, the frequency of secondary hemorrhage in Group A (cold steel method) was 1 case (1.96%), while in Group B (bipolar diathermy), it was 6 cases (11.76%) (p-value = 0.050). These findings align with a prior study that reported a secondary hemorrhage rate of 14% for bipolar diathermy and 0% for the cold steel technique.<sup>12</sup>

In diathermy tonsillectomy, the tonsil is extracted using the cold dissection technique, and hemostasis is ensured through diathermy. The cold dissection technique involves incising the mucosa and dividing tissue strands binding the tonsil to the pharyngeal wall. Simultaneously, visualization of vessels within these strands allows for coagulation before division, theoretically reducing blood loss and accelerating the operation by 40%<sup>16</sup> to 50%.<sup>17</sup> A refined version employs an operating microscope for dissection, aiding in the identification of the glossopharyngeal nerve, recognized as a significant source of referred otalgia after tonsillectomy.<sup>18</sup>

Khan AR et al<sup>19</sup> observed a secondary hemorrhage rate of 13.33% when bipolar diathermy was utilized, compared to only 4.16% with silk ligation. Roberts C et al<sup>20</sup> conducted a prospective study involving 1090 cases and observed a slight surplus of primary hemorrhage linked to ligation, along with a slight excess of secondary

hemorrhage associated with diathermy. Iqbal SM et al<sup>21</sup> conducted a study that compared the outcomes of diathermy coagulation with the suture technique for achieving hemostasis after tonsillectomy. The study revealed that the incidence of secondary hemorrhage following the suture technique was 5%, whereas after diathermy, it was 12%. In a study by Choy ATK et al<sup>22</sup>, the incidence of secondary hemorrhage (1.8%) was greater in the diathermy group compared to the cold steel method group (0.9%).

Malik MK et al<sup>23</sup>, in a comparative study involving 450 patients undergoing tonsillectomy by the dissection method with a hemostasis comparison between bipolar cautery and ligation methods, found the incidence of secondary hemorrhage in the ligation group to be 0.7%, whereas, in the bipolar cautery group, it was 1.3%. Notably, the use of bipolar cautery reduced the overall operative time but led to increased postoperative morbidity, such as throat pain.

In Iraq, Adel S and colleagues observed primary bleeding in 6 patients (2.4%) treated with bipolar diathermy hemostasis, in contrast to 13 patients (5.2%) who underwent silk ligation.<sup>24</sup> In a more extensive series comprising 1500 cases of the modified diathermy technique investigated in Karachi, Rafique Gooda and colleagues noted that only two patients experienced reactionary hemorrhage, requiring a return to the operating theater.<sup>25</sup>

In India, Shivkumar and colleagues conducted a study involving 100 similar cases. They discovered an equivalent occurrence of primary hemorrhage and concluded that the frequency of reactionary hemorrhage was comparable when employing both electrocautery and ligation as methods of achieving hemostasis.<sup>26</sup> Another investigation conducted by P.K. Moonka revealed that diathermy did not achieve sufficient hemostasis in 4 out of 188 cases, whereas ligation failed in 6 out of 188 cases. Moonka concluded that bipolar diathermy is as effective as ligation in controlling hemorrhage.<sup>27</sup>

On the contrary, a systematic review pointed out

a heightened risk of postoperative hemorrhage associated with hot techniques (electrosurgical) when compared to the cold dissection method.<sup>28</sup> The findings in our study are consistent with those of a randomized controlled trial<sup>29</sup> and large prospective cohort studies consistently demonstrate an increased risk of postoperative hemorrhage following tonsillectomy with electrocautery in comparison to cold dissection techniques.<sup>30,31</sup> Ali et al.'s retrospective study, involving 494 patients, similarly revealed elevated rates of postoperative hemorrhage associated with the bipolar cautery technique.<sup>32</sup> Cauterization tends to lead to a more profound and extensive zone of necrosis, exposing larger vessels during eschar sloughing, consequently raising the likelihood of hemorrhage.<sup>33</sup>

This study has limitations, including its single-center design, a relatively small sample size (102 patients), and a wide age range (3 to 59 years). Exclusion criteria may introduce selection bias, and the reliance on clinical judgment for post-operative hemorrhage assessment is subjective. The conclusion about a higher hemorrhage frequency with bipolar diathermy lacks a detailed exploration of potential confounding factors. These limitations should be considered when interpreting the study's findings.

## CONCLUSION

This study concluded that the frequency of post-tonsillectomy hemorrhage is higher in patients operated by bipolar diathermy as compared to the cold steel method. So, we recommend that the cold steel method should be used as a primary method in tonsillectomy patients to reduce the morbidity of the patients, and also junior trainees should be taught and paid more attention to learning this technique.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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




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**AUTHORSHIP AND CONTRIBUTION DECLARATION**

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Farzana Batool	Formulated and designed the study, was responsible for data collection, and wrote the manuscript.	
2	Sundus Ghani	Analyzed and interpreted the data, and helped in writing the manuscript and data collection.	
3	Mohammad Asif	Helped in analyzing and interpreting the data.	
4	Tahir Haroon	Helped in data collection and writing the manuscript.	
5	Mohammad Ibrahim	Helped in data collection.	
6	Naik Mohammad	Helped in data collection.	