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Research Article

A Comparative Study of Role of Feracrylum Vs Hydrogen Peroxide in Control of Bleeding In Tonsillectomy

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ABSTRACT
Background: Tonsillectomy remains one of the most frequently performed otolaryngological procedures worldwide. Hemorrhage, both intraoperative and postoperative, continues to be its most significant complication. Hydrogen peroxide has traditionally been used as a topical hemostatic agent owing to its effervescent action, but its hemostatic efficacy is limited. Feracrylum, a polyacrylic acid derivative with strong hemostatic and antimicrobial properties, has recently gained attention as a topical alternative. This study aimed to compare the hemostatic efficacy and safety of Feracrylum versus hydrogen peroxide in controlling hemorrhage during tonsillectomy.
Methods: A comparative study was conducted over two years at the Department of ENT, Government General Hospital, Kurnool, on 30 patients undergoing tonsillectomy. Each patient underwent bilateral tonsillectomy by the dissection and snare method. The right tonsillar fossa (Group A) was packed with gauze soaked in 5 ml of hydrogen peroxide, and the left tonsillar fossa (Group B) with gauze soaked in 5 ml of Feracrylum. Blood loss was measured separately on each side using pre- and postoperative gauze weights and suction volumes. Statistical analysis was performed using SPSS v20, with $p < 0.05$ considered significant.
Results: The mean total blood loss in the hydrogen peroxide group was 40.13 ± 12.44 ml, significantly higher than the Feracrylum group (24.07 ± 8.70 ml; $p < 0.001$). Blood soaked in gauze and suction volumes were consistently lower in the Feracrylum group. No cases of reactionary or secondary hemorrhage were observed in the Feracrylum group, whereas minor bleeding episodes occurred in the hydrogen peroxide group. Postoperative infection rates were also lower in the Feracrylum group.
Conclusion: Feracrylum demonstrates superior hemostatic efficacy compared to hydrogen peroxide in tonsillectomy, with reduced intraoperative blood loss, fewer postoperative hemorrhagic events, and better infection control. It represents a promising and safe topical agent in tonsillectomy practice.

Keywords: Feracrylum, Hydrogen Peroxide, Tonsillectomy, Hemostasis, Hemorrhage Control, ENT Surgery.

INTRODUCTION

Tonsillectomy can be considered one of the most common surgical operations performed by otolaryngologists and is mostly recommended in terms of recurrent chronic tonsillitis, obstructive sleep apnea, and tonsilloliths, and other chronic tonsillar pathologies. Although a tonsillectomy is generally described as a procedure with minor risks, still there are major risks associated with this relatively minor procedure including hemorrhage. Bleeding can happen during the surgical procedure, during the initial postoperative period (reactionary hemorrhage), or several days later (secondary hemorrhage), and bleed is the most dreaded complication owing to the possibility of developing morbidity and even resulting in death. Post-tonsillectomy hemorrhage is reported between 2 and 15 percent depending on the technique used and hemostatic settings [1,2]. This has put very high emphasis on the invention and advancement of helpful hemostatic measures in the exercise of otolaryngology.

A variety of hemostatic techniques have been employed during tonsillectomy, including cold dissection with ligature, diathermy coagulation, bipolar cautery, suturing, and the use of topical agents. Each of these methods has inherent limitations. For example, thermal methods such as cautery may lead to excessive tissue damage, delayed healing, and postoperative pain, while ligature methods can prolong surgical time and may not always be effective for diffuse bleeding [3]. Consequently, topical agents that can be directly applied to the tonsillar fossa to control bleeding have been explored as an adjunctive or alternative measure.

Hydrogen peroxide is one such topical agent that has historically been used in tonsillectomy for its hemostatic properties. Its mechanism of action lies in the liberation of oxygen when it comes into contact with blood, which produces effervescence. This effervescence aids in mechanically dislodging debris, providing a transient tamponade effect, and improving visualization of the surgical field. However, its hemostatic efficacy is limited, and several studies have pointed out that the effect is short-lived and inconsistent. Moreover, concerns have been raised about its potential to cause mucosal irritation, delayed wound healing, and, in rare cases, oxygen embolism [4]. Thus, while hydrogen peroxide remains widely available and inexpensive, its utility as a dependable hemostatic agent in tonsillectomy is increasingly being questioned.

Feracrylum, on the other hand, is a relatively newer hemostatic agent that has gained interest in various surgical disciplines. It is a polyacrylic acid derivative with a molecular weight ranging between 500,000 and 800,000 Daltons. Its hemostatic action is achieved through complex formation with plasma proteins, which accelerates coagulation at the site of bleeding. Additionally, it creates a protective film over the wound surface, which not only enhances hemostasis but also reduces the chances of secondary infection. Another important property of Feracrylum is its antimicrobial action, as it has been shown to inhibit the growth of both Gram-positive and Gram-negative organisms [5,6]. Because postoperative tonsillar infections can predispose patients to delayed healing and secondary hemorrhage, this dual property of Feracrylum offers a unique advantage.

Clinical studies in gynecology, dentistry, and general surgery have demonstrated the efficacy of Feracrylum in reducing intraoperative bleeding and postoperative complications [7]. More recently, its use in otolaryngology has been explored, with promising results in procedures such as tonsillectomy. Comparative studies suggest that Feracrylum is more effective than conventional agents, including hydrogen peroxide, in reducing blood loss and preventing complications [8]. However, the literature remains limited, and large, well-designed trials in the field of ENT are scarce.

This study was therefore undertaken to compare the efficacy of Feracrylum with that of hydrogen peroxide in controlling hemorrhage during tonsillectomy. The specific objectives were to evaluate and quantify the difference in blood loss when using these two agents, as well as to assess the incidence of complications such as reactionary hemorrhage, secondary hemorrhage, and postoperative infections. The findings of this comparative study are expected to provide further evidence on the potential role of Feracrylum as a superior hemostatic agent in routine tonsillectomy practice, thereby contributing to improved patient outcomes and greater surgical safety.

MATERIALS AND METHODS

Study Design and Setting

The study was a prospective comparative study and was carried out in a Department of Otorhinolaryngology Government General Hospital, Kurnool during a time span of two years.

Sample Size:

A total of 30 patients undergoing tonsillectomy were included.

Inclusion Criteria:

- Patients aged above 6 years.
- Patients diagnosed with chronic tonsillitis who consented to tonsillectomy.
- Patients with tonsilloliths or tonsillar cysts requiring tonsillectomy.
- Patients with hemoglobin levels ≥ 10 g/dl.

Exclusion Criteria:

- Patients with known bleeding disorders.
- Patients presenting with acute exacerbation of chronic tonsillitis.
- Patients with malignant tonsillar tumors.
- Patients unwilling to undergo tonsillectomy.
- Patients with hemoglobin < 10 g/dl.
- Patients undergoing interval tonsillectomy for quinsy.

Ethical Considerations:

A clearance of ethics was obtained within the institutional review board. A written informed consent was signed by all participants or by their legal guardians in the case of minor patients after thoroughly explaining to them both the procedure for the surgery and the curative potential, as well as the risks involved.

Preoperative Evaluation:

Routine investigations on all the patients were done consisting of complete blood count, bleeding time, clotting time, blood grouping and typing, prothrombin time and INR.

Surgical Procedure:

All patients underwent tonsillectomy by the dissection and snare method under general anesthesia. To eliminate bias, preoperative infiltration with lignocaine and adrenaline was avoided in all cases. Tonsillectomy was performed sequentially on both sides in the same patient. The right tonsil was always

removed first and assigned to Group A, followed by removal of the left tonsil, which was assigned to Group B.

Application of Hemostatic Agents:

After completion of the dissection and removal of the tonsils, hemostasis was achieved using topical agents as per the study design. In every case, the right tonsillar fossa was designated as Group A and packed with gauze soaked in 5 ml of hydrogen peroxide, while the left tonsillar fossa was designated as Group B and packed with gauze soaked in 5 ml of Feracrylum solution. The sequence of performing right-sided tonsillectomy first followed by the left side was standardized in all patients to minimize variability and to ensure uniform comparison between the two groups.

Estimation of Blood Loss:

The estimation of blood loss was carried out separately for each tonsillar fossa to allow a precise comparative evaluation between the two hemostatic agents. Two methods were used simultaneously. First, the gauze pieces used intraoperatively were weighed before and after application, and the difference in their weights was recorded, with the assumption that an increase of one gram in gauze weight corresponded to one milliliter of blood absorbed. Second, the volume of blood collected in the suction apparatus was carefully measured for each side. The total blood loss for each fossa was calculated by adding the estimated blood absorbed in gauze to the measured suction volume, thereby providing an accurate assessment of intraoperative hemorrhage attributable to each hemostatic agent.

Postoperative Monitoring:

All patients were monitored for immediate and delayed complications including reactionary hemorrhage (within 24 hours), secondary hemorrhage (after 24 hours), and postoperative infection.

Statistical Analysis:

The results were computed using Statistical Package for the Social Sciences (SPSS) version 20 in the Microsoft Excel 2012. Intra-group comparisons were made by paired t-tests and inter-group comparisons by Student t-tests. Data were reported as meanSD. Statistically significant results were taken to be p-value of less than 0.05.

RESULTS

Demographic Characteristics

The enrolments in the study totaled 30 patients. Included in the study were nonpregnant participants whose ages ranged between 6 and 38 years, with a mean age of 15.70 7.72. There was an obvious female bias in the study group with 21 females (70%) against 9 males (30%).

Tonsillar Grade Distribution

On clinical grading of tonsillar hypertrophy, the majority of patients belonged to higher grades. Eleven patients (36.7%) presented with Grade 4 tonsils and nine patients (30%) with Grade 3 tonsils. Eight patients (26.7%) had Grade 2 tonsils, while only two patients (6.7%) demonstrated Grade 1 hypertrophy. This distribution reflects the predominance of advanced grades of chronic tonsillitis as an indication for surgery in this cohort.

Comparison of Intraoperative Blood Loss

Blood loss was consistently higher in the hydrogen peroxide group compared to the Feracrylum group. The mean postoperative gauze weight in the hydrogen peroxide group was 46.30 ± 14.62 g, while in the Feracrylum group it was 34.60 ± 10.99 g. The mean blood absorbed in gauze was 24.43 ± 10.01 ml in the hydrogen peroxide group versus 12.73 ± 6.22 ml in the Feracrylum group. Similarly, blood collected in suction was higher in the hydrogen peroxide group (15.87 ± 7.70 ml) compared to the Feracrylum group (11.00 ± 6.57 ml). The total blood loss was 40.13 ± 12.44 ml in the hydrogen peroxide group and 24.07 ± 8.70 ml in the Feracrylum group. All these differences were statistically significant, with p-values < 0.05, indicating the superior hemostatic effect of Feracrylum.

Hematological Parameters

Baseline hematological parameters, including hemoglobin, bleeding time, and clotting time, were comparable across patients irrespective of tonsillar grade. Hemoglobin levels ranged from 11 to 15 g/dl with a mean of 13.01 ± 1.19 g/dl, while bleeding and clotting times were within normal physiological limits in all patients. This confirms that the observed differences in blood loss were attributable to the hemostatic agent used rather than patient hematological status.

Statistical Analysis

Paired t-test analysis revealed a significant increase in gauze weights between pre- and post-operative values in both groups. However, the magnitude of this increase was substantially lower in the Feracrylum group. Correlation analysis also confirmed a strong association between pre- and post-operative gauze weights in both groups ($r = 0.766$ in Group A and $r = 0.834$ in Group B, $p < 0.001$). Independent t-test further validated that Feracrylum resulted in significantly lower blood loss compared to

hydrogen peroxide across all measured parameters.

Postoperative Complications

In terms of complications, two patients in the hydrogen peroxide group developed minor reactionary hemorrhage within the immediate postoperative period, which was controlled with additional hemostatic measures. One patient in this group also developed postoperative infection requiring antibiotic therapy. In contrast, no cases of reactionary or secondary hemorrhage and no infections were noted in the Feracrylum group. This suggests that Feracrylum not only reduced blood loss but also offered a protective effect against postoperative complications.

Table 1. Sex Distribution

Sex	Frequency	Percentage	p-value*
Female	21	70.0%	0.042
Male	9	30.0%	
Total	30	100.0%	

*Chi-square test showed statistically significant female predominance (p = 0.042).

Table 2. Tonsillar Grade Distribution

Tonsillar Grade	Frequency	Percentage	p-value*
Grade 1	2	6.7%	0.031
Grade 2	8	26.7%	
Grade 3	9	30.0%	
Grade 4	11	36.7%	
Total	30	100.0%	

Table 3. Comparison of Blood Loss Parameters between Groups

Parameter	Group A (Hydrogen Peroxide) Mean ± SD	Group B (Feracrylum) Mean ± SD	p-value
Post-op gauze weight (gm)	46.30 ± 14.62	34.60 ± 10.99	0.001
Blood soaked in gauze (ml)	24.43 ± 10.01	12.73 ± 6.22	<0.001
Blood in suction (ml)	15.87 ± 7.70	11.00 ± 6.57	0.011
Total blood loss (ml)	40.13 ± 12.44	24.07 ± 8.70	<0.001

Table 4. Hematological Parameters across Tonsillar Grades

Tonsillar Grade	Age (Mean ± Sd)	Hb (Mean ± Sd) G/Dl	Bt (Mean ± Sd) Min	Ct (Mean ± Sd) Min	P-Value*
Grade 1	23.50 ± 2.12	12.00 ± 0.70	2.44 ± 0.08	4.70 ± 0.98	>0.05
Grade 2	23.13 ± 8.50	12.71 ± 1.10	2.93 ± 0.66	5.14 ± 0.70	
Grade 3	13.56 ± 5.48	13.47 ± 1.18	3.05 ± 0.62	4.95 ± 0.61	
Grade 4	10.64 ± 3.01	13.02 ± 1.27	2.81 ± 0.50	4.82 ± 0.83	
Total	15.70 ± 7.72	13.01 ± 1.19	2.89 ± 0.57	4.93 ± 0.71	

Table 5. Paired T-Test (Pre- Vs Post-Operative Gauze Weights)

Pair	Parameter	Mean ± SD (gm)	N	p-value
1	Group A: Pre-op gauze weight	21.87 ± 7.77	30	<0.001
	Group A: Post-op gauze weight	46.30 ± 14.62	30	
2	Group B: Pre-op gauze weight	21.87 ± 7.77	30	<0.001
	Group B: Post-op gauze weight	34.60 ± 10.99	30	

Table 6. Independent Student's T-Test (Group A Vs Group B)

Parameter	Group A (Hydrogen Peroxide) Mean ± SD	Group B (Feracrylum) Mean ± SD	p-value
Post-op gauze weight (gm)	46.30 ± 14.62	34.60 ± 10.99	0.001

Blood soaked in gauze (ml)	24.43 ± 10.01	12.73 ± 6.22	<0.001
Blood in suction (ml)	15.87 ± 7.70	11.00 ± 6.57	0.011
Total blood loss (ml)	40.13 ± 12.44	24.07 ± 8.70	<0.001

The pie chart illustrates the proportion of male and female patients included in the study. A female predominance was noted, with 70% of the study population being female and 30% male.

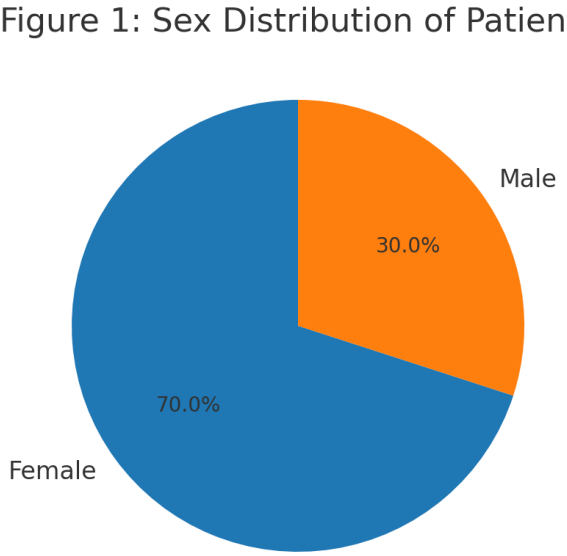

Figure 1. Sex distribution of patients undergoing tonsillectomy.

The bar chart demonstrates the clinical grading of tonsillar hypertrophy among the study cohort. Grade 4 hypertrophy was most common (36.7%), followed by Grade 3 (30%), Grade 2 (26.7%), and Grade 1 (6.7%).

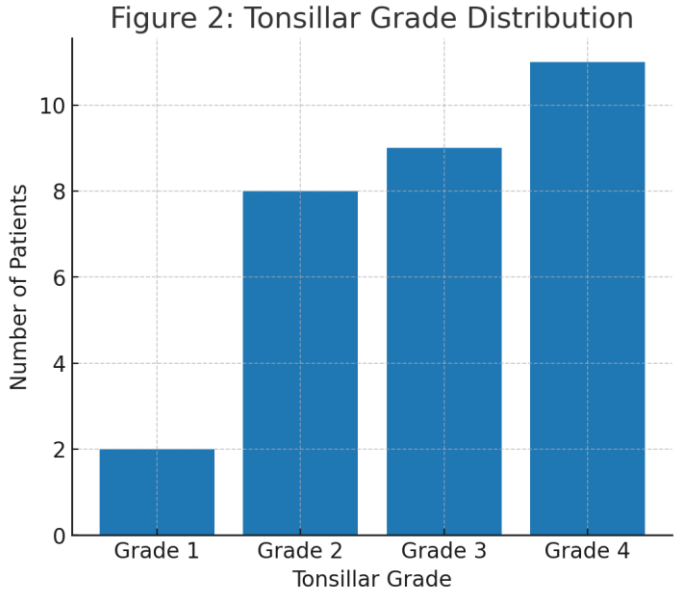

Figure 2. Distribution of Patients According To Tonsillar Grade.

The bar chart with error bars (± SD) shows significantly greater blood loss in the hydrogen peroxide group (40.13 ± 12.44 ml) compared with the Feracrylum group (24.07 ± 8.70 ml; $p < 0.001$).

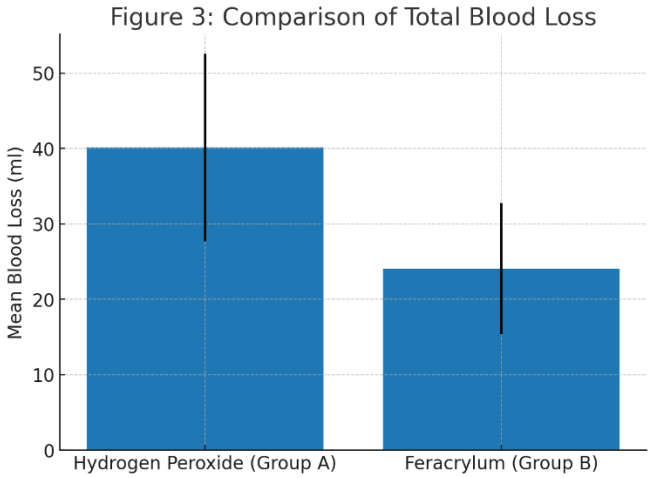

Figure 3. Comparison of Mean Total Blood Loss between Hydrogen Peroxide and Feracrylum Groups.

DISCUSSION

The findings of this study demonstrate that Feracrylum is significantly more effective than hydrogen peroxide in reducing intraoperative bleeding during tonsillectomy. The mean total blood loss in the Feracrylum group was nearly 40% lower than that observed in the hydrogen peroxide group, a difference that was statistically significant ($p < 0.001$).

Hydrogen peroxide, while long used in surgical practice, primarily acts via effervescence that mechanically dislodges debris and provides transient tamponade. However, its hemostatic effect is superficial and short-lived, with additional concerns of mucosal irritation and oxygen embolism in rare cases [3,4]. In contrast, Feracrylum promotes hemostasis by binding to plasma proteins, creating a stable coagulum, and forming a protective film at the bleeding site. This not only halts bleeding more effectively but also protects the raw surface from secondary infection [5–7].

Our study corroborates previous reports in gynecological and general surgical contexts, where Feracrylum significantly reduced intraoperative blood loss and minimized postoperative hemorrhage [7-15]. Importantly, no cases of reactionary or secondary hemorrhage were observed in the Feracrylum group, while minor episodes occurred in the hydrogen peroxide group. This observation underlines the clinical significance of Feracrylum in reducing potentially life-threatening postoperative complications.

Additionally, Feracrylum's antimicrobial properties offer an added advantage, as postoperative tonsillar fossa infections are known contributors to delayed healing and secondary hemorrhage [6]. In our series, infection rates were lower in the Feracrylum group, though the sample size was limited.

The study's strengths include its self-controlled design, with each patient serving as their own control, minimizing interpatient variability. Limitations include the small sample size, single-center setting, and lack of long-term follow-up beyond the immediate postoperative period. Future multicentric randomized controlled trials with larger cohorts are warranted to confirm these findings and establish Feracrylum as a standard topical hemostatic agent in tonsillectomy.

CONCLUSION

This comparative study establishes Feracrylum as a superior topical hemostatic agent compared to hydrogen peroxide in tonsillectomy. Feracrylum significantly reduced intraoperative blood loss, minimized the risk of reactionary and secondary hemorrhage, and demonstrated antimicrobial benefits. Its favorable safety and efficacy profile make it a valuable adjunct in tonsillectomy, with potential for wider application across surgical fields. Future large-scale randomized controlled trials are recommended to strengthen evidence and encourage routine use of Feracrylum in clinical otolaryngology practice.

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