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Original Research Article

Effectiveness of use of Intra-Operative Tincture of Benzoin Versus 3% Hydrogen Peroxide in Controlling Secondary Post-Operative Hemorrhage After Tonsillectomy: A Comparative Study

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Abstract

Introduction: Tonsillectomy is a widely performed surgical procedure, often utilizing the "hot method". A significant concern is secondary postoperative hemorrhage (bleeding after 24 hours, typically between days 5-10).

Aims: This study compares the effectiveness of two topical haemostatic agents, Tincture of Benzoin (TB) and 3% Hydrogen Peroxide, in controlling this complication.

Methods: This was an institution-based prospective analytical study conducted at Murshidabad Medical College and Hospital. Ninety eligible pediatric patients (up to 18 years of age) undergoing bilateral tonsillectomy for chronic tonsillitis (Paradise Criteria) were included. A paired design was used: TB was applied to the left tonsillar bed, and 3% hydrogen peroxide to the right tonsillar bed. Patients were followed for 10 days postoperatively to detect secondary hemorrhage. Data were analyzed using the McNemar's Chi-square test.

Results: A total of seven secondary hemorrhage events were recorded. All events occurred exclusively on the side treated with 3% Hydrogen Peroxide (Incidence: 7.8%). No secondary bleeding events (0.0%) were observed on the side treated with Tincture of Benzoin. The McNemar's Chi-square test showed a statistically significant difference between the two groups: (Chi-square = 5.143, $p < 0.05$).

Conclusion: Tincture of Benzoin is significantly superior to 3% Hydrogen Peroxide in preventing secondary postoperative hemorrhage after tonsillectomy. Its use should be considered for improved clinical protocols in managing this serious complication.

Keywords: Tonsillectomy; Secondary Postoperative Hemorrhage; Tincture of Benzoin; Hydrogen Peroxide 3%; Hemostasis; Paediatric Otolaryngology; Comparative Study; Mcnemar's Test; Post-Tonsillectomy Bleeding; Topical Haemostatic Agents.

Introduction

Tonsillectomy is a commonly performed surgical procedure for chronic tonsillitis, often utilizing the "hot method," which involves dissection combined with bipolar electro cauterization [1].

Despite being a relatively straightforward procedure, postoperative bleeding remains a serious complication, posing significant risks, particularly in paediatric patients [2,3].

Two types of postoperative bleeding can occur after tonsillectomy: primary bleeding and secondary bleeding. Post-tonsillectomy hemorrhage may rarely occur within the first 24 hours following surgery, referred to as primary post-tonsillectomy bleeding. More commonly, it presents after 24 hours—typically between the 5th and 10th postoperative day—and is classified as secondary bleeding [4].

The local application of 3% Hydrogen Peroxide to the tonsillar bed following tonsillectomy shows beneficial effects, including less operative time, reduced intra-operative blood loss, and a lower number of haemostatic sutures [5].

Tincture of Benzoin, a pungent 10–20% ethanol solution of Styrax Benzoin resin. It is valued for its antiseptic, protective, and adhesive-enhancing properties, making it a long-trusted staple in medical care. It supports wound healing, showing strong granulation growth and good re-

epithelialization [6]. It also has effective antiseptic action, with no microorganisms surviving after 24 hours [7]. It can be used on skin fissures, canker sores, and blisters as an antiseptic and stypic [8].

In this study, we assessed secondary bleeding in patients following bilateral tonsillectomy. After tonsillectomy, 3% Hydrogen Peroxide (H_2O_2) was applied intra-operatively to the right tonsillar bed as a haemostatic agent, while Tincture of Benzoin was applied to the left tonsillar bed for the same purpose. The patient was then followed up for 10 days postoperatively to monitor for any episodes of secondary hemorrhage.

Materials and Methods

Study Area & Settings: Applied therapeutic, tertiary institutional care centre.

Study place: The study will be conducted in the department of ENT and Head and Neck Surgery Murshidabad Medical College and Hospital.

Study Design: Institution based prospective analytical study comparing two pre-determined groups one of the tonsils (left) will be treated with Tincture of Benzoin and the other right with 3% H_2O_2.

Study Timeline Parameters: Timeframe of the study is about 12 months from approval of research proposal.

Timeline Parameters

- Preparatory Phase-1month
- Case Recruitment, data collection -12 months
- Data Entry and Analysis-1 month

Target study Population: Patients attending Murshidabad Medical College and Hospital, Outpatient Department of ENT and Head and Neck Surgery attending with chronic tonsillitis (by the Paradise Criteria) and about to undergo tonsillectomy.

Inclusion Criteria

- Age up to 18 years
- Haemoglobin ≥10 gm%
- Diagnosed chronic tonsillitis (Paradise Criteria) eligible for tonsillectomy as routine care
- Provides informed written consent

Exclusion Criteria

- Bleeding/clotting disorders
- Non-chronic tonsillar enlargement (e.g., abscess, neoplasm)
- Pregnancy/lactation
- Excessive iatrogenic bleeding
- Chronic systemic illnesses
- Unilateral tonsillar growth

Surgical and Treatment Protocol: The surgical procedure was bilateral tonsillectomy under general anaesthesia using the hot method. The study utilized a paired, split-mouth design where each patient served as their own control.

- **Left Tonsillar Bed:** Tincture of Benzoin was applied intra-operatively.
- **Right Tonsillar Bed:** 3% Hydrogen Peroxide was applied intra-operatively.

Immediate hemostasis was observed intra-operatively.

Outcome Measurement and Follow-up

Outcome Definition: Secondary haemorrhage was defined as any bleeding demonstrable from the site of surgery after 24 hours, typically between the 5th and 10th postoperative day. A positive examination included the presence of a clot, ooze, ooze and clot at the same time, or active bleeding [9].

Follow-up Schedule: Patients were followed daily for 7 days (12-hourly checks) and had a final OPD visit on Day 10.

Statistical Analysis: Data were entered into Excel and subsequently analysed using SPSS and Graph Pad Prism. Continuous variables were summarized as means with standard deviations, while categorical variables were presented as counts and percentages.

Comparisons between independent groups were performed using two-sample t-tests, and paired t-tests were applied for correlated (paired) data.

Categorical data were compared using chi-square tests, with Fisher's exact test applied when expected cell counts were small. A p-value of ≤ 0.05 was considered statistically significant.

Result

Table 1: Incidence of Secondary Hemorrhage by Treatment Site

Treatment Applied	Tonsillar Bed Side	Total Sides Studied (N)	Number of Hemorrhage Events	Incidence Rate
Tincture of Benzoin (TB)	Left	90	0	0.0%
3% Hydrogen Peroxide	Right	90	7	7.8%

Table 2: Details of Secondary Hemorrhage Events (3% Hydrogen Peroxide Side Only)

Patient ID	Day of Hemorrhage
P54	Day 6
P7	Day 7
P28	Day 7
P38	Day 7
P68	Day 7
P12	Day 10
P84	Day 10

Table 3: McNemar's Paired Contingency Table

TB Side (Left)	No Bleeding	Yes Bleeding
No Bleeding	n_{NN} = 83	n_{NY} = 7
Yes Bleeding	n_{YN} = 0	n_{YY} = 0

Table 4: McNemar's Test Results

Statistical Parameter	Value
Chi-square (χ^2)	5.143
Degrees of Freedom (df)	1
P-value	< 0.05

The study included 90 patients who underwent bilateral tonsillectomy. The total incidence of secondary postoperative hemorrhage across the 90 patients was recorded for each treatment site.

Incidence of Secondary Postoperative Hemorrhage

A total of seven secondary hemorrhage events were recorded within the 10-day follow-up period. As shown in the data table, all seven events occurred exclusively on the right tonsillar bed, which was treated with 3% Hydrogen Peroxide. No secondary bleeding events (0.0%) were observed on the left tonsillar bed treated with Tincture of Benzoin.

Application of Tincture of Benzoin (TB) to the left tonsillar bed was associated with a 0% secondary hemorrhage rate, whereas the contralateral application of 3% hydrogen peroxide resulted in 7 hemorrhage events among 90 treated sides (7.8%). All bleeding events occurred exclusively on the hydrogen peroxide–treated side (Table 1). The timing of hemorrhage ranged from postoperative day 6 to day 10, with the majority occurring on day 7 (5 of 7 cases), suggesting a clustered onset pattern during the first postoperative week (Table 2). McNemar's paired analysis further demonstrated that in all seven cases of secondary hemorrhage, the TB-treated side remained free of bleeding, producing an asymmetric discordant pattern ($n_{n\gamma} = 7$ vs. $n_{\gamma n} = 0$) indicative of a treatment-related difference (Table 3). The McNemar's test yielded a chi-square value of $\chi^2 = 5.143$ with 1 degree of freedom, corresponding to a p-value < 0.05, confirming that the difference in secondary hemorrhage incidence between the two treatments was statistically significant (Table 4). These findings support that TB markedly reduced postoperative hemorrhage risk compared with 3% hydrogen peroxide in this paired-site design.

Discussion

Secondary hemorrhage represents a significant source of morbidity following tonsillectomy, particularly in procedures utilizing the hot method, where tissue thermal injury may contribute to later sloughing and bleeding. The present study, employing a rigorous paired design, provides strong evidence regarding the prophylactic efficacy of Tincture of Benzoin versus 3% Hydrogen Peroxide in this critical phase.

The observation of zero secondary hemorrhage events on the Tincture of Benzoin-treated side compared to seven events on the Hydrogen Peroxide-treated side is clinically and statistically compelling ($p < 0.05$). This outcome strongly supports the hypothesis that Tincture of Benzoin is superior to 3% Hydrogen Peroxide in preventing secondary post-tonsillectomy bleeding.

This superior efficacy is likely rooted in the fundamental differences in the mechanism of action:

1. **Hydrogen Peroxide:** Acts primarily as a fast-acting topical haemostatic agent by rapidly decomposing into water and oxygen, creating an oxidative burst that aids in immediate clot formation. While effective for initial hemostasis, this action offers no sustained physical or antimicrobial protection against the causes of secondary bleeding, such as mechanical stress or eschar sloughing due to infection.
2. **Tincture of Benzoin (TB):** Provides a protective barrier or tissue-coating effect over the tonsillar fossa. This physical seal likely stabilizes the wound bed, protecting the forming eschar from mechanical disruption

during swallowing and offering prolonged antiseptic benefits. Previous studies have confirmed Tincture of Benzoin's positive role in wound healing, showing high rankings in re-epithelialization and granulation tissue growth. It is these sustained protective qualities that are theorized to prevent late-onset hemorrhage.

The statistically significant finding from this study justifies the recommendation of Tincture of Benzoin over 3% Hydrogen Peroxide as the agent of choice for prophylaxis against secondary post-tonsillectomy hemorrhage.

Conclusion

Based on the results of this prospective comparative study, Tincture of Benzoin is significantly superior to 3% Hydrogen Peroxide in preventing secondary postoperative hemorrhage following tonsillectomy.

The incidence of secondary bleeding was 0.0% on the Tincture of Benzoin-treated side, compared to 7.8% on the Hydrogen Peroxide-treated side (Chi-square= 5.143, $p < 0.05$). The use of Tincture of Benzoin should be considered for implementation in clinical protocols to enhance patient safety and improve post-tonsillectomy outcomes.

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