

Local Application of 3% Hydrogen Peroxide as Hemostatic Agent in Tonsillectomy

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ABSTRACT

Aims and objective: The aim of this study was to assess the hemostatic efficacy of topical application of 3% hydrogen peroxide in tonsillectomy.

Material and methods: The study was conducted in the Department of Otorhinolaryngology, Ananta Institute of Medical Sciences, Rajsamand, Rajasthan, India, for the period of 2 years from July 2016 to July 2018. Eighty randomly selected patients with the clinical diagnosis of chronic tonsillitis with or without adenoid hypertrophy and who underwent tonsillectomy or adenotonsillectomy were included in the study. In group A ($n = 40$), a gauze piece soaked with 3% hydrogen peroxide was applied to the tonsillar fossa for 5 minutes just after removal of the tonsil. In another 40 patients (group B), a normal saline-impregnated gauze piece was applied to the fossa for 5 minutes. Results were evaluated in terms of duration of surgery, operative blood loss, and the number of ties used to achieve hemostasis.

Results: Age of the patients ranged from 4 to 36 years with a mean age of 14.98 years. The number of female patients (57.5%) was more than male patients (42.5%). The average duration of surgery in group A was 27.63 (± 9.24) minutes, while in group B, it was 39.3 (± 4.13) minutes. The average amount of blood loss in group A was 70.2 (± 7.15) mL, while in group B, it was 92.4 (± 5.60) mL. The average number of sutures applied in group A was 1, while in group B, it was 2.1.

Conclusion: The use of 3% hydrogen peroxide in the tonsillar fossa after removal of the tonsil reduces the duration of surgery, the amount of intraoperative blood loss, and the number of ties used to control bleeding.

Keywords: Coblation, Cold dissection, Primary hemorrhage, Tonsillectomy.

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INTRODUCTION

Tonsillectomy is one of the commonest surgeries performed by otorhinolaryngologists. Cornelius Celsus was the first person to recognize the tonsillar disease and performed the first tonsillectomy in 40 AD using his fingernails.¹

Worthington² and Waugh^{3,4} first described the modern technique of tonsillectomy by dissection in the beginning of the 20th century. Since then, many surgical techniques of tonsillectomy have been developed, including electrocautery, cryosurgery, coblation, microdebrider, ultrasonic, monopolar and bipolar dissection, and laser removal, but still, the cold dissection and snare method is the procedure of choice in most of the centers worldwide.

Although tonsillectomy is relatively a safe surgery, some serious complications, like hemorrhage, dehydration, and postoperative infection, can occur which can be severe and lead to death. Hemorrhage following tonsillectomy can be primary (immediate bleeding occurs during surgery), reactionary (early bleeding occurs within 24 hours of surgery), or secondary hemorrhage (delayed bleeding occurs 5–10 days after surgery).

Many topical agents, like hydrogen peroxide (H_2O_2) and bismuth subgallate, have been used to control the bleeding in tonsillectomy. The incidence of oozing and active bleeding was found to be greatly reduced with the use of these agents.^{5–7}

Hydrogen peroxide has been used in medicine for more than 100 years. It is known in surgery as a highly useful irrigation solution by virtue of both its hemostatic and antimicrobial effects.⁸ It kills fibroblasts and occludes local microvasculature when applied to the wound.^{9,10}

The aim of this study was to assess the hemostatic efficacy of topical application of 3% hydrogen peroxide in tonsillectomy. The

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evaluation was done in terms of duration of surgery, operative blood loss, and number of ties used to achieve hemostasis.

MATERIAL AND METHODS

The study was conducted in the Department of Otorhinolaryngology, Ananta Institute of Medical Sciences, Rajsamand, Rajasthan, India, for the period of 2 years from July 2016 to July 2018.

Eighty randomly selected patients with the clinical diagnosis of chronic tonsillitis with or without adenoid hypertrophy and who underwent tonsillectomy or adenotonsillectomy were included in the study.

All the patients underwent regular medical examinations. Routine investigations along with coagulation profiles were done in all the patients. The surgery was done under general anesthesia by the classical dissection and snare method. Adenoidectomy, wherever required, was done by curettage. Risk of air embolism

with the use of H₂O₂ was explained to all the patients. Patients who refused to give consent were excluded from the study.

Out of the total 80 patients included in the study, in group A ($n = 40$), a gauze piece soaked with 3% hydrogen peroxide was applied to the tonsillar fossa for 5 minutes just after removal of the tonsil. In another 40 patients (group B), a normal saline-impregnated gauze piece was applied to the fossa for 5 minutes. After the removal of gauze pieces in both groups, stubborn bleeders were either cauterized or ligated with sutures.

The following parameters were recorded in all the cases:

- Duration of surgery: Duration between the Boyle–Davis mouth gag applied to the mouth and the time the gag removed was calculated.
- Operative blood loss: Operative blood loss was calculated by weighing the blood-soaked gauze pieces against the equal number of unused pieces and by measuring the volume of blood in a suction bottle. The volume of the blood in the gauze pieces was calculated by dividing the weight of blood on the gauze piece by the specific gravity of blood (i.e., 1.055).¹¹
- Number of sutures applied to achieve complete hemostasis.

RESULTS

A total of 80 patients who underwent tonsillectomy or adenotonsillectomy were included in the study for the period of 2 years from July 2016 to July 2018. Age of the patients ranged from 4 to 36 years with a mean age of 14.98 years.

All the patients underwent bilateral tonsillectomy by cold dissection method, and nine patients additionally required adenoidectomy (11.25%).

The number of female patients (57.5%) was more than male patients (42.5%). The two groups were matched with respect to age and sex of the patients.

All the patients were divided into two groups. In group A ($n = 40$), a gauze piece soaked with 3% hydrogen peroxide was applied to the tonsillar fossa for 5 minutes just after removal of the tonsil. In another 40 patients (group B), a normal saline-impregnated gauze piece was applied to the fossa for 5 minutes.

The average duration of surgery in group A was 27.63 (± 9.24) minutes, while in group B, it was 39.3 (± 4.13) minutes. It means that after the application of the H₂O₂ gauze piece, the time taken for surgery was 29.69% less than the time taken in group B where normal saline-impregnated gauze pieces were used instead of H₂O₂. The difference was statistically significant (p -value < 0.0001).

The average amount of blood loss in group A was 70.2 (± 7.15) mL, while in group B, it was 92.4 (± 5.60) mL, which means a 24.02% reduction in blood loss on using H₂O₂ gauze pieces. The difference was statistically significant (p -value < 0.0001).

The average number of sutures applied in group A was 1, while in group B, it was 2.1. The data suggested that there was 52.38% less suture requirement in surgery on using H₂O₂ gauze pieces. The difference was statistically significant (p -value < 0.0001). The results of the study are depicted in Table 1.

Among the 80 patients, only one patient had reactionary hemorrhage, which was immediately managed by applied pressure with adrenaline-soaked gauze in the fossa. One patient had a severe secondary hemorrhage and required hospitalization for 5 days with transfusion of three units of blood

Table 1: Results of the study in terms of duration of surgery, volume of blood loss, and number of sutures applied

Groups	Mean	Standard deviation (SD)	Decrease percentage (%)	<i>p</i> value
Duration of surgery (in minutes)				
Group A	27.63	9.24	29.69	< 0.0001
Group B	39.30	4.13		
Blood loss (in mL)				
Group A	70.2	7.15	24.02	< 0.0001
Group B	92.4	5.60		
Number of sutures required				
Group A	1	0.72	52.38	< 0.0001
Group B	2.1	0.96		

Group A—H₂O₂-soaked gauze pieces were applied in the tonsillar fossa; Group B—Normal saline-impregnated gauze pieces were applied in the tonsillar fossa

and intravenous antibiotic administration. Both of the patients were from group B.

DISCUSSION

Hydrogen peroxide has been used in medicine for more than 100 years. In neurosurgery, it is widely used as a hemostatic agent for a long time. Although the mechanism of action of H₂O₂ is not clear, several hypotheses have been proposed, among which are vasoconstriction, thrombus formation, platelet aggregation, and small blood vessel occlusion due to microbubbles.^{12,13}

The present study is done to assess the hemostatic efficacy of topical application of 3% hydrogen peroxide in tonsillectomy.

In the present study, age of the patients ranged from 4 to 36 years with a mean age of 14.98 years. Females (57.5%) were affected more than males (42.5%).

While reviewing the literature, very few studies were found on the use of H₂O₂ as a hemostatic agent in tonsillectomy. No literature was found of a similar study done anywhere in India. Chang et al. carried out a study in the year 2003 in 120 pediatric patients to evaluate the hemostatic efficacy of topical application of cold hydrogen peroxide in adenoidectomy. They concluded that the incidence of oozing and active bleeding decreased when cold hydrogen peroxide was applied. The intraoperative time was also significantly reduced while using cold H₂O₂.⁵

In the present study, a significant difference was found in group A and group B in terms of duration of surgery, volume of intraoperative blood loss, and number of sutures applied to control bleeding.

A similar study was done by Al-Abbasi et al. in the year 2008. They studied 30 tonsillectomy cases and concluded that local application of 3% H₂O₂ on the tonsillar bed after tonsillectomy is beneficial as it decreases the procedure time and the volume of intraoperative blood loss as well as the number of ties used during the surgery.⁶

Mushtaq Neema et al. in the year 2011 carried out a study to compare the use of hydrogen peroxide, iced packs, and non-agent packs in tonsillectomy hemostasis. They concluded that local application of 3% hydrogen peroxide on the tonsillar bed is beneficial in decreasing the volume of intraoperative blood loss more than any other application, while no significant difference

was found between the groups regarding the number of packs used and in the duration of surgery.¹⁴

An additional benefit of the application of hydrogen peroxide was to clarify the exact location of bleeders which need to be ligated. This use can be utilized during the intraoperative period to look for bleeders clearly and also during the postoperative period in case of primary or secondary hemorrhage. On examining patients with postoperative bleeding, there may be no active bleeding point or just a blood clot area in the fossa. The dislodgement of blood clots and gargle with hydrogen peroxide can clarify the exact location of the bleeder and help in the control of bleeding. This advantage has been utilized by Kalloo et al., who used hydrogen peroxide spray through an endoscope while performing upper gastrointestinal endoscopy which resulted in enhancement of clot dissolution and better visualization of the bleeder.¹⁵

None of the cases reported any kind of adverse effect with the use of hydrogen peroxide in tonsillectomy in our study. Some of the previous studies of the neurosurgical field have reported the dangerous gas emboli by the use of H₂O₂ irrigation.¹⁶ Informed risk consent was obtained from all the patients in the present study.

In the present study, only one patient had reactionary hemorrhage, which was immediately managed by applied pressure with an adrenaline-soaked gauze in the fossa. Adrenaline was available in the emergency tray of the ward, and it has also been extensively used as a hemostatic agent in the past.¹⁷ One patient had a severe secondary hemorrhage and required hospitalization for 5 days with transfusion of three units of blood and intravenous antibiotic administration. Both of the patients were from group B.

CONCLUSION

Tonsillectomy is one of the commonest surgeries performed by otolaryngologists, and it occupies a significant share of time in a surgeon's operation list. So any method to reduce the duration of the surgery will greatly affect the number of surgeries performed and reduce patient morbidity. The use of 3% hydrogen peroxide in the tonsillar fossa after removal of the tonsil reduces the duration of surgery, the amount of intraoperative blood loss, and the number of ties used to control bleeding. It is a very simple, easy, and cost-effective method to achieve hemostasis in tonsillectomy and can be used as a routine step in tonsillectomy.

INFORMED CONSENT

Well-informed and written consent was obtained from all the participants included in the study.

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