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Tonsillar healing membrane characteristic for tonsillectomy using combined cold dissection and bipolar electrocautery

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Abstract

Purpose To evaluate post-tonsillectomy healing process using combined cold dissection and bipolar cautery for hemostasis.

Methods This case series included patients for whom tonsillectomy was done by cold dissection and limited the bipolar cautery for hemostasis and dealing with the lower pole only. Saline irrigation was used for the tonsillar bed after tonsillectomy and a wet saline-moistened pack was placed into the tonsil fossa. Intra-oral digital photographs were reviewed postoperative, at 3rd, 5th, 7th, 9th, 11th, 13th, 15th, and 21st day after surgery. Patients were asked to register their postoperative pain using a standardized visual analog scale. The time of separation of the healing membrane (HM) and any blood clot and/or bleeding surface were recorded.

Results Among included 114 patients, the HM color was white without odor in all cases. Extension of the HM was limited to the tonsillar bed in 112 patients (98%) and exceeded in 2 patients (2%). The mean time for HM separation was 8.8 ± 1.1 days (range = 7–14) with a significantly longer period of separation in females ($p = 0.0008$). There was no significant correlation between the time of the HM separation and the age of the patients ($P = 0.9$).

Conclusion Cold dissection tonsillectomy with limited hot tools usage for hemostasis by bipolar cautery with frequent saline wash leads to odorless HM and a good healing process with an average separation of the HM and so less pain and post-tonsillectomy bleeding.

Keywords Tonsillectomy, Cautery, Healing membrane, Bleeding

Background

Worldwide, tonsillectomy is one of the commonest pediatric surgeries [1]. Postoperative pain is crucial because it can limit oral intake with consequent dehydration and may serious dehydration complications [2].

Tonsillectomy could be followed by complications such as hemorrhage, pain, dehydration, and infection. After tonsillectomy in pediatrics, it was encountered hemorrhage, dehydration, and infection or fever at 3%, 4%, and 1% estimated rates, respectively [3].

The post-tonsillectomy wound healing is an area that is poorly studied with very few available literature studies. Therefore, clinicians have limited evidence on how to direct dissection methods to improve post-tonsillectomy healing. Better knowledge in this area may lead to improved judgment of operative techniques and the postoperative experience. This might lessen the wound healing negative sequels and prevent the sizable related health-care costs [4].

In the current study, we combined cold dissection and bipolar cautery for hemostasis and dealing with the lower

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pole as a cheap and effective method for carrying out tonsillectomy safely and efficiently. We aimed to evaluate the surgical outcomes and the healing after this method of tonsillectomy.

Methods

This prospective case series study was conducted on patients for whom tonsillectomy was performed at the ORL Department, Universities Hospitals, from January 2021 to February 2022. This study was done following the Helsinki on Biomedical Research on Human Subjects declarations. The institutional review board (Zag-IRB#10777) authorized the work methodology. A preceding written instructive consent was gained from the parents of the included patients (age range from 3 to 12 years). Participants had the right to leave the study at any time. Entire patients' data were kept private.

Patients with a history of snoring/OSA surgery, had preceding tonsillotomy, missed follow-up, quinsy history, bleeding disorders, and contraindication to general anesthesia were excluded.

We did careful history collection and general and ORL examinations for all the study participants. Then, under general anesthesia with an oral cuffed endotracheal tube, a tonsillectomy was performed by the same surgeon.

Tonsillectomy was started by cold dissection using sharp scissor cut for the anterior and posterior pillars then dissecting the tonsils limiting bipolar cautery for hemostasis and dealing with the lower pole only utilizing a low power of 25watts.

After dissection of the first tonsil, the tonsil be was irrigated with saline and a wet temporary saline-moistened pack was placed into the first tonsil fossa. The same was done for the second tonsil.

Before removal of the mouth gag, intra-oral digital photographs were collected after tonsils removal to declare the condition of posterior and anterior pillars, preserved or not. For all patients, they were discharged on the same surgery day and paracetamol was prescribed.

All patients were reviewed on the days; 3,5,7,9,11,13,15 and 21 after surgery taking and recording pharyngeal digital photographs. Postoperatively, patients were asked to register their pain via a standardized visual analog scale (VAS) from 0 up to 10, where 10 meant the severest pain and 0 no pain, on postoperative days 1,3,5,7,9,11. Late complications (such as globus sensation, stenosis) was assessed at 6 months postoperatively.

Uvula edema; extent of the healing membrane (HM); thickness, odor, and color of the HM; separation time of the HM; and any blood clot or active bleeding surface in bed were recorded.

The data were gathered, registered, arranged in tables, and analyzed by SPSS statistics package Version20 for Windows (SPSS Inc., Chicago, IL, USA). *P* value was referred to as significant if < 0.05 (95% confidence interval).

Table 1 Patient data and healing membrane characters

Age (years)	Mean	6 ± 2.4
	Range	3–12
Gender	Male	56 (48%)
	Female	58 (52%)
Extension of healing membrane	Limited to tonsil bed	112 (98%)
	Exceed tonsil bed	2 (2%)
Color of the healing membrane	White without odor	All (100%)
Separation of healing membrane	Mean	8.8 ± 1.1
	Range	7–14

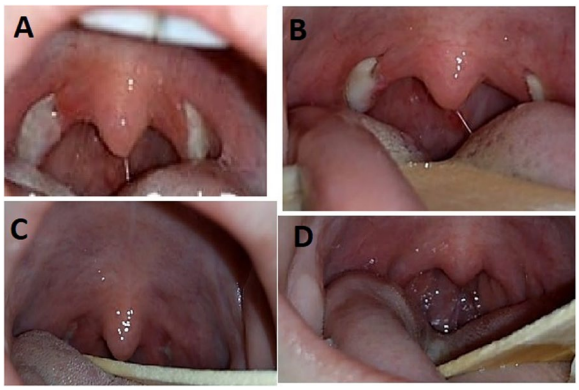

Fig. 1 Postoperative view of the tonsillar bed: **A** 3 days after tonsillectomy, **B** 5 days after tonsillectomy, **C** 8 days after tonsillectomy, and **D** 12 days after tonsillectomy

Results

One hundred fifty-five patients were eligible for the study; 11 patients did not accept sharing in the study, 26 patients had exclusion criteria and were not included, and 6 patients did not complete the follow-up scheduled visits. Thus, the study included 114 patients; 56 males (48%) and 58 females (52%) with ages range from 3 to 12 years (mean = 6 ± 24) (Table 1).

Recovery from anesthesia was event-less in all patients with no reported post-surgical complications. All patients completed the follow-up period without reported complications (such as hemorrhage and infection).

Pharyngeal digital photographs were gathered from a total of 114 patients during the postoperative office visits (Fig. 1).

In all patients, the HM color was white without odor and the HM appeared thin. The anterior pillar was preserved in 102 patients (89%). Extension of the HM was limited to the tonsillar bed in 112 patients (98%) and exceeded the tonsillar bed in 2 patients (2%) (Table 1).

The mean time for the HM separation was 8.8 ± 1.1 days (range = 7–14). The time for separation ranged from 8 to 10 days with a mean of 8.5 ± 0.7 days in males and ranged from 7 to 14 days (mean = 9.2 ± 1.35) in females with a significantly longer period of separation in females ($t = 3.457$, $p = 0.0008$). There was no significant correlation between the time of the HM separation and the patient's age ($R = 0.0107$, $R^2 = 0.0001$, $P = 0.9$).

Uvular edema was not observed in any patients. Pain VAS was between 1 and 3 and the postoperative pain was adequately controlled by oral analgesics and was relieved within 8–14 days. There were no reported early (hemorrhage and infection) or late complications (globus sensation, stenosis).

Discussion

Despite that tonsillectomy is one of the most commonly performed surgeries in children [1], very little was previously published on the HM after tonsillectomy with limited clinicians' knowledge of it. Improved knowledge of this issue will lead to improved evaluation of adjunctive therapies that potentially improve the postoperative experience, could minimize the post-tonsillectomy healing complications, decrease the health care cost, and direct the patients instructions and consent.

A better post-tonsillectomy healing process understanding would also allow surgeons to potentially prevent, anticipate, and manage post-surgical complications during the healing [5–7].

Cold steel tonsillectomy and hemostasis assisted by the thermal technique (such as electrocautery) are usually utilized tonsillectomy. There are several other techniques (such as laser, Harmonic® blade, coblation, and tissue welding) with some reported advantages in comparison to cold steel tonsillectomies and electrocautery. However, these techniques are often costly and/or not always available and so not widely used [5–7]. Gallagher et al. [8] reported lower rates of post-tonsillectomy hemorrhage and dehydration after intracapsular tonsillectomy compared to tonsillectomy utilizing coblation or electrocautery.

Nevertheless, many surgeons would not change their operative procedure and establish new and expensive instruments in preference to their easy technique, so cold-steel tonsillectomies and electrocautery could probably be the dominant technique for tonsillectomies in the coming years. However, reducing the post-tonsillectomy morbidity is an important future aim that demands to be reached as easily as possible [9].

We support the assumption that cold dissection tonsillectomy and then usage of the bipolar cautery for hemostasis in the way we described in methods could lessen the thermal consequence of bipolar electrocautery and lead to a good healing process. because it can limit oral intake with subsequent real dehydration sequels, post-tonsillectomy throat pain is very important and represents a significant challenge [2, 10]. The inadequate quality of postoperative pain management, the USA and Europe Surveys documented [11]. Electrocautery tonsillectomy is a fast and inexpensive technique for hemostasis, but electrocautery looks to be a chief postoperative pain source attributed to its high temperature. In the current study, we tried to reduce pain by cold dissection tonsillectomy, avoiding extended thermal damage with synchronous proper hemostasis, saline irrigation used for the tonsillar bed after dissection, and placing temporary operative wet saline-moistened packs within tonsil fossa to lessen the bipolar electrocautery thermal impression.

Very little information is available on the white HM thickness of the tonsillar fossa and the studies reported the white HM thickness did not give information on the HM separation. It was found that the thickness of the white HM of the tonsil fossa is positively correlated with postoperative pain degree [12]. In the present study, the HM appeared thin in all children throughout the follow-up till its separation and this may be the cause of less postoperative pain and absence of bleeding during the period of HM separation.

It is well accepted that thick HM is one of the results of extensive thermal damage during hemostasis with thermal methods, which prolongs patient recovery time. Moreover, the dis-association of these HM might lead to episodes of postoperative hemorrhage [9].

The color of the HM, in the current study, was clear white without odder reflecting less damage to the tonsilar bed. This is in agreement with the results of Li et al. [13] who found darker color of the HM after coblation tonsillectomy than bipolar diathermy tonsillectomy.

In the current study, the mean time for the separation of the post-tonsillectomy HM was 8.8 ± 1.1 days (range = 7–14) with a significantly longer period in females than in males ($p = 0.0008$) and without significant correlation between the time of the HM separation and the patient's age ($P = 0.9$). Thus, it is mostly related to the technique. Isaacson [12] found that the HM separation occurs at about 7 days.

Most prospective trials of tonsillectomy have main defects in that tonsillectomy was done by more than one surgeon. Their justification has been the similar qualifications and experience among surgeons. However, ideally, only a single surgeon would be involved. Thus, this defect was overcome in the current study as all cases were done by one surgeon.

Thus, cold dissection tonsillectomy with limited use of hot tools during hemostasis by bipolar cautery and saline wash leads to thin HM and good healing with

average HM separation and so less pain and post-tonsillectomy bleeding. However, further comparative studies for HM in different methods of tonsillectomies are recommended.

Conclusion

Cold dissection tonsillectomy with limited use of hot tools for hemostasis by bipolar cautery with frequent saline wash leads to odorless HM and good healing process with an average separation time of the HM and so less pain and post-tonsillectomy bleeding.

Abbreviations

HM Healing membrane
ORL Otorhinolaryngology

Acknowledgements

None.

Authors' contributions

MWE suggested and developed the research idea, reviewed the literature, assisted in preparing the figure, assisted in data collection and data interpretation, revised the written manicurist, and assisted in the statistical analysis. HIA reviewed the literature, prepared and followed up with the patients, consented to patients, assisted in obtaining IRB approval, assisted in collecting data, and assisted in writing the manuscript. AEG reviewed the literature, assisted in figure preparation, revised the written manuscript and data interpretation, and assisted in table preparation. AE prepared the IRB approval file, did the surgery, followed up with the patients, collected data and its interpretation, tabulated the data, and wrote the manuscript.
All authors have read and approved the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. The data cannot be shared openly to protect study participant privacy.

Declarations

Ethics approval and consent to participate

A preceding written instructive consent was gained from the parents of the included patients. Zagazig University Hospital's IRB approval was obtained.

Consent for publication

The patients included in this research gave written informed consent to publish the data contained within this study as patients were less than 16 years old, and their relatives signed the consent.

Competing interests

Dr. Mohammad Waheed El-Anwar is a co-author of this study and a co-editor of the journal. He has not been involved in handling this manuscript during the review process. The rest of the authors have no conflict of interest to declare.

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