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Bipolar-assisted tonsil reduction: a simple and inexpensive tonsillotomy technique

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Abstract

Objective: This study aims to investigate the novel use of a simple and inexpensive bipolar-assisted tonsil reduction (B-TR) technique in pediatric cases with adenotonsillar hyperplasia by evaluating long-term results, possible complications, need for reoperation and incidence of recurrence.

Methods: We present our long-term retrospective data from 78 consecutive pediatric cases undergoing B-TR combined with adenoidectomy from April 2013 to January 2017. The tonsillar sizes were recorded using the Brodsky grading scale from I to IV, and the patients only with prominant tonsillar sizes (III and higher) and adenoidal sizes exceeding 50% were included in the study group. The tonsil sizes were noted preoperatively, and during the latest follow-up visit after tonsillotomy (min. 9 months postoperatively).

Results: With a mean follow-up period of 18.3 months, the mean tonsillar size preoperatively was 3.47 (±0.50) and mean tonsillar size postoperatively was 1.35 (±0.48). A significant difference ($p<0.001$) was observed between these two groups, excluding the only case who later had undergone tonsillectomy. Minimal uvular edema was noted in 27 children (34.6%), which did not cause any upper airway obstruction in these patients.

Conclusion: We describe herein our B-TR technique in details so that it can be learned relatively quickly and used in pediatric cases with adenotonsillar hyperplasia as a treatment option.

Keywords: Tonsillotomy, tonsillectomy, bipolar diathermy, tonsil reduction.

Özet: Bipolar-destekli tonsil küçültme: Basit ve düşük maliyetli bir tonsillotomi tekniği

Amaç: Bu çalışmada, adenotonsiller hiperplazisi olan pediatrik olgularda basit, ucuz ve yeni bir yöntem olarak bipolar-destekli tonsil küçültme (BTK) tekniğinin, uzun dönem sonuçlarını, olası komplikasyonlarını, revizyon cerrahisi ihtiyacını ve rekürrens insidansını değerlendirerek klinik kullanımını araştırmayı amaçladık.

Yöntem: Nisan 2013 ile Ocak 2017 arasındaki periyotta adenoidektomi ile birlikte BTK uygulanan ardışık 78 çocuk hastamızdan elde ettiğimiz uzun dönem retrospektif verilerimizi sunmaktayız. Tonsil boyutları, I'den IV'e kadar Brodsky dereceleme skalası kullanılarak kaydedildi ve sadece belirgin derecede hipertrofik tonsilleri olan (III ve üstü) ve adenoid boyutları %50'yi aşan hastalar çalışma grubuna dahil edildi. Tonsil boyutları preoperatif olarak ve tonsillotomi sonrasındaki en son takip sırasında (postoperatif min. 9 ay) dosyalarına kaydedildi.

Bulgular: Ortalama 18.3 aylık izlem süresi sonrasında, operasyon öncesi ortalama tonsil büyüklüğü 3.47 (±0.50), operasyon sonrası ortalama tonsil boyutu ise 1.35 (±0.48) olarak kaydedildi. Daha geç dönemde klasik tonsillektomi uygulanan bir hastamız çıkarıldığında, bu iki grup arasında istatistiksel açıdan anlamlı bir fark saptandı ($p<0.05$). 27 çocukta (%34.6) minimal uvula ödemi gözlendi, ancak bu durum hastalarda herhangi bir üst hava yolu obstrüksiyonuna neden olmadı.

Sonuç: Bu çalışma sayesinde BTK tekniğimizi, adenotonsiller hiperplazisi olan pediatrik olgularda, nispeten kolaylıkla öğrenilebilen ve uygulanabilen bir tedavi seçeneği olarak ayrıntılı olarak tarif etmeyi planladık.

Anahtar sözcükler: Tonsilotomi, tonsillektomi, bipolar diatermi, tonsil küçültme.

Tonsillectomy is the most common major otolaryngological procedure performed in pediatric age group, alone or combined with adenoidectomy. Absolute indications for tonsillectomy and adenoidectomy include adenotonsillar hyperplasia with obstructive sleep apnea, failure to thrive, abnormal dentofacial growth; suspicion of malignant disease; acute rheumatic fever or (for tonsillectomy) hemorrhagic tonsillitis.[1] The two major criteria that are most commonly considered to justify surgical intervention are sleep-disordered breathing and recurrent throat infections

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which have a significant impact on children's health and life quality. Hence, adenotonsillectomy for the treatment of adenotonsillar hyperplasia in children is currently the most common indication in our practice. Typical and classical type of surgery in such cases is "extracapsular" tonsillectomy, where the tonsillar tissue and its fibrous capsule coverings are separated from the pharyngeal constrictor muscle as a whole. Exposed peritonsillar tissue containing vessels and muscle fibers can cause significant postoperative pain. Trauma to large extracapsular vessels can result in profuse hemorrhage, with risks of transfusion, further emergent procedures and, in rare cases, even death.[2] In order to decrease the complications and postoperative morbidities, there has been an increasing attention drawn to "intracapsular" tonsillectomy or tonsillotomy lately where the lateral portion of the tonsil and its capsule are preserved.[3] Various methods have been described in the literature and yet there is no consensus on which is the most convenient method, with the most commonly used ones today: radiofrequency, microdebrider, CO_2 laser, thermal welding, bipolar scissors and coblation.[3,4] Despite the reduction in complications due to these techniques, most employ relatively expensive equipment.

Herein, we describe the novel use of our simple and inexpensive bipolar-assisted tonsil reduction (B-TR) technique in 78 consecutive pediatric cases with adenotonsillar hyperplasia by evaluating long-term results, possible complications, need for reoperation and incidence of recurrence.

Materials and Methods

Patients

This is a retrospective chart review of the operated children suffering from snoring and obstructive symptoms due to adenotonsillar hyperplasia with no history of recurrent tonsillitis, who had been referred to our ENT department between April 2013 and January 2017. 78 children (52 f, 26 m) with tonsillar hyperplasia, aged 3–11 (mean age 7.2±2.4) years were included in this study. Exclusion criteria were recurrent tonsillitis, neoplasia, history of peritonsillar abscess or previous tonsillar surgery, comorbidities such as obesity, severe OSA, bleeding disorders and systemic diseases such as pulmonary, cardiac or metabolic abnormalities. Children with elevated titers of anti-streptolysine O, C-reactive protein or rheumatoid factor, and a positive throat culture for group A beta-hemolytic streptococci were also excluded from the study group. Parents were informed about the choices of B-TR technique, classical extracapsular tonsillectomy or conservative management. Written informed consent was obtained from all of the parents. The preoperative consent about B-TR technique included the possibility of tonsillar regrowth, recurrence of preexisting symptoms, occasionally leading to a revision surgery. Only patients treated with B-TR and classical adenoidectomy based upon parents' preferences were included in this retrospective analysis. The tonsil sizes were noted preoperatively, and during the latest follow-up visit (min. 9 months postoperatively). The tonsillar sizes were recorded using the Brodsky grading scale from I to IV, and only patients with prominant tonsillar sizes (III and higher) and adenoidal sizes exceeding 50% were included in this study group. All surgeries were performed by senior surgeons (K.C.K. and M.A.S.).

Surgical technique

Adenoidectomy was performed under general anesthesia at the beginning of the surgery and adrenalin-soaked gauze swaps were routinely inserted into nasopharygeal region to control a possible adenoidal bleeding meanwhile. The uvula was retracted anteriorly by means of a Henke tonsil elevator to avoid injury to anterior and posterior pillars and pharyngeal wall. Bipolar cauterization of the tonsils were initiated starting from the superior pole by inserting the tip of a non-stick bipolar forceps into tonsillar crypts and then activated. The cauterization power was adjusted to 20 W and the energy supply was stopped when blanching of the crypt entrance and neighbouring tonsillar areas occurred and this procedure was repeated multiple times towards to the inferior pole, until the final result was a yellowish residue of the denatured tonsillar tissue (**Figs. 1a–c**). Slight oozing of blood from the surface of the cauterized tonsils and the neighboring pillars could be expected, still these minor hemorrhages were easily managed by further superficial bipolar cauterizations. The entire procedure was brief and lasted between 10–15 minutes depending on the experience of the surgeon. Uvular edema was noted in 27 children (34.6%), most probably caused by pressure applied by the Henke elevator used to protect the operation field, but edema did not cause any upper airway obstruction requiring ICU care in these patients. No secondary hemorrhage occurred and all children were discharged same day. A diet list of soft and cold food was recommended to help resolve the uvular edema for only 3 consecutive days after surgery. We routinely prescribed acetaminophen (15 mg/kg PO q6–8 h) postoperatively for 5 days as our clinic protocol for adenotonsillectomy patients.

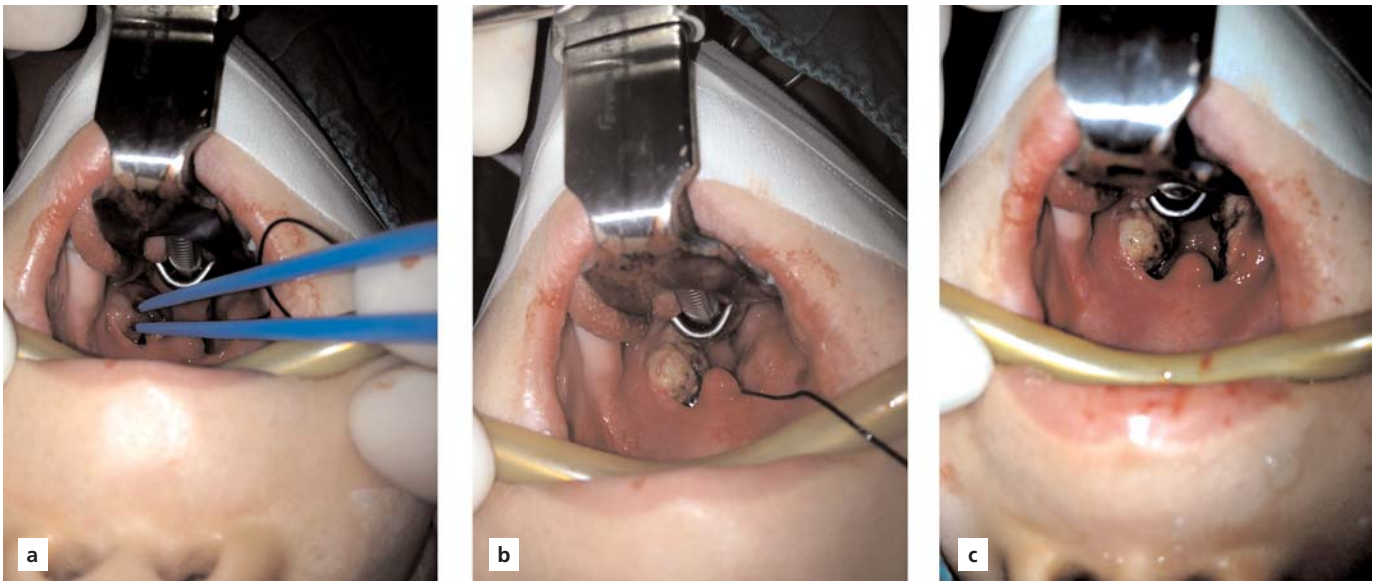

Fig. 1. (**a**) Oral photo documentation of the tonsils before the initiation of the procedure. (**b**) Note the complete blanching of the left tonsil. (**c**) Intraoperative appearance of the tonsils after the completion of the procedure. [Color figure can be viewed in the online issue, which is available at www.entupdates.org]

Results

None of our patients had primary postoperative hemorrhage and only one patient (1.3%) suffered from recurrent bacterial tonsillitis symptoms and had to undergo subsequent extracapsular tonsillectomy 16 months after the initial volume reduction operation. There were no technical difficulties during the operation such as adhesions or dissection problems and the histological investigation performed in this revision specimen revealed follicular hyperplasia and signs of chronic inflammation with no evidence of scarring or other signs of previous volume reduction surgery. None of the remaining patients needed reoperation due to tonsillar regrowth.

With a mean follow-up period of 18.3 months, the mean preoperative tonsillar size was 3.47 (±0.50) and mean postoperative tonsillar size was 1.35 (±0.48). A significant difference using Wilcoxon sign rank test ($p<0.001$) was observed between the median tonsil sizes of these two groups, excluding the only case who had undergone tonsillectomy (**Table 1**). As a clinical observation, asymptomatic small-sized tonsils stayed bordered by the palatinal arches (**Fig. 2a** and **b**) and the rest of the children (77/78) did not reveal any signs of recurrent infection or tonsillar regrowth until the last follow-up.

Discussion

In the new millenium, various kinds of methods for tonsil removal and volume reduction have been described to reduce pain and intra- and postoperative bleeding. With the emergence of such novel techniques, partial removal of the tonsil, "the tonsillotomy", has become popular again, whereas the percentage of classical tonsillectomies is rapidly decreasing.[5] For the treatment of non-inflammatory tonsillar hypertrophy resulting in pediatric obstructive symptoms, tonsillotomy combined with adenoidectomy should be considered as the treatment of choice.[5,6] The recent analyses from the national tonsil register in Sweden demonstrate that tonsillotomy + adenoidectomy has become the most commonly administered surgical procedure in pediatric age group of patients with upper airway obstructive symptoms due to tonsillar hyperplasia.[6] Sunnergren et al. claim that this paradigm shift results from the findings that tonsillotomy is superior to tonsillectomy by not only concerning the high rates of postoperative symptom relief, but

Table 1. Mean pre- and postoperative tonsillar sizes (n=77).

	Preoperative	Postoperative
Mean tonsil size	3.47±0.50SD	1.35±0.48SD

Wilcoxon signed rank test $p<0.001$.

Fig. 2. (**a**) Preoperative and (**b**) postoperative 6-month appearances of the tonsils in a different patient. [Color figure can be viewed in the online issue, which is available at www.entupdates.org]

also with reduced need for postoperative analgesia, lower rates of postoperative bleeding and reduced number of postoperative infections.[7,8] Leaving a coating layer of semi-viable tonsillar tissue has been shown to reduce exposure of the veins and nerves in the tonsillar plexus and superior constrictor muscle.[3] Additionally, significance of the remaining tonsillar tissue within the lymphoid system, rather than total excision has attracted an increased attention to tonsillotomy techniques.

Vogt et al.[9] presented their results of bipolar radiofrequency cryptolysis in hypertrophic tonsillar tissue and claimed that bipolar technique showed better results when compared to the monopolar method, with emphasis on the fact that lesser lateral heat damage around the bipolar electrodes could be achieved resulting in a hypothetic minor reaction of the tonsillar tissue; however, their results were not supported by a cohort study. Identical results have been observed in bipolar and monopolar applications for the reduction of the lower turbinates, where the energy was delivered by a bipolar double-needle electrode and the epithelium would be preserved, whereas monopolar usage – also known as so-called "coblation tunneling" leads to histological changes similar to CO_2 laser therapy involving the transformation of columnar epithelium into cuboidal or squamous epithelium due to inevitable burn injury. Taneja et al.[10] have demonstrated that intraturbinate bipolar submucosal diathermy prevents mucosal damage, since required intensity of electric current is extremely low compared to monopolar technique, hence the surgical trauma and post-operative pain is less than expected. Thus, bipolar hemostasis is the choice of treatment nowadays for the coagulation of blood vessels in sensitive areas such as the nasal cavity.

Conclusions

Our B-TR can be learned relatively quickly and no tonsillar dissection or incision is warranted in contrast to tonsillar coblation and most of the laser ablation techniques, so no blood vessels are injured, the capsules of the tonsils are left intact, thus postoperative pain is either absent or very minimal. This technique adds only 10–15 minutes to total operation time and is proven to be effective in tonsil size reduction. Another advantage of this method lies in its cost effectiveness. The cost of a single reusable bipolar forceps is $500 but it is autoclavable and can be reused up to 500 times.[4]

Having such advantages, B-TR technique is appropriate to utilize for ambulatory surgery in many cases. B-TR might be recommended as a treatment option in pediatric cases with tonsillar hyperplasia when long-term follow-up results of a larger cohort are analyzed in a prospective study.

Conflict of Interest: No conflicts declared.

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