Clinical and Experimental Health Sciences

The Effect of Ultrasonic Surgery Tool in the Treatment of Tonsillolithiasis

Eda Tuna Yalcinozan

Near East University, Faculty of Medicine Department of Otorhinolaryngology, Nicosia, Cyprus.

Correspondence Author: Eda Tuna Yalcinozan
E-mail: dr.etuna@gmail.com
Received: 03.02.2021 **Accepted:** 16.11.2021

ABSTRACT

Objective: This study aimed to reveal the effects of the ultrasonic surgical tools in tonsillolith treatment alongside its complaints as an office-based surgical procedure.

Methods: Forty-four patients included in this study who were aware of the white-yellowish lesions on their tonsils concurrently complained of either halitosis and/or the foreign body sensation. Patients were asked to mark their pain scores on the visual analog scale for the pain on the 1st day after the procedure. Halitosis and foreign body sensation were questionnaired before the procedure. The surgical procedure was performed under local anesthesia with the probe of the ultrasonic surgical tool after the tonsilloliths were removed. Tonsils were examined again, also halitosis and foreign body sensation were questionnaired on the postoperative 6th and 12th month period.

Results: There was a statistically significant improvement in the patients' halitosis complaint on the postoperative 6th (p=0.001) and 12th (p=0.000) month when compared to first attendance to the clinic. The foreign body sensation in the throat also had a statistically significant decrease in the postoperative 6th (p=0.000) and 12th month (p=0.000). Results showed that there is a statistically significant improvement of tonsilloliths on the postoperative 6th month (p=0.000) and 12th month (p=0.000).

Conclusion: The use of ultrasonic surgical tools in the treatment of tonsilloliths can be a favorable one-day office procedure. With its short duration of application, the lower pain scores, the day to return a normal diet, and its satisfactory results this procedure can be carried out easily and safely.

Keywords: Tonsillolithiasis, ultrasonic energy, halitosis

1. INTRODUCTION

Tonsil stones (tonsilloliths) are calcifications that can occur in enlarged tonsillar crypts and develop by the sedimentation of food debris and exfoliation of the crypt mucosa. This conglomerate can gradually calcify from a soft, gel-like mass to hard "stones" (1,2). Tonsilloliths are mostly smaller structures that are in 3-4 mm size, and prevalence is given as 16% to 46.1% in the literature (3,4). Although tonsilloliths are asymptomatic, they may cause chronic bad breath, dry cough, swallowing disorders, otalgia, foreign body sensation, or a bad taste in the mouth (5-7). Due to the recurrent inflammatory stages in the crypts, it is assumed that bacteria and epithelial deposits accumulate along with food debris. Calcification occurs through the storage of dissolved inorganic substances in saliva (8).

Asymptomatic tonsil stones do not require any treatment after the patient is informed besides symptomatic tonsilloliths can be either curetted or surgically removed with various techniques under local or general anesthesia (9,10,11). If clinical treatment with topical antiseptics and oral antibiotics does not provide relief, surgical removal of the tonsils is indicated. Laser and radiofrequency are already used powered instruments in the treatment of tonsillolith and its concurrent complaints (12,13,14), yet this is the first study in the literature in which we aimed to reveal the effect of ultrasound energy in the tonsillolith treatment.

2. METHODS

This study data obtained from patients who were presented to our Ear Nose & Throat (ENT) clinic between the 2017 – 2020 years. Our regular procedures in clinical evaluation and follow up was conducted for the patients with tonsilloliths. The approval for the research was obtained from the Local Ethics Committee (Approval Number: 2020/85-1196). The patients included in this study were aware of the white-yellowish lesions on their tonsils, concurrently complained of either halitosis and/or the foreign body sensation. The

DOI: 10.33808/clinexphealthsci.873557

participants were selected over 18 years old patients and questioned for their medical history. All patients went through a complete ENT examination. The ones with acute or chronic periodontal, gastrointestinal, sinonasal, oropharyngeal, pulmonary diseases, and who had uncontrolled gag reflex were not included in the study. Patients were questioned subjectively whether they have halitosis and foreign body sensation before the procedure and on the 6th and 12th-month follow up visits. Patients were asked to mark their pain scores on the visual analog scale (VAS), which was evaluated over 100 point, for the pain on the 1st day after the procedure. The day in which patients' pain is ended up and the day that they return to normal eating habits were also noted. Tonsils were examined again and noted whether if tonsillolths were still present on postoperative the 6th and 12th-month period.

2.1. Surgical Procedure

This procedure was performed under local anesthesia with 2% lidocaine injection (Jetokain simplex; Adeka İlaç San, Samsun, Turkey) on the tonsillar pillars and on the tonsil crypt surface, 10 minutes after the application of 10% lidocaine pump spray (Vemcaine; Vem İlaç San, Tekirdag, Turkey). After the gag reflex disappear tonsilloliths (Figure 1) were removed from the crypts with the help of forceps by applying pressure on the tonsil. First, the non-activated ultrasound probe (D&A UltraSurg II; Diamant Medical Equipment Ltd, Thessaloniki, Greece) was inserted deep into the cleared crypt (Figure 2). This powered instrument generates vibration between 20.000 and 60.000 Hz. At the 85% power setting, by using a foot pedal the apparatus was activated in 10 seconds for each application. The probe was drawn back with minimal circular movements to provide contact with the periphery of the crypt. The tissue gets blanched and the probe was also placed on the outer surface of that crypt (Figure 3). The process was finalized with the control of bleeding.

Figure 1. *The view of the tonslillolith in the right tonsil crypt*

Descriptive statistics were performed with Statistical Package for Social Sciences version 17.0 (SPSS Inc; Chicago, IL, USA). In the statistical analyses Chi-square test, Wilcoxon signed-rank and independent t-tests were used. A p-value of less than 0.05 was statistically chosen as the level of significance.

Figure 2. *Placement of the probe into the cleared crypt of the right tonsil*

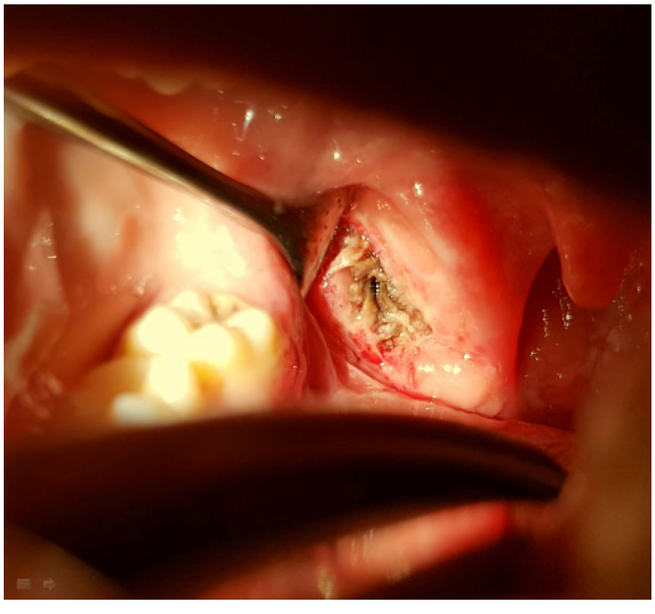

Figure 3. *The blanched right tonsil after the appliance of ultrasonic surgical tool*

3. RESULTS

There were 44 patients (24 women and 20 men) with a mean age of 32.18 ± 5.81 that existed in the study. 18 of them had

on the right, 16 on the left, and 10 of them had bilateral tonsilloliths. The region in which tonsilloliths were mostly seen as the upper pole of the tonsils (38.7%), the bottom of the tonsils was the area where the tonsilloliths were seen less frequently (9.1%). The patients who were smoking were in the percent of 63.6% (n=28). The patients who had halitosis and foreign body sensation in the throat, before the tonsilloliths were removed, were 77.3% (n=34) and 79.5% (n=35) consecutively. In VAS score mean value of pain was 18.72 ± 14.26 on the 24th hour of the procedure. The mean of the time when the pain was disappeared found as 1.54 ± 1.17 days. The mean time when the patients were started a normal diet was 1.88 ± 0.86th day.

19 of the 34 patients had complain of halitosis on the 6th month. The number of patients who had halitosis on the 12th month were 13. There was a statistically significant improvement in the patients' halitosis complaint on the postoperative 6th (p=0.001) and 12th (p=0.000) month when compared to first attendance to the clinic. When compared the 6th and 12th month the decrease in halitosis complaint was also found to be statistically significant (p=0.014). 14 of the 35 patients had complain of halitosis on the 6th month. The number of patients who had halitosis on the 12th month were 9. The foreign body sensation in the throat also had a statistically significant decrease in the postoperative 6th (p=0.000) and 12th month (p=0.000). When compared to the 6th month and 12th month there is also a statistically significant decrease in the foreign body sensation in the throat. (p=0.025). There was no correlation found between the day to start on a normal diet, and postoperative VAS scores (p=0.204). Although postoperative VAS score and the day in which pain set to zero was found statistically related to each other (p<0.001), the day that pain was completely disappeared showed no statistically significant correlation with the day on which normal diet was started (p=0.280). There was a statistically significant relation between the non-smoking patients and the day in which pain ends completely. (p=0.003)

10 patients had undergone the second procedure on the 6 months period due to tonsillolith reoccurance. Among these patients, 5 of them had tonsilloliths on the 12th month period also. Except them, also 1 patient had tonsilloliths on the 12th month period, so that total number of patients who had tonsilloliths on the 12th month period was 6. The tonsil sides were the same in the 4 patients and different in the 6 patients in the postoperative 6th month period. 12th month period only in 6 patients tonsilloliths became visible again and 4 of them had on the same side, 2 of them on the different tonsil sides. These results showed that there is a statistically significant improvement of tonsilloliths in the postoperative 6th month (p=0.000) and 12th month (p=0.000). But there is no significant change was observed between the 6th and 12th month (p=0.219). No complications were seen in any patient.

4. DISCUSSION

The tonsilloliths are most commonly found within the crypts of the palatine tonsils but there are few reports in which these calcified stones can be found in the lingual tonsil, adenoid and pharynx also (15-18). As the tonsillectomy and tonsillotomy techniques are evolved, various choices arose in handling the tonsilloliths. In the treatment of these calcifications several methods of cryptolysis which means the destruction of the tonsil crypts, have been used with different types of surgical instruments. Studies in recent years showed that ultrasonic surgery tools have been used efficiently for head and neck, general surgery, gynecology, cardiovascular and thoracic surgery procedures. Most commonly these tools are used in chronic tonsil diseases, oral cavity and neck oncology in otorhinolaryngology department (19). Ultrasonic energy converts into mechanical energy via transducer which lets acoustic waves to induce the tip of the probe and provides mechanical vibration. These vibrations denaturate the collagen fibers and as well coagulate vessels with lower thermal energy. It was found that only one study used this device for tonsillotomy in the literature, apart from that in each study ultrasonic energy were used for tonsillectomy. The tonsillectomy with ultrasonic surgery tools showed a significant reduction in operative time, intraoperative blood loss and rehospitalization due to secondary bleeding and was associated with early restoration of the nutritional routine (20).

Laser tonsil cryptolysis (LTC), radiofrequency (RF), coblators, and tonsillectomy are the most current procedures (12,13). Tonsillectomy is also one of the preferred procedures but mostly in patients who have chronic caseous tonsillitis, hypertrophic tonsils, and with large tonsil stones. When compare tonsillectomy to intracapsular techniques, it has higher rates of bleeding, prolongation in the duration of postoperative pain, and later progression to normal dietary habits. In the literature review we couldn't encounter any research which investigate the effects of ultrasonic surgery tools in tonsillolithiasis treatment, in this regard we discussed our results with the studies which used the other surgical tools for tonsillolith.

RF application with bipolar and monopolar rods have been studied several times. RF cryptolysis targeted to destruct the epithelium with the formation of fibrosis which tends to close the crypt openings (10,14,21,22). Vogt et al reported that the RF cryptolysis is a day case procedure that is minimally invasive with lower complaint rates, bipolar RF cryptolysis can cause less pain than the monopolar technique also. In several studies, it is indicated that laser cryptolysis has higher costs though it has a faster healing period with less postoperative pain, immediate return to normal dietary habits, and fewer complication rates (10,22). RF ablation costs are reported as less than laser cryptolysis and suggested as it can be more appropriate for the patients who have insufficient mouth opening and too much gag reflex (14). Our patients showed no significant gag reflex after applying lidocaine spray and

injection so we can manage to place an ultrasonic probe inside and around the crypts in which calcification was found.

In LTC, crypts are vaporised with thermal energy, and scar tissue occurs with the new formation of collagen tissue (14,23). LTC is also reported as one of the effective treatment methods for tonsilloliths and halitosis in patients. Hashemıan et al (10) compared LTC to RF ablation and reported that they are both effective although LTC has a faster healing period. Though LTC can have serious complications such as burning in the mouth, face, and even in the respiratory system, also it can affect the retina. Moreover, as the cost of laser equipment is known to be higher than other instruments that are used in the treatment of tonsil diseases, it can be difficult to provide (24).

Several researches studied halitosis in patients with tonsilloliths. Rio et al.reported that chronic caseous tonsillitis can be a risk factor for halitosis moreover CO2 laser cryptolysis help the improvement of halitosis and clearance of the tonsilliths (11,25). Hashemihan et al suggested that either with the radiofrequency or with the CO2 laser there is an improvement on tonsilloliths foreign body sensation and halitosis complaint of the patients (10). Finkelstein et al concluded that laser CO2 cryptolysis is an effective treatment for halitosis which requires repetitive second procedures at a low rate (21). In another laser cryptolysis study, which Krespi et al performed, the repetitive procedure rate was found as 1.16 procedures per patient (22). Similar to these studies we do have a rate of second procedure 1.22 per patient and also we have significant improvement in halitosis and foreign body sensation in the throat.

Chang et al. proposed that coblation cryptolysis also have satisfactory results in tonsillolith treatment with the tonsil resurfacing opportunity (24). In our study, we also benefit from this idea of resurfacing the tonsils, with ultrasonic energy. The harmonic scalpel (HS) which uses ultrasonic energy is one of the tonsillectomy/tonsillotomy techniques (26,27,28). In this study, we used a type of harmonic scalpel tool which differs by the operating instrument probe. Ultrasonic waves utilizes minimal thermal energy by providing simultaneous cutting and coagulation in the surrounding tissue with the vibration. The waves of the vibration form low pressure in the intracellular area which causes the explosion of cell and tissue separation. As a result, connective scar tissue occurs which seals the crypt. The tissue harm is reduced with the lower temperature heat (50-100°C) when compared to electrocautery (over 400ºC). Despite these Modi et al showed that harmonic scalpel, coblators, and electrocautery have a similar thermal injury in the tonsillar fossa during a tonsillectomy. The mean depth of thermal injury with ultrasonic tools was reported as 0.68 mm (29). Accordingly we supposed that the low postoperative pain scores can be related with this minimal thermal injury in our study. In the literature review there was only one study in which intracapsular tonsillotomy was performed with the same ultrasonic surgical instrument that we used. Khalaf AQ et al (26) reported satisfying results in chronic tonsillitis and tonsillar hypertrophy with this surgical tool. Several studies support that ultrasonic energy decreases pain scores with the least postoperative discomfort in tonsillectomy (27,28). Similar to these ultrasound energy performed a significant decrease in patient's complaints and also helps the elimination of the tonsilloliths in our study. However, some studies indicated that HS, coblator, and electrocautery have no difference in post-tonsillectomy pain (30).

In our study we discussed our results with other treatment modalities in the light of the literature. Comparing ultrasonic surgical tools with other procedures which are commonly used at the treatment of tonsillolith and performing objective methods for halitosis in the research might strengthen our results. These two subjects can be the shortenings of our study.

5. CONCLUSION

The use of ultrasounic surgery tools in the treatment of tonsilloliths can be a favorable one-day office procedure. With its short duration of application, the lower pain scores, the day to return a normal diet, and its satisfactory results this procedure can be carried out easily and safely. In the English literature review, there are no studies exist related to the ultrasound energy in the treatment of tonsilloliths. It is the first study that brings out the ultrasound as an alternative technique in tonsilloliths and the complaints that it caused. Nevertheless, there should be further studies have to be conducted to understand its tissue effects, halitosis management, and cost-effectiveness and also to determine the safety.

REFERENCES

[1] Myers NE, Compliment JM, Post JC, Buchinsky FD. Tonsilloliths a common finding in pediatric patients. Nurse Pract. 2006;31:53–54.

[2] Tsuneishi M, Yamamoto T, Kokeguchi S, Tamaki N, Fukui K, Watanabe T. Composition of the bacterial flora in tonsilloliths. Microbes Infect. 2006;8:2384–2389.

[3] Oda M, Kito S, Tanaka T, Nishida I, Awano S, Fujita Y, Saeki K, et al. Prevalence and imaging characteristics of detectable tonsilloliths on 482 pairs of consecutive CT and panoramic radiographs. BMC Oral Health. 2013;13:54.

[4] Fauroux M, Mas C, Tramini P, Torres JH. Prevalence of palatine tonsilloliths: a retrospective study on 150 consecutive CT examinations. Dentomaxillofac Radio. 2013; 42.

[5] Ansai T, Takehara T. Tonsillolith as a halitosis-inducing factor. Br Dent J. 2005;198:263–264.

[6] Mandel L. Multiple bilateral tonsilloliths: case report. J Oral Maxillofac Surg. 2008;66:148–150.

[7] Cantarella G, Pagani D, Biondetti P. An unusual cause of mechanical dysphagia: an agglomerate of calculi in a tonsillar residue. Dysphagia. 2006;21:133–136.

[8] Babu BB, Tejasvi MLA, Avinash CKA. Tonsillolith: a panoramic radiograph presentation. J Clin Diagn Res. 2013;7:2378–2379.

[9] Giudice M, Cristofaro MG, Fava MG. An unusual tonsillolithiasis in a patient with chronic obstructive sialoadenitis. Dentomaxillofac Radiol. 2005;34:247–250.

[10] Hashemian F, Moez HJ, Rabiei MAS, Jahanshahi J. Comparing the efficacy of temperature-controlled radiofrequency tonsil ablation versus CO2-laser cryptolysis in the treatment of halitosis. Iranian Journal of Otorhinolaryngology. 2018;30(3);98.

[11] Dal Rio AC, Franchi-Teixeira AR, Nicola EMD. Relationship between the presence of tonsilloliths and halitosis in patients with chronic caseous tonsillitis. British Dental Journal. 2007;204:E4.

[12] Ata N, Ovet G, Alataş N. Effectiveness of radiofrequency cryptolysis for the treatment of halitosis due to caseums. Am J Otolaryngol. 2014;35(2):93-98.

[13] Passos CAC, Altemani A, Nicola JH, Nicola EMD. Histopathological evaluation in biopsies of palatine tonsils submitted to cryptolysis by coagulation with CO2 laser for treatment of chronic caseous tonsillitis. Photomed Laser Surg. 2004;22(3):211-219.

[14] Vogt K, Konuhova S, Peksis K, Markow J. Development and clinical evaluation of bipolar radiofrequency cryptolysis. Otorhinolaryngol Head Neck Surg. 2016;2(1): 1-5.

[15] Mesolella M, Cimmino M, Di Martino M, Criscuoli G, Albanese L, Galli V. Tonsillolith. Case report and review of the literature. Acta Otorhinolaryngol Ital. 2004;24:302–307.

[16] Ben Salem D, Guiu B, Duvillard C, Couaillier JF, Ricolfi F. Nasopharyngeal tonsillolith: a report of 31 cases. J Radiol. 2007;88:259–262.

[17] Sakano H, Thaker AI, Davis GE. Adenoid Stones–"Adenoliths". J Otol Rhinol. 2015;4(4):240.

[18] Takahashi A, Sugawara C, Kudoh K, Yamamura Y, Ohe G, Tamatani T. Lingual tonsillolith: prevalence and imaging characteristics evaluated on 2244 pairs of panoramic radiographs and CT images Dentomaxillofacial Radiology. 2018;47(1).

[19] McCarus DS. The origin and evolution of the Harmonic Scalpel®. Surg Technol Int. 2019;35:1-13.

[20] Basu S, Sengupta A, Dubey A, Sengupta A. Harmonic scalpel versus coblation tonsillectomy. Indian J Otolaryngol Head Neck Surg. 2019;71(4):498–503.

[21] Finkelstein Y, Talmi YP, Ophir D, Berger G. Laser cryptolysis for the treatment of halitosis. Otolaryngol Head Neck Surg. 2004;Oct:131(4):372-377.

[22] Krespi YP, Kizhner V. Laser tonsil cryptolysis: In-office 500 cases review. Am J Otolaryngol. 2013;34(5):420-424.

[23] Finkelstein Y, Shapiro-Feinberg M, Stein G, Ophir D. Uvulopalatopharyngoplasty versus laser-assisted palatal surgery: Anatomic considerations. Arch Otolaryngol Head Neck Surg 1997;123:265-276.

[24] Chang CY, Thrasher R. Coblation cryptolysis to treat tonsil stones: a retrospective case series. Ear Nose Throat J. 2012;91(6):238-254.

[25] Dal Rio AC, Passos CA, Nicola JH, Nicola EM. CO2 laser cryptolysis by coagulation for the treatment of halitosis. Photomed Laser Surg. 2006;24(5):630-636.

[26] Khalaf AQ, Abdullah AH, Taher FS, Abdalrida EM. Intra-capsular tonsillotomy by ultrasonic method. J Otolaryngol ENT Res. 2017;9(4):1-7.

[27] Willging JP, Wiatrak BJ. Harmonic scalpel tonsillectomy in children: A randomized prospective study. Otolaryngol Head Neck Surg. 2003;128:318-325.

[28] Potts KL, Augenstein A, Goldman JL. A parallel group analysis of tonsillectomy using the harmonic scalpel vs electrocautery. Arch Otolaryngol Head Neck Surg.2005;131(1):49-51.

[29] Modi VK, Monforte H, Geller KA, Koempel JA. Histologic assessment of thermal injury to tonsillectomy specimens: A comparison of electrocautery, coblation, harmonic scalpel, and tonsillotome. The Laryngoscope. 2009;119(11):2248-51.

[30] Parsons SP, Cordes SR, Comer B. Comparison of posttonsillectomy pain using the ultrasonic scalpel, coblator, and electrocautery. Otolaryngol Head Neck Surg. 2006; 134(1):106-13.

How to cite this article: Tuna Yalcinozan E. The Effect of Ultrasonic Surgery Tool in the Treatment of Tonsillolithiasis. Clin Exp Health Sci 2022; 12: 145-149. DOI: 10.33808/clinexphealthsci.873557