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LARYNGOLOGY

Safety of cold ablation (coblation) in the treatment of tonsillar hypertrophy of the tongue base

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Abstract The treatment of diseases of the lingual tonsils is still under debate, and surgical interventions are often associated with significant morbidity and complications. The aim of the present study was to evaluate the safety of lingual tonsillectomy using cold ablation (coblation) as a new treatment of lingual tonsil diseases. In this retrospective, bicentric study, we included all patients between 2005 and 2012 who underwent cold ablation (Coblation®) of the lingual tonsils. We assessed the frequency of postoperative complications based on the patients' charts. A total of 108 patients (47 ± 13, 6 years) underwent lingual tonsillectomy using coblation. All patients were operated on under general anesthesia as inpatients. Intraoperative complications did not occur. Three patients (2.8 %) needed revision surgery due to postoperative hemorrhage, and in one of those cases, three revisions were necessary. There was no postoperative airway compromise and no need for tracheostomy. There was no hypoglossal nerve paralysis, but in the case needing multiple revisions, a weakness of the hypoglossal nerve persisted. In all the cases, oral intake was possible with adequate analgesia. Coblation of the tongue base is a safe procedure with a relatively low rate of postoperative complications. Postoperative hemorrhage is the most relevant complication that occurred in our series of patients. Future studies are needed to evaluate the efficacy of the procedure in the treatment of obstructive sleep apnea.

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Introduction

The hypertrophy of the tongue base is clinically of high relevance as it can cause dysphagia and globus sensation [1], dyspnea and especially obstruction of the upper airway in patients with obstructive sleep apnea (OSA) [2]. Additional symptoms may include sore throat, fever, lethargy, speech change, otalgia, and pain in the submandibular region, as well as chronic cough or choking on food [3]. Some of these symptoms may be explained by recurrent inflammation or infection of the lingual tonsils, which is sometimes caused by extraesophageal reflux (EERD) [4].

The most relevant complication of tongue base hypertrophy, however, is nocturnal upper airway obstruction causing OSA. OSA is associated with a reduced quality of life and is a risk factor for cardiovascular morbidity and mortality [5–7]. In patients with moderate to severe OSA, the tongue base is a particularly relevant and sometimes predominant level of obstruction [8]. Tongue base hypertrophy can be caused by a general hypertrophy of the tongue associated with macroglossia or by a hypertrophy of the lingual tonsils, the latter being the most relevant cause for isolated hypertrophy of the tongue base.

To date, various options for the surgical treatment of tongue base hypertrophy and tongue base obstruction are available: open surgical tongue base reduction with hyoepiglottoplasty (TBRHE) [9], submucosalintralesional excision with or without endoscopic control [10], radiofrequency surgery of the tongue base [11], glossopexia [12], adjustable tongue advancement [13], and laser midline glossectomy [14]. Recently, MacKay et al. [15]

reported on a technique to channel the tongue with coblation. This broad spectrum of surgical approaches reflects the fact that currently no established standard procedure exists for the surgical treatment of retrolingual and hypopharyngeal obstruction due to tongue base hypertrophy [16, 17].

All the procedures mentioned above have major limitations in either efficacy or invasiveness. Procedures that involve partial resection of the tongue base, especially have a high morbidity and complication rate [9, 12, 14, 18]. For example, TBRHE as first described by Chabolle et al. [9] was accompanied by a tracheostomy in all cases.

Surgical procedures to resect tongue base hypertrophy are often associated with relevant intra- or postoperative complications, including bleeding [14], respiratory distress [18], hypoglossal nerve paralysis [12], infections [9], and dysesthesia of the chin and lip [12]. For example, respiratory distress due to intra- or postoperative edema of the tongue, leading to delayed extubation, occurred in 2 of 34 patients who underwent posterior midline glossectomy [18]. The potential risk for postoperative infection, especially a lingual or submental abscess, is of relevance as it can lead to airway compromise or mediastinitis. Chabolle and colleagues reported that 5 of 10 patients who underwent TBRHE had a submental abscess, and drainage (3 cases) or removal (2 cases) of the lingual hyoid suspension was necessary [9]. Fujita et al. [14] reported that 3 of 11 patients experienced minor bleeding after midline glossectomy using a carbon dioxide laser.

In addition, minor complications of surgical procedures to resect tongue base hypertrophy are relatively frequent, such as minor bleeding (8–25 %), tongue edema (5 %), prolonged odynophagia for up to 3 weeks (5–8 %), and short-term changes in taste sensation (8–25 %) [14, 19–21].

Barakate et al. [22] described different techniques for lingual tonsillectomy in a series of patients (mostly children) with OSA or recurrent infection: diathermy, microdebrider, and laser resection. As an alternative, cold ablation (Coblation®) of the lingual tonsils may be used to enlarge the retrolingual airway in patients with upper airway obstruction due to hypertrophy of the lingual tonsils. Robinson et al. [23] were the first to describe this technique, which allows for complete excision of the lingual tonsils while leaving the tongue muscle intact. In addition, coblation is also used to perform a submucosal minimally invasive lingual excision [24–26].

To date, only a limited number of studies have evaluated coblation of the lingual tonsils, and most of these studies included only a small number of patients, making it difficult to reliably assess complication rates [1, 26, 27]. In some of these studies, coblation was performed with robotic assistance [28, 29]; others evaluated coblation of the lingual tonsils in children only [30, 31].

Despite the increasingly widespread use of coblation for lingual tonsillectomy hypertrophy, reliable data regarding the safety of the procedure in terms of intra- and postoperative complications are not available till date. The aim of the present retrospective study was therefore to assess these complications in a larger series of patients under routine conditions.

Materials and methods

This retrospective, bicentric study included all patients who underwent a cold ablation (coblation) of the lingual tonsils at the Department of Otorhinolaryngology, Head and Neck Surgery, Mannheim, Germany between 2005 and 2012 and at the private practice for Otorhinolaryngology Lichtenfels, Germany (HNO-Praxis Lichtenfels) between 2006 and 2011. Coblation could be supplemented by other interventions simultaneously.

The frequency of intra- and postoperative complications was assessed based on the charts of these patients, including the postoperative hospital stay and all the postoperative control visits, with a special emphasis on postoperative bleeding. All adverse events were recorded, especially additional hospital stays and the need for revision surgery. Furthermore, we assessed the individual characteristics of the patients such as body mass index (BMI), age, gender, apnea–hypopnea index (AHI), and epworth sleepiness scale (ESS) if available. We assessed the indications of surgery and the procedures performed.

The coblation of the lingual tonsils was performed under general anesthesia in both centers using nasotracheal intubation. To expose the tongue base for direct or endoscopic visualization using 30-degree or 70-degree rigid endoscopes, retraction sutures or a clamp was placed in the middle third of the tongue. The EVac® 70 Xtra Plasma Wand (Coblator, ArthroCare, Austin, TX, USA) was bent in such a way that the lingual tonsils could be completely ablated under endoscopic or direct visualization. The tissue of the tonsils could be distinguished relatively clear from the lingual muscle so that the latter could be preserved. Hemostasis was achieved by switching to the coagulation mode of the coblation wand [32].

Treatment with painkillers was assessed based on the charts of the subgroup of patients who underwent isolated coblation of the lingual tonsils in the Department of Otorhinolaryngology, Head and Neck Surgery in the University Hospital Mannheim.

Table 1 Coblation of the lingual tonsils ($n = 75$) was performed in combination with the following particular surgical treatments

Surgical treatment	Number of patients	%
Radiofrequency treatment of the soft palate	54	50.0
Coblation of the pharyngeal tonsils	33	30.6
Uvulo-palato-pharyngoplasty (UPPP)	12	11.1
Tonsillectomy	11	10.2
Reduction of the nasal turbinates	6	5.6
Uvulopalatal-flap	5	4.6
Hyoid suspension	3	2.8
Septoplasty	3	2.8
Partial resection of the epiglottis by CO_2-laser	2	1.9
Epiglottopexie	2	1.9
Lateral pharyngoplasty	1	0.9
Excision of a vallecula cyst	1	0.9

Results

Forty-seven patients were included from the Department of Otorhinolaryngology at the University Hospital Mannheim and 61 patients from the private practice for Otorhinolaryngology Lichtenfels.

The patients' average age was 47 ± 13.6 years, with 77 male patients and 31 female. The mean BMI was 29.9 ± 6.4 kg/m^2. The majority of patients were treated for OSA (79.6 %). The average AHI in these patients was 26.1/h ± 21.5, and the mean ESS was 10 ± 6.3. The remaining indications consisted of globus sensation in 5.6 %, recurrent infections of the lingual tonsils in 8.3 %, and various other diseases in 3.7 %.

In 75 cases (69.4 %), coblation of the lingual tonsils was performed in combination with the other upper airway procedures. The data of the particular surgical treatments performed in this study are summarized in Table 1.

There were no intraoperative complications and no patients had to be transferred to an intermediate or intensive care unit.

There was no postoperative airway compromise in any patient and there was no need for a tracheostomy. Postoperative bleeding at the site of lingual tonsillectomy was reported in ten patients (9.3 %). However, surgical revision to control postoperative bleeding was needed in three patients only (2.8 %); in one of these patients, three interventions were necessary to control the situation. Intubation for revision surgery was uneventful in all patients. In addition, seven patients (6.5 %) presented with postoperative hemorrhage that did not require surgical revision. There was no postoperative hypoglossal nerve paralysis; however, in the case that needed multiple surgical revisions, a unilateral weakness of the hypoglossal nerve was detected after the third-revision.

Potential risk factors for postoperative bleeding were analyzed amongst the patients requiring revision surgery due to postoperative hemorrhage. One patient was under antihypertensive medication but showed normal blood pressure values. One patient with known hypertension presented with intermittent hypertension in the postoperative period and the third patient presented with intermittent high blood pressure without known hypertension. The average age of these three patients was 59 years compared to 47 years in the study cohort. The mean BMI was 34 kg/m^2 compared to 29.9 kg/m^2 in the entire group of patients.

In the group of the 26 patients receiving isolated coblation of the lingual tonsils at the Department of Otorhinolaryngology Mannheim, all patients received nonsteroidal antiinflammatory drugs, and six patients (23 %) were additionally treated with a combination of oxycodon/naloxon. In nine of these cases (34.6 %) i.v. steroids were administered to reduce postoperative edema and improve pain control, routine administration of the steroid was not performed.

Discussion

The aim of the present retrospective, bicentric study was to evaluate the safety of lingual tonsillectomy using coblation in the treatment of tonsillar hypertrophy of the tongue base. The frequency of postoperative complications was assessed based on the charts of all patients who underwent a coblation of the lingual tonsils during a specific time frame at two centers.

In total, 108 patients were treated with lingual tonsillectomy using coblation. Intraoperative complications did not occur. Three patients (2.8 %) needed revision surgery due to postoperative hemorrhage, and in one of those cases, three revisions were necessary to control the situation. Intubation for revision surgery was uneventful in all patients. Potential risk factors for postoperative bleeding were analyzed amongst the patients requiring revision surgery due to postoperative hemorrhage. One patient was under antihypertensive medication but showed normal blood pressure values. One patient with known hypertension presented with intermittent hypertension in the postoperative period and the third patient presented with intermittent high blood pressure without known hypertension. With regard to the fact that intermittent high blood pressure in patients with hypertension may have been missed in the postoperative period, hypertension may be a risk factor for postoperative bleeding and blood pressure should be controlled in the postoperative period. The average age of these three patients was 59 years compared

to 47 years in the study cohort. The mean BMI was 34 kg/m^2 compared to 29.9 kg/m^2 in the entire group of patients. Older age and higher BMI therefore may be an additional risk factor for postoperative bleeding (maybe again via uncontrolled hypertension). With regard to the small number of subjects with revision surgery, however, a sound analysis of risk factors for postoperative bleeding is not possible in this cohort and requires further investigation. There was no postoperative airway compromise and no need for tracheotomy. In all cases oral intake was unaffected with adequate analgesia.

In comparison to other studies using coblation of the lingual tonsils, a higher rate of postoperative complications in terms of postoperative hemorrhage was documented in our series of patients. In the studies by Robinson et al. and Babademez et al. [23, 27], no postoperative hemorrhage or postoperative airway complications were reported. This may be due to the relatively small number of patients in these studies (16–18 subjects).

Robinson reported a transient change in taste, which was fully resolved at the 3-month follow-up visit, in 3 of 18 patients [23] and Babademez reported difficulty in swallowing solid foods for more than 30 days after surgery in 9 of 16 patients [27]. In our study, a change in taste was not reported, although taste was not systematically evaluated in these patients.

Coblation has also been used for a submucosal minimally invasive lingual excision. In comparison to studies using coblation for submucosal resection, a higher rate of postoperative complications in terms of postoperative hemorrhage was again documented in our series of patients. In the study by Maturo et al. and in a comparative clinical trial by Babademez et al., no secondary bleeding or airway obstruction was reported [10, 26]. This difference again may be due to the relatively small number of patients in these studies (4–17 subjects). In a larger retrospective analysis, Friedman et al. [24] described their experiences with a series of 46 patients receiving submucosal minimally invasive lingual excision (SMILE) using coblation. In this series, postoperative bleeding was controlled with pressure and topical adrenalin. In two cases, surgical revision was needed, one of which required ligation of the lingual artery via an external neck dissection. Bleeding occurred at a comparable rate in a recent publication from Gunawardena et al. [25], although the relatively extensive surgical excision they performed,it cannot be compared with our lingual tonsillectomy. Thus postoperative bleeding, although relatively rare, seems to occur at a comparable rate both with lingual tonsillectomy and with lingual excision using coblation and may require invasive surgery to control.

Comparison of our results with those of other studies investigating different surgical approaches at the level of the tongue base is difficult due to the substantial differences in the surgical techniques. In the studies assessing midline glossectomy, the incidence of secondary bleeding ranged from 0 to 25 % in patient groups of various sizes (6–34 patients) [14, 18, 20, 28, 29]. In earlier trials, patients regularly underwent tracheostomy (92 % in the trial of Fujita et al. [14] and 50 % in the trial of Mickelson et al. [20]). In contrast, tracheotomy was not necessary in any of our patients. In a more recent study by Hou et al. [18], the incidence of tracheostomy in midline glossectomy was smaller. Perioperative swelling leading to a prolonged stay in the intensive care unit and prolonged extubation was documented in 5.9 % of the patients [18]. Abdel-Aziz et al. [33] described the postoperative airway obstruction caused by edema in 18.8 % of patients. In our series of patients, no postoperative airway complications occurred.

Conclusion

Coblation of the tongue base is a relatively safe procedure with a low rate of postoperative complications, postoperative bleeding being the most relevant. The procedure does not require tracheostomy and postoperative airway compromise has not been reported. Especially in comparison to surgical resection of the tongue base, coblation of the lingual tonsils seems less invasive. In cases of tongue base hypertrophy due to a hypertrophy of the lingual tonsils, coblation of these lingual tonsils appears to be a safe and only moderate invasive alternative to other methods of surgical resection. Further studies are needed to investigate the efficacy of the procedure.

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