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Bipolar Electrocautery Cryptolisis Method for Chronic Caseous Tonsillitis

Hasan Şafakoğulları, Remzi Tınazlı, Eda Tuna Yalçınozan, Pertev Gündüz

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

Abstract

BACKGROUND/AIMS: The aim of this study was to evaluate the efficacy and safety of bipolar electrocautery cryptolysis (BEC) in treating chronic caseous tonsillitis (CCT), a condition commonly associated with halitosis and foreign body sensation (FBS) in the throat.

MATERIALS AND METHODS: CCT patients with halitosis will be evaluated with Finkelstein's tonsil smelling test and those with FBS will be evaluated with Visual Analogue Scale scoring. Pain levels, bleeding, and the time taken for patients to start work and achieve full recovery were assessed. Forty-two patients with CCT and complaints of halitosis were included in the study. Twenty-nine of these patients also had a FBS in their throat. All patients underwent BEC and they were followed for 12 months. Data were analyzed with IBM SPSS V23.

RESULTS: After 12 months, 64.29% of patients with halitosis and 65.52% of patients with FBS experienced improvements in their symptoms.

CONCLUSION: When we compare the laser and radiofrequency (RF) cryptolysis results in the existing literature with our BEC-C results, it can be concluded that it is as safe, comfortable, and effective as both procedures in the treatment of halitosis and FBS. The primary advantage of BEC over laser and RF methods is its greater economic feasibility, making it a more accessible treatment option in a variety of clinical settings.

Keywords: Caseous, tonsillitis, bipolar electrocautery, halitosis, foreign body

INTRODUCTION

Chronic caseous tonsillitis (CCT) can cause uncomfortable halitosis and an irritating foreign body sensation (FBS) in the throat. The unique anatomical and microbiological features of palatine tonsils play a role in the development of CCT. The crypts are tubular structures covered by stratified squamous epithelium, which invaginates from the surface of the palatine tonsils to the depths of the parenchyma. Each tonsil contains about 10-20 crypts.[1] Food residues, dead cells of the tonsils, and cell debris can accumulate in these crypts over time. These accumulations result in a yellowish soft malodorous mass called the caseum. As a result, a suitable environment for anaerobic bacteria occurs in the palatine tonsils.

Regardless of the cause of CCT, signs and symptoms of halitosis and FBS are well defined in CCT. It has been reported that up to 77% of individuals suffering from CCT experience complaints of halitosis.[2] Halitosis, which can lead to social withdrawal and even depressive symptoms, is caused by odorous compounds such as volatile sulfur, hydrogen sulfide (H_2S), methyl mercaptans (CH3SH), and dimethyl sulfide, which are produced by anaerobic proteolytic bacteria. Apart from halitosis, an irritating FBS is also common in the throat. This is due to caseum accumulation in the crypts that leads to inflammation, congestion, and hypertrophy of the palatine tonsils.

Initially, CCT treatment is conservative, involving topical antiseptics, anti-inflammatory agents, or oral antibiotics.[3] If conservative treatment does not work, alternative therapeutic interventions should

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ORCID IDs of the authors: H.Ş. 0000-0001-8896-4290; R.T. 0000-0003-3066-4804; E.T.Y. 0000-0001-5392-5937; P.G. 0000-0002-8277-416X.

Corresponding author: Pertev Gündüz
E-mail: pertevgunduz@gmail.com
ORCID ID: orcid.org/0000-0002-8277-416X

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be considered, including tonsil cryptolysis (TC) or surgical excision.[2] Tonsillectomy is not considered the primary treatment option, as it necessitates general anesthesia and presents a risk of significant postoperative complications such as hemorrhage and pain. TC may be performed using various modalities, including laser, radiofrequency (RF), or electrocautery techniques. Due to its cost effectiveness, CO_2-laser cryptolysis (LC) and temperature-controlled RF (TC-RF) are not widely used. On the other hand, bipolar electrocautery (BEC) can be used more extensively because it is relatively cheaper and easier to access.

This study was designed to show the efficacy and safety of BEC-TC in the treatment of CCT. The efficacy and safety of BEC-TC on halitosis and FBS in the treatment of CCT have not been investigated in the literature.

MATERIALS AND METHODS

The study received ethical approval from the Near East University Scientific Research Ethics Committee (approval no: 2019/72, date: 19.09.2019). All patients were informed about the study protocol, and written consent was obtained from each participant. A total of 42 patients diagnosed with CCT and halitosis were enrolled in the present clinical trial. Among them, 29 patients also had a FBS in their throat.

Statistical Analysis

Data were analyzed with IBM SPSS V23. Data distribution normality was assessed using the Shapiro-Wilk test. The Mann-Whitney U test was used to compare data that were non-normally distributed, between the paired groups. The Friedman test were used to compare three or more non-normally distributed data over time. Spearman's rho correlation coefficient was used to examine the relationship between non-normally distributed quantitative data. Categorical data are presented in the form of frequency (percentage) and quantitative data are presented as mean ± standard deviation, median (minimum-maximum). The significance level was taken as $p<0.05$.

Inclusion Criteria

The inclusion criteria were as follows: being over the age of 18, positive Finklestein tonsil smell test for halitosis, relief of FBS with the removal of the caseum, complaints that do not respond to routine medical treatment (10-day course of antibiotics for anaerobic bacteria and a 2-week saline mouthwash), and normal coagulation tests.

The severity of the halitosis was evaluated as follows:

Grade score 0: No symptom.

Grade score 1: Mild: Foul odor detected during the tonsil smell test, when the material was brought close to the examiner's nose, but no bad breath perceived when sniffing exhaled air from the patient's nose or mouth.

Grade score 2: Moderate: Bad breath is felt when sniffing the air exhaled from the patient's nares or mouth, or smelling a strong fetid odor from the material at a distance of 10 cm on tonsil smelling test.

Grade score 3: Severe: When bad breath is felt during a conversation with the patient.

FBS was evaluated by a Visual Analogue Scale (VAS). Namely, score 0 showed no signs of FBS, while score 10 showed the most severe signs.

Exclusion Criteria

Patients with the following conditions were excluded from the study. Diseases related to the tooth, gingiva, nose, sinus, pharynx, larynx, lung, gastrointestinal tract, hepatorenal system, and systemic diseases such as diabetes mellitus can affect overall health. Also, patients who are at risk for surgical intervention, use of electrocautery and anesthesia, and chronic medication (for example, those with clotting disorders, taking drugs related to chorionic villus sampling) were excluded.

These procedures were performed under local anesthesia. For BEC TC, the Covidien Force FX Electrosurgical Generator was set to a power level of 20-2. BEC probes were inserted into tonsillar crypts, and energy was applied until blanching of the tonsils was achieved (Figure 1). All patients were observed in the hospital for 3 hours following the procedure. Pain levels and bleeding amounts were evaluated as outcome measures. Pain was assesed, during the intervention, and on days 1, 3, 7 and 10 following the procedure, using a VAS. The patients were also asked how many days after the procedure they started to work again and how many days after the procedure they no longer felt pain. Patients were re-examined at 1, 3, and 12 months following the procedure, and the severity of halitosis and FBS was recorded postoperatively.

RESULTS

Forty-two patients, who had a CCT with halitosis, underwent BEC-TC. Twenty-nine of these patients also had FBS in the throat. Twenty-four of the patients who had CCT with halitosis, were female, and eighteen were male. In the group where FBS was also present, there were 18 females and 11 males. Some descriptive statistics for the quantitative data of patients are shown in Table 1.

In both the halitosis and the FBS group, there was a statistically significant difference between the medians of post-operative pain levels with respect to time ($p<0.001$). The mean number of days for patients in the halitosis group to start work were 1.48 (±0.66), while the days for full recovery were 10.91 (±3.96). Likewise, the mean number of days until patients start work was 1.87 (±0.69) and for full recovery was 11.01 (±4.11) in the FBS group (Table 1).

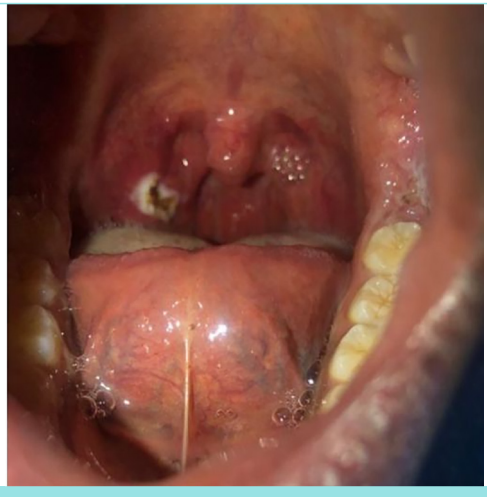

Figure 1. The view of he right tonsil after removal of caseous material and electrocauterization.

According to Mann Whitney U test, there was no significant difference between the medians of the number of tonsillitis per year and gender in both groups. And according to Spearmaans'rho test, there was no significant relationship between age and number of tonsillitis per year in both groups.

In both halitosis and FBS groups, there was a significant relationship between postoperative pain levels and the day of full recovery. Also, full recovery day and the time to start work showed a significant relationship (Table 2).

There was a statistically significant difference between halitosis improvement and postoperative times (p<0.001). Pre-operative mean halitosis scores were 2.31 (±0.67) and 1.21 (±1.10) at the 12th month. Also, it was found that 17 (40.5%) of the patients had severe halitosis during the pre-operative period and 7 (16.7%) had severe halitosis in the 12th month. At the 12th month, 27 of 42 patients with halitosis had recovered. Of these 27 patients who recovered, 13 (30.95%) had no symptoms. 14 participants (33.33%) had mild symptoms. Eight patients (19.05%) with moderate symptoms and 7 patients (16.67%) with severe symptoms were considered unsuccessful at the end of the 12 months (Table 3).

Table 1. Some descriptive statistics of quantitative data of patients with halitosis and foreign body sensation

Patients	Parameters	Mean ± SD	Median	Test statistics	p
			(min.-max.)		
Halitosis n (42)	Female (n=24) 57.1%				
	Male (n=18) 42.9%				
	Age	32.33±12.01	29 (17-67)		
	Tonsillitis per year	1.62±1.34	1.5 (0-5)		
	Full recovery day	10.91±3.96	10 (6-21)		
	Day to start work	1.48±0.66	1(1-3)		
	Post-op. mean pain level				
	1st day	0.45±0.16	0.47 (0.17-0.82)[a]		
	3rd day	0.35±0.15	0.37 (0.12-0.68)[a]	χ^2=114,714	<0.001
	7th day	0.18±0.15	0.16 (0.02-0.81)[b]		
	10th day	0.05±0.06	0.03 (0-0.27)[c]		
	Female (n=18) 62.1%				
	Male (n=11) 37.9%				
	Age	31.01±10.75	29 (17-67)		
	Tonsillitis per year	1.59±1.3	2 (0-4)		
Halitosis with foreign	Full recovery day	11.01±4.11	10 (6-21)		
Body	Day to start work	1.87±0.69	1 (1-3)		
Sensation	Post-op. mean pain level				
(FBS) n (29)	1st day	0.45±0.16	0.47 (0.17-0.82)[a]		
	3rd day	0.36±0.14	0.40 (0.12-0.68)[a]	χ^2=77,152	<0.001
	7th day	0.19±0.17	0.16 (0.03-0.81)[b]		
	10th day	0.05±0.06	0.03 (0-0.27)[c]		

χ2: Friedman test statistic, [a-c]: No difference between days with the same letter. SD: Standard deviation, min.: Minimum, max.: Maximum, FBS: Foreign body sensation.

Table 2. Relationship between post operative pain level, full recovery day to start work

Relationship between post operative pain level and full recovery day				Relationship between full recovery day and day to start work		
	Post-op. pain level	Full recovery day			Full recovery day	
		r	p		r	p
Halitosis	1. day	0.224	0.153	Start to work	0.773	**<0.001**
	3. day	0.462	**0.002**			
	7. day	0.759	**<0.001**			
	10. day	0.804	**<0.001**			
Foreign body sensation	1. day	0.194	0.313	Start to work	0.856	**<0.001**
	3. day	0.321	0.089			
	7. day	0.704	**<0.001**			
	10. day	0.775	**<0.001**			

r: Spearman's rhocor relation coefficient.

There was a statistically significant difference between pre- and post-operative medians of FBS scores (p<0.001). Pre-operative mean VAS score was 6.48, post-operative 1st month, 3.17, 3th month, 3.48, and 12th month was 3.62 (Table 4). 12th month VAS scores of FBS; 6 (20.69 %) patients had VAS score 0-1, 8 patient (27.59 %) had 2-3 scores and 7 patients (24.14 %) had 4-5 scores. However, 8 patients had an unsuccessful result of 6 or more VAS scores (Table 4).

In evaluating the impact of the treatment on symptom severity, the results show different improvements for each patient. The levels of response to treatment in patients, a very good improvement is defined as a 3-grade improvement for halitosis and an improvement of 6 or more in VAS scores for FBS. Good improvement means; only 2 grades improvement for halitosis and 4 or 5 scores improvement in VAS for FBS. Partial improvement means; only 1 grades improvement for halitosis and 2 or 3 scors improvement in VAS for FBS. No improvement means: no improvement or worse than pre-op for halitosis and FBS. Among 42 patients with halitosis, 1 patient reported significant improvement, while 18 patients showed good improvement. Eight patients had partial improvement, and fifteen patients showed no improvement, with some even experiencing worsening symptoms. Similarly, in the group of 17 patients with a sensation of a FBS, 4 patients showed very good improvement, 10 patients showed good improvement, and 5 patients showed partial improvement. However, 10 patients did not experience any improvement, and their symptoms, either stayed the same or worsened (Table 5).

DISCUSSION

The palatine tonsils serve as an ideal environment for gas-producing bacteria due to their unique anatomical and microbiological properties, making them a common source of halitosis in addition to acute localized infections.[4] The surface epithelium of the tonsils extends into the parenchyma, forming invaginations that create tonsillar crypts.[5]

Even in the core of normal or seemingly non-inflamed tonsils, there is a mixed flora of aerobic and anaerobic bacteria.[6] Among the most common organisms are gram-positive cocci[5], such as *Staphylococcus* and *Streptococcus* species, as well as anaerobes like *Prevotella, Fusobacterium,* and *Peptococcus*, which are known to produce volatile sulfur compounds such as H_2S and CH3SH.[7]

Electrocautery, a cost-effective and widely available tool, has been increasingly used for its utility in performing tonsillotomy procedures.[8] However, to our knowledge, no study has been published in the English-language literature specifically investigating the use of BEC for tonsillar cryptolysis in patients with halitosis and FBS due to CCT. Therefore, this publication will be a novel contribution to the literature. However, there are a considerable number of studies with laser or RF in the treatment of halitosis and FBS in the literature.

Finkelstein et al.[5] evaluated the effectiveness of CO_2 LC (CO_2-LC) for treating halitosis in 53 patients with CCT and found that 52.8% of patients achieved halitosis resolution after a single session. Two sessions were required for 34% of patients, and three sessions were necessary for 9%.

Table 3. Mean and number (percentage) of halitosis before and at different time points after the intervention (first, third, and twelfth month) are shown. (Halitosis severity according to Finklestein tonsil smell test: no symptom means grade score 0, mild symptoms means grade score 1, moderate symptoms means grade score 2, and severe symptoms means grade score 3.)

Halitosis	Grade scores	Median	No symptom (grade 0)	Mild (grade 1)	Moderate (grade 2)	Severe (grade 3)
	Mean ± SD	(min.-max.)	n (%)	n (%)	n (%)	n (%)
Pre-op	2.31±0.67	2 (1-3)[a]	0 (0)[a]	4 (9.5)	21 (50)	17 (40.5)
Postop 1. month	0.83±0.99	1 (0-3)[b]	18 (42.9)[b]	17 (40.5)	3 (7.1)	4 (9.5)
Postop 3. month	1.1±1.05	1 (0-3)[b]	14 (33.3)[b]	15 (35.7)	8 (19)	5 (11.9)
Postop 12. month	1.21±1.10	1 (0-3)[b]	13 (30.95)[b]	14 (33.3)	8 (19.05)	7 (16.67)
Test statistic x^2=	68,012	p<0.001				

χ^2: Friedman test statistic, [a-b]: No difference between days with the same letter. SD: Standard deviation, Min.: Minimum, Max.: Maximum.

Table 4. Mean and number (percentage) of foreign body sensation before and at different time points after the intervention (first, third and twelfth month) are shown. Foreign body sensation was evaluated with the visual analog scale (VAS). Namely, score 0 did not indicate any foreign body sensation, while score 10 indicated severe foreign body sensation

Foreign body			VAS scores				
Sensation	VAS scores	Median	0-1	2, 3	4, 5	6, 7	8, 9, 10
	Mean ± SD	min.-max.	n (%)	n (%)	n (%)	n (%)	n (%)
Preop	6.48±1.12	7 (4-8)[a]	0 (0)	0 0%	5 (17.24)	19 (65.52)	5 (17.24)
Postop 1. month	3.17±2.27	3 (0-7)[b]	7 (24.14)	9 (31.03)	5 (17.24)	8 (27.59)	0 (0)
Postop 3. month	3.48±2.37	4 (0-7)[b]	6 (20.69)	8 (27.59)	6 (20.69)	8 (27.59)	1 (3.44)
Postop 12. month	3.62±2.38	4 (0-8)[b]	6 (20.69)	8 (27.59)	7 (24.14)	7 (24.14)	1 (3.44)
Test statistic x^2=	39,861	p<0.001					

χ^2: Friedman test statistic, [a-b]: No difference between days with the same letter. Min.: Minimum, Max.: Maximum, SD: Standard deviation, VAS: Visual Analogue Scale.

Table 5. The levels of improvement in halitosis and foreign body sensation symptoms as a result of patient's response

Levels of improvement	Halitosis n (%)	FBS n (%)
Very good improvement	1 (2.38)	4 (13.80)
Good improvement	18 (42.86)	10 (34.48)
Partial improvement	8 (19.05)	5 (17.24)
No improvement	15 (35.71)	10 (34.48)

Very good improvement means a 3-grade improvement for halitosis and an improvement of 6 or more in VAS scores for FBS. Good improvement means; only 2 grades improvement for halitosis and 4 or 5 scors improvement in VAS for FBS. Partial improvement means; only 1 grades improvement for halitosis and 2 or 3 scors improvement in VAS for FBS. No improvement means; no improvement or worser than pre-op for halitosis and FBS.
VAS: Visual Analogue Scale, FBS: Foreign body sensation.

Hashemian et al.[2] used laser and RF in his study, and found a success rate of 76.9% in halitosis and 90.9% in FBS with laser therapy. Dal Rio, on the other hand, in a study investigating the effects of CO2-LC, found improvement in halitosis after the procedure in all patients and also found that volatile sulfur compounds were reduced by 30.1%. Caseum retention was also found to be significantly reduced.[9]

In another retrospective study, the efficacy of RF cryptolysis in the treatment of halitosis associated with CCT was investigated. The results showed that the mean VAS score was significantly reduced from 6.82±1.45 to 0.88±2.5 after 12 months. In addition, after one session of RF cryptolysis, 76.5% of the patients were found to be negative in the Finkelstein test.[10]

Another study comparing bipolar RF cryptolysis with monopolar RF cryptolysis in the treatment of patients with halitosis showed superior results with bipolar RF.[11]

In our study, BEC was applied in a single session. At the end of the 12th month, an improvement was observed in 27 (64.29%) of the cases with halitosis. Of these, 13 (31%) of these 27 patients had no symptoms. Considering all our patients, it was observed that the preoperative halitosis mean symptom grade decreased from 2.31 to 1.21 at the 12th month (Table 3).

We obtained similar results in the patients in the FBS group. At the end of 12 months, we had 21 (72.42%) patients who have 5 or less in VAS score. The number of patients with VAS score more than 5 was 8 (27.58%) (Table 4).

In other words, 8 patients showed a one-grade improvement in their Finkelstein smell test scores for halitosis, while 19 patients, approximately 45%, showed a good or very good (two- or three-grade) improvement. Again, in the FBS group, we found that 4 patients (13.80%) improved very well and 10 (34.48%) showed good improvement at the end of the 12th month. There was no improvement in 10 of 29 patients (34.48%) (Table 5).

These findings suggested that a second or third treatment session might be necessary in patients who show partial or no response.

Our study also assessed recovery time, with patients returning to work after a mean of 1.48 days post-BEC for halitosis alone and 1.87 days post-BEC for FBS. Pain levels, as assessed by the VAS, showed a significant decrease from day 1 (mean score of 0.45) to day 10 (mean score of 0.05). This indicates that discomfort and symptoms; including procedural pain, swallowing difficulties, and throat discomfort, resolved by a mean of 10.91 days for halitosis patients and 11.01 days for FBS patients (Table 1). These findings are consistent with those found by Finkelstein et al.[5] regarding the time of transition to a regular diet.

In their studies, Hashemian et al.[2] found that patients returned to regular diet in 1-3 days following LC.[5] In addition, Hashemian found the time to return to a regular diet following the RF procedure was longer for RF than for laser (3.1 days for RF and 1.9 days for LC).

Hashemian et al.[2] detected minimal bleeding that stopped spontaneously in one of five patients who underwent RF; and found significantly less bleeding in the laser applied group compared to RF. Similarly, in the Tanyeri study, after the RF procedure, only 1 out of 58 patients detected very little bleeding. In addition, a tonsillectomy was performed in a patient who experienced bleeding 24 hours after the procedure.

In our study, 10 of the 42 patients experienced mild, short-term spontaneous leakage during the procedure, but none required intervention. No significant bleeding was reported in the patients who were discharged. These results suggest that BEC is a safe, effective, and well-tolerated procedure for the treatment of halitosis and FBS due to CCT. It offers a viable alternative to tonsillectomy, with minimal risk of bleeding and a relatively shorter recovery time. This technique may serve as an attractive option for patients seeking treatment for these conditions.

Study Limitations

Since each individual has a different pain threshold, variations in responses to the questions and non-compliance with the prescribed diet constitute limiting factors for the study.

CONCLUSION

In conclusion, when we evaluate the results of laser and RF cryptolysis in English publications and our BEC-C results, we can conclude that all three procedures are effective in the treatment of halitosis and FBS in the throat. Also, all three procedures have minimal postoperative bleeding and low pain levels. It has been observed that after these procedures, patients can return to normal working life quickly. However, a notable advantage of the BEC-C procedure is its cost-effectiveness compared to laser and RF treatments, making it more accessible and feasible in a wider range of clinical settings. Additionally, based on the results of our study, we suggest that multiple treatment sessions may enhance the success rate of BEC-C in managing halitosis and FBS. Future studies could further explore the potential benefits of repeated sessions on the treatment of halitosis and FBS in CCT.

MAIN POINTS

- Chronic caseous tonsillitis (CCT) can cause an unpleasant halitosis and foreign body sensation in the throat.
- Bipolar electrocautery cryptolisis method is as successful as laser and radiofrequency in the treatment of CCT.
- Electrocautery is a safe, inexpensive and easily accessible instrument that can be used in every clinic.

ETHICS

Ethics Committee Approval: The study received ethical approval from the Near East University Scientific Research Ethics Committee (approval no: 2019/72, date: 19.09.2019).

Informed Consent: All patients were informed about the study protocol, and written consent was obtained from each participant.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.Ş., Concept: E.T.Y., Design: P.G., Data Collection and/or Processing: P.G., Analysis and/or Interpretation: R.T., Literature Search: R.T., Writing: R.T.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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