

Use of Coblation In Debulking Obstructing Laryngeal Tumors

Original
Article

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ABSTRACT

Background: Management of airway in cases of obstructing laryngeal tumors (OLT) is considered a challenging surgical problem. Tracheostomy can secure a patent airway; however, it was reported as a negative prognostic factor. Endolaryngeal debulking (ED) of these tumors, without doing tracheotomy, aims at ensuring a patent airway till starting the appropriate definitive treatment (DT). Coblation can induce localized molecular disintegration of the tissues with a low temperature. Therefore, it can be used safely in airway surgery with low risks of postoperative edema or scarring

Aim of Work: To study the safety of using temperature-controlled radiofrequency ablation (coblation) in ED of OLT without doing tracheostomy

Method: This is an uncontrolled interventional prospective case series study that included 16 cases having OLT. All of them were prepared for coblation-assisted ED and biopsy. They were followed up till initiation of the DT.

Results: From February 2023 until October 2023, 16 patients with OLT were first presented to our unit. 13 patients were intubated successfully and coblation-assisted ED without primary tracheostomy was done for them. Extubation was performed Successfully, without the need for re-intubation or tracheostomy, in 12 cases with coblation debulking success rate of 92.3%

Conclusion: Using coblation in endolaryngeal debulking of obstructing laryngeal tumors is an effective surgical procedure to avoid temporary tracheostomy before initiation of the definitive treatment.

Key Words: Coblation; debulking; obstructing laryngeal tumors; tracheostomy.

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INTRODUCTION

Cancer larynx is one of the most common head and neck cancers. In 2017, the estimated global incidence of new cases of laryngeal cancer was 2.76 per 100,000 inhabitants, and the estimated global prevalence of laryngeal cancer in the same year was 14.33 cases per 100,000 inhabitants^[1]. Moreover, the 5-year mortality rate of cancer larynx has increased in the last decades^[2]. Delayed diagnosis is still one of the causes of high mortality of cancer larynx where 60% of patients are first presented in the advanced stages (stage III or IV)^[3].

Patients with advanced laryngeal cancers (stage III or IV) are usually presented by obstructive airway symptoms that are usually worsened during taking biopsy or during initiation of radiotherapy; consequently, temporary tracheostomy is sometimes indicated before starting the appropriate curative definitive treatment (DT). However, temporary tracheostomy is one of the major

causes of recurrence of laryngeal cancer^[4]. The incidence of stomal recurrence after temporary tracheostomy was estimated to be from 8 to 41% with an average of 17%^[5]. In addition, the tracheotomy incision may cause difficulties during salvage laryngectomy incision.

Many surgical methods can be used in Endolaryngeal Debulking (ED) of obstructing laryngeal tumor (OLT), such as cold steel instruments, cautery, microdebrider, or vaporization by CO₂ laser. Temperature controlled radiofrequency ablation, or coblation, is a surgical tool that can deliver a localized bipolar radiofrequency energy through a conductive solution, which is saline, to the target tissue. This energy can cause dissociation of the chemical bonds in the target tissue resulting in reduction of the tissue volume, or tissue ablation, without producing a high thermal energy. The temperature in the field is usually below 85° C^[6]. Therefore, using of coblation in airway surgery is advantaged by low postoperative pain, edema, and scarring^[7].

We think that coblation can be used safely in ED of OLT without the need of doing temporary tracheostomy. There is little published research on the use of coblation in ED of OLT^[8]. Additional supporting case series studies are needed to support this concept.

PATIENTS AND METHODS

Technical design

This is an uncontrolled interventional prospective case series study that was performed in a single tertiary care center and included 16 cases with OLT presented to us during the period from February 2023 to October 2023. Institutional review board (IRB) Approval (number: 10393-12-2-2023) was obtained from ZU-IRB at the beginning of the study. All patients signed a full informed consent regarding their participation in the study.

Patients

All patients included in the study were admitted with undefined obstructive laryngeal tumors, suspected cancer larynx, and were prepared for diagnostic direct laryngoscopy and biopsy. The tumor was defined as an obstructing tumor based on the finding of airway narrowing during flexible fiberoptic laryngoscopy as well as the presence of at least one symptom of airway obstruction such as stridor and dyspnea. All patients were followed up until the start of their DT or for at least one week after surgery.

We excluded patients who had laryngeal tumors with definitive diagnosis such as hemangiomas, patients with recurrent laryngeal tumors, and patients with distant metastasis (M1). In addition, we excluded patients with other severe comorbidities or who had American Society of Anesthesiologists (ASA) scores equal to or greater than 4.

Pre-operative assessment

All included patients were subjected to complete history taking and full clinical examination. All cases had their larynx examined preoperatively with a flexible fiberoptic laryngoscope to determine the nature of the tumor and the degree of laryngeal obstruction. Preoperative neck CT scans with contrast were performed for all patients included in the study to determine the extent and staging of the tumors before surgery.

Surgical technique

All cases included in the study underwent a trial of intubation by a senior anesthesiologist using either GlideScope, fiberoptic intubation or retrograde intubation depending on the case. In cases of failed intubation, a tracheostomy is performed as an emergency life-saving procedure.

Direct laryngoscopy was applied and fixed in a position that allowed for complete exposure of the tumor. Multiple

punch biopsies were first taken from the tumor. Then, the ED of the tumor was performed by coblation using both the ablation, or cutting, mode, and the coagulation, or fulguration, mode. The debulking was continued laterally until an adequate air way is confirmed or until the thyroid cartilage on the affected side is reached.

Hemostasis was secured by coblation using the coagulation, or fulguration, mode. In a few cases, suction monopolar diathermy was also used to help in hemostasis (Figure 1 a, b).

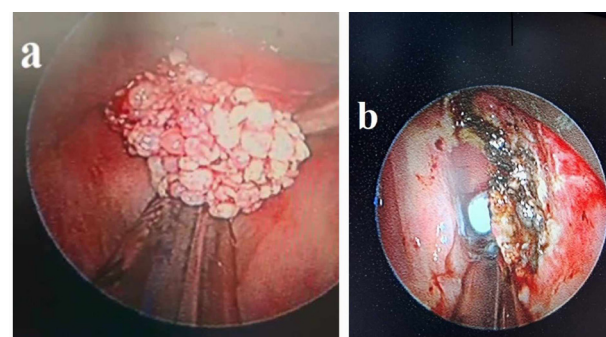


Fig. 1: a, obstructing laryngeal tumor during direct laryngoscopy and biopsy intake step; b, adequate laryngeal airway after coblation assisted debulking with monopolar cautery hemostasis.

After finishing the debulking procedure and securing adequate hemostasis, extubation was performed in the operating room with careful monitoring of the oxygen saturation and respiratory functions. All necessary equipment for reintubation or tracheostomy must be available in the operating room during extubation. ED was considered successful if the patient had no severe airway obstruction that necessitated reintubation or tracheostomy during this follow up period.

RESULTS

During the period from February 2023 till October 2023, 16 patients with OLT were first presented to our unit. All those patients were prepared for initial management through coblation-assisted ED and biopsy. Thirteen patients were intubated successfully and coblation-assisted ED without primary tracheostomy was done (Table 1). The other three patients, failed to be intubated during surgery; therefore, an awake tracheotomy was performed urgently, and the ED was abolished (Table 2)

The mean age of the included patients was 56.4 ± 5.5 years. Twelve patients were males, and the other 4 patients were females. The T stage of the tumors in the included patients was T3 in 9 cases and T4a in 6 cases. The mean duration of ED surgery was 47.7 ± 14.5 minutes.

In 12 cases (92.3%), extubation was performed successfully, without the need for re-intubation or tracheostomy. Consequently, the success rate of

coblation-assisted ED in our study was 92.3%. One patient (7.7%) experienced severe aspiration and dyspnea after surgery. He was therefore transferred to the intensive care unit (ICU) for continuous monitoring and proper

management. The next day, there was no improvement in oxygen saturation on room air; Therefore, tracheostomy was performed urgently.

Table 1: The relevant data of patients who performed ED.

No	Sex	Age (Y)	Tumor site	T stage*	Duration of ED (M)	Postoperative hospitalization period (D)	time to initiation of DT (D)	Tracheostomy	Postoperative complications
1	M	47	Glottic	T3	45	2	11	No	No
2	M	57	Transglottic	T4a	75	3	7	No	Mild aspiration
3	M	58	Glottic + subglottic	T4a	50	2	6	No	Mild dyspnea
4	M	55	Glottic	T3	35	2	7	No	No
5	F	54	Glottic	T3	40	1	7	No	No
6	M	45	Supraglottic	T3	80	1	10	No	No
7	F	60	Transglottic	T4a	40	2	7	No	Mild aspiration
8	M	64	Transglottic	T4a	45	5	8	Yes	Sever aspiration
9	M	52	Glottic	T3	35	1	9	No	No
10	M	53	Glottic	T3	55	2	10	No	No
11	F	59	Supraglottic	T3	40	2	9	No	No
12	M	56	Glottic + subglottic	T4a	45	3	8	No	Mild dyspnea
13	M	57	Glottic	T3	35	2	10	No	No

M= male, F = female , Y= years, M= minutes, D= days.*American Joint Committee on Cancer (AJCC). TNM Classification of Malignant Tumors: T = PrimarTumor

Table 2: The relevant data of patients who failed to be intubated.

No	Sex	Age (Y)	Tumor site	T stag-	Postoperative hospitalization period (D)	time to initiation of DT (D)	Tracheostomy
1	M	66	Glottic	T3	5	8	Yes
2	M	57	Transglottic	T4a	12	12	Yes
3	M	62	Glottic + subglottic	T4a	8	16	Yes

M= male, Y= years, D= days. *American Joint Committee on Cancer (AJCC). TNM Classification of Malignant Tumors: T = Primary Tumor

During recovery, two patients (15.4%) showed mild aspiration and shortness of breath with decreased oxygen saturation levels. They were transferred to the ICU for management. Subsequently, they showed significant improvement in symptoms and oxygen saturation levels and were discharged from the ICU in the next day without re-intubation or tracheostomy.

In our study of 16 cases with OLT, the total number of patients who required tracheostomy, either initially or after ED failure, was four patients (25%). The mean age of patients who required tracheostomy was statistically

significantly higher than the mean age of patients with successful ED. However, there was no statistically significant difference between patients who required tracheostomy and patients with successful ED regarding the preoperative T stage (Table 3).

Regarding the postoperative hospitalization period, patients with successful ED had statistically significantly lower postoperative hospitalization periods. However, there was no statistically significant difference regarding time to initiation of the DT (Table 3).

Table 3: Comparing patients with successful ED and patients who underwent tracheostomy.

		Tracheostomy	Successful ED	<i>P value</i>
Number		4	12	-
Age (Y)		62.25 ± 3.86	54.42 ± 4.6	0.0087
Sex	M	3	9	1
	F	1	3	
T stage*	T3	1	8	0.1457
	T4a	3	4	
time to initiation of DT (D)		11 ± 3.83	8.42 ± 1.62	0.0701
Postoperative Hospitalization period (D)		7.5 ± 3.31	1.91 ± 0.66	0.0001

Y= years, M= male, F= female, D= days. *American Joint Committee on Cancer (AJCC). TNM Classification of Malignant Tumors: T = Primary Tumor. *P value* is statistically significant if < 0.05.

DISCUSSION

Management of OLT usually involves two steps. The first step is the definitive diagnosis step, which includes a surgical biopsy and a detailed endoscopic examination. The second step is the definitive treatment step which may be surgical or non-surgical treatment.

Another option for management of OLT is a one-step surgical procedure through emergency laryngectomy after a frozen section biopsy^[9]. However, emergency laryngectomy, as a single step management of OLT, does not allow for better oncologic evaluation or psychological preparation of the patient. With the recent modalities of organ preservation, emergency laryngectomy became a less popular option^[8,10,11].

In two-steps management of OLT, maintaining the airway between the two steps usually represents a surgical debate. Tracheostomy is considered the traditional safe way for maintaining the airway in those risky cases with airway obstruction before taking the biopsy^[11]. However, it is well established that tracheostomy is considered a negative prognostic factor^[4,12] and results in higher risks of stomal recurrence^[5]. In addition, the relatively low position of the tracheostomy and the resulting scar usually cause technical difficulties in the surgical reconstruction or repair^[8].

Avoiding tracheostomy in OLT during biopsy intake is a surgical challenge because the resulting edema caused by the surgical intervention, the concomitant bleeding, and the effect of general anesthesia on the respiratory system can cause further deterioration of the airway resulting in the demand of doing tracheostomy as an emergency lifesaving procedure^[11,13].

Endolaryngeal debulking (ED) of OLT can achieve the target of the first step of management without the need for tracheostomy. Various surgical tools have been reported to be used effectively in ED of OLT. Most of the previous studies reported the use of CO2 laser^[12-18].

and the microdebrider^[19,20]. To date, there has been one published report on the use of coblation in ED of OLT^[8].

Although using CO2 laser in ED has been proved to be an effective technique, it still has many disadvantages. CO2 laser necessitates well trained staff, relatively expensive laser equipment, and specific laser-compatible endotracheal tubes. Even so, there is still risk for endotracheal fire which is a life-threatening complication^[8,13,14]. Coblation causes less tissue charring with less rise in surrounding tissue temperature, causing less postoperative edema^[6,7]. In addition, the use of coblation in ED of OLT is relatively less expensive and more available than the use of CO2 laser.

Gul *et al.* performed ED in 46 cases with OLT. They used CO2 laser in 17 cases and coblation in 29 cases. The Success rate was 82.35% (14/17) in the laser group and 93.1% (27/29) in the coblation group^[8]. In our study, the success rate of coblation-assisted ED was 92.3% (12/13).

In our study, all operable cases presented to us with OLT were planned to be initially managed with ED. Tracheostomy was only performed in case of failure of intubation or in case of airway deterioration after unsuccessful debulking. In previous literature, selected cases of OLT were managed initially by ED, while other cases were managed initially by awake tracheostomy^[8,12,13,14].

In our study, the total incidence of patients who required tracheostomy among all included patients with OLT was 25% (4/16). This incidence was 52.8% (46/87) in the study of Gul *et al.*^[8], and it was 73.8% (31/42) in the study of Langerman *et al.*^[11], and it was 64.8% (24/37) in the study of Samedy *et al.*^[12]. The reason for the relatively low incidence of tracheostomy in our study may be because it is a prospective study with small number of patients, and we included all cases with primary OLT. All cases in our study were prepared for ED. Tracheostomy was only performed in cases of failed intubation or failed ED, as an emergency procedure.

We found that among cases with OLT, the group who required tracheostomy had a significantly higher age than the group who underwent a successful ED. There was no significant difference regarding the tumor stage in-between the 2 groups. Therefore, we advise that the decision of ED should be taken carefully in elderly patients.

We found that one of the important advantages of ED in OLT is the significant decrease in the postoperative hospitalization period. Gul *et al*^[8] also reported a significant reduction of the hospitalization period after successful ED. We did not find a significant decrease in the time to initiation of the DT after ED. However, Gul *et al*^[8] and Du *et al*^[20] reported a significant decrease in the time to initiation of the DT in patients performed a successful ED.

Our study is a prospective case series study that was conducted on all patients presented to us with an operable OLT. However, there are some limitations in the study regarding the small sample size and the short follow up periods. We think that further studies should be carried out to compare coblation with other techniques, as CO2 laser and the microdebrider. in ED of OLT.

CONCLUSION

Using coblation in endolaryngeal debulking of obstructing laryngeal tumors is an effective surgical procedure to avoid temporary tracheostomy before initiation of the definitive treatment.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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