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TO EVALUATE THE EFFICACY AND USEFULNESS OF COBLATION IN LARYNGOTRACHEAL AND SINONASAL SURGERIES

ENT

Dr. Deepthi Satish MBBS, DNB, Assistant Professor, Department Of ENT, ST. JOHN'S Medical College Hospital, Bangalore, Karnataka, India.

Dr. Josephine Joy* MBBS, MS ENT, Fellow In Head And Neck Surgery, HCG Hospital, Bangalore. Karnataka, India. *Corresponding Author

Dr. Pratibha C. B MBBS, DLO, DNB, Associate Professor, Department Of Ent, ST. JOHN'S Medical College Hospital, Bangalore, Karnataka, India.

Dr. Balasubramanya A. M MBBS, MS, Professor, Department Of ENT, ST. John's Medical College Hospital, Bangalore, Karnataka, India.

Dr. Anita Ross MBBS, MS, Professor, Department Of ENT, ST. JOHN'S Medical College Hospital, Bangalore, Karnataka, India

ABSTRACT

Aim: To evaluate the efficacy and usefulness of coblation in laryngotracheal and sinonasal surgeries. **Materials And Methods:** With approval from the Institutional Ethics Committee of St. John's Medical College Hospital, Bangalore, Karnataka, India, we did a retrospective chart series of 135 patients who underwent coblation assisted otorhinolaryngological surgeries over the past 3 years. A laryngeal specific radiofrequency plasma ablation device (Coblator Procise LW, smith &nephew) was used for supraglottic lesions, Micro Laryngeal Wand (MLW) was used for glottis, subglottic and tracheal lesions, Procise Max EIC wand was used for sinonasal masses. **Results:** In all our cases, Coblation was used to perform a range of different procedures, including removal of granulation tissue and early soft stenosis in the trachea, posterior cordotomy in Bilateral abductor palsy, removal of sinonasal tumours, Adenoidectomy, Sphenopalatine artery ligation, choanal atresia repair and creating adequate exposure in skull base tumours. 37 out 47 patients with laryngotracheal stenosis were decannulated after coblation surgery. All 12 patients with bilateral abductor palsy were decannulated. 13 patients with sinonasal masses are still on follow up without any recurrences. Majority of patients experienced good results without major complications in the perioperative period or any post-operative sequelae. **Conclusion:** Coblation is a relatively new bipolar radiofrequency ablation tool that is gaining favour for laryngotracheal and sinonasal surgeries. Potential benefits may include reduced intraoperative bleeding, improved endoscopic visualization, and reduced pain. Coblation is a minimally invasive, highly viable, safe and effective technique which can be recommended for a variety of otolaryngological surgeries.

KEYWORDS

Coblation, Tracheostomy, laryngotracheal stenosis, Bilateral abductor palsy.

INTRODUCTION

Traditional electrosurgery has been utilized in Ear Nose and Throat (ENT) surgery as an alternative to the scalpel for cutting tissue. An additional advantage of conventional electrosurgery is that it provides immediate hemostasis during surgery without extensive tissue damage.

A new approach which provides resection, ablation and hemostasis without any significant collateral damage to surrounding tissues is the Coblation system.[1]

The term coblation is derived from "Controlled ablation" first discovered by Hira V. Thapliyal and Philip E. Eggers. Initially coblation technology was used in arthroscopic surgeries in the year 1998 and is now being used successfully in arthroscopic, ENT, neuro, spine, and plastic surgical procedures. This procedure involves non-heat driven process of soft tissue dissolution using bipolar radiofrequency energy under a conductive medium like normal saline. When current from radiofrequency probe passes through saline medium it breaks saline into sodium and chloride ions. These highly energized ions form a plasma field which is sufficiently strong to break organic molecular bonds within soft tissue causing its dissolution.[2]

It was first used in otorhinolaryngology for tonsillectomy and has since been used for a wide spectrum of otorhinolaryngological procedures like adenoidectomy, tongue base reduction surgeries, uvulopalatopharyngoplasty, vallecular cyst excision, benign laryngeal lesions, laryngeal papillomatosis, cordotomy for bilateral abductor palsy, subglottic stenosis. In nasal surgeries, coblation is being used for excision of benign and malignant lesions and turbinate reduction.

Coblation is established as an effective technique for tonsillectomy. A number of studies have compared coblation tonsillectomy to other tonsillectomy techniques with regards to postoperative pain. The majority of these have found that there is significant reduction in postoperative pain with coblation tonsillectomy.[3]

Coblation adenoidectomy is now widely performed with the aid of rigid endoscopes, which makes the procedure more precise, with effective haemostasis and also ensures complete clearance. Coblation is being widely used for the volumetric reduction of soft palate in cases of sleep-disordered breathing. The most commonly performed procedure is uvulopalatopharyngoplasty. Coblation channelling of the tongue is an effective technique either alone or combined with an uvulopalatopharyngoplasty in cases of mild to moderate Obstructive Sleep Apnoea.[3]

Prolonged endotracheal intubation has been observed to be the most common cause for airway stenosis in many cases. Subglottis is the most commonly affected subsite; however, the glottis and trachea may also be involved. Many endoscopic surgical techniques have been described for the treatment of airway stenosis like bougie dilation, balloon dilation, and laser-assisted dilation along with intra operative injection of steroids or antifibrinolytic agents like mitomycin locally.[4]

A paper by Chan et al described 10 adult patients who underwent coblation resection for airway stenosis with good results. Although a small study, it suggests that the efficacy of coblation may be similar to that of other contemporary techniques with the advantages of improved hemostatic potential, reduced risk of fire and reduced local thermal tissue injury. Unique ablative properties of Coblation, may also have the potential to reduce recurrence of stenosis, even though this has not been definitively proven as of yet.[5]

The main advantages of the coblator technique are rapid removal, ease of using the instrument endoscopically, ability to continue oxygenation without a fire risk, reduced thermal damage, integrated suction and coagulation, that minimises damage to the distal tissue.[6]

METHODOLOGY

All patients with laryngotracheal stenosis were ventilated via the tracheostomy tube. A suspension laryngoscope was placed and larynx

visualized. A zero-degree endoscope was introduced into the subglottis to visualise the extent of granulation. Under endoscopic guidance the MLW was used with ease to lift the granulations off the tracheal wall and ablated without any damage to the cartilage or the anterior tracheal wall. Coblation was performed at a setting of 7 for coagulation and 3 for cauterization. Mitomycin C was applied at the site to prevent recurrence. Early soft stenosis causing concentric narrowing of the tracheal lumen were coblated in a radial fashion.

In cases of bilateral abductor palsy posterior cordotomy with partial resection of ipsilateral false cord was done using the MLW.

In sinonasal masses endoscopic coblation-assisted excision was done via endonasal approach using the adenoid wand. Coblation system has the advantage of vaporisation of the tissue as it coagulates thereby debulking the tumour and also controlling bleeding. Feeding vessels of the tumour was selectively coagulated with adenoid wand.

RESULTS

A total of 135 patients were identified from hospital database and included in this retrospective study. There were 47 female patients and 88 male patients.

The study included 47 patients with laryngotracheal stenosis. This group included tracheostomised patients with a history of difficult decannulation. Patients with grade 1, 2 and 3 stenosis (Cotton Myers classification)[7] were taken up for coblation surgery. We were able to successfully decannulate 37 out of 47 patients. Among the remaining 10 patients, 7 patients had to undergo an open procedure, 3 patients were lost to follow up.

12 patients with bilateral abductor palsy presented with stridor and underwent an emergency tracheostomy. Of the 12 patients, 11 had idiopathic bilateral abductor palsy and 1 had palsy post total thyroidectomy. All patients were decannulated, out of which 10 patients were decannulated within 1 week to 10 days, but 2 patients required re-coblation and were decannulated within a month.

Procise Max Adenoid wand was used for tumour excision in all 13 patients with Sino nasal masses. Most common pathology was inverted papilloma. Other cases included tumours like ossifying fibroma, juvenile nasopharyngeal angiofibroma, mucoepidermoid carcinoma, hemangiopericytoma, sinonasal teratocarcinoma, esthesioneuroblastoma with intracranial extension and sinonasal undifferentiated carcinoma. Regular follow up of these patients was done with nasal endoscopy and imaging whenever required.

24 cases of adenoid hypertrophy were included in the study. Transnasal endoscopy was done for visualisation of the adenoids and coblation of the adenoid tissue was done using a Procise Max Adenoid wand through a retroplataine route with adequate hemostasis intraoperatively.

Coblation has proved to be an effective surgical tool in creating a wide surgical corridor for excellent exposure of the anterior skull base with reduced intraoperative bleeding. 25 cases of pituatory tumours with or whithout parasellar extension were approached by the transnasal transphenoidal route using Procise Max Adenoid wand. The procedure involved creation and ablation of a Hadad flap, coblation of superior turbinates along with coagulation of the branches of sphenopalatine artery around the sphenoid ostium to expose sphenoid sinus.

We had 2 cases of laryngeal papillomatosis, which were treated with coblation assisted micro laryngeal surgery, both of which came back with recurrence at an interval of 6 months.

2 children with voice change with no airway compromise were diagnosed with anterior glottic web and underwent coblation assisted microlaryngeal surgery. However, they were lost to follow up.

In 2 neonates with bilateral membranous choanal atresia, endoscopic transnasal coblation assisted recanalisation with posterior septectomy was done without stenting. Post op recovery was uneventful with no respiratory distress and adequate feeding.

DISCUSSION

Laryngotracheal Stenosis:

Laryngotracheal stenosis is a complex problem that may be difficult to manage. The majority of stenosis is acquired and related to endotracheal intubation. Historically, open airway surgery with laryngotracheal reconstruction (LTR) has been the gold standard in the treatment of complex subglottic stenosis. These procedures involve long operative time and prolonged hospitalizations, while being effective. With evolution and expansion of surgical techniques, the indications for endoscopic treatment of airway stenosis have expanded in recent years to balloon dilatation, carbon dioxide laser and intraluminal stenting.[4]

In 1972, Strong and Jako were the first to describe endoscopic management of laryngotracheal stenosis with the carbon dioxide (CO2) laser.[8] However with the use of laser, there is always a risk of airway fire due to high concentrations of inspired oxygen (used in jet ventilation) and temperatures upwards of 400 – 600°C along with excessive scarring and restenosis. The operative time is also prolonged.

In 2009, Kitsko and Chi described the use of coblation to remove suprastomal granuloma.[9]

Coblation has many advantages over LASER. Coblation works at a much lower temperature (40-70 degree). It rapidly removes tissue at low temperature and this limits the risk of airway fire. The coagulation setting helps in control of bleeding and with its unique ablative properties coblation reduces scar tissue and thus helps prevention of re-stenosis. Additionally, lesser operative room set up time is required for coblation as compared to LASER.[5]

The tactile sensation with the coblation wand over the tissue is much superior to the laser beam. This helps in differentiating the granulation tissue from the tracheal wall. The malleable wand can be bent to allow the distal electrodes to reach difficult to access areas of the trachea. In revision cases, Mitomycin C can be applied as an antifibrinolytic agent to prevent further recurrence.

In our institution we have used coblation in various surgeries mostly for laryngotracheal stenosis resulting from prolonged intubation. Laryngeal wands are of two types. Normal laryngeal wand (LW) which is used for ablating laryngeal mass lesions and Mini laryngeal wand (MLW) used for glottic, tracheal and subglottic lesions. The MLW has a pin point tip which helps in precise application and also the wand can be bent to reach the difficult to access areas.

Patient selection for coblation assisted laryngeal surgeries depends on the aetiology, site, grade and nature of the stenosis. In our study, most patients had stenosis following prolonged intubation, few of them had post traumatic stenosis. Outcome in these patients was good when compared to other aetiologies like Organophosphorus Poisoning. Majority of our patients presented with grade 1- 3 stenosis (Cotton Meyer's classification) which were short segment soft granulations involving the cervical trachea. Success rate with tracheal stenosis was better than with subglottic stenosis in our study. Patients with higher grade of stenosis and multilevel involvement as was seen in Organophosphorus Poisoning, may not be good candidates for coblation assisted surgery.

Bilateral Abductor Palsy:

For centuries tracheostomy has been the gold standard in the management of bilateral abductor vocal fold paralysis. After the introduction of endoscopic endolaryngeal surgical procedures, Kashima operation is used for the treatment of bilateral abductor vocal cord palsy where a C shaped posterior cordotomy is done.[10]

CO_2 laser is a popular method for cordotomy in bilateral abductor paralysis, however with risk of airway fire and longer operation room set up time. Posterior cordotomy with coblation technology is really promising therapy which restores suffcient glottic space without compromising the phonatory and sphincteric functions of the larynx.

We had 12 patients with bilateral abductor palsy, all of whom presented with stridor and underwent emergency tracheostomy. Posterior cordotomy was done using Microlaryngeal Wand (MLW), selecting the more medialised cord for ablation. Partial ablation of false cord was also done. In those patients who required more than one sitting, a partial arytenoidectomy had to be done, to provide a good airway. Thus, we were able to successfully decannulate all our patients who presented with bilateral abductor cord palsy.

Sinonasal Mass:
Coblation has been adapted for use within the sinonasal cavity, in the management of adenoid hypertrophy, inferior turbinate hypertrophy, nasal polyps, encephaloceles, and sinonasal and skull base tumours. A common rhinologic application of Coblation is adenoidectomy. Adenoid curette shaves off the adenoid tissue with sheer force and without direct vision with greater chance of injury to peripheral structures. However, in Coblation technique, movement of wand occurs under endoscopic vision, dissecting layer by-layer of adenoid tissue till its bed is reached, thus avoiding inadvertent injuries to peripheral tissues.[11] Also the post operative recovery is more dramatic with obvious improvement in the breathing pattern particularly in children with OSA in view of complete and precise removal of adenoid tissue. Coblation wand used in conjunction with endoscope facilitates precise removal of adenoid tissues specially around the Eustachian tube opening and posterior choanae, which are common areas of residual tissue.

The management of sinonasal and anterior skull base tumours has rapidly evolved over the past few decades. Large infiltrative tumours that would traditionally be resected with open approaches are increasingly being accessed from a minimally invasive endoscopic approach using 30, 45 and 70 degree endoscopes, paving way for improved visualization and access, One of the challenges to safe and effective endoscopic skull base surgery is impaired visualization from tumour bleeding which has been taken care of by the advent of coblation technology to ablate tissue and reduce intraoperative blood loss, thus improving visualization.[12]

In our series, Procise Max Adenoid Coblation Wand was used in endoscopic endonasal excision of sinonasal masses - both benign and malignant. Coblation aids in complete resection of the mass with less intraoperative bleeding, better visualisation and reduced risk of injury to vital structures. This technique provided an added advantage of coagulating the vascular pedicle of the tumour when encountered during dissection thereby alleviating the absolute need for pre-operative embolization in vascular tumours.

Laryngeal Papillomatosis:
In our patients with laryngeal papillomatosis, in whom coblation was used, we observed that they came back with recurrence. Hence it was noted that coblation alone as a treatment for laryngeal papillomatosis is not sufficient unless complimented with adjuvant treatment to reduce the frequency of recurrences.

Sphenopalatine Artery Ligation:
Coblation is also being used as a tool in management of refractory epistaxis as in cases of Hereditary Haemorrhagic Telangiectasia and also in endoscopic sphenopalatine artery coagulation. We have been using the coblation wand to raise the flap in the sphenopalatine artery area in order to visualise the artery for ligation with better hemostasis and field of view.

Choanal Atresia:
Coblation assisted recanalization was done in 2 neonates with membranous choanal atresia. The use of the wand helped in ablation of the choanal membrane and posterior part of nasal septum which is usually soft in children. Postoperatively, an adequate airway was achieved without requirement of a stent and the children are doing well on follow up.

CONCLUSION
Coblation is a relatively new bipolar radiofrequency ablation tool that is gaining favour for laryngotracheal and sinonasal surgeries. Potential benefits include reduced intraoperative bleeding, improved endoscopic visualization and reduced pain with relatively minimal post operative sequale. Coblation has proved to be an effective tool in creating a good surgical corridor with excellent exposure to the anterior skull base in resection of skull base neoplasms with overall reduction in operative time. Coblation is a minimally invasive, highly viable, safe and effective technique which can be recommended for a variety of otolaryngological surgeries.

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