



AN APPROBATION FOR COBLATION IN KASHIMA PROCEDURE

Vrinda B Nair, Balasubramanian Thiagarajan, Seethalakshmi Narasimhan

Stanley Medical College

ABSTRACT

The most common cause of BVFI is iatrogenic or surgical (44%) [1]. Among surgical procedures, Thyroid surgery is the most common culprit. The management of BVFP is a delicate equilibrium between airway, voice and swallowing. This article discusses our experience in treating BVFP by Posterior Cordotomy - Kashima's procedure by Coblation Technology, which restores sufficient glottic space, at the same time preserving the phonatory and sphincteric functions of the larynx. As Coblation causes minimal tissue injury, our patients could be decannulated on the third postoperative day as opposed to traditional teaching. All of them were successfully decannulated from tracheostomy with an adequate airway & exercise tolerance, a near normal voice and no aspiration.

INTRODUCTION

Bilateral Vocal Fold Paralysis is a surgical emergency which has to be promptly addressed and airway secured, voice preservation taking a backseat.

In this context two terms need to be explained -BVFI & BVFP. Bilateral Vocal Fold Immobility (BVFI) is a broad term which encompasses all forms of reduced or absent movement of the vocal folds ;whereas Bilateral Vocal Fold Paralysis refers to the Neurological causes of BVFI and specifically refers to the reduced or absent function of the Vagus nerve or its distal branch, the Recurrent Laryngeal Nerve.[1]

CASE REPORTS

CASE 1

Our first case was a 16 year old boy, a student, who presented with dyspnea on exertion, dry cough and voice change for 3 months which aggravated over the previous 5 days. On examination he had a palpable stridor.

Indirect laryngoscopic examination and Video Laryngoscopy revealed BVFP with the vocal cords in a paramedian position. Rest of the examination and evaluation was normal. He was diagnosed as Idiopathic BVFP. We took him up for tracheostomy followed by Kashima's Procedure by Coblation.

CASE 2

A 38 year old home-maker who had undergone Total Thyroidectomy and an on table tracheostomy 5 years back was decannulated 2 years later. After 3 years, following an episode of URI, she developed stridor and ended up with a re-tracheostomy after being diagnosed as BVFP. Six months following her second tracheostomy, she came to our Centre for decannulation.

CASE 3

A 42 year old home-maker, had undergone Completion Thyroidectomy for Hurthle Cell CA, 2 years back. She developed dysnoea on exertion and voice change following surgery with which she managed to lead a near normal life. 2 years post-operatively, she developed stridor following an episode of URI, was diagnosed as BVFP and ended up with an Emergency tracheostomy. She came to our department after 2 months for decannulation.

CASE 4

Our 4th patient was a 45 year old male, a deaf mute, who had undergone Total Thyroidectomy 2 years back. Six months postoperatively, he developed breathing difficulty and noisy breathing. He was diagnosed of BVFP and was subjected to emergency tracheostomy. After 1 ½ years of living with a tracheostomy, he came to our Centre for decannulation.

PRE OPERATIVE WORK UP

All except one of our patients came with a tracheostomy tube wishing to be decannulated. One boy who was diagnosed as an idiopathic case of BVFI was taken up for tracheostomy.

For all the patients, a detailed history was recorded and preliminary investigations done. All our patients were subjected to Videolaryngoscopy and Videostroboscopy and the glottis chink assessed.

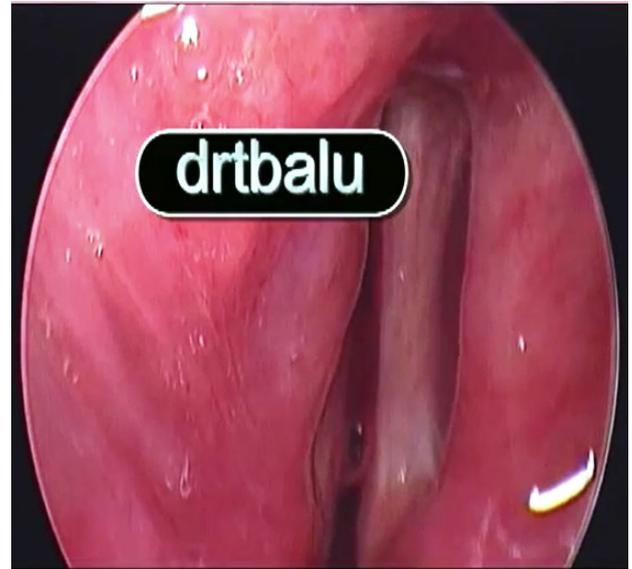
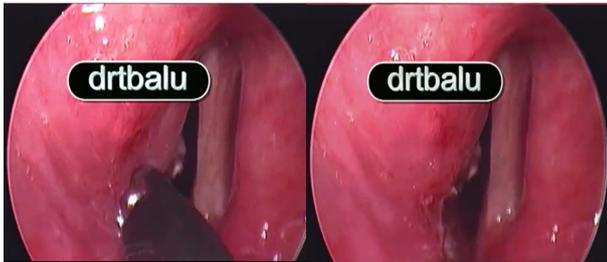
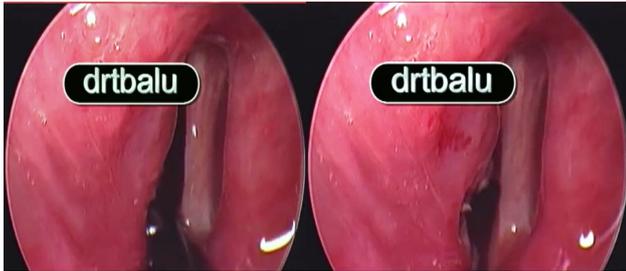
OPERATIVE PROCEDURE

All these patients were on tracheostomy and were taken up for Posterior Cordectomy-Kashima's Procedure. Anesthesia was given via tracheostomy. A Kleinsasser Suspension Laryngoscope was inserted and under endoscopic visualization, larynx inspected. Mobility of the cricoarytenoid joint checked with a probe.

Though Kashima and Dennis originally used CO₂ LASER for the procedure, in our center we used Coblation Technology for the same. The PROcise[®] MLW Plasma Wand, which provides ablation, coagulation, irrigation, and suction capabilities in one versatile single-use device was used. An incision was made 1mm^[2] in front of the vocal process of arytenoid and a 3.5-4mm C-shaped portion of the posterior 1/3rd of vocal cord ablated from the free border of the membranous cord, extending 4mm laterally over the ventricular band. This created around 6-7mm transverse opening at the posterior glottis.

Vocal process was not exposed. Anterior 2/3rd of the vocal cord was left undisturbed. Hence phonation and sphincteric function of the larynx remained undisturbed.

On follow up patients were found to have an adequate voice and good exercise tolerance. There was no limitation of their activity levels, as in they were able to pursue their daily routine, walk briskly and able to climb stairs without any exertional dysnoea.



Before

As Coblation caused minimal tissue injury, postoperative tissue edema was minimal in all the patients. Hence on POD 1, we changed their Portex[®] Cuffed Tracheostomy tubes into Fuller's Bivalved Metal Tracheostomy Tube and used a spigot to plug their tracheostomy tubes during day time, for 2 days, followed by a full 24 hour period. All patients tolerated the spigot with adequate exercise tolerance. Their tubes were removed after a period of 72 hours postop and wounds approximated and plastered.



After

History of laryngeal surgeries dates back to 1855 with Manuel Patricio Rodríguez García, a Spanish singer and vocal pedagogue, inventing an indirect laryngoscope. He invented the laryngoscope in 1854 and published observations of his own larynx, using a small dental mirror, the next year. García was interested in movements connected with the production of the singing voice and did not anticipate the importance of laryngoscopy in medicine.

In 1860s Turk & Knight first described vocal cord paralysis.



Garcia



Chevalier Jackson

In 1922, Chevalier Jackson, an American laryngologist, sometimes known as the Father of Endoscopy, did the first surgical procedure for BVFP - a Ventriculocordectomy. This provided an excellent airway at the expense of voice and airway protection.

Hoover tried Submucosal resection of the vocal fold, which resulted in excessive scarring, posterior glottis stenosis and postoperative dysphonia. Since 1922 laryngologists, in a quest for more conservative methods described procedures like Arytenoidectomy, Vocal cord Lateralisation, and LASER surgeries.

DISCUSSION

BILATERAL ABDUCTOR PALSY

Bilateral abductor paralysis is a surgical emergency. The most common cause of BVFP is iatrogenic, and of the surgeries Thyroid surgery is the most common culprit. It is often diagnosed a few days postoperatively. When detected on table, extubation should be deferred and airway secured by a Tracheostomy.^[11]

CAUSES OF BVFI^[2, 10]

The causes of BVFI can be divided into

Mechanical	Neurologic
Inflammatory	Radiation injury
Malignancy	Metabolic
Surgery	Toxins

Mechanical causes:

ACUTE COMPLICATIONS OF INTUBATION	CHRONIC COMPLICATIONS OF INTUBATION
<ul style="list-style-type: none"> • Arytenoid dislocation • Anterior Dislocation of thyroid relative to cricoid -> RLN injury • Hyperextension of neck -> Vagus n. Stretch • Laryngeal mask airway • Excessive cuff pressure -> RLN injury 	<ul style="list-style-type: none"> • Post glottis stenosis – prolonged/traumatic intubation • Excessive cuff pressure -> RLN injury • Stent placement in proximal esophagus

INFLAMMATORY CAUSES OF CA JOINT	NEUROLOGICAL CAUSES	RADIATION CAUSES
<ul style="list-style-type: none"> • Mumps • Rheumatoid arthritis • Gout • Ankylosing Spondylitis • Reiter syndrome • SLE • Crohns Disease 	<ul style="list-style-type: none"> • Arnold chiari malformation • DM • Meningomyelocele • Amyotrophic lateral sclerosis • Myasthenia gravis • Hydrocephalus 	<ul style="list-style-type: none"> • Radiation therapy • Post radiation fibrosis of CA , VF or both • Chondronecrosis

SURGICAL CAUSES
<ul style="list-style-type: none"> • Thyroid surgery • Parathyroid surgery • Esophageal surgery • Tracheal surgery • Brain stem surgery • Anterior approach to cervical disk

CLINICAL FEATURES^[1]

The chief complaints of a patient with BVFP are related to airway, voice and swallowing. Onset of symptoms may be Acute, Subacute or Chronic depending on etiology. A patient usually presents with airway difficulty in the form of stridor. Initially when the vocal cords are far apart voice will be breathy in nature. Over time, vocal cords may get medialised, and then the patient will have a near normal voice and cough, despite stridor. Aspiration and dysphagia may or may not be a part of the symptom complex.

EVALUATION

A thorough history and Head & Neck and laryngeal examination should be done. An X-ray Chest and CT Neck (Skull base to Thoracic inlet on the right, and up to Aortic arch ,on the left) are to be taken.

INFLAMMATORY CAUSES	MALIGNANCY	METABOLIC CAUSES
<ul style="list-style-type: none"> • WEGENERS GRANULOMATOSIS • TB • SYPHILIS • GERD • SARCOIDOSIS • RELAPSING POLYCHONDritis • AMYLOIDOSIS 	<ul style="list-style-type: none"> • LARYNGEAL NEOPLASM • SQUAMOUS CELL CA • CHONDROMAS / CHONDROSARCOMAS 	<ul style="list-style-type: none"> • HYPOKALEMIA • HYPOCALCEMIA • DM • ALPORT SYNDROME

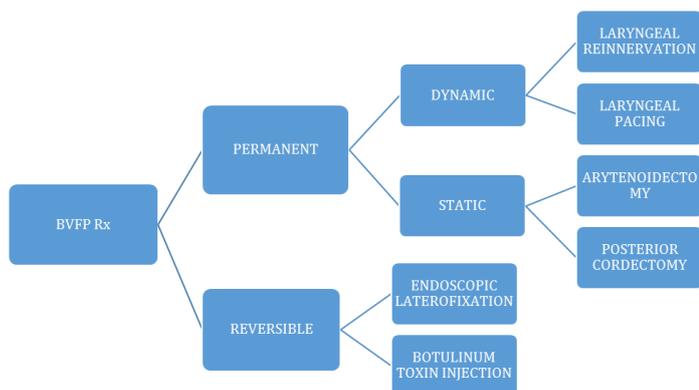
Video laryngoscopic Examination will show vocal cords in the paramedian position.

An EMG should be taken 30-40 days (baseline) after injury and then 1 month later.^[1]

- Normal action potential – normal nerve
- Absent potentials – nonfunctioning nerve
- Defibrillating potentials – worsening nerve
- Polyphasic potentials –regenerating nerve.

MANAGEMENT

In case of Medical or Neurological causes of BVFI, treatment of the cause will suffice. In iatrogenic causes where the nerve has been injured but not severed, EMG monitoring can be done to obtain an index of potential recovery. Permanent surgical procedures may be avoided till 9 months^[1] to allow time for spontaneous recovery. Given below are the management modalities of BVFI at a glance.



POSTERIOR CORDECTOMY

Posterior cordectomy by **Kashima and Dennis (1989)** is a more conservative procedure useful in mild to moderate airway compromise. Originally *Kashima* used CO₂ LASER for the procedure. KTP LASER may also be used. LASER has the advantage of causing minimal tissue bleeding.

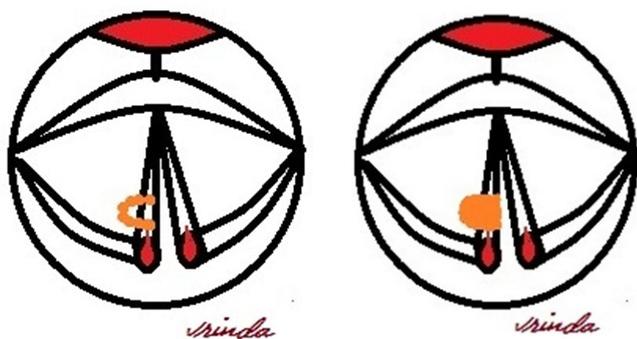
Using LASER, an incision is made 1-2 mm in front of the vocal process of arytenoid. This frees the vocal ligament and vocalis from the vocal process. The incision is carried laterally through the width of the vocal ligament and vocalis to the thyroid lamina, and posterior 1/3rd of the vocal cord removed.^[2] Cicatricial contraction of the region will produce a sufficient and stable airway lumen. Since anterior 2/3rd of the vocal cord is preserved, phonation is spared. Also, the preservation of arytenoid and aryepiglottic plica prevents the risk of aspiration.^[3]

Now, *which cord to operate?* We should choose the more medially placed cord for the procedure. If both cords are in identical positions, go for the cord that shows at least a trace of mobility.

If both cords have equal mobility and are in identical positions, the surgeon should choose the side to which he has a better access.^[4]

Post operatively, apart from antibiotics, patients should be given antireflux treatment for upto 8 weeks. They can be decanulated around 6-8 weeks. But in our center, thanks to Coblation we were able to spigot the patients on the first post-operative day and decanulate them 72 hours post op.

As Coblation causes minimal tissue injury, our patients could be decanulated on the very first postoperative day as opposed to traditional teaching.



Incision

Result



Laryngeal wand



COMPLICATIONS OF POSTERIOR CORDECTOMY ^[3,5]

Postoperative edema

Granuloma formation

Scar formation

Posterior glottic web

POSTERIOR CORDECTOMY USING COBLATION

What we used for Kashima Procedure is a PROcise[®] MLW (MicroLaryngeal Wand) Plasma Wand. It has an extended length, ultra slim wand shaft with good surgical field visualization, access to anterior commissure, "Pin-point" precision for bipolar ablation and coagulation.

^[6]The Coblator is a bipolar radiofrequency (RF) electro-surgical system designed for use in ENT surgeries. It is indicated for ablation, resection, coagulation of soft tissues and hemostasis of blood vessels. It works by passing RF energy through a conductive solution mode when sufficient energy is applied, the conductive solution is converted into a plasma layer containing

charged particles. When these particles come in contact with tissues, they cause its disintegration through molecular dissociation. This results in relatively low treatment site temperatures (40-70o C) when compared to conventional electrosurgical systems, thus yielding limited collateral tissue damage. Another major advantage of Coblation is the reduced risk of airway fire as compared to LASER or other electrosurgical methods.



Figure showing the equipment

When a lower voltage is used between active electrodes, the electric field is below the threshold required for plasma formation and resistive tissue heating occurs. This mode is useful for coagulation of blood vessels or vascular tissues.

Use of Coblation is contraindicated in patients using pacemakers or other electronic implants.

Coblation technology is being used in various ENT surgeries, viz., tonsillectomy, adenoidectomy, uvulopalatoplasty, laryngeal & tracheal surgeries, turbinate reduction surgeries, tongue base reduction surgeries. And there are different types of single-use wands designed for each surgery.

The other procedures for BVFI will be dealt in a limited manner, as their detailed discussion is out of scope of this article.

ARYTENOIDECTOMY

The various methods are ^[7]

Postero lateral extra laryngeal approach, where the vocal process is left and sutured to thyroid ala.

Endoscopic arytenoidectomy with electrocautery.

Endoscopic LASER arytenoidectomy.^[10]

VOCAL CORD LATERALISATION / ARYTENOIDOPEXY^[10]

This involves suture lateralization of the immobile vocal fold. It is an alternative to tracheostomy in cases with a favorable prognosis for recovery. It is easy to perform, adjustable and reversible. It may also be combined with an endolaryngeal arytenoidectomy. ^[7]

REINNERVATION

Reinnervation of the posterior cricoarytenoid muscle can be done for Recurrent Laryngeal Nerve or Vagal nerve paralysis. The neuromuscular pedicle used is *ansa hypoglossi+ omohyoid muscle*. Direct nerve implant using *phrenic nerve*, has been tried in animal models. But this is a difficult technique. ^[7, 8]

LARYNGEAL ELECTRICAL PACING ^[7, 9, 10]

This is still in the experimental stage. Here a pacing device is implanted into the Posterior Cricoarytenoid Muscle which gets triggered with inspiration.

CONCLUSION:

Hence Posterior Cordectomy is a relatively simple, and efficient procedure for BVFP therapy, which restores sufficient glottic space, without damaging the phonatory and sphincteric functions of the larynx. But the credit for lesser tissue injury, minimal postoperative edema and early decanulation, all goes to Coblation Technology. Thanks to the advent of Coblation technology, Posterior Cordectomy is now a piece of cake in the hands of an expert.

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