

A Dissertation on
**'RETROSPECTIVE STUDY ON ROLE OF COBLATION IN DENNIS
KASHIMA FOR BILATERAL ABDUCTOR VOCAL CORD
PARALYSIS'**

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COLLEGE & HOSPITAL**

**THE TAMILNADU DR. M.G.R.MEDICAL UNIVERSITY,
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APRIL 2017

CERTIFICATE

This is to certify that the dissertation “ **RETROSPECTIVE STUDY ON ROLE OF COBLATION IN DENNIS KASHIMA FOR BILATERAL ABDUCTOR VOCAL CORD PARALYSIS**” presented by **DR. RAJASEKAR.G**, is an original work done in the department of otorhinolaryngology, Government Stanley Medical College and hospital, Chennai in partial fulfilment of regulations of the The Tamil Nadu Dr.M.G.R. Medical University, for the award of degree of M.S. (Otorhinolaryngology) Branch IV, under my supervision during the academic period 2014-2017.

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DECLARATION

I, **Dr. RAJASEKAR.G**, solemnly declare that the dissertation, titled “**RETROSPECTIVE SYUDY ON ROLE OF COBLATION IN DENNIS KASHIMA FOR BILATERAL ABDUCTOR VOCAL CORD PARALYSIS**” is bonafide work done by me during the period of Dec 2015 to September 2016 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of **Prof.Dr.F.ANTHONY IRUDHAYARAJAN, MS., D.L.O.**, Department of Otorhinolaryngology, Government Stanley Medical College and hospitals, Chennai.

This dissertation is submitted to **The Tamil Nadu Dr.M.G.R.Medical University**, in partial fulfillment of the rules and regulations for the M.S. degree examinations in Otorhinolaryngology to be held in April 2017.

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ABSTRACT

Vocal cords are very delicate and intricate structure that help a human being to Breath, Speak as well as to sings. It is a micro structure and their functions are very accurate,even a small change in it by a lesion can produce enormous change in its function (Voice and Singing).

Any lesions affecting vocal cord results in changes of voice,breathing difficulty. bilateral abductor palsy is one such condition that can occur due various etiologies which had to be treated appropriately and effectively. there are many techniques available but dennis kashima is recently evolved technique which is used most commonly now a days because of increased precision,better hemostasis and minimal handling of tissues.

25 patients were selected on the basis of inclusion and exclusion criteria and who had underwent dennis kashimausing coblation technique and were studied based on the subjective and objective parameters and statistical analysis were made.

AIM AND OBJECTIVE:

The present study is aimed at measuring the effectiveness of dennis kashima procedure in treating the bilateral abductor palsy.

Subjective and objective evaluation of the patient who underwent dennis kashima procedure using coblation. parameters used are improvement in breathing,phonation and reduced aspiration

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ABSTRACT

Vocal cords are very delicate and intricate structure that helps a human being to Breathe, Speak as well as to sing. It is a micro structure and their functions are very accurate, even a small change in it by a lesion can produce enormous change in its function (Voice and Singing).

Any lesion affecting vocal cord results in change of voice, breathing difficulty. Bilateral abductor palsy is one such condition that can occur due various etiologies which had to be treated appropriately and effectively .there are many techniques available but Dennis kashima is recently evolved technique which is used most commonly now a days because of increased precision, better hemostasis and minimal handling of tissues.

25 patients were selected on the basis of inclusion and exclusion criteria and who had underwent dennis kashima using coblation technique and were studied based on the subjective and objective parameters and statistical analysis were made.

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The present study is aimed at measuring the effectiveness of dennis kashima procedure in treating the bilateral abductor palsy.

Subjective and objective evaluation of the patient who underwent Dennis kashima procedure using coblation .parameters used are improvement in breathing, phonation and reduced aspiration.

INCLUSION CRITERIA:

1. Patients with bilateral abductor palsy of all cause
2. Patients between age 10-60 years

EXCLUSION CRITERIA:

1. Malignancy of larynx
2. Patients with cardiac pacemakers
3. Age below 10 years and above 60 years
4. Patients who underwent revision cordectomy
5. patients who are not fit for general anaesthesia

INTRODUCTION

The history of procedures used to treat vocal cord immobility begins in 1835 with Garcia's work on mirror laryngoscopy. It's a challenge to the surgeons to identify a technique to increase the glottic space in patients with bilateral vocal cord paralysis not causing much damage to vocal quality and airway protection.

In 1860s, Turk and Chevalier Jackson is the first surgeon to perform the first surgical procedure in case of bilateral vocal cord palsy. But he endoscopically resected the complete vocal cords on both side. The airway was obtained sparing voice and airway protection.

Submucosal resection of vocal fold proposed by Hoover resulted in excessive scarring and thus leading to glottis stenosis and post-operative dysphonia.

Laryngologists over a period described arytenoidectomy as the treatment of choice, later vocal cord lateralization and introduce the use radiofrequency waves. Procedures on arytenoid include extra laryngeal arytenoidectomy in which arytenoid cartilage was freed from all its muscular and ligament attachments except the vocal muscle. In lateralization procedure, the arytenoids are fixed in laterally to thyroid ala. This was modified by fixation of corresponding vocal fold in order to conserve a good glottis opening.

Evidences of performing laryngofissure with arytenoidectomy along with aim to lateralize vibrating vocal cord with suture and silastic materials creating glottis airway of 4 to 6 mm at its posterior aspect .various techniques of endoscopic approach for the treatment of bilateral vocal fold mobility have proposed and modified by various surgeons.

The posterior cordectomy procedure was first proposed by the surgeons Kashima and Dennis in 1989. With time this procedure has taken its shapes now is performed to treat vocal cord palsy complications are rare ,simple and easily performed if needed its repeatable ,trans oral c laser his arguably most important technique for cordectomy with the advantage of increased accuracy ,better hemostasis, easy handling

REVIEW OF LITERATURE

EMBRYOLOGY OF LARYNX:

1. Development of larynx begins at 4th week of intrauterine life in the form of laryngotracheal groove which is nothing but the midline ventral respiratory diverticulum of the foregut. This groove gradually deepens and fused in the midline to form a septate later divides the laryngotracheal tube from the larynx and esophagus at its dorsal aspect.

2. The fusion of two separate ends starts caudally and ends at cranial end which forms the larynx and trachea .whereas Caudal end divides into two from which two main bronchi develop.

3. Epiglottis develop from the posterior part of hypo branchial eminence.

DEVELOPMENT OF LARYNGEAL CARTILAGE

Branchial Arch Derivatives

II : Lesser horn and upper portion of the hyoid bone

III : Greater horn and lower portion of the hyoid bone

V : Supraglottic structures (thyroid cartilage), superior laryngeal nerve structures (cricothyroid muscle and pharyngeal constrictors)

VI : Glottic/subglottic structures (cricoid, cuneiform, corniculate, and arytenoid cartilages) and recurrent laryngeal nerve structures (all intrinsic laryngeal muscles except the cricothyroid)

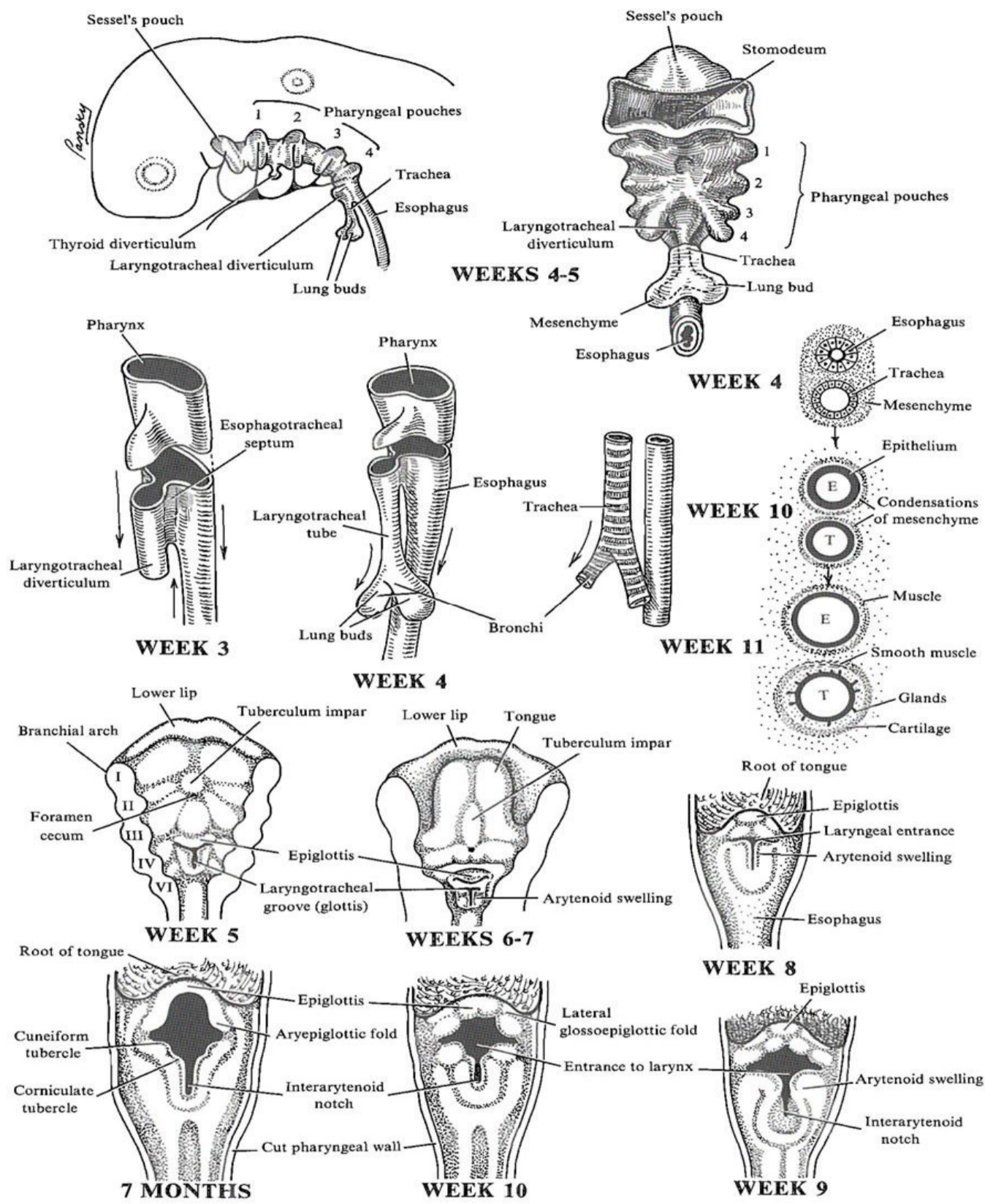


Fig-1 Various Stages of Development of larynx.

FRAMEWORK OF LARYNX

Definition:

Larynx composed of articulated cartilages interconnected by Ligaments, internally invested by mucosa, acted upon by muscles supplied by blood vessels and nerves and drained by lymphatics. Situated from C3 to C6 Vertebra in men is higher.

Table:-1 Dimension of Larynx

SEXES	LENGTH	TRANSVERSE DIAMETER	ANTEROPOSTERIOR DIAMETER	CIRCUMFERENCE
MALES	44mm	43mm	36mm	136mm
FEMALES	36mm	41mm	26mm	112mm

CARTILAGES OF LARYNX

The Cartilage of larynx divided into Paired and unpaired. Paired cartilages are three in numbers named 1.Corniculate 2.Cuneiform 3.Aretynoids.Unpaired cartilages are also three in number named 1.Thyroid 2.Cricoid 3.Epiglottis.

THYROID CARTILAGE

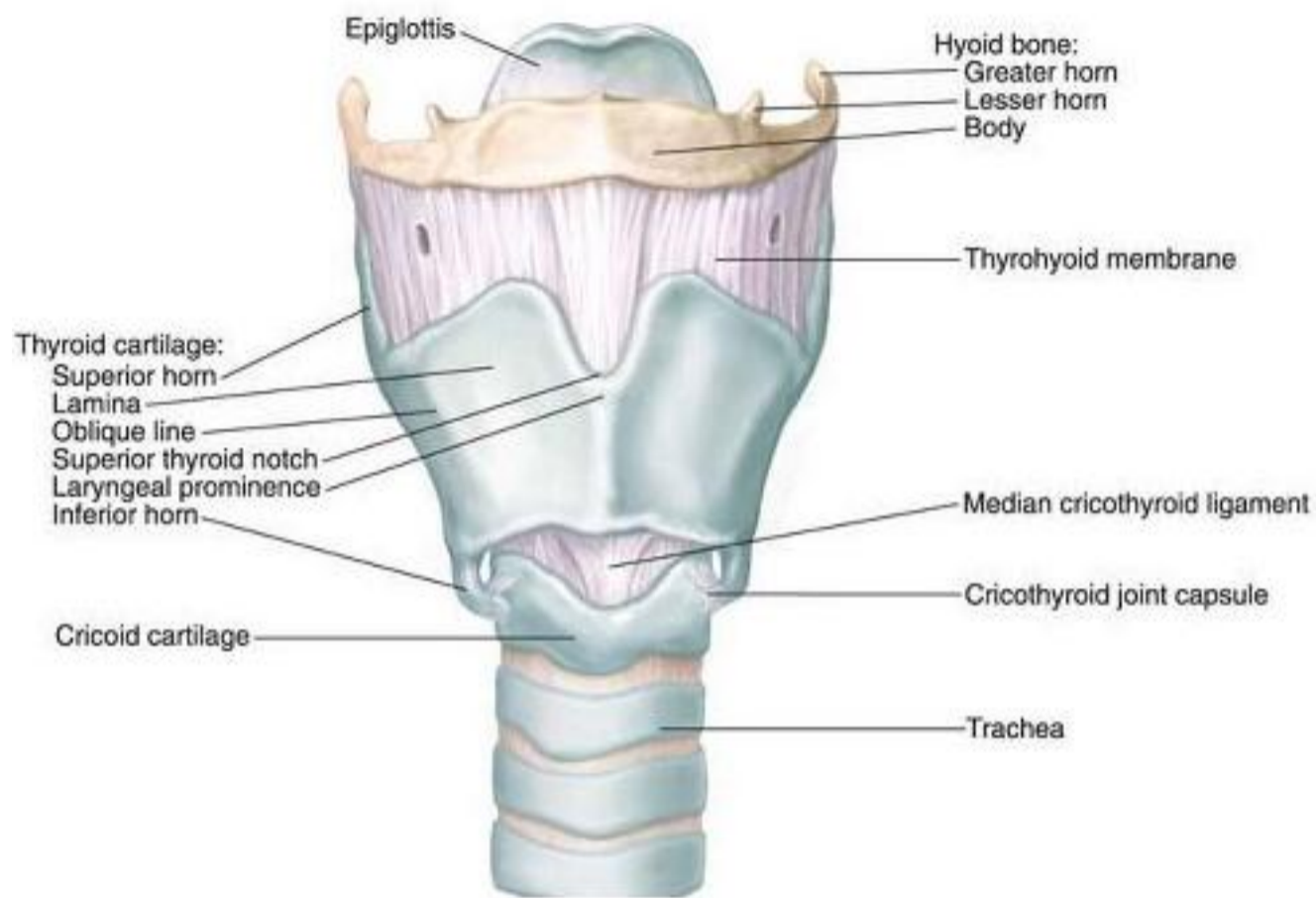


Fig - 2 Laryngeal Cartilages

Shield in Shape, Consists of two pentagonal plates which meet anteriorly in midline to form an angle of 90 degree in men and 120 degree in women. It is largest of all laryngeal cartilages. The fused anterior border in men produce a prominence which is easily palpable and known as “ADAMS APPLE” Lamina of thyroid cartilage deviated posteriorly and prolonged to form a slender process called superior and inferior cornua respectively, the Superior cornua is curved upward and backward and medially and ends in a conical projection seen on either side of the cornua where thyrohyoid ligament gets attached. The short and thicker inferior cornua arches downward medially and articulate with the small facet present in the cricoid cartilage.

In the Outer surface of lamina there is a oblique notch like line ext from the above at the level of superior thyroid tubercle to inferior tubercle. Following structures attached to the oblique line, they are

1. Thyro hyoid muscle

2. Sterno hyoid muscle

3. Inferior Constrictor Muscle. Inner part of lamina is covered by mucous membrane.

CRICOID CARTILAGE

It is the only cartilage having a complete cartilaginous ring in the airway system. It has narrow arch anteriorly and broad lamina posteriorly. Lamina has facets for arytenoids near the junction of arch and lamina for inferior horn of thyroid cartilage. It is a synovial type of joint, its vertical line gives attachment to esophageal longitudinal fibers. Superior margin gives attachment to the cricothyroid ligament. Lateral gives attachment to crico arytenoid muscle.

ARYTENOID CARTILAGES:

It is positioned at antero lateral border of cricoid lamina and its Shape looks like three sided pyramid. Its forward extension is called as Vocal Process, Lateral projection also called Muscular process gives attachment to cricoarytenoids at its

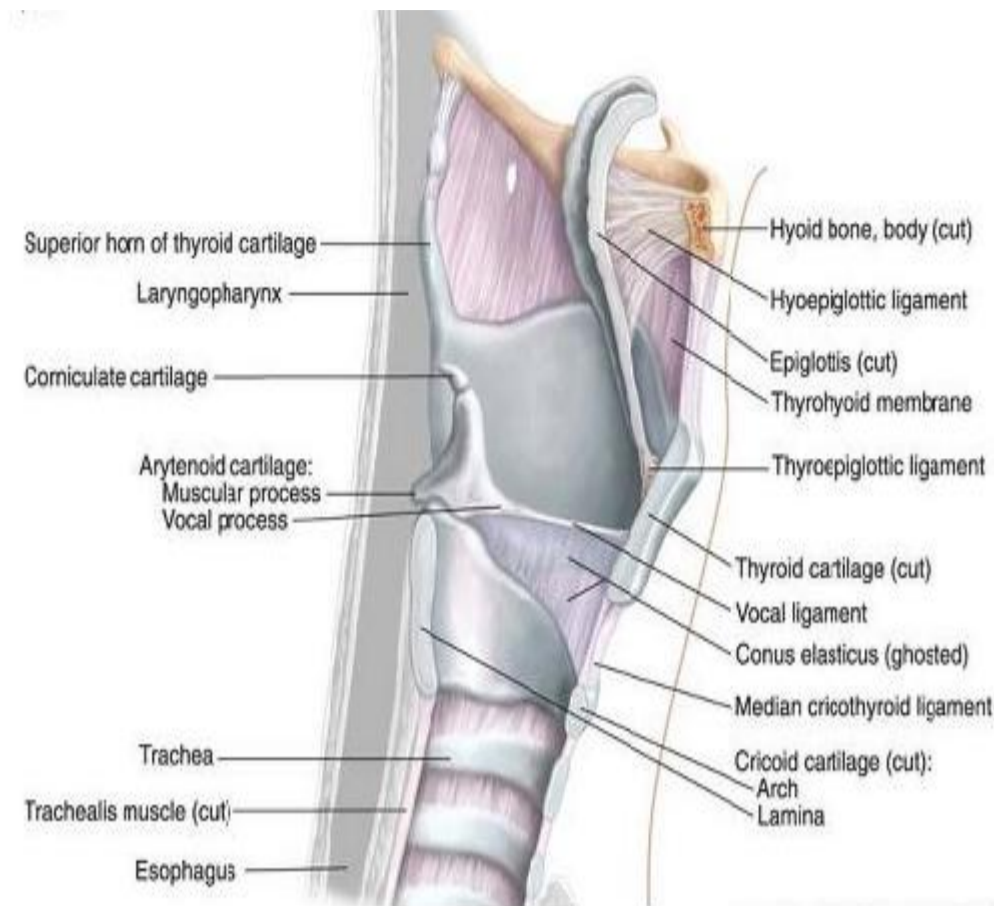


Fig - 3 Laryngeal framework – Lateral View

Posterior lateral aspect. Medial surface gives attachment to vestibular ligaments upper part and lower part gives attachment to crico arytenoid muscle.

CORNICULATE (SANTORINI) AND CUNEIFORM (WRISBERG)

CARTILAGES:

Small conical nodule like structure two in number which is a type of fibroelastic cartilage and articulate as a synovial joint. In front of corniculate, the elongated cuneiform cartilage present. They are enclosed in aryepiglottic fold.

EPIGLOTTIS:

Type of elastofibro cartilage thin leaf like sheet projecting behind the tongue base and body of hyoid . Below the thyroid notch, At sides there

is aryepiglottic folds. It's posterior surface is concave, smooth and with a central tubercle. Median and lateral glossoepiglottic folds forming the vallecula presents at its anterior surface. Hyoepiglottic ligament is connected to hyoid.

LIGAMENTS:

Table - 2 Intrinsic and Extrinsic muscles of Larynx

EXTRINSIC	INTRINSIC
1. Thyrohyoid membrane	a) Quadrilateral membrane
2. Median thyrohyoid ligament	between epiglottis and arytenoid
3. Lateral thyrohyoid ligament (enclose cartilago triticea)	i) Aryepiglottic fold – upper Borders ii) Vestibular ligament – lower margin
4. Cricotracheal Ligament	b) ConusElasticus (Cricothyroid or cricovocal ligament)
5. Hyo Epiglottis ligament	i) Vocal ligament – upper border

MUCOUS MEMBRANE:

The mucous membrane continuous with lining of pharynx above and trachea below. It is rich in mucous glands especially in the region of ventricle of Morgagni (Laryngeal ventricle). This mucous membrane is closely adherent

to epiglottis, aryepiglottic fold and vocal cords. The Lining epithelium of larynx are squamous, ciliated columnar or transitional.

LARYNGEAL MUSCLES:

The Laryngeal muscles are subdivided into intrinsic, extrinsic and accessory.

INTRINSIC LARYNGEAL MUSCLES:

Based on the effect on the shape of glottis and vibratory behavior of vocal cord they are classified into adductors, abductors, relaxers and tensor muscles.

THE POSTERIOR CRICOARYTENOID MUSCLE:

The Posterior crico arytenoid muscle originate behind the cricoid cartilage and inserted to arytenoids along its muscular part . PCA composed of vertical and horizontal compartments insert into the lateral and medial aspect of muscular process of arytenoids. Each of these compartments receive its own nerve from recurrent laryngeal nerve and have different function.

The functions of PCA during phonations is unclear but widely accepted that it pulls the vocal fold away during voice.

INTERARYTENOID MUSCLE

Table - 3 Functions of Laryngeal Muscles in Vocal Cord.

Function of Laryngeal Muscles in vocal cord					
	CT	VOC	LCA	IA	PCA
Position	Paramedian	Adduct(Membranous portion)	Adduct(Entire Fold)	Adduct(Cartilaginous portion)	Abduct
Level	Lower	Lower	Lower	--	Elevate
Length	Elongate	Shorten	Elongate	(Shorten)	Elongate
Thickness	Thin	Thicken	Thin	(Thicken)	Thin
Edge	Sharpen	Round	Sharpen	--	Round
Cover	Stiffen	Slacken	Stiffen	Slacken	Stiffen
Transition	Stiffen	Slacken	Stiffen	Slacken	Stiffen
Body	Stiffen	Stiffen	Stiffen	Slacken	Stiffen

It is a unpaired muscle that get originated from the posterior aspect of each arytenoids cartilage. It mainly approximates the posterior end of arytenoid cartilage there by it has major role in the phonation and sphincter mechanism of larynx.

LATERAL CRICOARYTENOID MUSCLE:

This muscle originates from the cricoids arch and inserted into the muscular processes of arytenoids cartilage. Its main function is to adduct **the** vocal folds.

THE THYROARYTENOID MUSCLE:

Through isometric contraction the muscle can influence the tension of vocal folds and can affect vibration ability. The M Vocalis rises from the medial section of the M. thyroarytaenoides from the inner surface of the anterior surface of the thyroid cartilage and appears in the form of thin projection on the front surface of the processes Vocalis of the arytenoid cartilage.

They serve as an elastic receptor and are responsible for a control system in the measurement of the tension and the length of the muscle fibers.

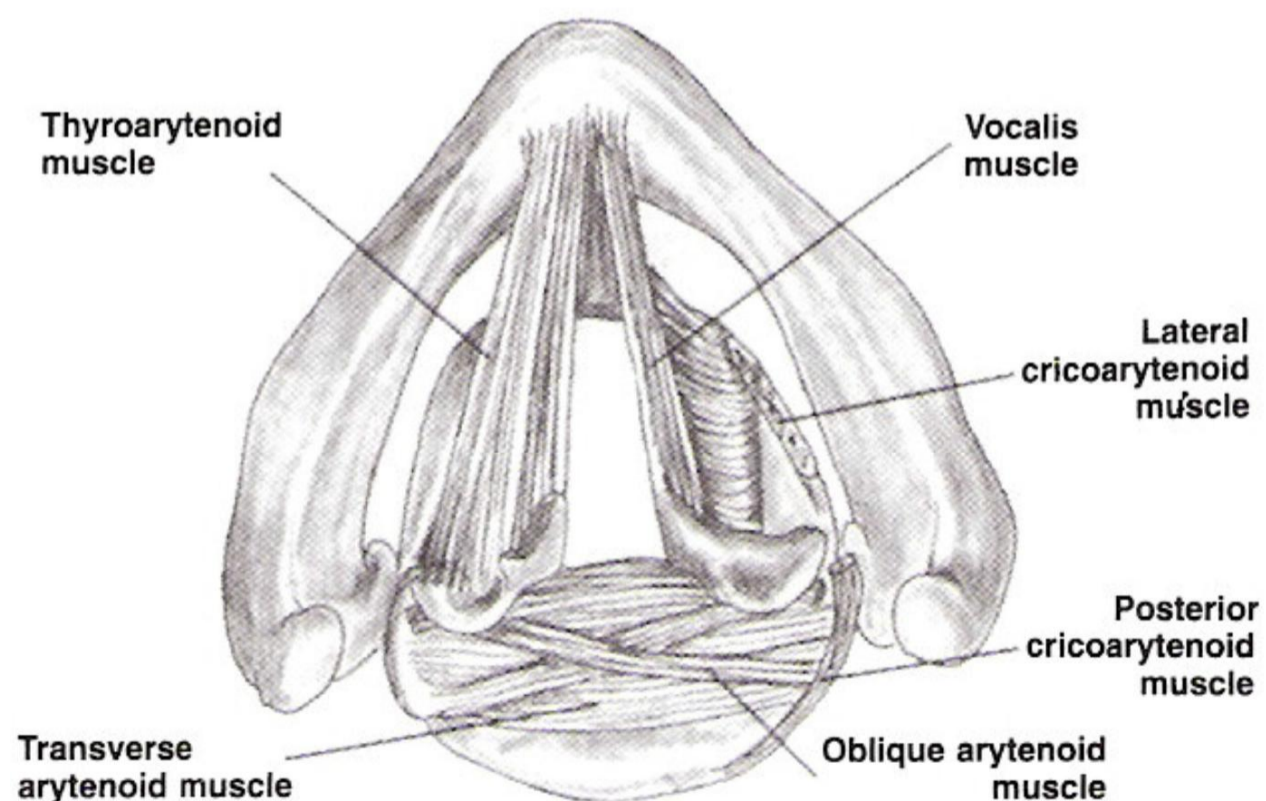


Fig-4 Larynx – Intrinsic muscles

FUNCTIONAL ANATOMY

Many Factors are involved in the production of the human voice. The vibration of vocal folds requires a highly differentiated and precisely coordinated series of many individual movements of the larynx, It is important to note the energy is reduced to a minimum while speaking, whereas during singing energy increases. The micro structure of the vocal folds is responsible for a precise series of movements. The vocal tract and neuro-anatomy of voice production plays a fundamental role in voice production and biochemical and biophysical factors are also influential.

MICROSTRUCTURE OF VOCAL FOLDS

This consists of

1. The Mucosa(Epithelium and parts of the lamina propria)
2. The Vocalis muscle complex.

LAMINA PROPRIA

The tissue of lamina propria connects to the epithelial layer of the vocal fold. This can be differentiated into three layers.

1. The Superficial layer :This consists of a light connective tissue rich in blood vessels and nerves; the superficial layer of the lamina propria- the sub epithelial connective tissue-is analogous to the Rinke's space.
2. The intermediate layer : This consists much elastic tissue
3. The Deep Layer: It Consists mainly of collagen fibers, but also contains elastic fibers.

VOCAL CORD (VOCAL LIGAMENT) AND CONUS ELASTICUS

These are formed out of the intermediate and deep layer of the lamina propria. The vocal ligament alone forms the upper free edge of the conus elasticus.

M. THYROARYTAENOIDEUS(M.VOCALIS)

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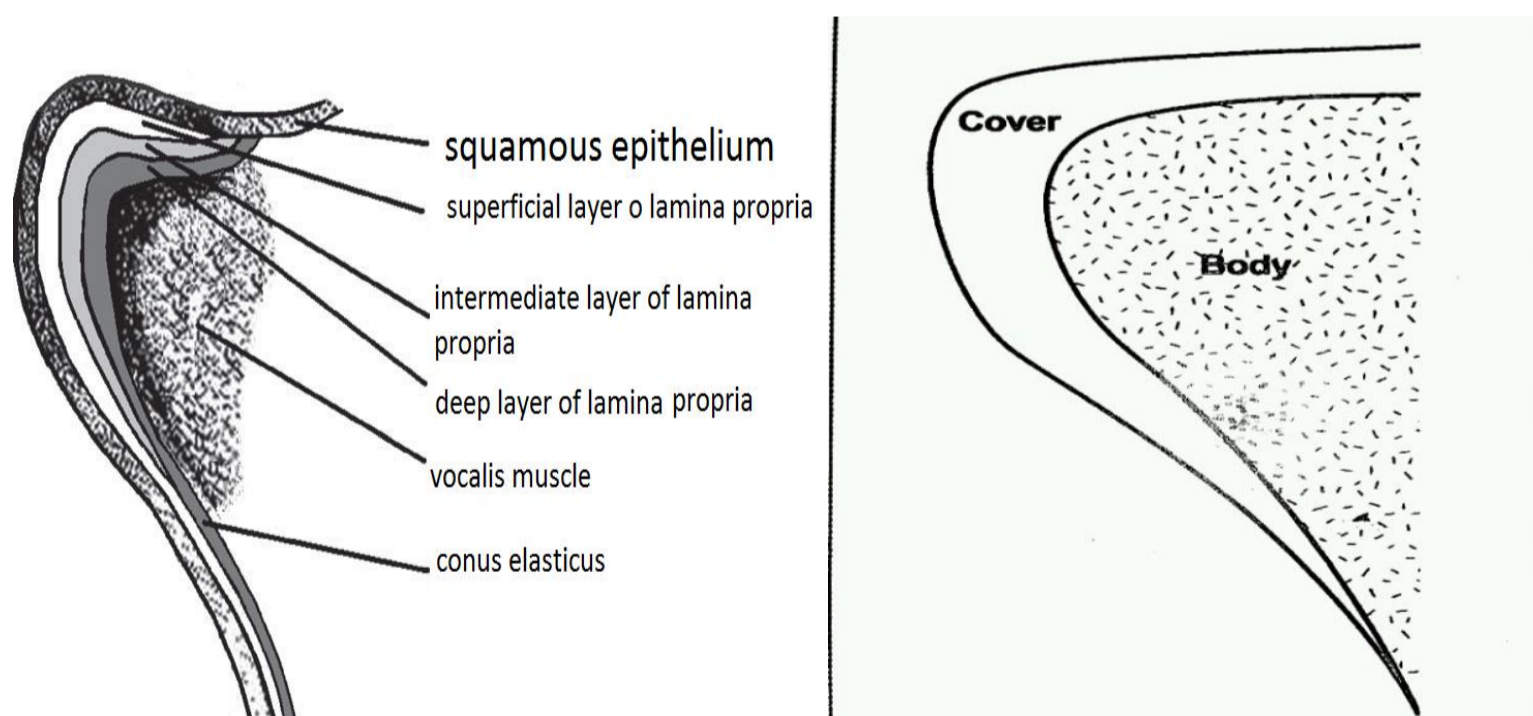


Fig 5 Functional layers of Larynx

Table-4

FUNCTIONAL TWO-LAYERED STRUCTURE OF THE VOCAL FOLDS

Five-layered schema		Body-Cover-Model	
Epithelium		Mucosa	Cover
Lamina propria	Superficial Layer		
	Intermediate Layer	Vocal Ligament	Transition
	Deep Layer		
M. Thyroarytaenoideus		Muscle	Body

THE BASEMENT MEMBRANE ZONE:

This is an area between the epithelium and the upper layer of lamina propria. The basal cells of epidermis are attached by the attachment plaques (AP) to the sub-basal dense plate (DP) to the anchoring filaments (AFL) through the lamina densa of the BMZ to the anchoring fibers to the superficial layer of the lamina propria. Many of the structures are composed of one or more proteins. One such protein, epidermolysis bullosa acquisita (EBA) is involved in the actual attachments of the epithelium to the underlying tissue.⁵

The lamina densa area contains proteins that add strength to the BMZ. Type IV collagen is also found in the lamina densa region. The BMZ is very susceptible to injury due to vibration and shearing forces.

The fibers that anchor the BMZ loop from the lamina densa into the superficial layer of the lamina propria and then back to the lamina densa. Type III collagen fibers also appear to pass through these loops creating an arrangement that resembles a chain link fence. The lamina densa area contains proteins that add strength to the BMZ.

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Disease and trauma may damage these fragile connection links between the epithelium and the BMZ. It is conjectured that some aberrations of or injury to the BMZ maybe the cause of nodules and benign lesions. Once laid down, it tends to stay and had been implicated in scar formation. It has been found in human vocal nodules. But neither fibronectin nor collagen type II is found in human polyps .

PHYSIOLOGY OF PHONATION :

The voice is an integral part of the unique human ability to communicate by speech. The larynx is the major source of sound used during speaking. Phonation is the generation of sound by vibration of vocal cords.

THEORIES OF PHONATION:

It is based on three theories.

a) **Aerodynamic or myoelastic theory:** (Van den Berg - 1958) this theory postulates that vocal cords are subject to well established aerodynamic and physical forces. There is a building up of infraglottic air column, and its pressure act on the vocal folds which are kept tensed by the tonic contraction of the laryngeal muscles. This increased infraglottic pressure forces the vocal cords apart and it is set in vibration, once again the pressure falls, vocal cords recoil following which the subglottic pressure raises. The mode and frequency of vibration is dependent on properties of the cord and interplay of the intrinsic muscles of the larynx.

b) **Neuromuscular or clonic theory (Husson):** This is not accepted now. This states that each new vibratory cycles are initiated by nerve impulses transmitted from brain to the vocalis muscle by way of the vagus nerve. This means that the frequency of vocal cord vibration is dependent on rate of impulses delivered. There was very little conclusive evidence to support this theory.

c) **Cavity tone or transient theory (Wills)** this states that larynx functions simply to supply puffs of air that might excite the supraglottic Resonating cavity. This explains sound production based on the resonance chambers alone.

MECHANISM OF PHONATION

Phonation requires coordinated interaction of the mouth pharynx, larynx, diaphragm and neck muscles.

Normal phonation requires five conditions:

- 1) Adequate breath support
- 2) Approximation of vocal cords
- 3) Favorable vibrating properties
- 4) Favorable vocal cord shape
- 5) Control of length and tension.

The upward movement of diaphragm increases the intrathoracic pressure and air from lungs reaches the atmosphere air through vocal folds this causes a continuous production of air pulses in accordance to the resonances of the vocal tract. Thus the basic resonance, vocal formants, varies according to the action of the articulators to produce distinct voice and sounds.

PHONATORY PHYSIOLOGY:

GLOTTAL TONE INITIATION

The process of phonation begins with inhalation of air. The vocal folds are approximated in the midline or near the midline (phonatory position) and the glottis space is obliterated. The subglottic pressure builds up to about 7cm of water, for conversational speech. The subglottic pressure increases than the supraglottic to push the vocal cord progressively apart from the bottom up until

a space develops. Bernoulli's effect of air flow along with the elastic forces of the cords begin to close the glottis almost immediately even while the upper edges are still separating. The elastic recoiling effect which is more in the upper part makes the vocal cords to click back to the midline completing the cycle. Subglottic pressure then builds up again and again to repeat the cycle.

Bernoulli's effect is an important aerodynamic event responsible for closing the vocal cords. Bernoulli's law states that the sum of the static pressures at the kinetic pressures in a gas system is always equal to a constant. In the larynx, the vocal cords cause a partial obstruction of airflow. The molecules travelling along the walls of the rings of the trachea at the junction of the vocal cords travel a long distance to meet the molecules that travel in the center of trachea. Molecules along the vocal cord surface must increase both velocity and kinetic pressure. This produces pressure on the surface of the vocal folds to decrease. Vocal folds which are mobile and elastic will begin to move towards the midline of the trachea because of this variation in pressure. Eventually, the two cords will meet in the midline, and airflow will cease.

When the cords close there is sudden decrease of airflow and when it opens there is a momentary delay in starting the flow of air due to the inertia.

This gives the characteristic shape of the airflow pulse through the glottis where the rising airflow phase is slower than the opening of the vocal folds. Intra glottis pressure is solely dependent on particle velocity.

It is necessary to properly tense and elongate the vocal cords prior to actually producing sounds, which is regulated by the laryngeal muscles. It is also important that in the myoelastic – aerodynamics mechanism of phonation the vocal cords emit pulses of air and also there is a vertical phase difference. In the lumen of larynx develops a phase difference so the lower portion of vocal cord gradually opens and close before the upper part displacing the vocal cord cover. Thus mucosal wave can be examined by stroboscopic light.

The vocal cord length, mass and tension determine the fundamental basic frequency which corresponds to pitch can be changed by changing the air pressure or the length of the cord mechanical properties of the vocal cord.

Contraction of cricothyroid muscle along with the thyroarytaenoides muscle increases the length and tension of the vocal cords, resulting in raising the pitch.

In the lower vocal range, contraction of thyroarytaenoides alone results in lower pitch because it decreases the tension in the vocal cover. Vocal frequency decrease as the mass of the cord increases. The vocal intensity corresponds to loudness.

The sound generated by vibration of the vocal cords is then modulated by the resonating chambers. Variation in shape and volume of pharynx varies in proportion to produce the resonance; this is also controlled by various positions of the larynx, tongue or jaw protrusion, or by the nasopharynx and nose. Voice training and speech therapy public speaking concentrates heavily

on tuning and producing high resonance. The goal is to produce the most efficient mode of sound with pleasant tone and pitch with minimal strain and effort on the larynx.

VOCAL CORD PARALYSIS

Paralysis of intrinsic muscles of larynx is called vocal cord palsy. musculature of larynx can be divided into intrinsic muscles and extrinsic muscles. The vagus nerve is the nerve that innervates these muscles and it has a long anatomical course.

vagus nerve:

The vagus is a large mixed cranial nerve. It has a more elaborate course and distribution than other cranial nerves, and runs through the neck, thorax and abdomen. The nuclei lie in the upper medulla and give rise to 8–10 rootlets that lie between the glossopharyngeal nerve superiorly and the spinal accessory nerve inferiorly. The vagus nerve exits the skull through the jugular foramen which is accompanied by the accessory nerve, which both share an arachnoid and a dural sheath. The vagus nerve descends vertically in the neck within the carotid sheath, between the internal jugular vein and the internal carotid artery, to the upper border of the thyroid cartilage, and then passes between the internal jugular vein and the common carotid artery to the root of the neck. Its further course differs on the two sides. The right vagus nerve descends posterior to the internal jugular vein to cross the first part of the subclavian artery and enters the thorax. The left vagus enters the thorax between the left common carotid and subclavian arteries and behind the left brachiocephalic

vein. After emerging from the jugular foramen, the vagus bears two marked enlargements, a smaller superior ganglion and a larger inferior ganglion.

Nuclei for vagus nerve located in medulla oblongata and they are 3 in no.

Nucleus ambiguus: motor nucleus of the vagus nerve lies within the medulla and 20mm long in reticular system of brain. Superior, middle, inferior portion of these nucleus located in the medulla give it fibres to 9th 10th and 11th cranial nerves respectively . The efferent fibers innervates the smooth involuntary muscles of GIT, cardiac and bronchi. Sensory fibers from the pharynx, larynx, and esophagus are derived from nucleus tractus solitarius.

The vagus nerve exits through the jugular foramen with 2 ganglions.

1. The smaller superior ganglion.
2. larger inferior or nodose ganglion.

Superior ganglion

The superior ganglion is greyish, spherical and 4 mm in diameter. It is connected to the cranial root of accessory nerve, the inferior glossopharyngeal ganglion, and the sympathetic trunk. The significance of these connections contains aberrant motor fibres from the nucleus ambiguus to be distributed to the palatal, pharyngeal, laryngeal and upper oesophageal musculature via the vagus.

Inferior (nodose) ganglion

The inferior or nodose ganglion is larger, elongated and cylindrical in shape with a length of 25 mm and a maximum width of 5 mm. It is connected with hypoglossal nerve, loop between the first and second cervical spinal nerves, and with the superior cervical sympathetic ganglion. Both vagal ganglia are exclusively sensory, and contain somatic, general visceral and special visceral afferent neurones. The superior ganglion is chiefly somatic, and most of its neurones enter the auricular nerve, while neurones in the inferior ganglion are concerned with visceral sensation from the heart, lungs, larynx, and the alimentary tract from the pharynx to the transverse colon. Large afferent fibres are derived from muscle spindles in the laryngeal muscles. Preganglionic motor fibres from the dorsal vagal nucleus and the special visceral efferents from the nucleus ambiguus, which descend to the inferior vagal ganglion, provide motor innervation to the larynx in the recurrent laryngeal nerve, together with some contribution to the superior laryngeal nerve supplying cricothyroid.

Branches in the neck

The branches of the vagus in the neck are the meningeal, auricular, carotid body, pharyngeal superior and recurrent laryngeal nerves and the cardiac branches.

Meningeal branch(es)

Meningeal branches start from the superior vagal ganglion and pass through the jugular foramen to be distributed to the dura mater in the posterior cranial fossa.

Auricular branch

It passes behind the internal jugular vein and enters the mastoid canaliculus on the lateral wall of the jugular fossa. Traversing the temporal bone, it crosses the fallopian canal approximately 4 mm above the stylomastoid foramen and supplies an ascending branch to the facial nerve. The auricular branch then traverses the tympanomastoid fissure, and divides into two rami. One ramus joins the posterior auricular nerve and the other is distributed to the skin of part of the ear and to the external auditory canal. In neck it runs behind the jugular vein and carotid artery supply the muscles of the pharynx and muscles of soft palate.

Pharyngeal branch:

Arises from the inferior ganglion which also carries fibres from cranial accessory forms the main motor innervation to pharynx which then branches to form pharyngeal plexus after joining glossopharyngeal nerve.

Branches to carotid body:

It arises from the inferior ganglion.

Superior laryngeal nerve: It has 2 branches

1. Internal laryngeal nerve
2. external laryngeal nerve.

The internal laryngeal nerve enters the thyrohyoid membrane and provide sensory innervation upto the level of vocal cords. Cricothyroid muscle is supplied by the external branch of superoior laryngeal nerve.

The **right recurent laryngeal nerve branches from right vagus** at the level subclavian artery anterior to it and it winds the subclavian artery to enter the tracheo oesophageal groove along with inferior thyroid artery from there it takes separate course to enter posterior to the cricothyroid joint in to the larynx.

Surgical importants: it is the most common site of nerve injury during thyroid surgeries.

The **left vagus** gives its recurrent laryngeal branch after reaching the thorax which loops around the thoracic aorta behind ligamentum arteriosum then recurs to reach the larynx passes between tracheo oesophageal groove.

Laryngeal musculature:

1. Extrinsic muscles that attach the larynx to neighboring structures
2. Intrinsic muscles innervated by the recurrent laryngeal nerve governs the movements of the vocal cords.

1. **Posterior cricoarytenoid:**

The **only abductor** of the vocal cords. Which opens the glottis during respiration and phonation and during phonation the cord tenses due to action of this muscle.

2. **Lateral cricoarytenoid:** by medial rotation of arytenoid this muscle tends to close the glottis.

3. **Transverse arytenoid:** this muscle is the only unpaired intrinsic muscle of larynx, it acts by closing glottis posteriorly.

4. **Oblique arytenoid:** During swallowing it acts by closing the laryngeal inlet.

5. **Thyroarytenoid:** 3 portions

1. Thyroarytenoidus internus or vocalis muscle, tenses the vocal cord

2. Thyroarytenoidus externus -Major adductor of vocal fold

3. Thyroepiglotticus: This muscle shortens the vocal ligaments

3 physiologic sphincters which divide the larynx functionally they are

1. Aryepiglottic folds

2. Vestibular ligament

3. Vocal ligament

derived from intrinsic muscles of larynx, sphincteric components act to prevent aspiration of food into the airway. .

Pathophysiology of vocal cord paralysis:

The vocal fold paralysis adversely affect the functions of larynx Interference with the protectionof airway, respiration and phonation. In recurrent laryngeal nerve palsy the vocal cords assume various positions.

1.Median, 2.Paramedian,3. Cadaveric or intermediate 4. partial abduction
5.Complete abduction.

Theories related to vocal cord position in vocal cord paralysis

Various theories proposed to explain the various positions in paralysis of vocal cord.

Semon's law states that “abductor components in the recurrent laryngeal nerves are more sensitive to pressure and damage when compared to adductor components”.

In first stage the vocal cords approximate in the midline only the abductor fibers are damaged and adduction is possible.In Second stage vocal cords adducts and assumes the median position as additional contracture of adductors occur.

Third stage the vocal folds assume a cadaveric position since adductors become paralysed

Abductor component(superficial) of the recurrent laryngeal nerve which supplies the the vocal cord lie in the periphery and this is the reason why abductors involves early in the progressive lesion compared to adductors(deeper).Gentically adductors are older and more resistant to damage than the abductors which are phylogenetically newer. During recovery adductors recovers before the abductors .

Differential innervation theory: Injury to specific branches of a nerve causes paralysis of individual groups of muscles and not all group of muscles this is the reason why vocal cords assumes differet positions in vocal cord palsy.

Interarytenoid muscle contraction: contraction of interarytenoid muscle attributes to the paramedian position of a paralysed vocal cord not true in reality.

Disturbance of autonomic supply: Autonomic innervation determines the position of vocal cord in nerve palsy.

Wagner and Grossman theory: this theory predicts varying positions of a paralysed vocal cord . Proposed by Wagner and Grossman (1897) proposed this theory . “ complete paralysis of recurrent laryngeal nerve the cord lies in the paramedian position” as cricothyroid muscle adducts the cord is not affected as it is supplied by the superior laryngeal nerve when paralysed the cord remain in cadaveric position due to loss of adduction.

Pathogenesis of vocal cord paralysis lesion anywhere along the cranial nerve nuclei to the periphery may cause vocal cord paralysis. Bilateral paralysis is common in lesions involving nucleus ambiguus rather than unilateral palsy.

There are 3 types of Peripheral damage to the laryngeal innervation:

1. Damage to the vagal trunk higher the level of superior laryngeal nerve
2. Damage below or at the level of recurrent laryngeal nerve
3. Damage to SLN(superior laryngeal nerve) alone.

Vocal cord palsy may be either congenital or acquired.

Congenital vocal cord palsy: In newborn, congenital paralysis of vocal cords present with stridor and other associated congenital abnormalities. The most commonly hydrocephalus. The mechanism of vocal cord palsy most often due to damage of the vagus nerve due to stretching.

Acquired causes of vocal cord palsy:

Causes :

Iatrogenic	-	44%
malignancy	-	24%
Endotracheal intubation	-	10%
Non surgical trauma	-	7%
Idiopathic	-	5%

Inflammatory	-	4%
Neurologic	-	2%
Miscellaneous	-	4%

Malignant disease: One fourth of vocal cord paralysis is due to malignancy, most common are lung and thyroid malignancies followed by oesophageal, temporal lobe malignancies, posterior cranial fossa tumors, etc.

Surgical trauma: most common cause of vocal cord palsy. Thyroid surgeries accounts for most no. of cases. Other causes include Mediastinal and oesophageal surgeries.

Nonsurgical trauma, penetrating injuries to neck can cause vocal cord paralysis.

Inflammatory : Tuberculosis, due to scarring of the apex of lung along the mediastinum and hilar nodes enlargement damaging the nerve.

Neurologic causes: Include brain stem vascular compromise, multiple sclerosis and cranial injuries.

Miscellaneous causes: include hemolytic anemia, subclavian vein thrombosis, syphilis, collagen vascular disorders, metal poisoning.

Idiopathic causes: In most of the cases no detectable abnormality to recurrent laryngeal nerve palsy, Left cord palsy is common. and Many of these caused by viral infections (subclinical)

Clinical features:

Unilateral superior laryngeal nerve injury:

Slight change in voice is the only presentation occasional hoarseness of voice. Difficult to raise the pitch. Diplophonia is common. The pitch range is decreased due to the paralysis of cricothyroid muscle which maintain vocal cord tension.

On video laryngoscopic examination the vocal cords appear normal during normal breathing. Posterior commissure deviation to the paralysed side and is slightly shortened, lie at a lower level than the opposite cord.

Associated with sensory loss in the supraglottic region leading to symptoms like, voice fatigability, dryness and foreign body sensation of throat, frequent throat clearing and coughing.

Bilateral superior laryngeal nerve injury: very rare, results complete sensory loss in the supraglottic region causing fatal aspiration and pneumonitis. There is no asymmetry between the vocal folds and diagnosis is difficult.

Unilateral recurrent laryngeal nerve injury: Most common condition affecting the Left cord because of its tortuous and lengthy course the left vagus nerve than the right vagus nerve. Initially the voice is breathy in nature, because of the early compensation of the opposite normal vocal cord. The air way is adequate and there is no stridor and breathing difficulty.

On video laryngoscopic examination the paralysed cord may appear not to be immobile, and opposite normal cord will try to compensate lost mobility of the affected cord. Tuberculosis or bronchial malignancies should be considered in right cord palsy. In oesophageal malignancies and viral infections usually the left vocal cord is affected.

Unilateral superior and recurrent laryngeal nerve injury: High vagal or brain stem lesions is the most common cause, Vocal folds assumes intermediate position and breathy voice and tend to aspirate.

Bilateral recurrent laryngeal nerve palsy: Thyroid malignancies and total thyroidectomy surgeries are the most common causes bilateral recurrent laryngeal nerve palsy. When the cords are in median position patient presenting with stridor. When in paramedian position presenting with breathing difficulty later. Phonation appears to be normal.

Bilateral superior and recurrent laryngeal nerve injury: both vocal cords assumes intermediate position, flaccid, and immobile. Complete loss of phonation with dreaded complication for aspiration.

Evaluation:

Proper diagnostic workup and evaluation of the unknown etiology of a patient with vocal cord paralysis is as follows:

Thorough history (past history of neck surgery, viral infections, trauma)

IMAGING:

Chest X Ray (to R/O Tuberculosis and lesions of lung)

XRay cervical spine to rule out secondaries, barium swallow to R/O

Oesophagesl malignancies

THYROID PROFILE

Thyroid function test and USG Thyroid,Radionuclei study to R/O benign and malignanat lesions of thyroid.

CT or MRI of skull base to diaphragm screening

BLOOD INVESTIGATION

Complete Hemogram, ESR, Rheumatoid factor, Parathyroid hormone, calcium and glucose levels,electrolytes, VDRL, fungal titers,a lumbar puncture for csf analysis

SCOPY:

Indirect and direct laryngoscopy,Diagnostic nasal endoscopy.

LARYNGEAL ELECTROMYOGRAPHY

Described by Miller, this method is used to evaluate laryngeal muscle innervation by nerve stimulation. It analysis the electrical activity generated under local anesthesia where electrodes are placed percutaneously over the cricothyroid muscles to test superior laryngeal nerve and thyroarytenoid

muscles to test the recurrent laryngeal nerve. It is the most accurate method to test the function of superior laryngeal nerve.

Imaging has a vital role to identify the causes for vocal cord paralysis.

CT scan and MRI imaging of skull base to diaphragm to identify malignant lesions that cause damage to the recurrent laryngeal nerves.

Management:

It depends on the complaints and causes for vocal cord palsy. In any vocal cord palsy a transit period of 6- 9 months for the spontaneous recovery even in post traumatic cases after this period the is evaluated and mode of treatment is decided accordingly and it can be temporary or permanent surgical intervention.

Indications of early intervention include

1. Aspiration is considered most dreaded complication which needs early surgical intervention.
2. A etiology which has definitely no chances of spontaneous recovery.
3. Psychological factors and in speakers and singers

Unilateral paralysis of vocal cord have the chance of spontaneous recovery can be awaited for 6 months in some patients.

Treatment for unilateral paralysis of vocal cord :

1. Speech therapy
2. Thyroplasty techniques.(medialisation of the lateralised vocal cord)
3. Injections techniques
4. Selective reinnervation of muscle through nerve grafting and electrical stimulus.

Speech therapy:

Usefull in unilateral vocal cord palsy alone or an adjuvant with other surgical mode of treatment.

Surgical medialisation:

Currently the most accepted method of surgical treatment for most of the cases of unilateral vocal cord palsy which shows no spontaneous recovery in uncompensated paralysis of vocal cords.

Technique

In late 1970's Isshiki introduced this thyroplasty techniques and it is performed under local anaesthesia so as to check the improvement in voice peroperatively. Incision is made horizontal over thyroid alae on the paralysed side obliquely strap muscles dissected and retracted. Window size of 10×6mm cerated in the thyroid alae not extending above the midline and 5mm posterior to thyroid eminence perchondrium dissected autogenous graft or silatic

material inserted through the window between perichondrium and thyroid alae
cut window is replaced and sutured.

Advantages:

1. Reversible technique
2. Greater degree of control in determining the position of vocal cord
3. Allows normal recovery and motor functions of vocal cord.
4. Performed under local anesthesia
5. Day care procedure.

Note: usually undercorrection is better than over correction.

Complications:

1. Chondritis
2. Penetration of endolaryngeal mucosa
3. Implant extraction or migration
4. Airway obstruction.
5. Wound infection.

Arytenoid adduction technique:

Horizontal incision made in the thyroid cartilage longer than thyroplasty
incision margin extending beyond the thyroid cartilage alae posteriorly
thyropharyngeus muscle is sectioned and elevated around the posterior margin
to the inner surface of thyroid cartilage. cricothyroid joint dislocated arytenoids

exposed and palpated. care taken not to injure the pyriform fossa. Cricoarytenoid joint opened and suture fixed to the surrounding structure. The suture are pulled gently which will cause rotation and medialisation of vocal cord. sutures are delivered out and fixed to thyroid alae to maintaining the tension.

MEDIALIZATION TECHNIQUE :

Injection techniques:

Indications:

1. Permanent paramedian position of vocal cord with dysphonia
2. Dysplastic dysphonia
3. Post aretenoidectomy to compensate the space

Steps:

Done under local/general anaesthesia .arnold syringe is used to inject the teflon material .which is provided with piston .the amount of material that can be injected is 0.1m each time and repeated for 3-4 times ,usually a collagen paste or teflon on paralyzed side ,paralysed vocal cord is exposed on its upper surface .the false cord retracted and needle inserted in plane at mid 1/3 of the cord on its posterolateral aspect.then injected according to the required position of vocal cord and simultaneously phonating.

Materials used are bovine collagen, paraffin, glycerin, cartilage, silicone and gel foam

Types of injection :

1. Intracordal,
2. Intramucosal

Routes:

1. Percutaneous,
2. Peroral, and
3. Laryngoscopic

Advantage:

1. No skin incision
2. Day care procedure

Disadvantage: of using injection for medialization

1. Injection pushes only membranous cord
2. A non-reversible procedure

SELECTIVE REINNERVATION:

Nerve-Muscle Transfer:

Tucker in 1977 started using this procedure the omohyoid along with its nerve supply branch of the ansa hypoglossi. The procedure is based on the fact that strap muscle also helps in respiration so, this nerve muscle pedicle harvested is used to innervate the thyroarytenoid muscle on the affected side.

Note: Mobile cricothyroid joint is a must for performing this nerve transfer technique, and ansa hypoglossi nerve should not be paralysis as this is essential for reinnervation **Technique** :

Usually performed under anesthesia. Horizontal lateral neck incision is made along the skin crease corresponding to the lower border of the thyroid cartilage. Close to jugular vein lies the nerve hypoglossi and the nerve is identified and traced.

This nerve supply the anterior belly of omohyoid. Extending the dissection the pedicle of approximately 3mm of muscle from the muscle is excised, including the hypoglossi nerve. The cartilage incision is made and window created to expose the thyroarytenoid muscle. This is the targeted muscle to which nerve-muscle pedicle is then sutured.

Post operative care given and may take 6-8 months for the improvement in voice to be appreciated. Results as published by the author of this procedure documents 80% success rate. This technique is combined with medialization of cord for immediate improvement in phonation.

Advantages:

1. Artificial implants are not required in this procedure.
2. Quality of voice if the phonation improves is better.
3. If this fails other procedures can be performed.

Disadvantages:

1. open procedure which leaves scar

MANAGEMENT OF BILATERAL ABDUCTOR VOCAL CORD**PALSY:**

The initial presentation of patients with b/l nerve palsy is stidor. depending upon the position of cord. it may be paramedian in some not causing immediate nerve palsy but upper respiratory infection can provoke breathing difficulty in such patients. if the cord assumes the median position then to secure the airway emergency tracheostomy should be performed.

TRACHEOSTOMY:

Infiltration given and the procedure is done under local anaesthesia. skin incision may be vertical as in emergency like trauma. If done in a post operative case following tracheostomy the horizontal skin crease incision is followed. the vessels retracted and fascia is dissected vertical incision and strap muscles retracted laterally. thyroid fascia identified and divided. isthmus is clamped and cut ligated. pre tracheal fascia is gently desected and trachea palpated for incision site. and conformed with syringe aspiration. Horizontal incision is made over the trachea in between 2nd and 3rd ring. entire ring removed and cuffed portex tracheostomy tube is inserted and secured.

In children the tracheal incision is vertical.

AIM:

The aim in performing surgery in b/l abductor palsy is the early decanulation and to avoid permanent tracheostomy.

Vocal cord lateralisation procedures:

PROCEDURES AND TECHNIQUES

The three most commonly utilized techniques are arytenoidectomy, arytenoidopexy, and cordectomy

Available procedures for b/l abductor palsy are

EXTRA LARYNGEAL :

1. Woodmaan's operation
2. King's operation
3. Kelly's operation
4. Orton's operation
5. Montgomery's technique

INTRA LARYNGEAL :

1. Thornell's operation
2. Endoscopic arytenoidectomy
3. Dennis kashima's cordectomy using co₂,LASER, Coblation

COMBINED:

1. Ejnell's technique

WOODMANN'S OPERATION :

Tracheostomy done to secure the air way. Under GA horizontal skin incision made at the level of cricoid 'muscles retracted and dissected through the constrictor behind the thyroid cartilage .the thyroid ala is rotated so as to view the cricoarytenoid which is then disarticulated giving access to arytenoid .first the arytenoid is disarticulated from cricoid,then vocal process is identified and sutured to the lateral wall so as to lateralize it .then gently the arytenoid is removed .end of the procedure endoscopic confirmation of adequate glottic space of 4mm is ensured.

KELLY'S OPERATION:

Under GA horizontal skin incision is made and a window is created in the thyroid ala of size 1.5cm along its posterior aspect .perichondrium is split through thyroarytenoid muscle arytenoid is approached .which is then dissected and removed .

This procedure was developed so as to avoid the difficulty in posterior approach adequate glottic space is ensured .

ORTON'S OPERATION:

Initial incisions were similar to that of other techniques but a vertical incision is made anterior to the posterior margin of thyroid ala .perichondrium is dissected and inner perichondrial is incised arytenoids identified vocal process lateralized through sutures.

DOWNIE'S ARYTENOIDECTOMY:

Incision is anterior collar incision at the level of thyroid cartilage exposing it through vertical midline incision .by retracting the each half of thyroid lamina laryngeal lumen is reached ,the arytenoid is removed using Freer's elevator .through sutures the vocal process is sutured to the laryngeal lumen inferior to it and a through and through suturing done lateralizing the cord .

ARYTENOIDOPEXY:

This procedure can be performed endoscopically this differs from routinely performed surgeries as it do not involve the removal of tissue .the vocal process and arytenoids are displaced gently. Endoscopic guided lateralization of vocal cord and sutured to lateral wall

CORDECTOMY:

Corpectomy is one among procedure done in case of b/l abductor palsy. The position of cord when in median position and shows no signs of recovery the need for permanent tracheostomy is unavoidable .the patients need to

suffer the complications of permanent tracheostomy and the care it needs .this method is aimed at giving an alternative to permanent tracheostomy by creating adequate space in the posterior glottis .

METHODS:

1. Corpectomy through laryngofissures
2. Endoscopic corpectomy

ENDOSCOPIC METHODS:

1. Conventional methods
2. Carbon dioxide LASER attached with microscope
3. KTP-532 LASER
4. COBLATION corpectomy

DENNIS KASHIMA PROCEDURE:

Dennis and Kashima performed this procedure using carbon dioxide laser .the patient with b/l abductor palsy could be treated easily now with advent of various radio frequency equipment like laser , coblation .

INDICATION: bilateral abductor palsy and cords in median position .

TRACHEOSTOMY, the patients usually would have undergone tracheostomy for securing the airway as they present with stridor .if not the airway is secured on table .

ANAESTHESIA: General anesthesia through tracheostomy tube ventilation

POSITION: supine , head in extension , ring under the head .

INSTRUMENTS:

SUSPENSION LARYNGOSCOPE:

Kleinsasser Suspension This is a set of 1.a laryngoscope 2.chest support 3.port for endoscope , laryngoscope introduced and positioned so as to view the whole of the cord from anterior commissure till the arytenoids .ensuring this the scope is suspended to a chest support. The camera is connected to the telescope which is then connected to monitor.

Kashima and Dennis operated with the use of a carbon dioxide using microscope focal length 400-mm lens.

PROCEDURE

The paralyzed cords are visualized in entire from anterior commissure till arytenoids and the position of cord at rest is noted the cord most affected and medial is accessed preoperatively and that particular cord is chosen for surgery.

INCISION: incision is made a few millimeters 1-2 mm in front of the vocal processes anteriorly to arytenoid and 3.5-4 mm “C”-shaped or wedge shaped dots marked and this portion of the posterior 1/3rd of vocal fold is removed using laser from the free border of the membranous an cord, extended

laterally upto 5mm over the false cord thus creating around 7-8 mm transverse opening at the posterior glottis which will produce a sufficient and stable airway lumen

Note: Vocal process was not exposed and Anterior 2/3rd of the vocal cord not disturbed which prevents phonation and sphincter function of the larynx with minimal tissue injury, postoperative tissue edema

COBLATION TECHNOLOGY

COBLATION the Technology in which radiofrequency waves are used . controlled plasma field is produced from a medium usually saline to remove tissue accurately at a low temperature . soft tissues damage is low resulting in minimal thermal damage. compared to traditional radiofrequency-based surgical devices, such as lasers , use imprecise heat-driven to remove tissue

Table-5 Difference between Coblation Device and Conventional Devices

	COBLATION DEVICE	CONVENTIONAL DEVICES
Temperatures in degree Celsius	40 to 70	400 to 600
Thermal penetration mili micron	1100	2200
Effects target tissue	ablation, dissolution	Increased heat, blackening Due to burning of tissue

Integrated saline and bipolar energy

Principle and mechanism of action

The body fluids usually act as medium for heat transfer but in this technique Plasma is formed from saline. This plasma forms high density field around the electrical system. Saline irrigation forms the key to sustained and stable plasma layer. Without which plasma must be formed using the body's in fluid but has the disadvantage of early dissolution once energized. COBLATION uses bipolar energy which control the amount of energy and heat to the target and reducing the damage to near by soft tissue

Controlled, continuous plasma

The bipolar energy when combined with continuous irrigation of saline, is able to create a stable plasma layer .The active plasma layer is just 100µm-200µm thick around the electrode. This is the reason for precise and accurate excision of tissue. Less amount of heat is transferred to the patient .this also cause less tissue damage .

Coblation is derived from “Controlled ablation”. Soft tissue disintegration using bipolar RF energy system in saline medium. current is made to flow from radiofrequency waves and saline is irrigated this breaks saline into highly energized sodium and chloride ions .thus forming the plasma field this has reasonable energy to break organic molecular bonds. This organic bonds are the force that held the tissue molecules.

Hira V. Thapliyal and Philip E. Eggers invented this molecular dissolution technique. Initially this technology was used in arthroscopic surgeries in treating the ligament injuries. Conventional high frequency apparatus is in use from 1950 which produce more heat to cause tissue ablation and coagulation causing collateral damage to normal tissues. Coblation .

Saline is a good conductor of electric energy this excellent conductivity is made use of in this technology. The energized saline produces high energy plasma .

Stages of plasma generation:

1. First stage – : This is transition from bubble to film boiling which decreases heat emission and increase in surface temperature. Vapor and gas piston formation
2. Second stage – proper ablation occurs in this second stage
3. Third stage – current is passed across the electrode and amplitude is varied /reduced
4. Fourth stage – electrical dissociation of molecules like electron energy at the surface of the electrode
5. Fifth stage –the electrical energy is dissipated in to thermal power coblation is applied intermittently to ensure maximum potential and effect, constant presence of stage of vapor film pulsation is also needed, which is the initial step.

Effect of plasma on tissue:

Plasma forms the chemical energy effect and no heat is produced. P charged H and OH ions are formed due to the electrical splitting of the saline and this is called plasma . OH radical splits the molecular bonding causes protein disintegration . coblation used for surgery causes low temperature molecular dissolution . High volume tissues removed with minimal damage. Adjacent Thermal penetration is Minimal . no Deep Effects on Target tissue, the advantage of no Rapid heating, minimal to no burning of tissue

Components of Coblation system:

1. Radio frequency generator (RF generator)
2. Coblation Foot pedal control unit which has separate pedals for coagulation and coblation
3. Continuous saline Irrigation system
4. Wand Is similar to the electrode that is used

This generator is capable of adjusting both automatically and manually the settings according to type of wand used. Two settings are set i.e. cauterization and coagulation . Recommended settings for Coblation is 7 (plasma setting) and for Cauterization it is 3 .but the setting can be changed according to the type of wand used Foot pedal has two color coded pedals. 1.Yellow for coblation and 2. blue for RF cautery with 2 separate sounds indicating to the surgeon the mode . current passes is very minimal so as the

damage to tissue through the tissue during coblation. The thickness of plasma is 100-200 milli micron thick around the electrode.

USED IN 1. Adeno tonsillectomy as the emerging one for more than decades

2. Tumors of Tongue base reduction ,mass lesions involving the base of the tongue
- 3.. UP3 Uvulo palato pharyngoplasty for sleep apnea syndrome
4. Benign lesions of larynx including papilloma ,vocal nodule can be treated easily by coblation
5. Dennis Kashima's procedure, posterior cordectomy for b/l abductor paralysis of the vocal cord
6. Turbinate mucosal hypertrophy reduction and Nasal polypectomy

TYPES OF WAND:

1. **Adenotonsillar wand** most commonly used wand for all oral and pharyngeal surgeries this type of wand is cheap compared with laryngeal and micro laryngeal wands.
2. **Laryngeal wand** Normal laryngeal wand used for laryngeal mass lesions, tumor reduction and Dennis kashima procedure for vocal cord paralysis
3. **Micro laryngeal wand** is used to remove lesions like vocal nodule and polyp.

4. **Nasal wand** and nasal tunneling wands for turbinate reduction in hypertrophy of turbinate.

Equipment specification:

1. Modes of operation – Dissection, ablation, and coagulation
2. Operating frequency of the RF generator – 100 kilo hertz
3. Power supply – 110/240 volts , 50/60 kilo hertz .

Coblation wand has two electrodes. Saline flows between these two electrodes separated by ceramic. Saline gets broken down into ions thereby forming active plasma which ablates tissue.

Effective usage:

1. Application of ablation mode should not be continuous. There needs pausing in-between to give adequate time for plasma formation
2. Continuous and enormous irrigation of normal saline which aids in constant ion dissipation
3. Warm saline can be replaced by using cold saline

Coblation is a smokeless procedure when there is smoke in the field indicates the presence of ablated tissue intrepted in the wand between the electrodes. Hence to be flushed using a syringe. Lower frequencies less than 100 kilo hertz can cause neuromuscular damage caution taken not to produce

much damage. This technology is acquired by learning and practice . After this a surgeon can efficiently handle laryngeal lesions.

DENNIS KASHIMA BY COBLATION TECHNIQUE

The original procedure were followed .but instedt of co2 LASER the micro laryngeal wand is used and the radio frequency wave is used .The COBLATION WAND provides its own comfort so the sugeon get used easily and this technique is cost effective

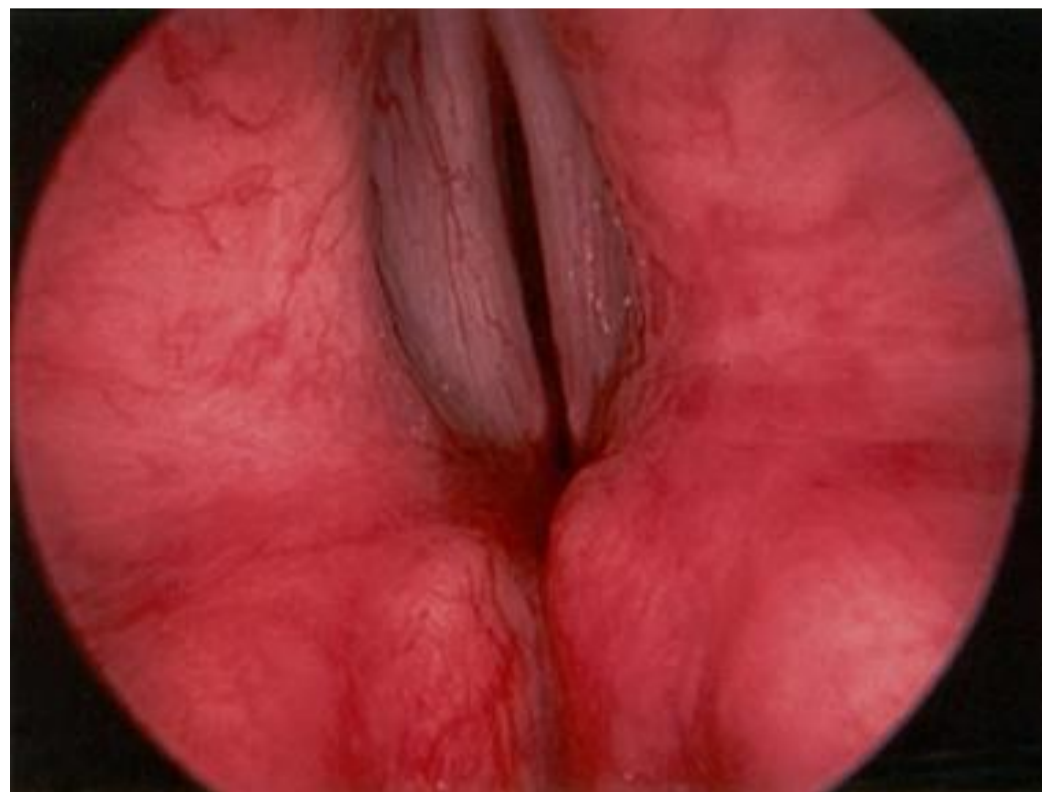


Fig-6 VLS showing Bilateral abductor palsy Cord in medial position

Selection of patients :

All patients with bilateral abductor palsy with cord either in median and Para median positions. These patients were on tracheostomy at the time of surgery. The recovery period of 6 -8 months was allowed in all cases.

PRE OPERATIVE ANALYSIS

1.basic blood investigations, 2.complete thyroid profile, 3.imaging x-ray, CT and MRI skull base to diaphragm, 4.cardiac evaluation, 5.pulmonary function test 6.video laryngoscope.

PROCEDURE:

The paralyzed cords are visualized in entire from anterior commissure till arytenoids .pre operatively the vocal cord position is noted and compared with post-operative glottic space

INCISION:

Incision is made using the tip of the wand in close approximate to the cord 1mm in front arytenoid ,“C”-shaped or wedge shaped tissue /membranous part of the vocal coed is coblated not involving the cord muscles. posterior 1/3rd of vocal cord is removed using micro laryngeal wand along the free border of the membranous cord, extended laterally up to 5mm over the ventricular band thus creating around 6-7mm transverse opening at the posterior glottis which will produce a sufficient and stable airway lumen

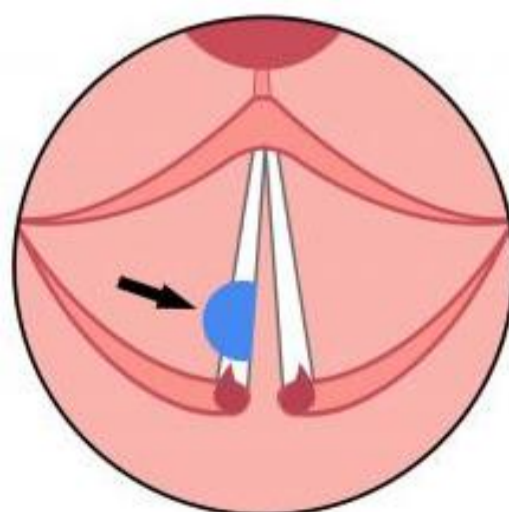


Fig-7 Dennis Kashima Incision

Cautions:

1. Irrigation to wand should be continuous
2. The wand tip should not come in contact with the tissue so as to allow space for plasma formation
3. Smoke during procedure should alert the assistant to flush the wand to remove the unablated tissue in to wand tip .

Advantages :

1. The procedure could be done more accurately and precise
2. Very minimal or no bleeding
3. Very minimal post-operative scar and granuloma formation
4. The chance of post-operative stenosis is very minimal
5. Edema of the vocal cord is very minimal so that the patient can be de cannulated earlier
6. Procedure is reversible ,if gone for failure the procedure can be repeated on the other side later
7. Cost effective when compared to other radio frequency devices
8. The cut surface and the diameter of the tissue to be removed can be determined so excessive is not removed and phonation is not compromised for airway.

POST OPERATIVE CARE:

1. Steroids unless is contraindicated is given for five days following surgery. inj.dexamethasone 8mg iv for 5 days
2. Anti-reflux like proton pump inhibitors like pantoprazole continued for 14 days post operatively .it can be given through parenteral route.
3. Voice rest as such is just observed on the day of surgery unlike other conventional procedure where it will be for 5 days .
4. The patient is changed to metal tracheostomy tube on the day of surgery and closure of the tube tried gradually and once the patient tolerates de cannulated .
5. Video laryngoscopy done post operatively to access the glottic space before de cannulation and day of discharge planned accordingly

FOLLOW UP :

1. First month patient followed once in a week
2. First three months patients followed once in a month
3. From then on every three month once each time video laryngoscope done and recorded for future study.
4. Thyroid profile done every six months and in post op thyroidectomy causing b/l abductor palsy TFT done every six months and serum calcium if needed.



Fig-8 Coblator



Fig-9 Foot pad



Fig-10 Video Laryngoscope equipments

MATERIALS AND METHOD

This retrospective study was conducted in the Department of Otorhinolaryngology of

Government Stanley Medical College and Hospital during the period of December 2015 to September 2016. Based on the inclusion and exclusion criteria, 25 patients with bilateral abductor palsy various etiology who were treated with Dennis Kashima procedure using coblation from the year 2011-2015 were selected in to the study.

After getting valid consent from the patients, patients were evaluated with about mentioned parameters. Information regarding the patients were collected from

1. MRD (medical records department) :the personal details for the contact information their address were collected
2. Register maintained in the department of ENT: the outpatient register which is maintained in the department which contains the detail of these patients attended for various other complaints were collected.
3. Operation theater register: that contains the surgical details and course of surgery and anesthetic complication if any .
4. Emergency register :the patients who attend emergency opd and casualty ,interventions were collected from this register .

5. Follow up register: maintained by the concerned . by the data's collected through these register the data's were classified and the patients were subjected to my study following the rules of the study and ethical committee

These patients were followed according to our study design. Subjective and objective analysis of the patient were done by using preformed questionnaire and results were obtained by statistical analysis.

Materials used :

Surgical equipments which includes

1. LARYNGOSCOPE
2. CHEST SUPPORT
3. ENDOSCOPE (12degree)
4. METAL SUCTION TUBE
5. VOCAL CORD RETRACTOR
6. UP-TURN CUP FORECEPS
7. SINGLE CHIP HD CAMERA
8. HD MONITOR SCREEN

COBLATION SET which includes

1. MICRO LARYNGEAL WAND (with suction and irrigation ports)
2. COBLATOR
3. FOOT PAD (separate a.cutting and b.coblatng)

DECONGESTANT :

1. ADRENALINE (1:10000)

METHOD:

The patients were graded using three parameters

1. Improvement in breathing ,assessed by questionnaire and video laryngoscopy to access the glottic space
2. Aspiration episodes
3. Phonation

DAY OF DECANULATION :

The aim of our method and the valid reason for surgical intervention in these patients was the early DE cannulation. Surgery serves patient by giving them relief from tracheostomy and its care.

IMPROVEMENT IN BREATHING:

Stridor is the chief complaint the patient presents to us initially for which surgery is done and the aim of the procedure is giving adequate airway.

They were graded from 1-4 ,where 1 being the better score and 4 the worst, and this was repeated during my follow-up done at 3,6,9&12 months . Data's collected were analyzed.

Grading of parameters:

Table-6 Grades – Improvement in Breathing

Improvement in breathing	
No difficulty in breathing	1
Breathing Difficulty on strenuous exercise	2
Breathing difficulty on routine daily activities	3
Breathing difficulty at rest	4

The improvement in these parameters was analyzed by grading in an easy way patient remembers and they really want to be treated for.

1. Whether the patient is comfortable doing all routine activities compared to the normal person or he himself when normal if so graded as – 1
2. These patient have difficulty in breathing during strenuous exercise and graded -2
3. Difficulty in performing regular activities graded -3
4. Dyspnic at rest were given least grade -4

The similar grading done every 3 months and the results were analyzed to know any significant improvement or deterioration in patients symptoms worsening of symptoms were attributed to the glottic narrowing due to granulation formation, sicatrization ,edema all these conditions were considered and correlated

Aspiration is considered as one of the parameters as it's the complication usually seen in any patients postoperatively after surgery during conventional methods. The surgery performed removes the part of vocal cord in its posterior aspect. This prevents complete closure of cord during deglutition causing some accidental spilling of liquids. If the patient was overcorrected the symptoms increase. This could be correlated with the VLS finding regarding gottic space.

The patients were graded from 1 to 4 according to episodes of aspiration and severity of aspiration

Table-7 Grading - Aspiration

Aspiration	
No aspiration	1
Occasional episodes for liquids	2
Frequent episodes for liquids	3
Frequent episodes for liquids and solids	4

Table-8 Grading - Phonation

Phonation	
Normal conversation	1
Able to converse in sentences	2
Able to converse few words	3
Able to speak only single word	4

PHONATION : the cords in median position as such don't cause any difficulty in phonation .but as the surgery was done ,knowing the fact that compromise in phonation .but even then these patients don't suffer much as the cords were usually undercorrected.

OBSERVATION AND RESULTS

Table-9: Age distribution

Age distribution in decades	Number of cases
11 - 20 yrs	1
21 - 30 yrs	2
31 - 40 yrs	17
41 - 50 yrs	3
51 - 60 yrs	2

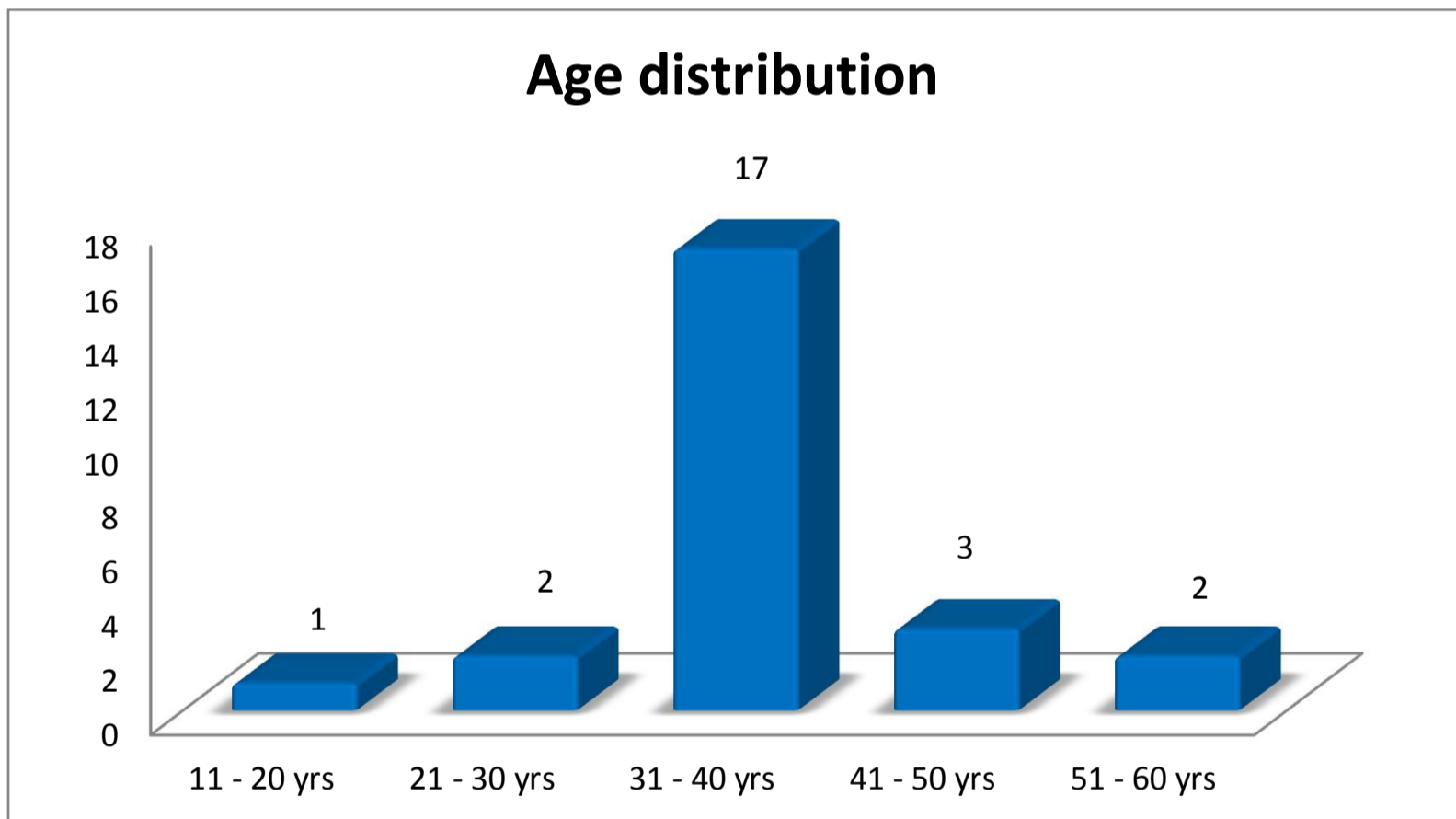


Fig-11 Bar diagram : Age distribution

AGE DISTRIBUTION

Vocal cord palsy in early decade is very rare. In our study only one case was reported in its 2nd decade .most of the cases were in the 4th decade because of the prevalence of thyroid disease and contributes more than 65%. Three cases in 5thdecade and 2 cases in 6th decade

Table-10 Day of Decannulation

Day of decannulation	Number of Cases
0-3 days	3
3-7 days	18
More than 7 days	3
Not decannulated	1

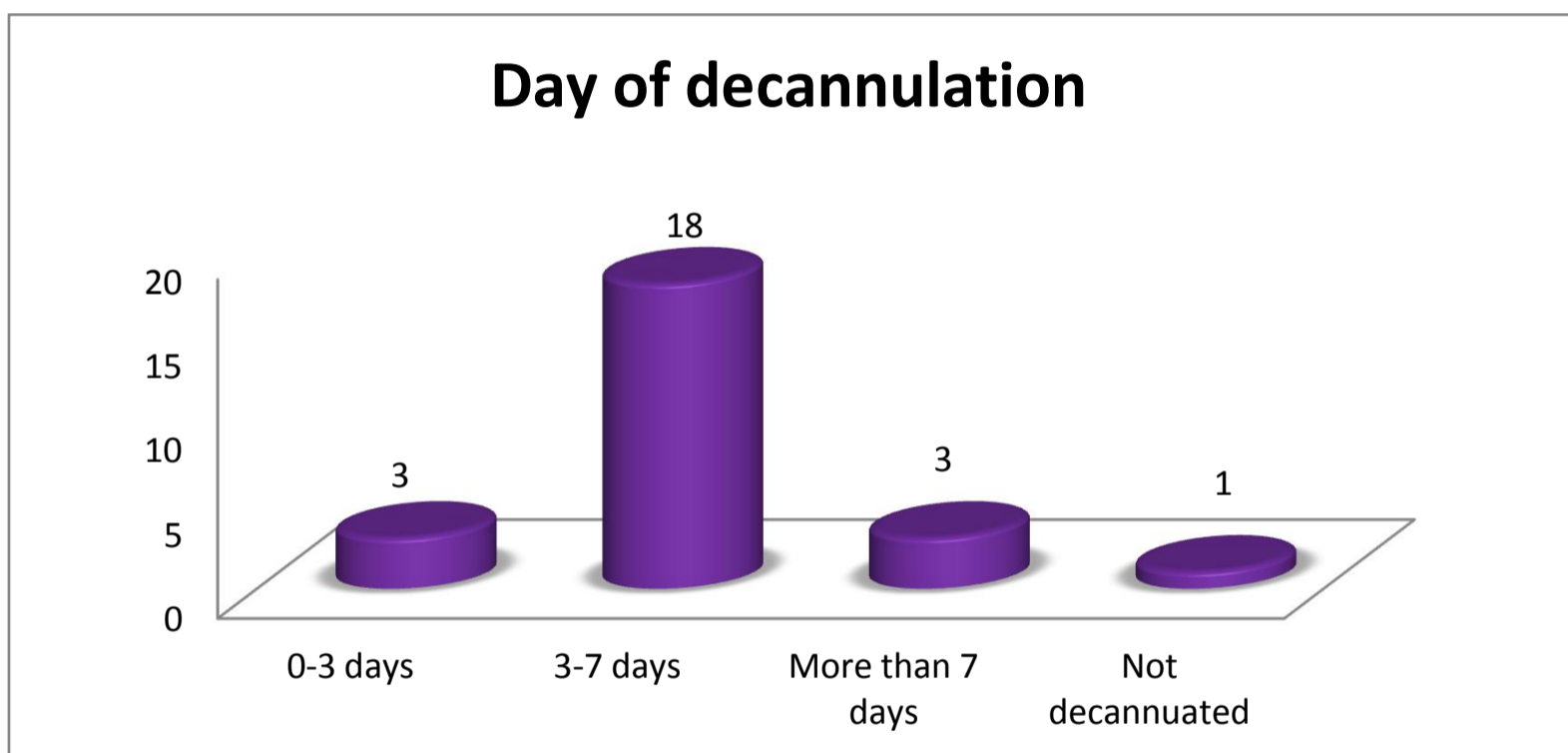


Fig-12 Bar Diagram- Day of Decannulation

Day of De cannulation is the important para meter of concern as the patients treated by coblation in dennis Kashia for b/l abductor palsy are DE cannulated early .the bar diagram clearly states most of the patient 18 of 25 patients were DE cannulated within a week .and remaining patients within 2 weeks .this is an advantage of using coblation . This technique has the advantage of reduced post-operative oedema .

Table-11 Causes

Causes	Number of Cases
Idiopathic	2
Infective	1
Iatrogenic	22

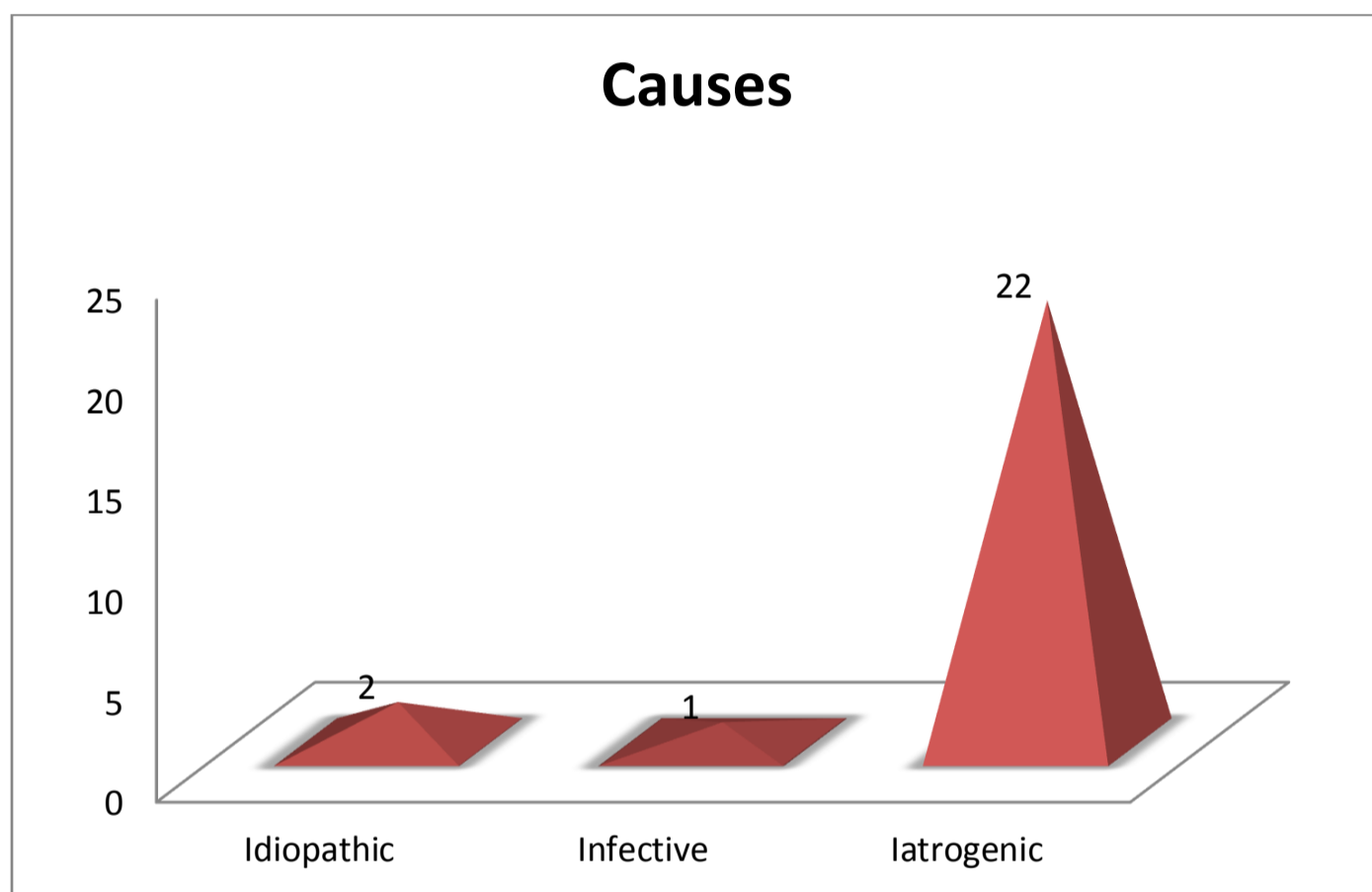


Fig-13 Bar diagram- Causes

Among the 25 cases evaluated one case is of infective cause. 2 cases are of idiopathic etiology, whereas majority of cases are traumatic etiology. Only 2 cases are due to prolonged intubation and 20 cases were due to post total thyroidectomy. This distribution correlates with that of the most references.

Table-12 Comorbidities

Comorbidities	Number of cases
Diabetic	3
Hypertensive	4
asthmatic	1
No Comorbid	17

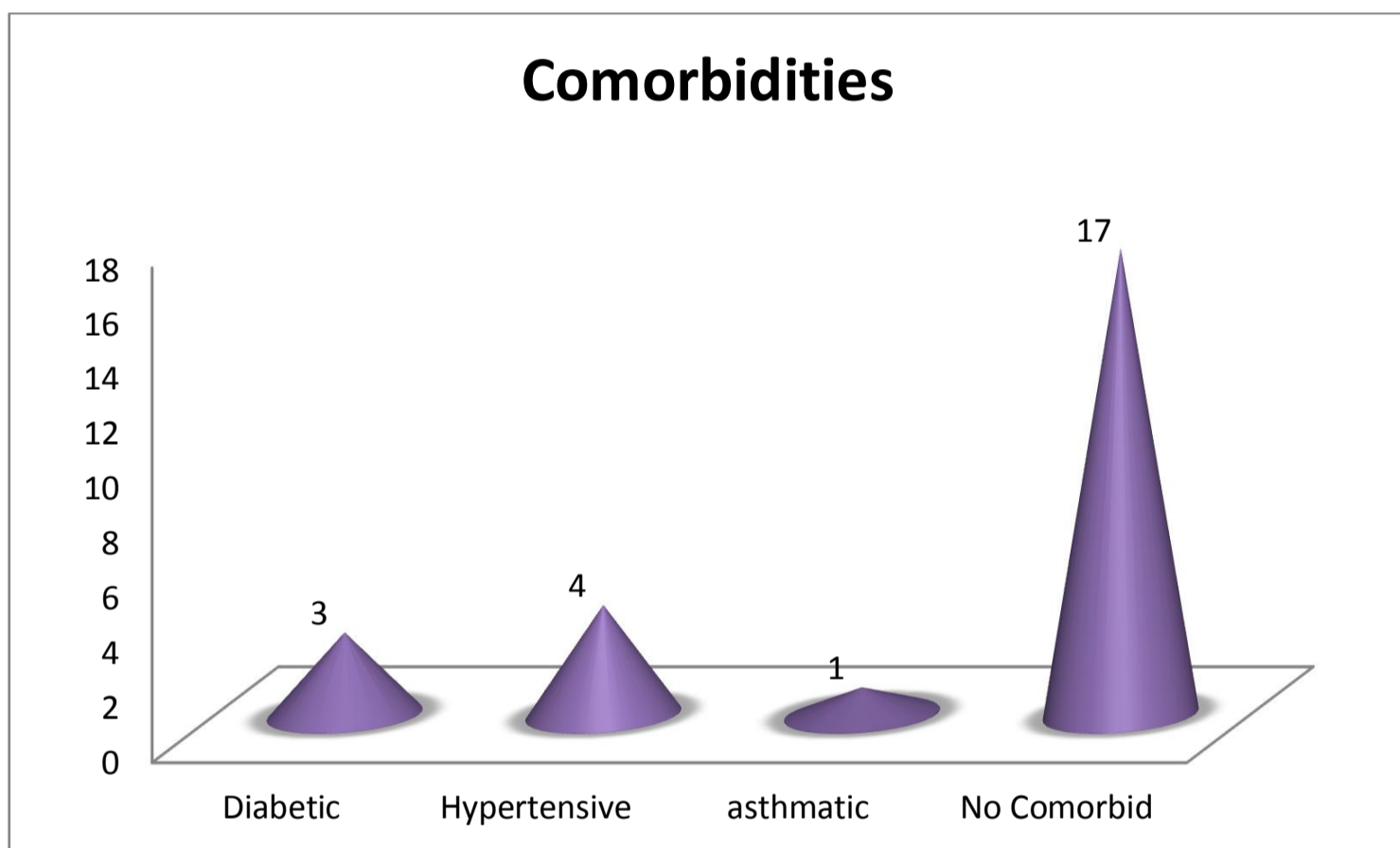


Fig-14 Bar Diagram: Comorbidities

Total cases of coblation dennis kashima performed in patient with comorbidity 8 cases. 3 of them are diabetic and 4 were hypertensive. Most of the patients were with no other comorbidity, as most of the patients were in their 3rd and 4th decade. Our technique is more precise and it is effective equally in all patients and comorbidity does not influence the outcome of the result except in asthmatic patients.

Table-13 Frequency Table - Gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	22	88.0	88.0	88.0
	Male	3	12.0	12.0	100.0
	Total	25	100.0	100.0	

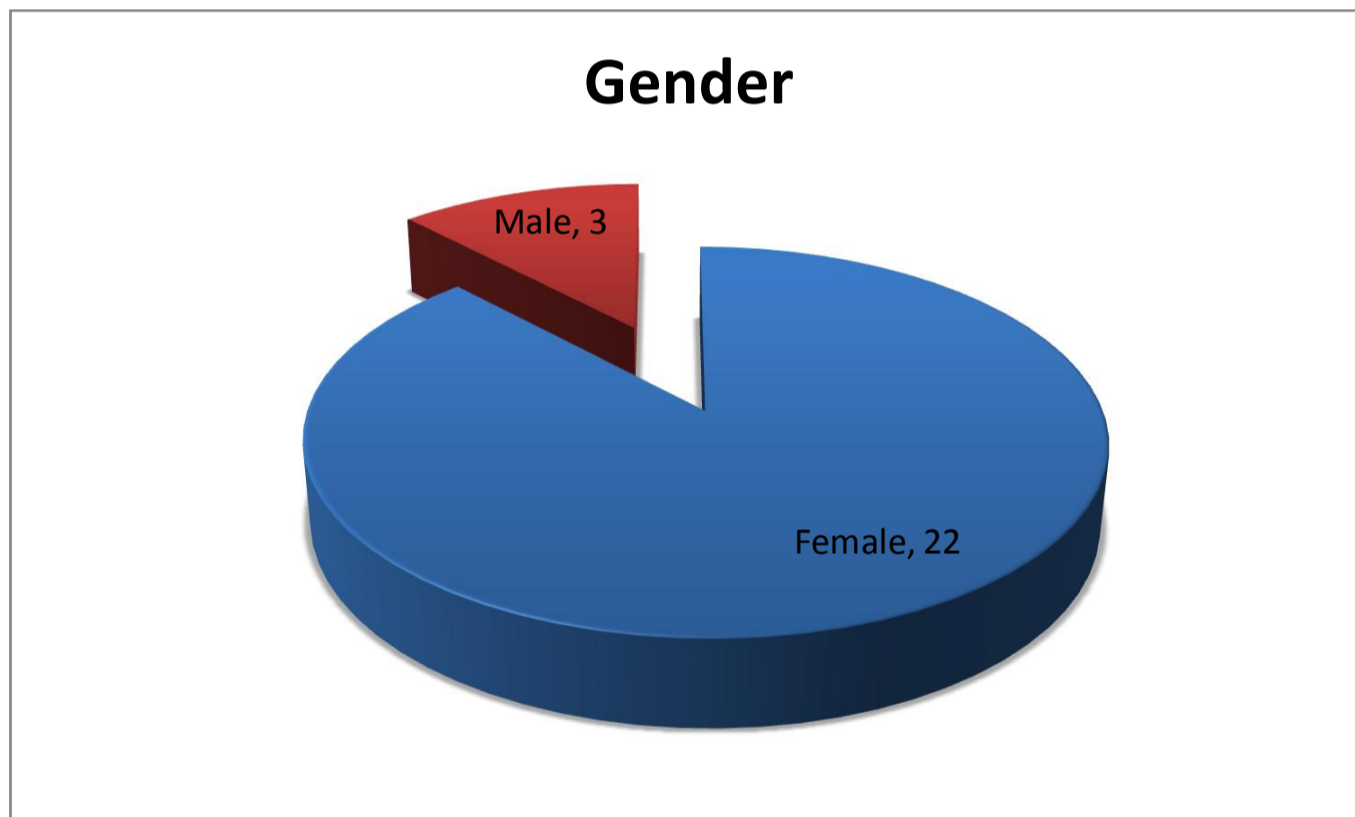


Fig-15 Pie chart - Gender

Inference from the above frequency distribution table is the majority of the cases were female and accounts for 88% of the total patient treated with coblation dennis kashima procedure . higher incidence in female is due to the prevalence of thyroid disease among that population .

PARAMETERS : the important part of our study is to analyse the the following four parameters

1. Improvement in breathing

2. Aspiration

3. Phonation each parameters are graded from 1-4 . one being the best score and four the worst .the grading was done at 3,6,9&12 months and the results were summarised below

IMPROVEMENT IN BREATHING DIFFICULTY :

At 0-3 months :

Out of total 25 patients subjected to our study 17 patients which accounts for 68% were of grade 1.and 5 patients graded 2 accounts for 20% and 2 patients were of grade 3 . with cumulative percent of 96% and only one patient presented with breathing difficulty at rest on spigot ting .

At 3-6 months:

20 patients out of 25 presented normal with no breathing difficulty accounting to 80%and 1 patient presented with grade 4 which is less than 5%

At 9-12 months:

21 patients out of 25 were grade 1 and 3 patients were grade 3 . 96%of the patients were of less than grade 2.

Frequency distribution Tables (4) – Improvement in Breathing

B 0-3 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No difficulty	17	68.0	68.0	68.0
	On strenuous exercise	5	20.0	20.0	88.0
	In routine activities	2	8.0	8.0	96.0
	At rest	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

B 3-6 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No difficulty	20	80.0	80.0	80.0
	On strenuous exercise	4	16.0	16.0	96.0
	At rest	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

B 6-9 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No difficulty	21	84.0	84.0	84.0
	On strenuous exercise	3	12.0	12.0	96.0
	At rest	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

B 9 -12 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No difficulty	21	84.0	84.0	84.0
	On strenuous exercise	3	12.0	12.0	96.0
	At rest	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

ASPIRATION:

The detailed information of the difficulty due to aspiration in patients who underwent dennis kashima procedure using coblation is collected . based on the episodes of aspiration to liquids and solids at 3,6,9 and 12 months was collected and analysed. The results are

At 0-3 months

25 patients were analysed out of which 20 patients are grade 1.and 5 patients were of grade 2 . cumulative percent of 100 % were of grade less than 2.

At 6-9 months

The cumulative percent increases from 90 to 96 % at the end of 9 months which predicts that the patients aspiration history don't show much improvement

At 9-12 months

Out of the 3 patients of grade 3 during 9 months was reduced to 2 patients of grade 2 and one with grade 3on the worse side .

Frequency distribution tables (4) – Aspiration

A 0-3 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No aspiration	20	80.0	80.0	80.0
	Occasional episodes for liquids	5	20.0	20.0	100.0
	Total	25	100.0	100.0	

A 3-6 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No aspiration	21	84.0	84.0	84.0
	Occasional episodes for liquids	4	16.0	16.0	100.0
	Total	25	100.0	100.0	

A 6-9 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No aspiration	20	80.0	80.0	80.0
	Occasional episodes for liquids	4	16.0	16.0	96.0
	Frequent episodes for liquids & solids	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

A 9-12 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No aspiration	20	80.0	80.0	80.0
	Occasional episodes for liquids	2	8.0	8.0	88.0
	Frequent episodes for liquids	1	4.0	4.0	92.0
	Frequent episodes for liquids & solids	2	8.0	8.0	100.0
	Total	25	100.0	100.0	

PHONATION:

Grading of the phonation is from 1 to 4 . when the patient is able to converse normally its grade 1 and if speaks sentences as grade 2. few words graded 3 . and worse part not able to complete words or broken words is graded 4 .

At 0-3 months :

Initially in the first 3 month 14 patients converse normally .and 7 of them grade 2. and 4 were grade 4. The cumulative percent of 84% are less than grade 2

At 6-9 months :

15 patients out of 25 were grade 1 and 10 of the remaining were grade 2 with no patient in grade 3 and 4. The cumulative percent of 100% in grade 1 and 2

Frequency distribution tables (4) - Phonation

P 0-3 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Abelto converse in sentences	14	56.0	56.0	56.0
	Able tto converse few words	7	28.0	28.0	84.0
	Able to speak only single word	4	16.0	16.0	100.0
	Total	25	100.0	100.0	

P 3-6 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	4	16.0	16.0	16.0
	Abelto converse in sentences	17	68.0	68.0	84.0
	Able tto converse few words	3	12.0	12.0	96.0
	Able to speak only single word	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

P 6-9 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	12	48.0	48.0	48.0
	Abelto	13	52.0	52.0	100.0
	converse in				
	sentences				
	Total	25	100.0	100.0	

P 9-12 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	15	60.0	60.0	60.0
	Abelto	10	40.0	40.0	100.0
	converse in				
	sentences				
	Total	25	100.0	100.0	

DISCUSSION

THE AIM of my study is to analyse the significance of coblation technique in performing dennis kashima procedure for bilateral abductor vocal cord palsy

CAUSE FOR VOCAL CORD PARALYSIS as seen may be a surgical traum, malignancy, inflammatory and infective . From our study in our set up iatrogenic trauma to nerve during thyroidectomy is the most common cause, followed by idiopathic

SEX prediction females are more commonly affected as the cause for bilateral cord paralysis is thyroid surgeries mainly the total thyroidectomy .the male patient presented was thyroid malignancy.

AGE most of our patients were on 4th decade as the prevalence of thyroid mass is more common at this age .age and sex do not influence the outcome of results in coblation procedure .

STUDY done was an retrospective study in which the patient data's were utilized to enumerate the results of the study

DENNISH KASHIMA PROCEDURE:

The vocal cords remain in median position after vocal cord paralysis and pt in stridor .emergency tracheostomy procedure is must for all and done .recovery period of 6-9 months was waited .then those patients who don't

improve or recover were evaluated and after anaesthetic consent .fitness for the procedure obtained from anaesthesia ,cardiac and chest medicine .

PROCEDURE done under general anaesthesia .video laryngoscope evaluation done to confirm the position of cord. Laryngoscope inserted and fixed. Posterior part of the membranous cord ablated and removed on one side creating space in the glottis. This procedure is done using coblation, a radio frequency device used to ablate the tissue is used in our department as a routine was studied .

PARAMETERS: 3 parameters were considered for analysis 1.breathing 2.aspiration 3, phonation, the observation and inference were tabulated .

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	25	15	54	36.04	8.080
Valid N (listwise)	25				

NPar Tests

Friedman Test

Ranks

	Mean Rank
B 0-3 months	2.84
B 3-6 months	2.44
B 6-9 months	2.36
B 9 -12 months	2.36

Test Statistics

N	25
Chi-Square	15.632
Df	3
Asymp. Sig.	.001

a. Friedman Test

NPar Tests**Friedman Test****Ranks**

	Mean Rank
A 0-3 months	2.44
A 3-6 months	2.36
A 6-9 months	2.52
A 9-12 months	2.68

Test Statistics

N	25
Chi-Square	4.200
Df	3
Asymp. Sig.	.241

a. Friedman Test

NPar Tests

Friedman Test

Ranks

	Mean Rank
P 0-3 months	3.58
P 3-6 months	2.78
P 6-9 months	1.94
P 9-12 months	1.70

Test Statics

N	25
Chi-Square	50.889
Df	3
Asymp. Sig.	.0005

a. Friedman Test

Breathing

	0-3 months	3-6 months	6-9 months	9 -12 months
No difficulty	17	20	21	21
On strenuous exercise	5	4	3	3
In routine activities	2	1		
At rest	1		1	1

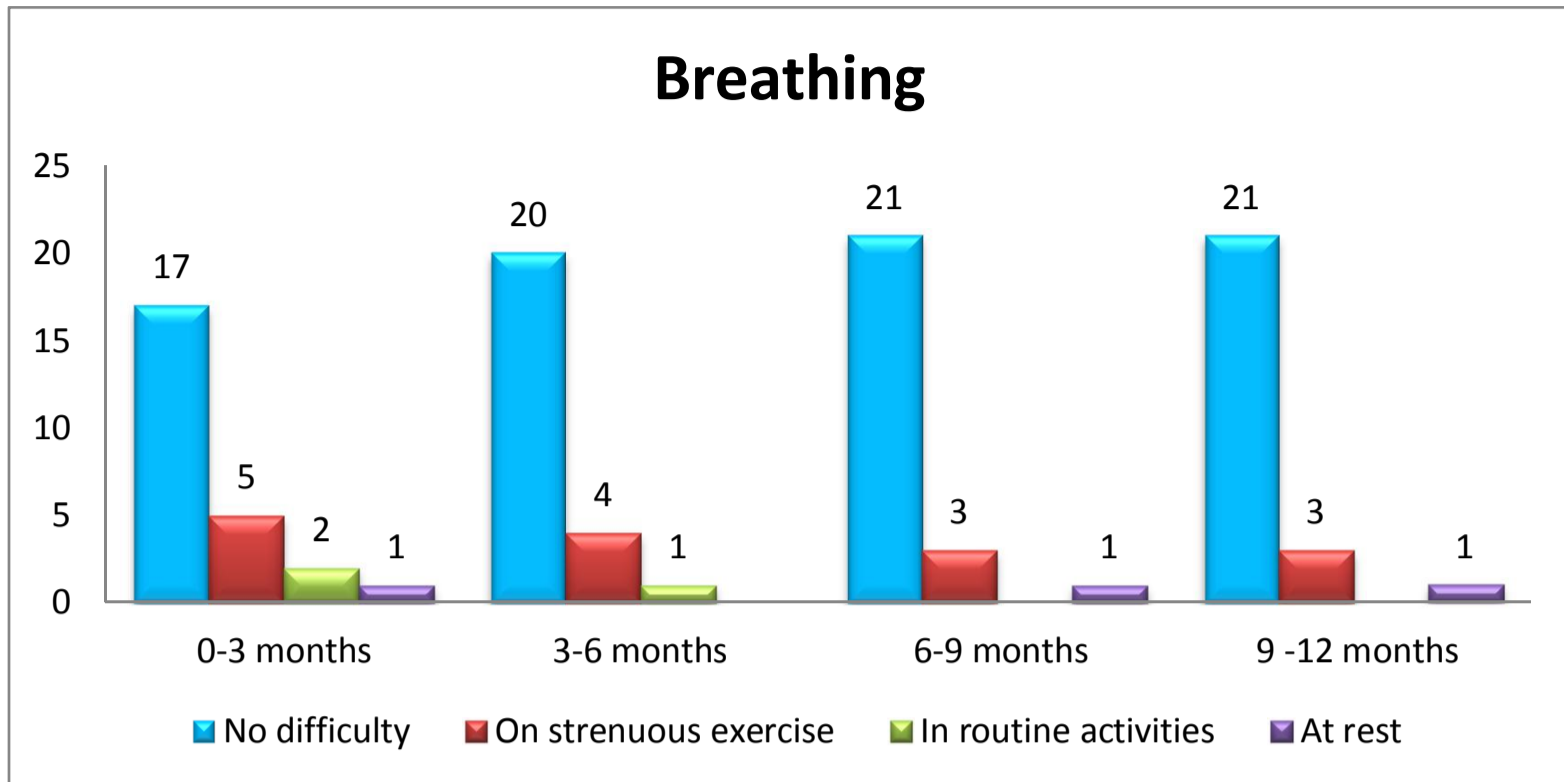


Fig 16- Bar Diagram – Improvement in Breathing

Inference :

From the diagram mentioned above ,the number of cases with grade 1 (no difficulty)increases over the time feom 17 during 0-3 months to 21cases at 9-12 months .at the same time the only 3 cases have grade 2 difficulty .the improvement in breathing is good after surgery using our procedure .

This symptomatic improvement was correlated clinically through the VLS to demonstrate the adequate glottic space .thus coblation reduces the number of days for DE cannulation in patients who were on tracheostomy before surgery.

Post-operative tissue reactions like tissue oedema ,granulation tissue formation was minimal with coblation which may be the reason for early decannulation and improvement in symptoms over time .

Aspiration

	0-3 months	3-6 months	6-9 months	9 -12 months
No aspiration	20	21	20	20
Occasional episodes for liquids	5	4	4	2
Frequent episodes for liquids				1
Frequent episodes for liquids & solids			1	2

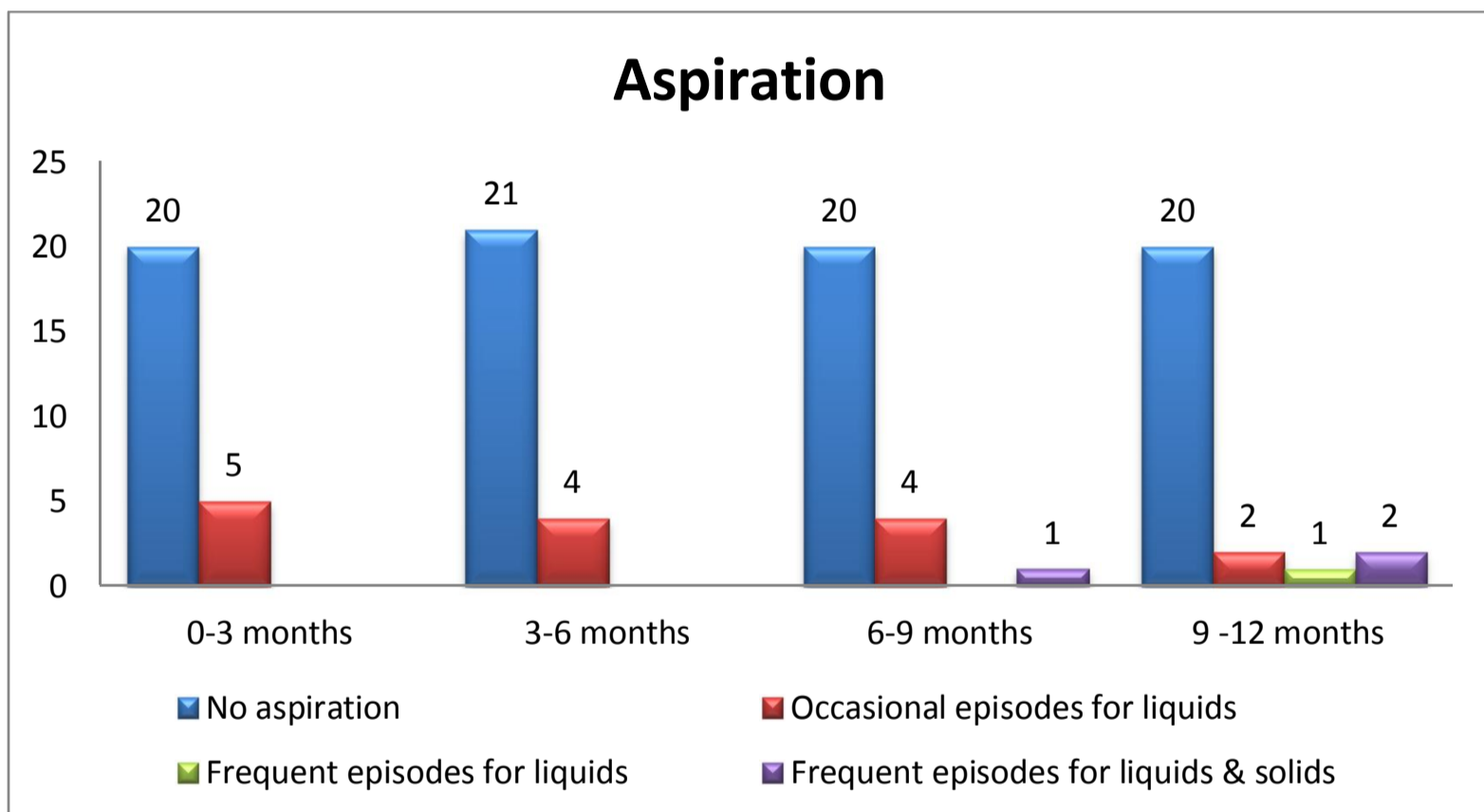


Fig-17 Bar Diagram: Aspiration

Inference:

In the above mentioned diagram the average number of cases with grade 1 history of aspiration were 20 and it does not show much variation .total number of cases with grade 2 and grade 3 aspiration were 5 which reduces over the period of one year to 2.

But the number of cases with grade 4 aspiration is 2 at the end of one year.

The adequate space in posterior glottis would improve breathing ,but when over corrected would improve breathing but cause aspiration .in our procedure the cords were not over corrected as the procedure done through coblation could be performed later in failure cases with no complications advantage of coblation .

Phonation

	0-3 months	3-6 months	6-9 months	9 -12 months
Normal		4	12	15
Able to converse in sentences	14	17	13	10
Able to converse few words	7	3		
Able to speak only single word	4	1		

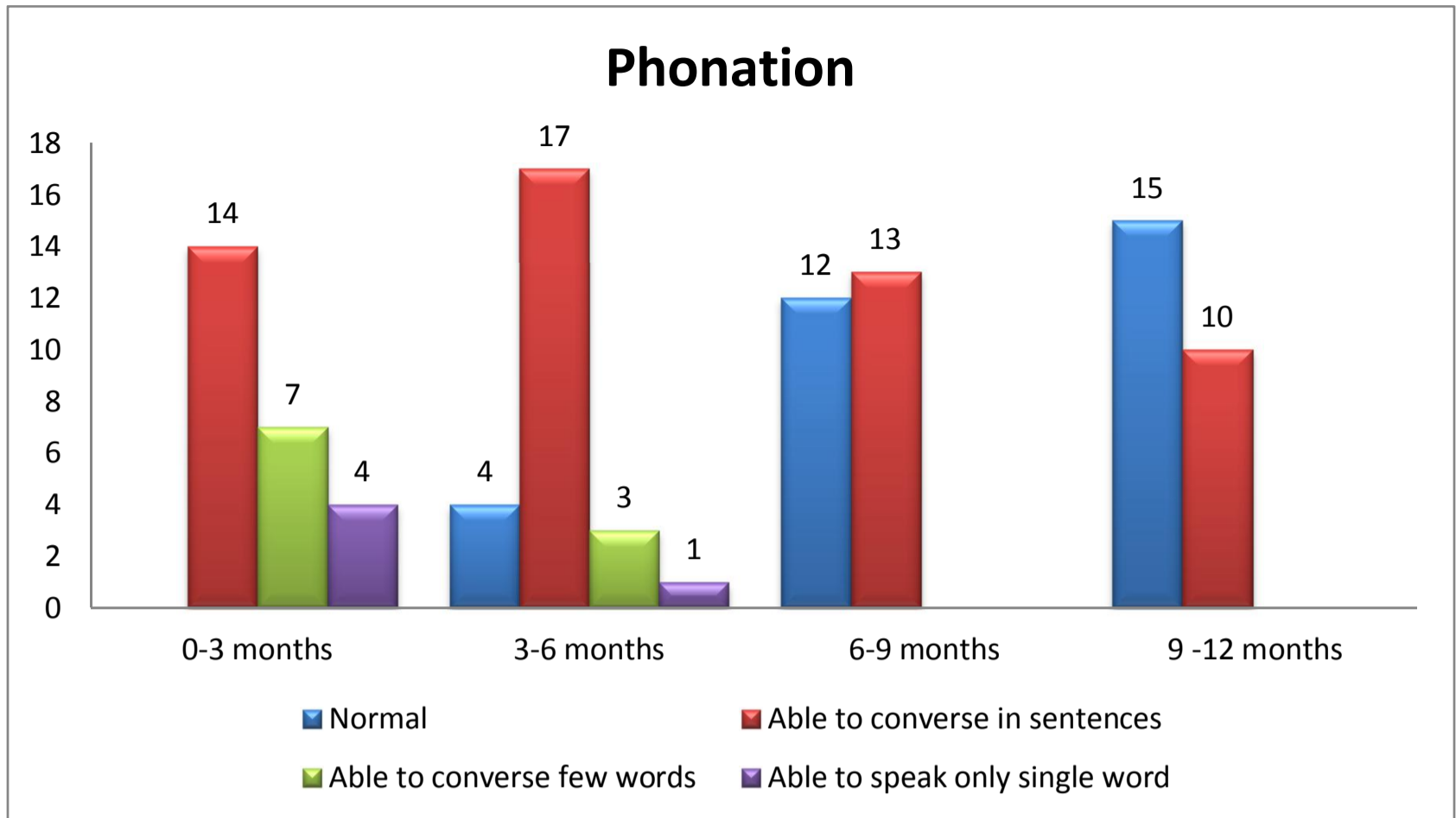


Fig-18 Bar Diagram: Phonation

Inference:

The phonation could be assessed better in later months of follow up rather in the early period as some patients were to go for speech therapy post-operatively to improve their phonation. Out of 25 cases, 15 cases were able to converse normally, i.e. the breath holding time is adequate. 4 cases with grade 4 was reduced at 12 months, and 10 cases were grade 2 converse a sentence.

The technique of coblation is more precise so normal tissues were not much damaged. The procedure is intended to provide airway not at the expense of compromising voice. So using coblation has good results in maintaining near normal phonation post-operatively.

CONCLUSION

BILATERAL ABDUCTOR PALSSY WAS TREATED BY PERMANENT TRACHEOSTOMY ONCE, TOOK VARIOUS PHASES, MANY SURGICAL PROCEDURES WERE DONE TO PROVIDE ADEQUATE AIRWAY AND AVOID PERMANENT TRACHEOSTOMY. ONE SUCH PROCEDURE IS THE POSTERIOR CORDECTOMY DONE INTRODUCED BY DENNIS KASHIMA L.MANY NEWER TECHNOLOGIES WERE EVOLVED ONE SUCH IS COBLATION TECHNIQUE WHICH IS COST EFFECTIVE .USING COBLATION TECHNIQUE IN DENNIS KASHIMA PROCEDURE IN BILATERAL ABDUCTOR PARALYSIS IS EFFECTIVE.

REFERENCES

- 1) Henick DH. Laryngeal development. In: Rubin Js, Stataloff RT, Korovin GS. Diagnosis and treatment of voice disorders. Second edition. Delmar learning: 2003.2. 17-26
- 2) Neil W. Anatomy of larynx and tracheo bronchial tree. In. Gleeson M . Scott brown. Sixth edition. Butterworth Heinemann; 1997.1(12).1-18
- 3) Hirano M. surgical anatomy and physiology of vocal folds,In: Gould WJ, Satalof RT, Spiegel JR. Voice surgery. Mosby: 1993. 6.156.
- 4) Sasaki CT, Kim YH; Anatomy of human larynx. In: Rubin JS, Satalof RT, Korovin GS. Second edition Diagnosis and treatment of voice disorders. Delmar learning; 2003. 27-38
- 5) Understanding voice problems, a physiological perspective for diagnosis and treatment Second edition; Colton RH, Casper FK; Williams and Wilkins; 1996.3.59-63.
- 6) Zemlin WR. Phonation. In: Dragin SB. Speech and hearing signs, anatomy and physiology. 4th edition; Editor: Allyn Bascon 1998; 3.182-183.
- 7) Understanding voice problems, a physiological perspective for diagnosis and treatment Second edition; Colton RH, Casper FK, Williams and Wilkins;1996;10.326
- 8) Woodson GE. Laryngeal and pharyngeal function. In: Cummings CW. Otolaryngology and head and neck surgery, fourth edition. Elsevier Mosby 2005.3(3).1970-1973
- 9) Satalof RT, Functional anatomy and physiology of voice. In: Gould WJ, Satalof RT, Spiegel JR. Voice surgery. Mosby. 1993.6.165-171

- 10) Koufmann JA, Issacson G. The spectrum of voice dysfunction. *Otolaryngol clinNA*; 1991.24 (5).986
- 11) Rosen CA, Murray T: Nomenclature of voice disorders in vocal pathology. *Otolaryngol clin NA* 2000; 33 (5).1035-1045
- 12) Fourcin A, McGlashan J, Huckvale M. The generation and reception of speech. In: Gleeson M. Scott brown. Butterworth Heimemann; 1997 1(14).1-4
- 13) Jacobson BH, Johnson A; The voice handicap index development and validation. *American journal of speech language pathology*; 1997 6: 66-70
- 14) Wilson JA, Webb A, Carding PN, Steen IN, Mackenzie K, Deary IJ, Voice symptom scale and voice handicap index, a comparison of structure and content. *Clinical otolaryngol*. 2004; 29:169-174
- 15) Rosen CA, Lee AS, Osborne J, Zullo T, Murry T. Development and validation of voice handicap index 10: *Laryngoscope*. 2004;114:1549-1556
- 16) Rubin JS, Yanagisawa E. Benign vocal fold pathology through the eyes of the laryngologist. In: Rubin JS, Satalof RT, Korovin GS;. *Diagnosis and treatment of voice disorders*. Second edition. Thomson Delmar learning; 2003.6.76
- 17) Gray SD, Hammod E, Hanson DF. Benign pathological response of the larynx. *Annals of otology rhinology, laryngology*. 1995;104:13-18
- 18) Kleinasasser O. *Microlaryngoscopy and endolaryngeal microsurgery*. Third edition. Mosby inc 1991.46-47
- 19) Rubin JS, Yanagisawa E. Benign vocal fold pathology through the eyes of the laryngologist. In: Rubin JS, Satalof RT, Korovin GS. *Diagnosis*

and treatment of voice disorders second edition; Thomson Delmar learning publisher;2003.6.75-76

- 20) Kleinasasser O. Microlaryngoscopy and endolaryngeal microsurgery. Third edition. mosby inc 1991.46-47
- 21) Rubin JS, Yanagisawa E. Benign vocal fold pathology through the eyes of the laryngologist. In: Rubin JS, Satalof RT, Korovin GS;. Diagnosis and treatment of voice disorders. Second edtion. Thomson Delmar learning;2003.6.78
- 22) Damste PH. Disorders of the voice. In: Hibbert J.Scot brown otolaryngology sixth edition : Butterworth Heinemann. 1997.5(6).14-15
- 23) Rubin JS, Yanagisawa E. Benign vocal fold pathology through the eyes of the laryngologist. In: Rubin JS, Satalof RT, Korovin GS;. Diagnosis and treatment of voice disorders. Second edtion. Thomson Delmar learning; 2003.6.76-77
- 24) Rosen CA, Lombard LE, Murray T. Acoustic, aerodynamic, and videostroboscopic features of bilateral vocal fold lesions. Annals of otol rhinol laryngol. 2000;109:823 - 828
- 25) Woo P, Casper J, Colton R, Brewer D. Aerodynamic and stroboscopic findings before and after microlaryngeal phonosurgery. Journal of voice. 1994; 8:186-194
- 26) Colton RH, Woo P, Brewer DW, Griffing B, Casper J. Stroboscopic signs associated with Benign lesions of the vocal folds. Journal of Voice. 1995; 9: 312-325
- 27) Hsiung MW. Videolaryngostroboscopic observation of mucus layer during vocal cord vibration in patients with vocal nodules before and after surgery. Acta otolaryngol. 2004; 124: 186- 191

- 28) Noordzij JP, Woo P. Glottal area waveform analysis of benign vocal fold lesions before and after surgery. *Annals of otol rhinol laryngol.* 2000; 109: 441-446
- 29) Deary IJ, Webb A, Mackenzie K, Wilson JA, Carding PN. Short, self-report voice symptom scales: Psychometric characteristics of the Voice Handicap Index-10 and the Vocal Performance. *Otolaryngol head and neck surgery.* 2004;131(3):232-235
- 30) Speyer R, Wienneke GH, Dejonckere PH. Self assessment of voice therapy for chronic dysphonia. *Clinical otolaryngol.* 2004; 29: 66-74
- 31) Behrman A, sulica L, He T. Factors predicting patient perception of dysphonia caused by benign vocal fold lesions. *Laryngoscope.* 2004; 114: 1693-1699
- 32) Jacobson BH, Johnson A, Grywalski C, Silbergleit A, Jacobson G, Benninger MS, et al. The voice handicap index development and validation. *American Journal of Speech language pathology.* 1997; 6: 66-70
- 33) Murry T, Rosen CA. Outcome measurement and quality of life in voice disorders. *Otolaryngol clin NA. voice disorders and phonosurgery I.* 2000;33:905-916

ANNEXURE

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Retrospective study on role of Coblation in dennis Kashima for Bilateral abductor vocal cord paralysis.

Principal Investigator : Dr. G. Rajasekar

Designation : PG MS (ENT)

Department : Department of ENT,
Government Stanley Medical College,
Chennai-01

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 14.06.2016 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.


MEMBER SECRETARY,
IEC, SMC, CHENNAI

CASE PROFORMA

Name:

Age:

Sex:

IP No:

PRESENTING COMPLAINTS:

Breathing difficulty/ difficulty in phonation/ aspiration

HISTORY OF PRESENT ILLNESS:

H/o breathing difficulty, onset, aggravating/relieving factors

H/o difficulty in phonation, onset, progression

H/o aspiration

H/o difficulty in swallowing

H/o cough/sneezing

PAST HISTORY:

Comorbid conditions.

PERSONAL HISTORY:

H/o Diet, Bowel, bladder habits, Tuberculosis, Bronchial Asthma, Allergy, Epilepsy

FAMILY HISTORY:

Order of birth. Menstrual history, similar illness in family.

OCCUPATIONAL HISTORY:

Any h/o exposure to dust or allergens in home or workplace.

TREATMENT HISTORY:

Any h/o treatment for previous illnesses/ surgeries

GENERAL EXAMINATION:

Built, Nourishment, Consciousness, orientation, febrile or not,
any pallor, icterus, cyanosis, clubbing, significant lymphadenopathy,
Pulse rate, Blood Pressure.

SYSTEMIC EXAMINATION:

Cardiovascular System,
Respiratory System,
Central Nervous System,
Gastrointestinal System

LOCAL EXAMINATION:

NOSE:

External Contour, Columella, Vestibule, Septum,
Anterior Rhinoscopy

	Inferior Turbinate	Inferior Meatus	Middle Turbinate	Middle Meatus	Septum	Floor
Right						
Left						

Posterior Rhinoscopy,

	Choana	Post end of Middle Turbinate	Post end of Inferior Turbinate	Post end of Septum	Eustachian Tube Orifice	Fossa of Rosenmuller
Right						
Left						

Cotton Wool Test, Cold Spatula Test, Cottle Ring Test, PNS Tenderness
Diagnostic Nasal Endoscopy.

THROAT:

Lips, perioral area,
gums, oral mucosa, floor of mouth, tongue, teeth,
palate, pillars, tonsils, uvula, posterior pharyngeal wall.

INDIRECT LARYNGOSCOPY:

VIDEO LARYNGOSCOPY:

STROBOSCOPY:

EAR:

Pinna,
Preauricular area,
post auricular area,
external auditory canal,
tympanic membrane.

NECK:

Any palpable Lymph nodes.

INVESTIGATIONS:

- a) CBC, RFT, Blood Grouping and typing
- b) Urine Routine
- c) RBS
- d) HIV and Hep B
- e) X ray Nasopharynx
- f) DNE

DIAGNOSIS:

SURGERY:

Procedure

Anesthesia

Approach

Technique

Follow Up

POST OPERATIVE PERIOD: Grading

IMPROVEMENT IN BREATHING	
No difficulty in breathing	1
Breathing Difficulty on strenuous exercise	2
Breathing difficulty on routine daily activities	3
Breathing difficulty at rest	4

PHONATION	
Normal conversation	1
Able to converse in sentences	2
Able to converse few words	3
Able to speak only single word	4

ASPIRATION	
No aspiration	1
Occasional episodes for liquids	2
Frequent episodes for liquids	3
Frequent episodes for liquids and solids	4

சுய ஒப்புதல் படிவம்

ஆராய்ச்சி நிலையம் : காது, மூக்கு, தொண்டை பிரிவு

ஸ்டான்லி அரசு மருத்துவக்கல்லூரி

மருத்துவமனை

பங்கு பெறுபவரின் பெயர்:

பங்கு பெறுபவரின் எண்:

மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. எனது தொண்டையில் குரல்வளையில் நரம்பு பாதிப்பு ஏற்பட்டு குரல்வளை செயலிழந்துள்ளது என்பதை அறிந்து கொண்டேன் . எனது தொண்டை நோய் பற்றிய சந்தேகங்களை கேட்கவும் அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்பளிக்கப்பட்டது. இந்த நோயைக் குணப்படுத்த பலவகை அறுவை சிகிச்சை முறைகள் உள்ளன என்பதும் எனக்கு அதில் ஒன்றான DENNIS KASHIMA அறுவை சிகிச்சை முறை பயன்படுத்தப்பட உள்ளது என்பதும், இந்த முறையில் எனது தொண்டையில் ஏற்பட்ட குரல்வளை பாதிப்பு சரிசெய்வது பற்றி விளக்கப்பட்டது. இந்த அறுவை சிகிச்சையின் விளைவுகளை ஆய்வில் பயன்படுத்தவும் தன்னிச்சையாக சம்மதிக்கிறேன். எக்காரணத்தினாலும் எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் பரிசோதனை முடிவுகளையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் தேவைபட்டால் என்னையும் எனக்கு நடக்கும் அறுவை சிகிச்சையையும் புகைப்படம் எடுக்கவும் நான் முழு மனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம்:

நாள்:

கட்டைவிரல் ஒப்பம்:

இடம்:

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்:

தகவல் படிவம்

தங்களுக்கு செய்த பரிசோதனைகள் மூலம் தங்கள் தொண்டையில் குரல்வளை செயலிழந்துள்ளது தெரிய வந்துள்ளது. இதன் விளைவாக தங்களுக்கு முச்சுத்திணறல், குரல் பாதிப்பு ஏற்படலாம்.

இந்த நோயை குணப்படுத்த பலவகை அறுவை சிகிச்சை முறைகள் உள்ளன. அதில் ஒன்றான DENNIS KASHIMA அறுவை சிகிச்சை முறை பயன்படுத்தப்பட உள்ளது. இந்த அறுவை சிகிச்சை முறையில் தங்களின் தொண்டையில் உள்ள பாதிப்பு சரிசெய்யப்படும். மேலும் இந்த அறுவை சிகிச்சையின் மூலம் விளைவுகளை ஒப்பிட்டு ஆய்வு மேற்கொள்ளப்படவுள்ளது. இது குறித்த விவரங்களை ஆய்வில் பயன்படுத்த விரும்புகிறோம்.

தாங்கள் விரும்பினால் மருத்துவ ஆய்விலிருந்து எப்பொழுது வேண்டுமானாலும் விலகிக்கொள்ளலாம். எந்த சட்ட சிக்கலுக்கும் எப்பொழுது வேண்டுமானாலும் தாங்கள் ஆய்விலிருந்து விலகிக்கொள்ளலாம்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களும், பரிசோதனை முடிவுகளும் தங்களின் ஒப்புதலின் மூலம் மட்டும் ஆய்வில் பயன்படுத்தப்படும்.

ஆய்வாளரின் கையொப்பம்:

ஆய்வாளரின் பெயர்:

இடம்:

நாள்:

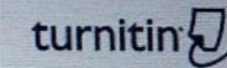
Originality

GradeMark

PeerMark

RETROSPECTIVE STUDY ON ROLE OF COBLATION IN DENNIS KASHIMA FOR

BY RAJASEKAR GUNASEKARAN



15%
SIMILAR

--
OUT OF 0

ABSTRACT

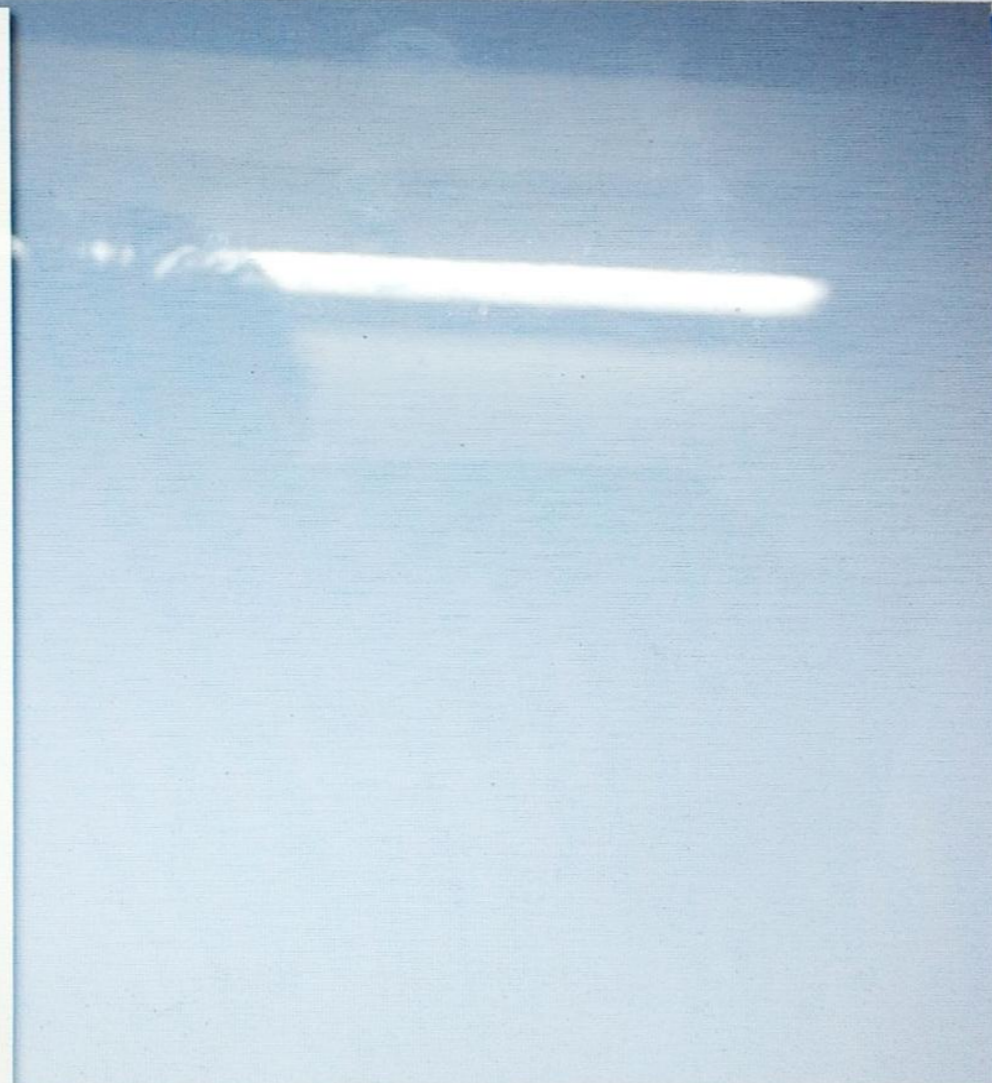
Vocal cords are very delicate and intricate structure that help a human being to Breath, Speak as well as to sings. It is a micro structure and their functions are very accurate,even a small change in it by a lesion can produce enormous change in its function (Voice and Singing).

Any lesions affecting vocal cord results in changes of voice,breathing difficulty. bilateral abductor palsy is one such condition that can occur due various etiologies which had to be treated appropriately and effectively .there are many techniques available but dennis kashima is recently evolved technique which is used most commonly now a days because of increased precision,better hemostasis and minimal handling of tissues.

25 patients were selected on the basis of inclusion and exclusion criteria and who had underwent dennis kashimausing coblation technique and were studied based on the subjective and objective parameters and statistical analysis were made.

AIM AND OBJECTIVE:

The present study is aimed at measuring the effectiveness of dennis kashima



Match Overview

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MASTER CHART

S.No.	I.P.NO.	age	sex	decannulation	improvement in breathing				aspiration				phonation			
				POD	0-3 mon	3-6 mon	6-9 mon	9-12 mon	0-3 mon	3-6 mon	6-9 mon	9-12 mon	0-3 mon	3-6 mon	6-9 mon	9-12 mon
1	1123765	36	f	4	1	1	1	1	1	1	1	1	2	2	2	2
2	1152876	52	f	5	2	1	1	1	1	1	1	1	2	2	2	1
3	1109988	45	f	5	1	1	1	1	1	1	2	2	2	2	2	1
4	1267489	38	f	4	2	1	1	1	1	1	1	1	2	2	1	1
5	1267588	31	f	3	1	1	1	1	2	2	4	4	4	3	2	2
6	1232156	36	m	5	1	1	1	1	1	1	1	1	2	2	1	1
7	1277854	27	f	12	2	2	2	2	1	1	2	2	2	1	1	1
8	1375486	32	f	5	1	1	1	1	1	1	1	1	4	3	2	2
9	1368646	36	f	6	2	1	1	1	1	1	1	1	2	2	2	1
10	1376567	32	f	4	1	1	1	1	2	2	2	4	2	1	1	1
11	1365342	31	f	14	3	2	2	2	1	1	1	1	2	2	1	1
12	1375765	38	f	5	1	1	1	1	2	2	1	1	2	1	1	1
13	1376645	45	m	5	1	1	1	1	1	1	1	1	2	1	1	1
14	1478767	35	f	NIL	4	4	4	4	2	1	1	1	4	4	2	2
15	1486785	39	f	5	1	1	1	1	1	1	1	1	3	2	1	1
16	1478676	15	f	3	1	1	1	1	1	1	1	1	3	3	2	2
17	1465554	54	f	6	1	1	1	1	2	2	2	3	3	2	2	2
18	1475764	46	f	3	2	2	1	1	1	1	1	1	3	2	2	2
19	1479876	32	m	4	1	1	1	1	1	1	1	1	2	2	1	1
20	1565577	28	f	4	1	1	1	1	1	1	1	1	3	2	1	1
21	1535424	35	f	15	3	2	2	2	1	1	1	1	2	2	2	2
22	1576576	34	f	4	1	1	1	1	1	1	1	1	3	2	1	1
23	1533547	37	f	5	1	1	1	1	1	1	1	1	2	2	2	2
24	1543423	32	f	5	1	1	1	1	1	1	1	1	4	2	2	2
25	1563657	35	f	5	1	1	1	1	1	1	1	1	3	2	1	1