A Dissertation on

A COMPARATIVE STUDY ON TURBINECTOMY AND TURBINOPLASTY

Submitted to the

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

in partial fulfillment of the regulations for the

award of the degree of

MASTER OF SURGERY BRANCH IV
(OTORHINOLARYNGOLOGY)

GOVERNMENT STANLEY MEDICAL COLLEGE AND HOSPITAL

THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY
CHENNAI, TAMILNADU

APRIL 2014

DECLARATION

I, **Dr GOMATHI K** solemnly declare that this dissertation titled "**A COMPARATIVE STUDY ON TURBINECTOMY AND TURBINOPLASTY"** is a bonafide record of work done by me during the period of March 2012 to October 2013 in the Department of Otorhinolaryngology, The Government Stanley Medical College Hospital, Chennai 600 001 under the expert guidance and supervision of **Prof Dr M. Ramani Raj MS DLO,** Professor in Otorhinolaryngology, The Government Stanley Medical College Hospital, Chennai 600 001. This dissertation is submitted to The Tamil Nadu Dr. MGR Medical University in partial fulfillment of rules and regulations for the MS degree examination in Otorhinolaryngology to be held in April 2014.

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Place: Chennai 600 001

Date : .12.2013

CERTIFICATE

This is to certify that this dissertation titled "**A COMPARATIVE STUDY ON TURBINECTOMY AND TURBINOPLASTY"** by **Dr GOMATHI K** is an original work done in the Department of Otorhinolaryngology, The Government Stanley Medical College Hospital, Chennai 600 001 in partial fulfilment of rules and regulations of The Tamil Nadu Dr. MGR Medical University for the award of degree of MS (Otorhinolaryngology) Branch IV under my supervision during the academic period 2011 to 2014.

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ACKNOWLEDGEMENT

I am indebted to **Prof Dr S GEETHALAKSHMI MD Ph.D, THE DEAN,** Government Stanley Medical College and Hospital for being kind enough in permitting me to utilize the facilities of this institution for the conduct of study thereby making the dreams of every post graduate, just not mine come true.

I am always awestruck by the way my teacher explains things to me. Bitter or sour, in every attire and approach of his; things turn sweet, and lucid. Every move of his; anywhere in the work place codes to decorum and establishes his supremacy as a teacher, a great mentor in fact. My humble thanks and heartfelt gratitude to such a great mentor whom I have had an absolute privilege and honour of being a student to **Prof Dr M RAMANI RAJ MS DLO,** Professor in Otorhinolaryngology, Government Stanley Medical College and Hospital in sculpturing this piece of work at its every stage.

Words cannot express the sincerity, respect and thanks that I wish offer to the respected teacher of mine, who has always and is continuing to inspire me with his distinct, unique and innovative style of teaching, pioneering the field of medicine, surgery and computers standing as an enigmatic figure in re-defining teaching, **Prof Dr T BALASUBRAMANIAN MS DLO**, Professor and Head of the Department of Otorhinolaryngology, The Government Stanley Medical College and Hospital in encouraging me to do things with utmost perfection.

I would like to thank **Prof Dr N SEETHALAKSHMI, MS DLO DNB**, Professor in Otorhinolaryngology, The Government Stanley Medical College and Hospital in constantly backing me up with information that would complete and magnify the scope of this study.

My sincere thanks to my assistant professors **Dr NANMULLAI MS, Dr KARUPPASAMY MS DLO, Dr CHANDRAMOULI MS, Dr ATHIYAMAN MS, Dr BHARANIDHARAN DLO**, for the everlasting and unexplainable support that they offered during the course of this study.

My heartfelt thanks for the timely help offered by the post graduate fellow -mates, interns, staff nurse, theatre personnel in making this study possible.

It would be unjust and incomplete if I forget to sincerely thank all my patients, the true authors of this study, without whom this piece of work is just a bunch of papers.

Of all, a special mention to my family for standing aside me in accomplishing this Herculean task with utmost ease. My humble prayers and thanks to the almighty for making this endeavour a success, with his infinite mercy.

ABSTRACT OF THE STUDY

INTRODUCTION

The commonest presenting symptom of any pathology associated with nasal cavity is nasal obstruction. Inferior turbinate hypertrophy is one of the main causes for nasal obstruction. It is a separate bone covered by lamina propria including erectile tissue and ciliated pseudo stratified columnar epithelium. Inferior turbinate hypertrophy can be diagnosed by anterior rhinoscopic examination. Whole turbinate hypertrophy could be confirmed by diagnostic nasal endoscopy.

AIM OF THE STUDY

- This prospective study aims to compare the surgical results of conventional inferior turbinectomy with that of micro-debrider assisted inferior turbinoplasty.
- To find out the symptomatic improvement by pre-operative and post-operative clinical examination.
- To find out the healing process by post-operative diagnostic nasal endoscopic examination.

SELECTION CRITERIA

- Age more than 20 years and less than 45 years.
- Sex: Both male and female patients were considered for the study.
- Patients clinically presenting with Inferior Turbinate Hypertrophy and nasal obstruction with or without allergic rhinitis were taken up.
- Patients with ostio- meatal complex involvement were excluded from this study
- Patients with previous history of nasal surgeries were excluded from this study.

MATERIALS AND METHODS

In patients, refractory to medical management, surgery is preferred. This is achieved by either reducing the size of or removing the inferior turbinate. Among the 60 patients taken into study, 30 underwent inferior turbinectomy and 30 underwent inferior turbinoplasty. Post-operative evaluation assessing symptomatic relief was done. Post-operative morbidity like bleeding, crusting, synechiae formation was considered as failure events. These variables were evaluated pre and post operatively by clinical and diagnostic nasal endoscopic examination.

RESULTS AND INTERPRETATION

30 out of 60 underwent inferior turbinectomy in which 25 patients (95%) recovered completely without any symptoms at the end of 6 months of follow up. 5 patients had mild nasal obstruction and dryness of nose. Inferior turbinoplasty was done in 30 patients of whom 28 (98%) completely recovered. Only 2 patients had oedema of mucosa and rhinitis till the end of 6 months of post-operative follow up. Our study concluded that there was no significant difference in the outcome of the two techniques.

CONCLUSION

Keeping in mind the anatomy and physiological functions, inferior turbinoplasty takes an upper hand, owing to the preservation and maintenance of the inferior turbinate, despite being statistically insignificant with inferior turbinectomy.

KEY WORDS: Inferior Turbinate Hypertrophy, Inferior Turbinectomy, Inferior Turbinoplasty, Nasal obstruction.

TABLE OF CONTENTS

1. INTRODUCTION

Inferior turbinate hypertrophy is one of the most common causes of nasal obstruction. Surgery on the inferior turbinates is reported as the eighth most common procedure performed by an otorhinolaryngologist.

Inferior Turbinate is composed of conchal bone. It is a separate bone covered by lamina propria including erectile tissue and ciliated pseudo stratified columnar epithelium. Autonomic nervous system controls the congestion of inferior turbinate.

Cyclic alteration of inferior turbinate vasculature results in nasal cycle which occurs every 4 to 12 hours. Its anterior head forms the posterior aspect of the internal nasal valve. It offers 50% of resistance during airflow on inspiration.

Inferior turbinate hypertrophy is caused by rhinitis of various etiology those are allergic, infective, vasomotor, hormonal or medications induced. Most of the patients respond well with medical treatment such as topical or systemic corticosteroids, antihistamines and decongestants. Unexpectedly long term irreversible hypertrophy may need surgical intervention.

In addition to mechanical obstruction, it has a role in functional obstruction. Sensation of airflow depends upon the airway resistance, whether high or low resistance leads to subjective complaints of nasal obstruction.

Hence, injured mucosa or absence of inferior turbinates may present with nasal obstruction instead of widely patent nasal airway.

Inferior turbinate hypertrophy can be diagnosed by anterior rhinoscopic examination. Whole turbinate hypertrophy could be confirmed by diagnostic nasal endoscopy.

Various techniques have been described over the cause of years. Those are inferior turbinectomy, sub-mucosal diathermy, steroid injection, inferior turbinate out fracture, cryosurgery, radiofrequency ablation, laser turbinoplasty, and coblation turbinoplasty and micro-debrider assisted turbinoplasty.

Here in this study, we compare the surgical outcome of endoscopic turbinectomy and micro-debrider assisted turbinoplasty in comparison to each other.

2. AIM OF THE STUDY

- To compare the surgical results of conventional inferior turbinectomy with that of micro-debrider assisted inferior turbinoplasty.

- To find out the symptomatic improvement by pre-operative and post-operative clinical examination.

- To find out the healing process by post-operative diagnostic nasal endoscopic examination.

3. REVIEW OF LITERATURE

3.1 EMBRYOLOGY OF THE INFERIOR TURBINATE

Development of the head and neck along with the face and para nasal sinuses takes place simultaneously in the short period of time. At the end of 4th week, branchial arches, pouches and primitive guts make their appearance. When embryo is identifiable as head, face and orifice in the middle known as stomodeum is seen.

Stomodeum is surrounded by maxillary and mandibular processes bilaterally. It is limited superiorly by the frontonasal eminence, inferiorly by the mandibular arch. Frontonasal process differentiates into 2 projections known as the nasal placodes which is invaded by the growing ectoderm, mesenchyme and these, later fuse to form nasal cavity and the primitive choana.

The developing embryo buries the nasal placodes, maxillary process, in midline to form maxilla and beginning of the external nose.

Frontonasal prominence gives rise to mesodermal projection which forms the nasal septum and dividing the nose into two cavities. Simultaneously, skull and facial bones develop. At 25 – 28 weeks of gestation, 3 medially directed projections arise from the lateral wall.

THE INFERIOR MAXILLOTURBINATE PROJECTIONS form the INFERIOR TURBINATE and MAXILLARY SINUS.

EMBRYOLOGY OF THE TURBINATES

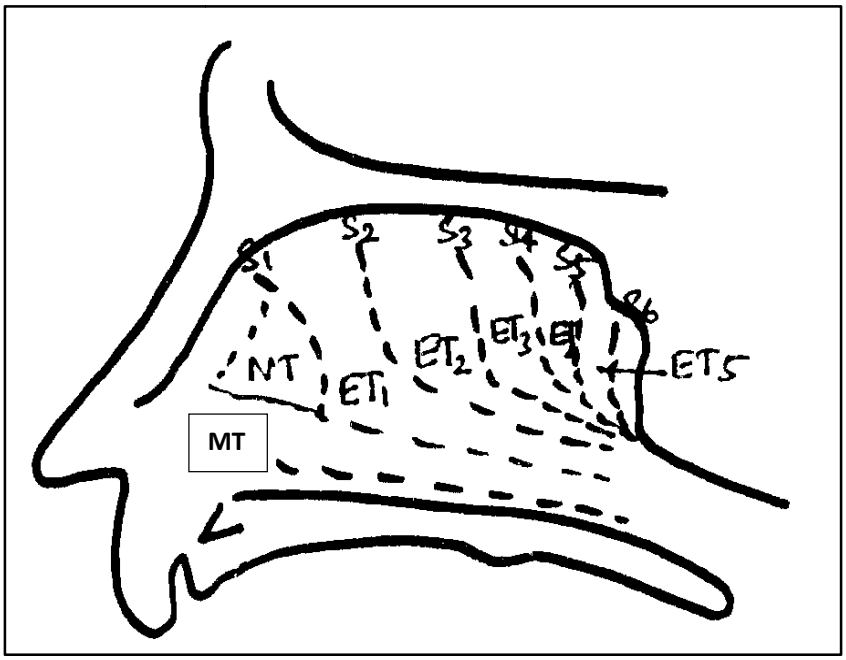


Fig.1: Embryology of the Turbinates

LEGEND

ET1 to ET5 are the Primary ethmo-turbinals which fuse to form 2 to 3 persisting ethmoidal turbinates.

S1 to S6 are the major furrows between primary ethmo-turbinal crests

MT is the Maxillo-turbinal projection

NT is the Naso-turbinal projection

DESCRIPTION

Inferior Turbinate has its origin from the Maxillo-turbinal projections whereas the other turbinates have their origin from the Ethmo-turbinal projections

3.2. ANATOMY OF THE INFERIOR TURBINATE

It is a part of the lateral nasal wall. Inferior turbinate is composed of a separate bone which has irregular surface, perforated and grooved by vascular channels. Muco periosteum is firmly attached to the inferior margin of the maxillary hiatus. It is shaped like in resemblance to that of an inverted canoe.

Its shape and stronger foundation leads to more resistant to outfracture than other turbinates.

It lies opposite to the lower part of the septal cartilage and hoods the lower opening of the naso-lacrimal duct.

It articulates with the ethmoid, palatine and lacrimal bone which forms the medial wall of the naso lacrimal duct. It possesses sub mucosal cavernous plexus with large sinusoids under autonomic control which has the major contribution to the nasal resistance.

The turbinate is covered by respiratory epithelium and has innumerable goblet cells and sero-mucinousglands which recede in number posteriorly.

The nasal valve: The nasal valve has two components: external, internal. The external nasal valve is formed by the caudal edge of the lateral crus of the lower lateral cartilage, soft tissue alae, membranous septum of the nostril. This site is occasionally the area of nasal obstruction for mainly who have undergone rhinoplasty in the past.

Anterior end of the turbinate, lower edge of the upper lateral cartilages and septum with surrounding soft tissue forms the internal nasal valve, narrowest part of the airway, thereby offering a higher resistance.

ANATOMY OF THE INFERIOR TURBINATE

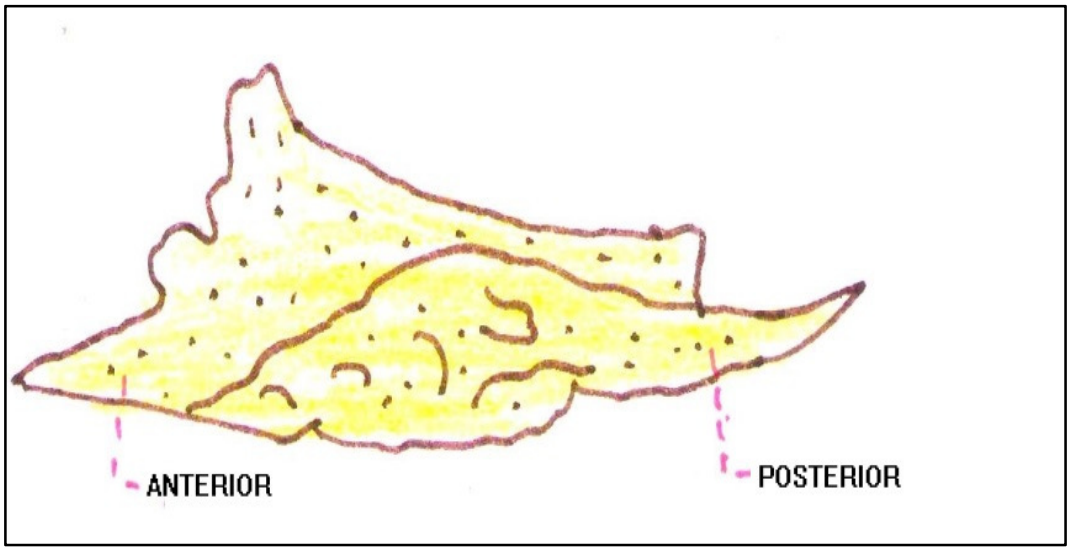


Fig.2: Anatomy of the Inferior Turbinate

It is a separate and independent bone.

It is composed of the inferior concha, which is a separate bone.

It is engulfed by the respiratory epithelium.

3.3 . HISTOLOGY OF THE INFERIOR TURBINATE

The basement of the mucous membrane of the lining mucosa of nasal cavity is fused with the underlying periosteum and perichondrium without definite border that creates muco-periosteum and muco- perichondrium.It is highly vascular and is continuous with the mucosa of the para nasal air sinuses, naso-pharynx and the lacrimal system.

Respiratory mucosa (Schneiderian's membrane) lines the nasal cavity from middle turbinate downward. It consists of pseudo-stratified ciliated columnar epithelium and mucous secreting goblet cells which among the columnar cells surface epithelium is invaginated into numerous cysts to form the ducts of the mucous glands. They are especially abundant on the medial surface of the inferior turbinate.

3.4 .VASCULATURE OF THE INFERIOR TURBINATE

Arterial Supply

Main descending branch of the spheno-palatine artery gives off its branches in the spheno-palatine foramen. This artery enters the inferior turbinate on the superior aspect of its lateral attachment about 1 – 1.5 cm from the posterior tip.

Here it enters the bony canal and branches into two. One branch remains high and lateral and the other low and medial.

Both remain in the bony canal for much of length of the turbinate. The artery increases in size as it progresses anteriorly.

Posteriorly the fleshy tip of the inferior turbinate has a small branch supplying it which is entirely in the soft tissue.

Venous Drainage

The venous drainage is through the spheno-palatine vein via the facial and the ophthalmic vessels, intracranially via the ethmoidal veins to veins on the dura to superior sagittal sinus.

BLOOD SUPPLY TO THE LATERAL WALL OF THE NASAL CAVITY

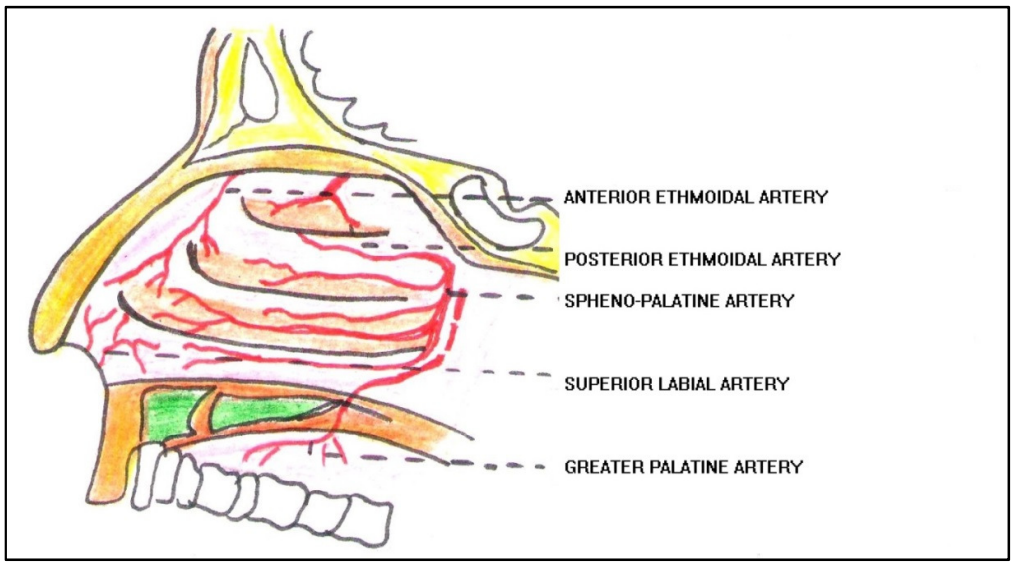


Fig.3: Blood Supply to the lateral Wall of the Nasal Cavity

The lateral wall of the nasal cavity receives its blood supply as depicted in the picture above.

A twig from the external Carotid artery namely, the Spheno-palatine artery supplies all the turbinates and meatus.

Anterior ethmoidal artery, a branch of internal carotid artery, supplies the roof and lateral wall of the nose.

The superior labial artery, a branch of the external carotid artery supplies the alae nasi.

3.5. INNERVATION OF THE LATERAL WALL

It receives ordinary sensation from the anterior ethmoidal nerve. Antero superiorly branches of pterygo-palatine ganglion and posteriorly anterior palatine nerves innervate. A small area is supplied by the infra orbital nerve and anteriorly antero superior alveolar branch gives a small branch to antero inferior meatus which may be damaged in the inferior meatal surgery.

NERVE SUPPLY TO THE LATERAL WALL OF NOSE

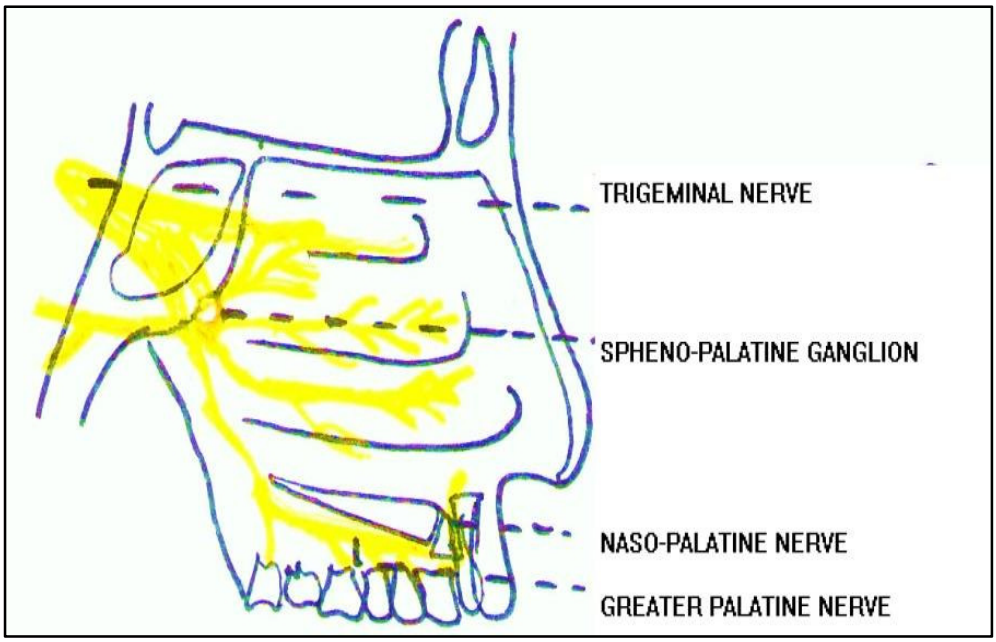


Fig.4: Nerve Supply to the Lateral Wall of Nose

3.6. LYMPHATIC DRAINAGE OF THE LATERAL WALL

Anteriorly, it drains with the external nose to sub mandibular nodes and it drains posteriorly to the lateral pharyngeal, retro pharyngeal and upper deep cervical lymph nodes.

3.7. MICROANATOMY OF THE BLOOD VESSELS OF THE TURBINATE

Arteries, arterioles produce resistance while veins and venules offer capacitance. Blood shunted between the arteries and veins deep in the mucosa.

Most of the shunting occurs in the anastomotic arteries through the cavernous plexus of the veins over the surface. Arteries branch into arterioles that lack the elastic lamina, end in capillaries that run below the surface epithelium and around the mucous gland.

Capillaries drain into the superficial venous system. Sinusoids receive arterial and venous blood. Blood flow is regulated by the cushion veins which have the longitudinal muscle coat.

They donot close the lumen completely; instead regulate the flow through the deep venous plexus. Vascular pattern within the turbinate resemble that of the vasculature of the penis, and is hence called the pseudo-erectile pattern of vasculature.

The Blood flow may be assessed by changes in colour, temperature and photo-electric plethysmography and laser doppler. Blood flow may exist by balance between arterial flow, arterio-venous shunting and venous pooling of blood. Clinically, three variations are seen.

They include:

- Hyperaemia with both shunting and venous congestion,
- Reduced arterial perfusion and
- Ischemia.

Autonomic nervous system and inflammation controls the blood flow.

SUB – EPITHELIAL VENOUS PLEXUS AND ERECTILE TISSUE IN THE TURBINATES

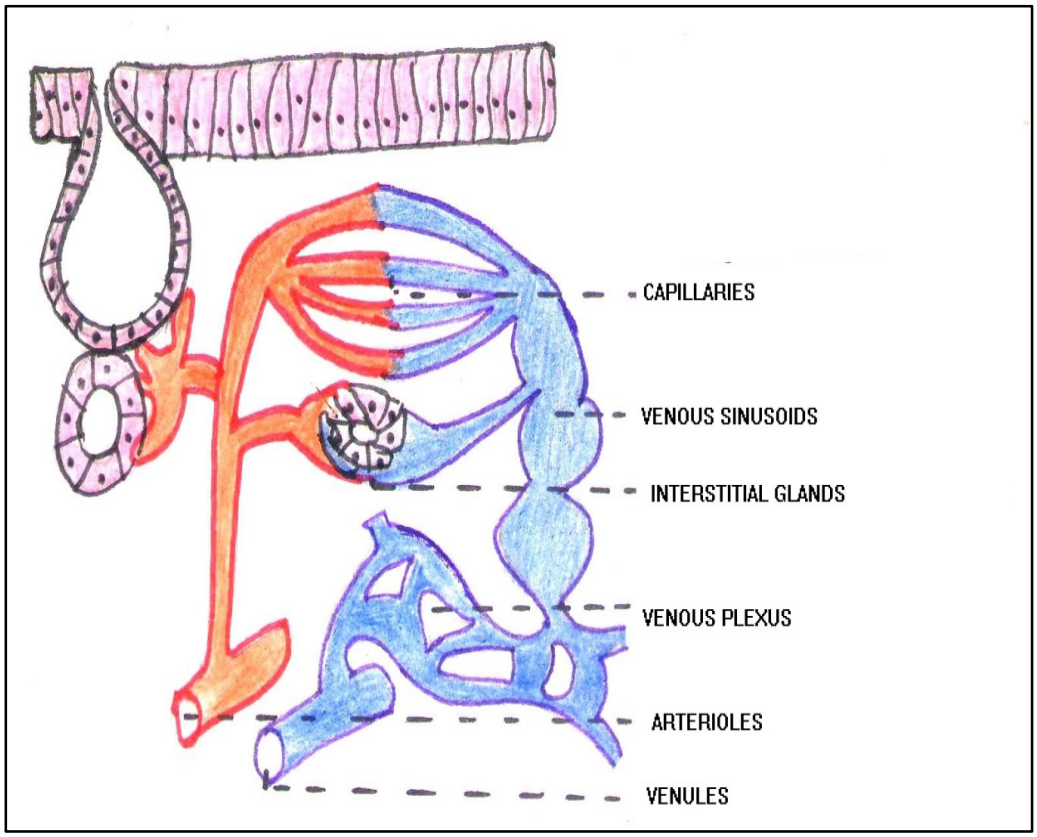


Fig.5: Sub – Epithelial Venous Plexus and Erectile Tissue in the Turbinates

3.8. AUTONOMIC NERVOUS SYSTEM

MOTOR NERVES AND SYMPATHETIC NERVE SUPPLY

It is from the lateral horn of the gray matter of the first and the second thoracic vertebrae. Pre ganglionic axons run through the anterior nerve root and synapse the superior cervical ganglion. Post ganglionic fibres run along the carotid to the deep petrosal nerve and the vidian nerves. They pass through the spheno-palatine ganglion into the nasal cavity.

PARASYMPATHETIC NERVE SUPPLY

Pons contains the superior secretory nucleus. Pre ganglionic fibres having cell bodies here proceed via the intermediate branch of facial nerve to the geniculate ganglion continuing along the greater superficial petrosal nerve, deep petrosal nerve, nerve of the pterygoid canal synapse in the spheno-palatine ganglion. Post ganglionic fibres pass to the nasal mucosa.

SENSORY NERVES

Ophthalmic and maxillary nerves supply the nose which arises from the Trigeminal ganglion. Nasal mucosa appreciates temperature, pain touch or irritation. Sensory nerve ending have H1 receptors, cold receptors that sense the airflow and these are more near the nasal vestibule.

AUTONOMIC INNERVATION OF THE NASAL CAVITY

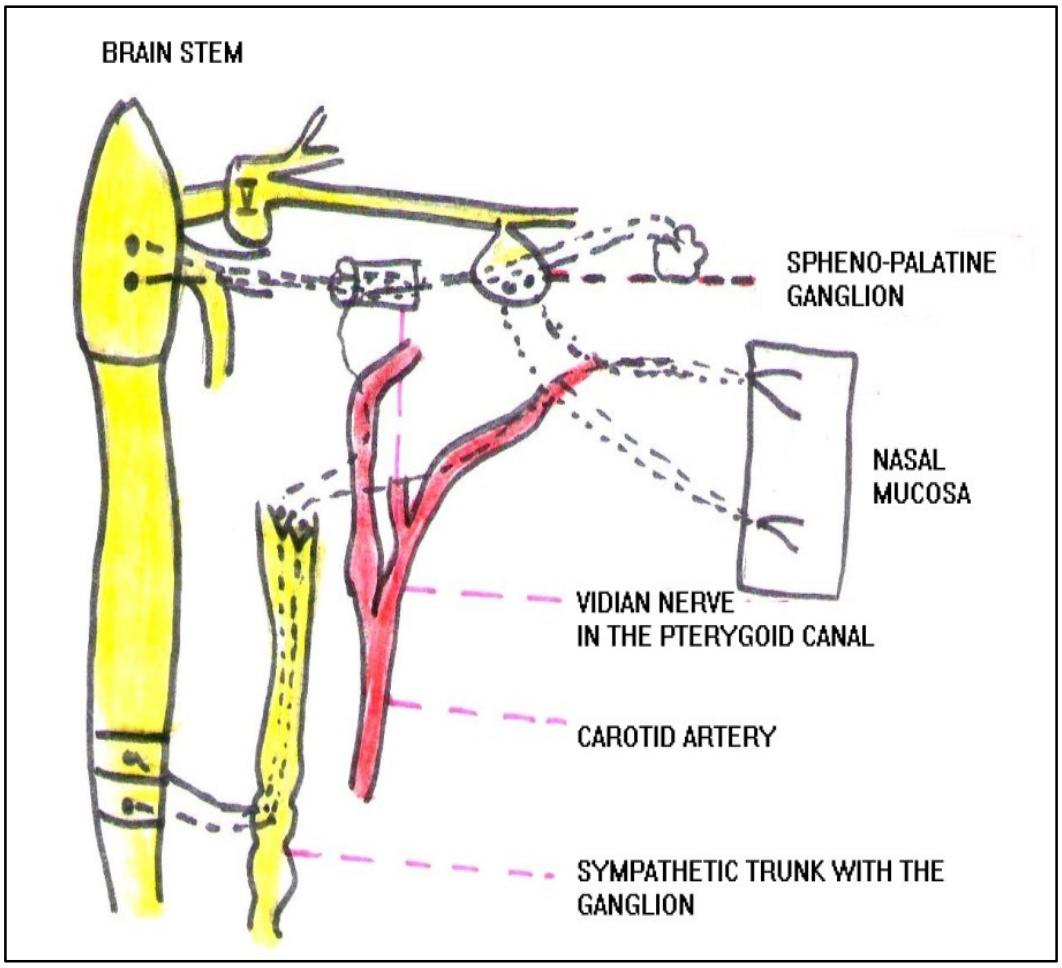


Fig.6: Autonomic Innervation of the Nasal Cavity

Pre ganglionic axons: run via the anterior nerve root and synapse the superior cervical ganglion.

Post ganglionic fibres: run along the carotid to the deep petrosal nerve and the vidian nerves. They pass through the spheno-palatine ganglion into the nasal cavity.

3.9. PHYSIOLOGY OF THE NOSE

FUNCTIONS OF NASAL CAVITY

- Regulation of nasal respiration.
- Lower respiratory tract protection.
  A. Regulation of filtration
  B. Regulation of temperature and humidity
  C. Regulation of muco-ciliary function
  D. Regulation of sneeze reflex
- Regulation of vocal resonance
- Regulation of olfaction
- Serving as an outlet to the lacrimal secretions.

Since the first two functions are much relevant and are physiologically significant with this study, they are detailed beneath:

NASAL RESPIRATION

The nose acts as an air conditioning effect. Nasal resistance is made up of bone, cartilage and attached muscles. It is high for infants.

NASAL CYCLE

First described by Kayser in 1895, is probably controlled by brainstem.It consists of alternate nasal blockage between passages. This is produced by vascular activity. It depends on the volume of the blood on the venous sinusoids.

Cyclical changes occur between 4 and 12 hours and are constant for every person. It is absent in laryngectomized and tracheostomized patients.

LOWER RESPIRATORY TRACT PROTECTION

It is achieved by

A. FILTRATION

Filtration of large particles entering the nasal cavity is brought about by the Vibrissae in the nasal vestibule and micro particles by ciliary blanket.

B. TEMPERATURE AND HUMIDIFICATION

The direction of the blood flow inside the nasal cavity and the direction of the inspired air are in the exact opposite directions and this counter- current mechanism is responsible for humidification of the inspired air thereby adhering larger particles to the mucosal blanket.

This counter current mechanism is responsible for the pre- heating of the inspired air thereby acting as a pivotal element in temperature regulation of the inspired air.

C. THE MUCOUS BLANKET (NASAL SECRETION)

Composed of mucous and water, is produced by the mucous and serous glands. Mucous glands offer glycoproteins like sialo-mucin, ferro-mucin, and sulpho-mucin offering viscosity and elasticity wherein the serous glands contribute water and ions. various enzymes include lysozyme and lacto-ferrin, circulatory proteins and immuno-globulins E, A, G, M, D and cells are also secreted.

REGULATION OF MUCOUS SECRETION

Both sympathetic and para-sympathetic system affects the level of engorgement of nasal mucosa and production of mucous. Sympathetic system regulates the blood volume of nasal mucosa by regulating resistance vessels while para-

sympathetic nervous system regulates the capacitance vessels and hence the sympathetic stimulation results in less blood flow and nasal decongestion.

It is influenced by the partial pressure of carbon-di-oxide via the carotid and aortic chemo-receptors and para-sympathetic stimulation leads to relaxation of the capacitance vessels that will allow congestion and oedema formation in the tissues.

ULTRASTRUCTURE OF CILIA

Function of the cilia is to propel the mucous from nose to the naso-pharynx. Nasal cilia are short, 5µm and are up to 200 per cell. Nine paired outer micro-tubules surround a single inner layer of a pair of micro-tubule. Outer linkage is by nexins and inner pairs by central spokes.

Nasal and mucous film has 2 layers namely the upper viscous and lower watery layer in which cilia are free to move. Ciliary beat frequency is 07 to 16 Hz at body temperature which remains constant between 32 and 40 degree Celsius. It consists of rapid propulsive stroke phase and slow recovery phase.

Mucous flow is antero-posterior viz. from the sinuses, joins the flow on the lateral nasal wall and then swallowed.

NEUROTRANSMITTERS

Acetyl Choline (ACh) is the main parasympathetic neurotransmitter. Vaso-active intestinal peptide (VIP) is present in the post-ganglionic fibres. Specific VIP receptors are on blood vessels and not on the glandular epithelium.

ACh produces vaso-dilatation and hence increased glandular activity. VIP results in atropine resistant vaso-dilatation.

ACh controls VIP by negative feedback mechanism. Nor Adrenaline is the main sympathetic neurotransmitter and it causes arteriolar vaso-constriction.

Various neurotransmitters like Pancreatic Polypeptide and Neuropeptide Y are also present. Some sensory C fibres contain Neuropeptide substance P, which is present in the spheno-palatine ganglion, near the blood vessels, just below the surface epithelium.

REFLEXES

Reflexes are mediated through the brain-stem but axon reflexes occur via the sensory nerve alone.

A. Axon Reflexes

Substance P is a vaso-dilator which transmits the anti-dromic reflex due to the mechanical irritation.

B. ***Reflexes from the nasal stimuli***

Chemical irritation, temperature change and physical stimuli cause cardio-vascular and respiratory responses. It depends on the intensity of the stimulus and ranges from sneezing to cardio-respiratory arrest.

C. ***Naso-pulmonary Reflexes***

It means increasing airflow through one side of the nose associated with ventilation of the same side lung.

Nasal blowing causes bronchiolar smooth muscle relaxation on the same side and elevates the respiratory activity.

D. Reflexes acting on the nose

Exercise, emotion, stress causes vaso-constriction. Nasal vaso-constriction occurs with elevated arterial CO_2 and hence, hyperventilation causes nasal congestion.

CUTANEOUS STIMULATION

Warming the skin of the feet, arm, neck increases the nasal resistance. Pressure to the axilla or lying on the dependent side will cause nasal congestion.

3.10. BIOPHYSICS OF THE AIRFLOW

NASAL RESISTANCE

The nasal resistance is highly influenced by a resultant vascular response and erectile tissue function that is regulated solely by the Autonomic nervous system, much by the sympathetic nervous system.

Components of nasal resistance

- Nasal vestibule (the external nasal valve)
- Lower lateral cartilage – posterior end
- Nasal septum
- Inferior and middle turbinates (the internal nasal valve)

The various factors that are known to modify the nasal resistance have a considerable effect and can result in pathological states. They include:

- Age
- Exercise
- Respiration
- Nasal Cycle

- Posture
- Nasal reflexes
- Skin and air temperature
- Emotional response
- Psychological response

Airflow is mandatory to find out obstruction.

If there is change in velocity of the air flow, reversible pressure changes occur.

It is described by Bernoulli's equation:

$$\mathbf{P + \tfrac{1}{2}\rho V^2 = constant},$$

P - Pressure

ρ - Density

V – Volume

This is not strictly applicable though.

Nose has variable cross sections and hence pressure and velocity will alter continuously.

Reynolds's Number $R_e = dv\rho/\eta$

d - Diameter,

v - Velocity,

ρ - Density and

η – Viscosity of the fluid.

Reynolds's number varies from 2000 to 4000, flow changes from streamlined to turbulent.

3.11. VARIATION OF AIRFLOW WITH RESPIRATION

Inspiration

Airflow is directed upwards and backward initially from the nasal valve, mainly the anterior part of the inferior turbinate.

It splits into below and over the middle turbinate, then goes to the posterior choana.

A) INSPIRATORY AIR FLOW

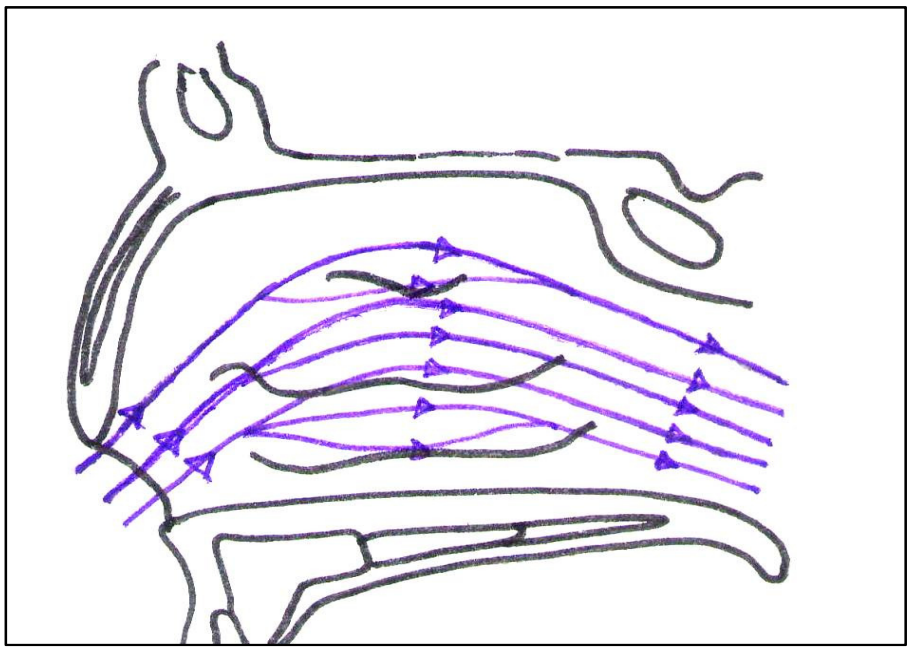


Fig.6: Inspiratory Air Flow

Inspiratory air currents pass vertically up through the anterior nares at the rate of 2 to 3 m/s. The flow converges to a laminar pattern at a velocity of 12 to 18 m/s at the narrowest point viz. the nasal valve after which the flow becomes horizontal. Laminar flow is important for cleaning and conditioning of air. Most of the air conditioning

occurs along the middle meatus and the floor of the nose, but eddying occurs in the olfactory area.

Expiration

Longer than the inspiration, flow is turbulent as is the nature of the extra pulmonary airflow, because the direction changes and airway varies, hence the walls of the nasal cavity are not smooth.

For example, in inferior turbinate hypertrophy, surface area is enlarged by both the turbinates and micro-anatomy of the epithelium is altered and Reynolds's number is exceeded.

A) EXPIRATORY AIR FLOW

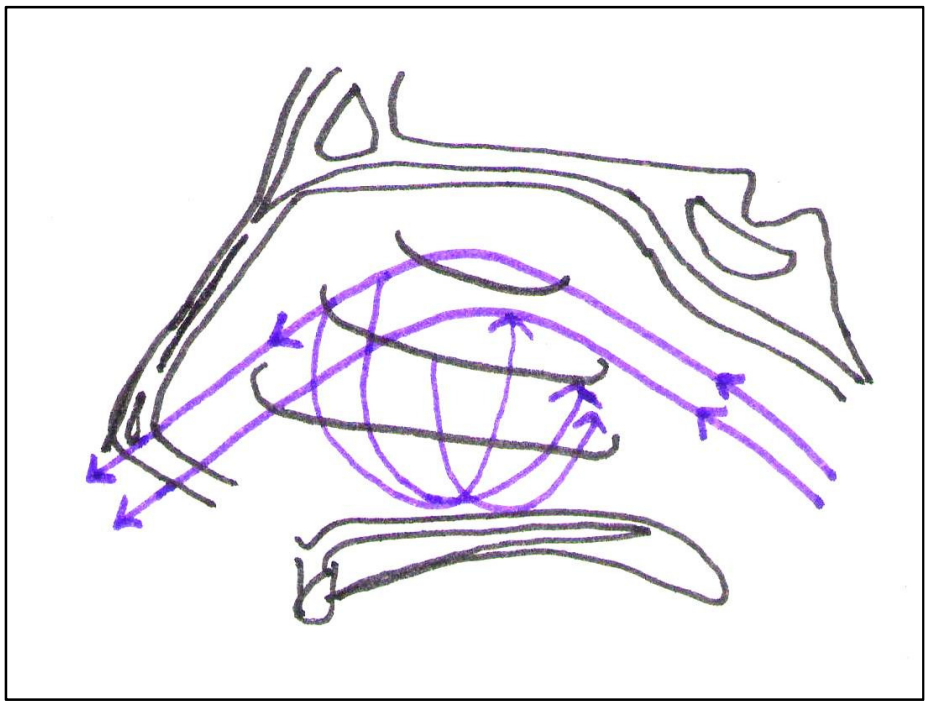


Fig.7: Expiratory Air Flow

Expiratory air currents are most turbulent, with air flowing through the nasal cavity, sweeping inspired air out of the olfactory region, producing eddies in the middle meatal region.

3.12. OBJECTIVE METHOD OF MEASURING NASAL RESISTANCE

ACOUSTIC RHINOMETRY

It is done by measuring the cross sectional area of the nasal cavity by presenting a shock wave to the nasal airway and measuring the reflected sound and is measured during inspiration and apnoeic phases.

Normally inspiration to apnoeic cross sectional area ratio is 1. Ratio less than 1 during inspiration indicates significant nasal valve collapse. Low cross sectional area during both inspiration and apnoea indicates fixed obstruction.

RHINO-MANOMETRY

Described by Coutade in 1902, it measures the trans-nasal air flow and pressure allowing the calculation of the nasal resistance. Trans-nasal pressure on both sides of the nose and flows can be added to obtain the total nasal airflow for that pressure. In a graph, with pressure on x – axis and flow on y – axis, greater the pressure to flow ratio, closer will be the curve to the pressure axis, that is more obstructed and converse is also true.

Both are obtained for experimental purposes, not considered standard of care while evaluating a patient for nasal obstruction.

PRESSURE FLOW CHANGES FOR NASAL RESPIRATION

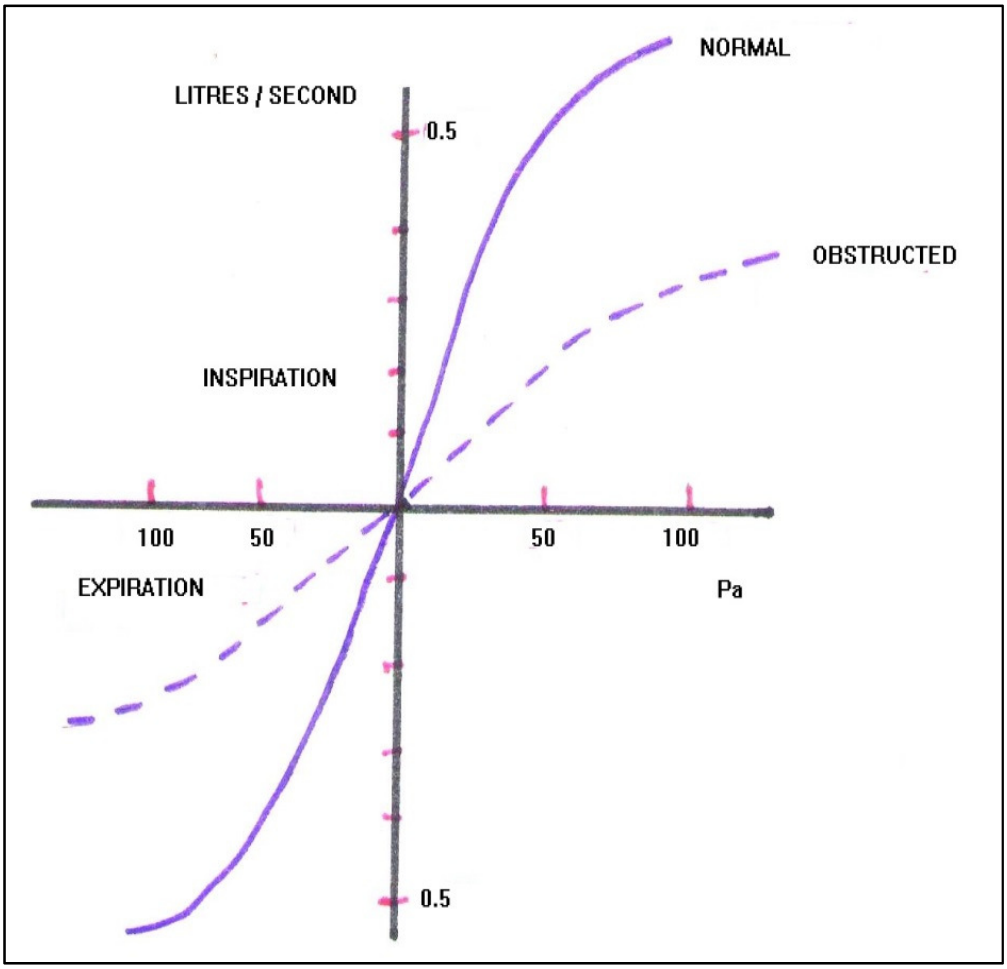


Fig.8: Pressure Flow Changes for Nasal Respiration

3.13. PATHOLOGY

Physiologically, the nasal mucosa of the turbinate swells as a part of the nasal cycle but Inhalant allergens, airborne irritants and infection lead to mucosal hyper-activity and can exacerbate this physiological swelling into pathological causing hypertrophy of mucosal or osseal part of the turbinate.

Sensation of appropriate nasal airflow depends on upper airway resistance. Both excessively high and low resistances lead to subjective complaints of nasal obstruction.

Therefore patients with injured mucosa or absence of inferior turbinate may present with nasal obstruction inspite of wide patent nasal airway on examination.

MECHANISM

Chemical or mucosal irritation of inferior turbinate leads to rapid inflammatory response primarily by the activation of mast cells, basophils and other leucocytes which leads to swelling of the turbinates, primarily in the lamina propria, that is the place of venous sinusoid (where the venous sinusoids reside).

The turbinate and the other nasal mucosa undergo cyclic side to side engorgement known as the nasal cycle.

It lasts from 4 to 12 hours but does not affect the total nasal resistance.

3.14. CAUSES OF NASAL OBSTRUCTION

INTRINSIC

- Allergic Rhinitis
- Perennial Rhinitis
- Vasomotor rhinitis
- Exacerbatory Rhinitis

SYSTEMIC

- Cystic fibrosis
- Wegener's granulamatosis
- Sarcoidosis

- Rhinoscleroma
- Lymphoma
- Fungal Infections

MEDICAL

- Aspirin exacerbated respiratory disease
- Non- Steroidal Anti- Inflammatory Drugs
- Angiotensin Converting Enzyme Inhibitors
- Adreno-ceptor antagonists
- Methyl dopa
- Beta blockers
- Oral Contraceptive pills

TRANSIENT

- Normal fluctuation seen during menstrual cycle and pregnancy
- Previous rhinoplasty leading to valve collapse

LIFESTYLE

- Smoking – impairs Muco-ciliary clearance
- Cocaine abuse – destruction of nasal support structures

Since Allergic Rhinitis is often associated with Inferior Turbinate Hypertrophy, it is elaborated as under

3.15. AETIO – PATHOGENESIS OF ALLERGIC RHINITIS

This is complex, involving cell mediators like the cytokines, chemokines, neuropeptides and adhesion molecules which cooperate in a complex network to produce the specific symptoms of allergic rhinitis and the nonspecific hyperactivity.

The reaction can be considered in four phases.

1. Sensitization

2. Early phase reaction

3. Late phase reaction

4. Systemic activation.

1. SENSITIZATION

This involves the capture of allergen in an atopic individual by dendritic antigen presenting cells called the Langerhans cells and the maturation of these cells and subsequent antigen processing which are then presented to the native resting T cells in local lymph nodes .the latter mainly into helper T_2 cells at the site of allergic response which secrete cytokines,mainly Interleukins-4,5 and 13 which also stimulate Immune globulin E (IgE) production by B cells.

2. EARLY PHASE

The early phase of the subsequent reaction to an allergen involves binding of IgE (Immuno globulin E) to mast cells, cross-linking of bound IgE by allergen which promotes degranulation of mast cells and release of mediators: histamine, leukotriene C4 and prostaglandin D2 causing sneezing, rhinorrhea, pruritus and nasal obstruction.

Other cytokines may be involved in the regulation of the IgE response.

3. LATE PHASE

The late phase immune response, occurring in approximately half of exposed patients, involves the ingress of eosinophils, basophils, mastcells, T lymphocytes,

neutrophils and macrophages into local tissues, all of which contribute to the inflammatory response which presents as nasal obstruction and hyper reactivity.

EOSINOPHILS

Eosinophils have a pro-inflammatory role. Granulocyte Monocyte Colony Stimulating Factor (GM-CSF), Interleukin-5 and eotaxin, released by mast cells, are all involved in eosinophil recruitment, maturation and activation.

Eosinophils secrete a number of products which increase vascular permeability,mucous secretion and cause further inflammatory cell influx as well as toxic products which may alter surface nasal epithelium.

STRUCTURAL ENDOTHELIAL CELLS

Structural endothelial cells participate in the recruitment of leucocytes by releasing chemotactic factors and modulating adhesion molecules. Like epithelial cells they possess H_1 receptors which are activated by histamine.

EPITHELIAL CELLS

Epithelial cells apart from their barrier and muco- ciliary clearance functions also release chemokines,cytokines,eicosanoids and endopeptidases.

FIBROBLASTS

Fibroblasts also produce cytokines and chemokines.

NEUTROPHILS

There is evidence of minor up regulation in allergic reactions.

4. **SYSTEMIC ACTIVATION**

Antigen stimulation in the nose and lungs causes the release of eosinophil precursors from the bone marrow which circulates to both sites.

3.16. Therapy of Inferior Turbinate Hypertrophy

All pathological enlargement of turbinate indicate the necessity of surgery.

Surgery is only indicated after six months of conservative therapy if there is no subjective or objective success.

Main aim of the turbinate surgery is the preservation of functioning mucous membrane and creating a large airspace to ensure humidification, purification of air and maintenance of physiological airway resistance at the same time.

Patient should have relief of symptoms on clinical examination with good healing effect without any oedema, nasal crusting, bleeding and dryness of nose and throat.

3.17. Surgical Options

There are many a number of surgical modalities employed for the treatment of inferior turbinate hypertrophy that is refractory to medical treatment and they include:

- Chemo- coagulation
- Thermal coagulation
- Lateralization
- Partial Resection
- Injection of cortico-steroids
- Injection of sclerosing agents
- Vidian neurectomy

- Conventional Inferior Turbinectomy
- Micro-debrider assisted inferior turbinate reduction
- Inferior turbinate outfracture
- Sub mucous resection (SMR)
- Electro-cautery
- Argon plasma surgery
- Temperature controlled radio-frequency ablation of the turbinate (TCRFA)
- Carbon-di-oxide laser ablation
- Harmonic Scalpel
- Cryosurgery
- Coblation Technique

A) Inferior Turbinate out-fracture

- A blunt elevator is here used to fracture the conchal inferior bone laterally. This is usually done simultaneously with other procedures for better outcome.
- Very minimal morbidity

B) Sub-mucous resection of the inferior turbinate

- This involves the removal of underlying erectile tissue and conchal bone.
- An incision is made in a posterior to anterior fashion along the inferior border of anterior two thirds of the inferior turbinate.
- Muco-periosteal flaps are then elevated exposing the inferior turbinate bone.
- Resection of bone is done using turbinate scissors, Jansen- Middleson rongeur or Takahashi forceps.
- Flaps are then approximated and nasal packing is done.

C) Electro-cautery

It is a spectrum of procedures that includes

a) Mono-polar cautery

b) Bipolar cautery

c) Sub-mucous diathermy

- Surface Electro-cautery (mono and bipolar cautery) has a tendency to injure the mucosa of the inferior turbinate causing nasal crusting and dryness.
- Sub-mucous diathermy involves inserting an insulated needle electrode into the inferior turbinate extending sub-mucosally into the posterior aspect of the same.
- 5 to 10 seconds of activation of diathermy while needle is withdrawn from the turbinate, completes the procedure.

D) Temperature controlled radio-frequency ablation of the turbinate (TCRFA)

- It consists of a radio-frequency control unit that delivers variable energy levels at controlled temperate and hence the name.
- The tissue heats up to a resistance at a temperature of 60 to 90^0C.
- Inferior turbinate reduction is achieved by
  a) Contraction of area of fibrosis
  b) Resorption which occurs over a longer time

E) Carbon-di-oxide laser ablation

- With minimal blood loss as its major advantage, it cuts, coagulates and vapourises the tissues thereby achieving reduction of the inferior turbinate.

F) Cryosurgery

- This involves placing a cryo-probe on the medial and lateral surfaces of the inferior turbinate for 60 seconds leading to local freezing and controlled destruction of the tissues.
- This causes sequence of events as listed below resulting in reduction of inferior turbinate:
  a) Intra cellular dehydration
  b) Alteration of intra cellular pH
  c) Increased concentration of electrolytes
  d) Denaturation of cell membrane lipoproteins
  e) Disruption of nuclear and cell membranes
  f) Thermal shock
  g) Arrest of respiratory function of cell
  h) Ischemic infarction
  i) Cryo- injury
- Highly effective in patients with vasomotor rhinitis.
- Multiple treatments may be required

G) Coblation Technique

- Also referred to as an electro-dissociation procedure, it is a direct extension of standard electrosurgical techniques which employs an oscillating electrical current to disrupt the surrounding tissue.
- The electrodes at the tip of the coblation probe serve as a source if radio frequency energy which is conducted through conductive medium (normal saline or gel).
- This is used to deliver the electrical energy.
- Radio frequency excites the saline solution creating a field of Na+ ions that are able to dissociate the tissue molecular bonds. Due to steady flow of saline from the probe, the system generates relatively low tissue temperature of 40 to 70 degree Celsius compared to that of standard electro-surgery (400-600 degree C) thus sparing the healthy tissue.
- It also allows haemostasis through the coagulation option.

A Glimpse from the past

1) Article in German Lorenz KJ Marsh

Conducted micro debrider assisted inferior turbinoplasty with conventional partial inferior turbinectomy. The results revealed that turbinoplasty has advantage of short healing time with minor post-operative complications and good functional outcome.

2) Van Del den MR, Cook PR, and Davis.

They compared micro- debrider assisted inferior turbinoplasty with other techniques of inferior turbinectomy. They observed post- operative improvement of nasal

patency by rhino- manometry was better with micro- debrider assisted inferior turbinoplasty compared with inferior turbinectomy.

3) Hatem Badran et al:

Two groups of equal number were taken based on the procedure done (inferior turbinectomy and inferior turbinoplasty) and studied. The results showed that partial inferior turbinectomy was better as it was associated with less blood loss and complications.

4) Thimmaiah, Vidya B

Conducted post-operative endoscopic evaluation on 30 patients on whom either inferior turbinectomy or turbinoplasty was done and observed that both procedures had comparable success rates. But they considered inferior turbinectomy better compared to turbinoplasty as complete removal of turbinate bone resulted in lower recurrent obstructive symptoms.

5) Chen YL, Tan CT, Huang HM

They studied 160 patients with perennial allergic rhinitis and hypertrophic inferior turbinates to evaluate the long-term efficacy of micro-debrider-assisted inferior turbinoplasty compared to turbinectomy. They concluded that Micro-debrider-assisted inferior turbinoplasty appears to be as effective as turbinectomy at relieving nasal symptoms and decreasing total nasal resistance in patients.

6) Huang TW, Cheng PW

They conducted a prospective study on 50 patients with perennial allergic rhinitis who had substantial inferior turbinate hypertrophy and who underwent micro-debrider-assisted inferior turbinoplasty with follow-up 1 year after surgery.

Results suggested that micro-debrider-assisted inferior turbinoplasty is effective for decreasing symptoms.

7) Friedman M, Tannery H, Lin J, Landsbergis R, Caldarelli D:

They studied 120 patients with nasal obstruction due to ITH who underwent sub mucous inferior turbinate resection using micro-debrider. They observed that micro-debrider allows precise and incremental tissue removal, preserving the mucosa, thereby preventing complications associated with turbinectomy.

4. MATERIALS AND METHODS

STUDY DESIGN	Prospective Cohort Study
STUDY PLACE	Department of Otorhinolaryngology Government Stanley Medical College Hospital (GSMCH), Chennai – 01.
STUDY PERIOD	March 2012 – October 2013
SAMPLE SIZE	60 patients
FOLLOW UP PERIOD	6 months

The study was conducted in 60 patients who attended the out-patient department of Otorhinolaryngology in The Government Stanley Medical College Hospital, Chennai- 600001. The study period was from March 2012 to October 2013.

Ethical committee clearance and approval was obtained prior to the commencement of study.

Data Analysis was performed using EpiInfo software version 7.0 downloaded from the CDC website.

4.1. FORMULATION OF HYPOTHESIS

NULL HYPOTHESIS

There is no significant difference between the outcomes of the two surgical techniques i.e. Inferior turbinectomy and Micro- debrider assisted Inferior turbinoplasty.

ALTERNATE HYPOTHESIS

There is significant difference between the outcomes of the two surgical techniques i.e. Inferior turbinectomy and Micro- debrider assisted Inferior turbinoplasty.

4.2. SELECTION CRITERIA

- Age more than 20 years and less than 45 years.
- Sex: Both male and female patients were considered for the study.
- Patients clinically presenting with Inferior Turbinate Hypertrophy and Nasal Obstruction with or without allergic rhinitis were taken up.
- Patients with ostio- meatal complex involvement were excluded from this study
- Patients with previous history of nasal surgeries were excluded from this study.
- After getting the informed consent duly signed, these patients were subjected to detailed systemic and ENT examinations.

4.3. PRE-OPERATIVE ASSESSMENT

Clinically patient should have a symptom of nasal obstruction.

CT Para Nasal Sinuses: To rule out any ostiomeatal complex involvement.

INVESTIGATIONS FOR ANESTHETIC ASSESSMENT:

- ***Complete Blood Count***

  Total Leucocyte Count

  Differential Count

  Haemoglobin

  Erythrocyte Count

  Erythrocyte Sedimentation Rate

  Mean Corpuscular Volume

  Mean Corpuscular Haemoglobin

  Mean Corpuscular Haemoglobin Concentration

  Platelet Count

- ***Renal Function Tests***

  Random Blood Glucose

  Blood Urea

  Serum Creatinine

- ***Coagulation Profile***

  Bleeding Time

  Clotting Time

  Prothrombin Time

  Activated Partial Thrombo-plastin Time

  International Normalised Ratio

- ***Viral Markers***

  HIV (Human Immuno – deficiency Virus)

  HBsAg (Hepatitis B surface Antigen)

  Anti HCV (Hepatitis C Virus) antibody

- Blood grouping and Rh typing
- ***Urine Examination***

  Colour

  Specific Gravity

  Erythrocytes

  Deposits

  Casts
- Chest X-ray PA (Postero-Anterior) view
- ECG (Electro Cardio Gram) in all leads

4.4. ANTERIOR RHINOSCOPY

With Thudichum's Nasal Speculum, Anterior Rhinoscopy is performed.

Hypertrophied Inferior Turbinate (as seen in Anterior Rhinoscopy)

Fig.9: Anterior Rhinoscopy

4.5. ROLE OF DIAGNOSTIC NASAL ENDOSCOPIC EXAMINATION

Under Local Anaesthesia, 4% Xylocaine with adrenaline soaked nasal packs are kept for 10 – 15 minutes as stated below:

1. In the floor of the nose
2. In the middle meatus
3. Posterior end of the middle turbinate and septum

After removing the packs, 0^0 endoscope is then passed and the following structures are then examined on both sides subsequently.

FIRST PASS:

- Nasopharynx
- Choanae
- Septum
- Inferior Turbinate
- Inferior Meatus

SECOND PASS

- Sphenoid Sinus ostium
- Spheno-ethmoidal recess
- Superior Turbinate
- Superior Meatus

THIRD PASS

- Middle Turbinate
- Middle Meatus

- Uncinate
- Bulla Ethmoidalis
- Accessory Ostia.

INFERIOR TURBINATE HYPERTROPHY AS SEEN IN DIAGNOSTIC NASAL ENDOSCOPY:

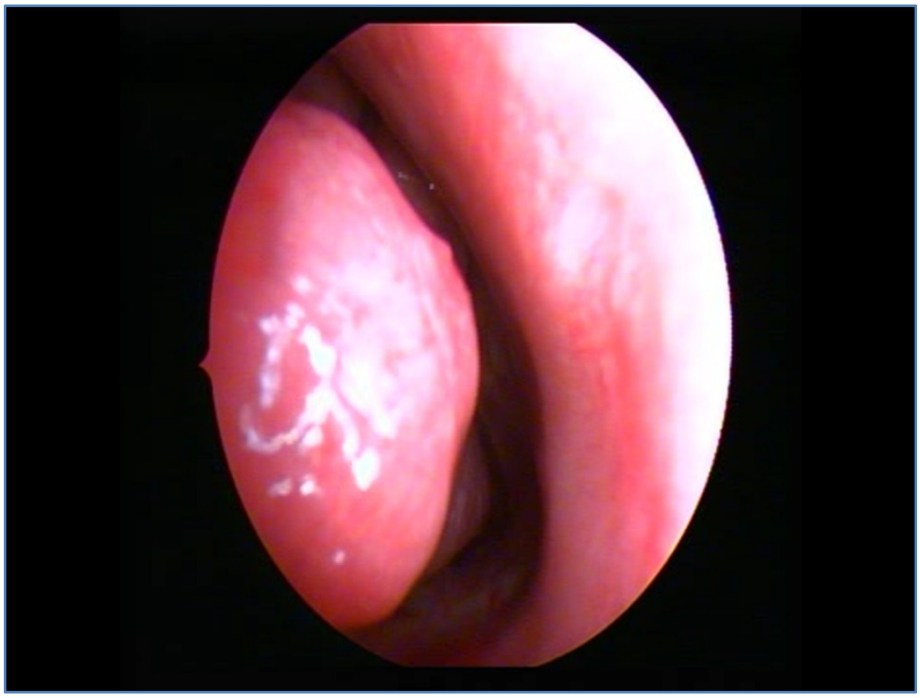


Fig.10: Inferior Turbinate Hypertrophy

RADIOLOGICAL IMAGING OF PARA NASAL AIR SINUSES SHOWING INFERIOR TURBINATE HYPERTROPHY:

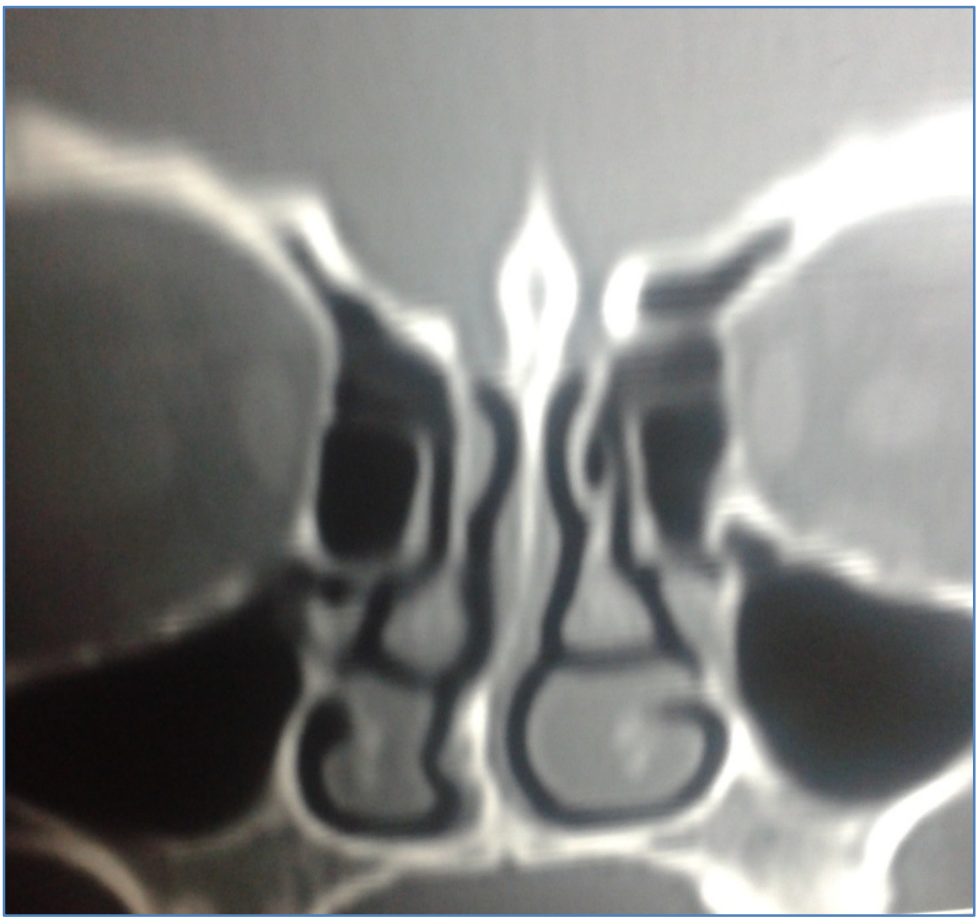


Fig.11: CT Para nasal Air Sinuses Showing Inferior Turbinate Hypertrophy

4.6. SURGICAL TECHNIQUES

Conventional Inferior Turbinectomy:

INSTRUMENTS USED:

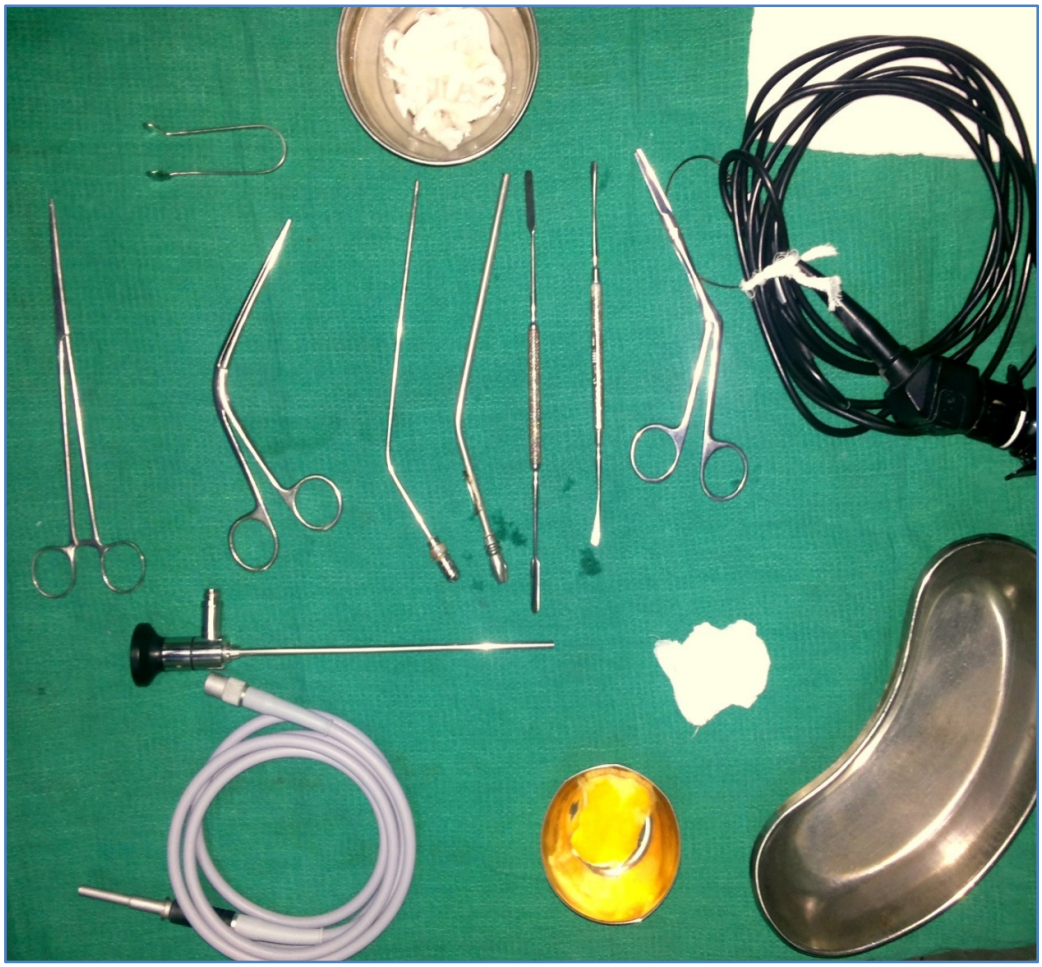
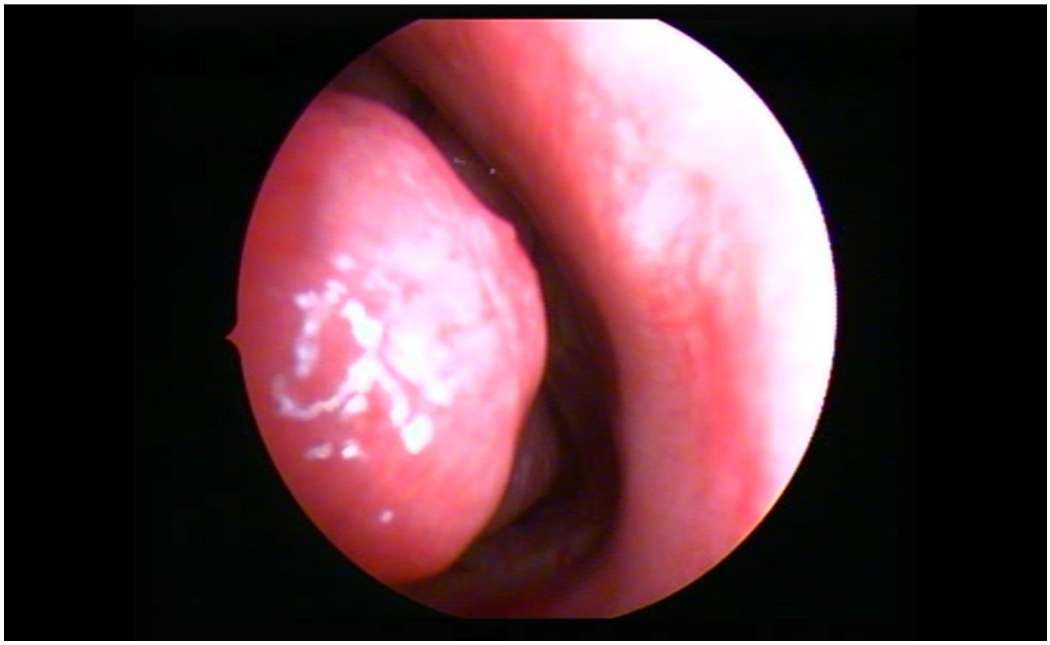


Fig.12: Surgical Instruments for Inferior Turbinectomy

LEGEND:

Fig.12. Top to Bottom:Thudichum's Nasal Speculum, Sterile Nasal Packs, Burkitt's Long Artery Forceps, Tilley's Forceps, Suction Tips, Freer's periosteum elevator, Heymann's Turbinectomy scissors, 0° endoscope.

FIG 13: PRE OPERATIVE ENDOSCOPIC VIEW OF INFERIOR TURBINATE HYPERTROPHY



ANAESTHESIA:

Local/General Anaesthesia

POSITION:

Supine with head end elevated to about 30^0.

SURFACE ANAESTHESIA:

Local infiltration of 2% Xylocaine with 1 in 80,000 dilution adrenaline is given to anterior, middle and posterior end of the inferior turbinate.

PROCEDURE:

- Under 0° endoscopic visualization,
- Using Freer's Elevator, the lower end of the inferior turbinate is elevated.

- Initially anterior 1/3 of the turbinate is crushed followed by crushing the whole turbinate thereof using a Heymann's Turbinectomy scissors.
- Nasal pack soaked in 4% Xylocaine with adrenaline is kept in the operated site and observed for a period of 3 to 5 minutes.
- The pack is removed thereafter and is indicative that complete haemostasis has been achieved.

INTRA OPERATIVE FINDINGS:

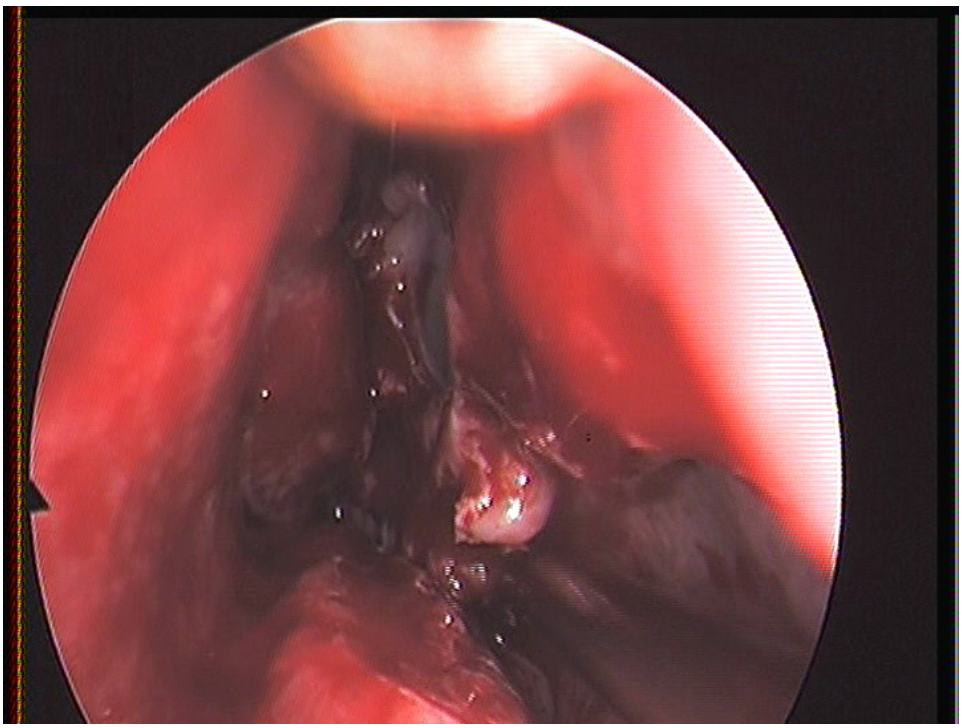


Fig 14: Image showing removal of inferior turbinate

Micro-debrider assisted Inferior turbinoplasty

Fig 15: Surgical Instruments for Inferior Turbinoplasty

LEGEND: From Top to Bottom,

Foot control, Micro-debrider, Blades of Micro-debrider, Suction Tube

The Micro-debrider: The Micro-debrider, also termed as the Vacuum rotatory dissector, soft tissue shaver, hummer is a powered rotatory instrument which offers continuous suction. It has a cannula with a hand piece which is then connected to a motor, foot control and suction apparatus in sequence. It has two parts, the outer blunt tip with a lateral port that offers safety while the oscillating inner cannula with a similar lateral port has a serrated blade which cuts and extracts the soft tissue in a uni-directional oscillatory fashion up to a speed of 3000 rpm maximally.

ANAESTHESIA:

Local/General Anaesthesia

POSITION:

Supine with head end elevated to about 30^0.

SURFACE ANAESTHESIA:

Local infiltration of 2% Xylocaine with 1 in 80,000 dilution adrenaline is given to anterior, middle and posterior end of the inferior turbinate.

PROCEDURE:

- An incision is made in the anterior head of the inferior turbinate and sub-mucosal tunnel is created.
- Sub-mucosal tissue is then removed by introducing the micro-debrider into the created mucosal pouch.
- Now the micro-debrider blade is laterally positioned so as to remove the erectile tissue and to prevent the intact overlying mucosal pocket from being injured.
- Suction Electro-cautery is used to achieve hemostasis when indicated.
- The reduction of the inferior turbinate is immediately appreciated thereof. Post- operative nasal packing done. Kept for 24 hours.

INTRA OPERATIVE FINDINGS:

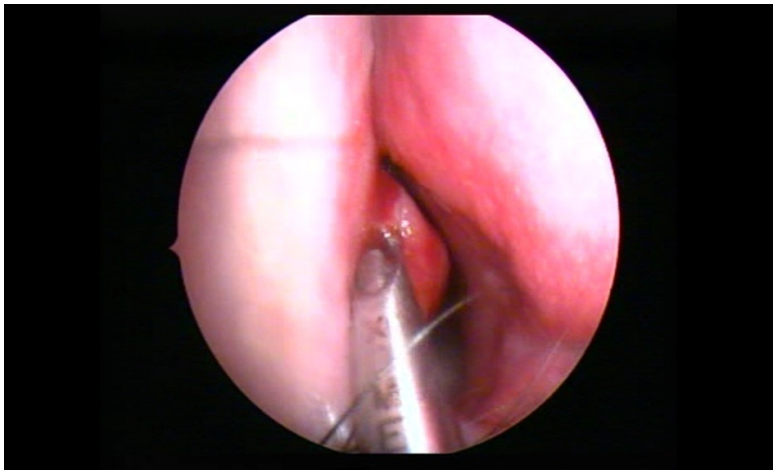


Fig 16: Image showing the incision for micro-debrider assisted turbinoplasty

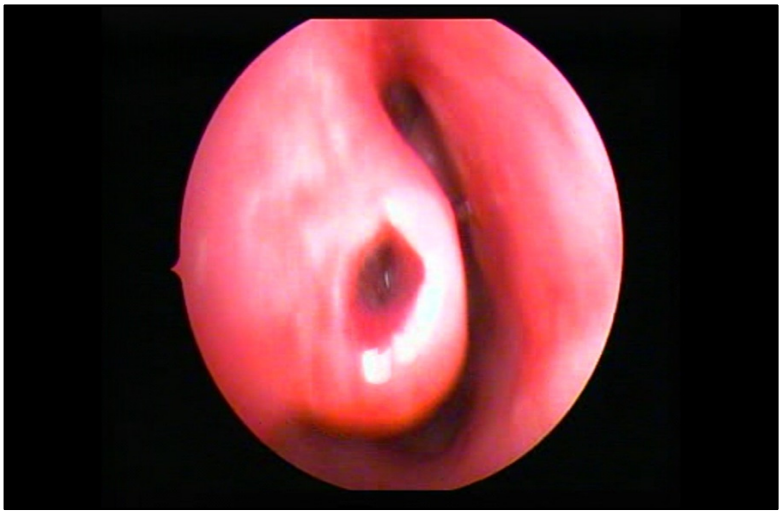


Fig 17: Image showing tunneling of inferior turbinate

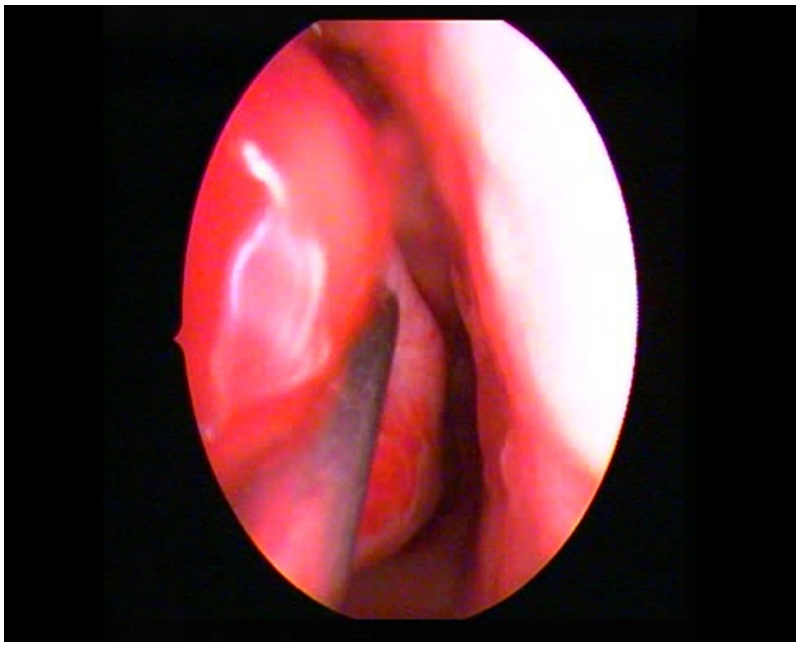


Fig 18: Image showing shrinkage of inferior turbinate

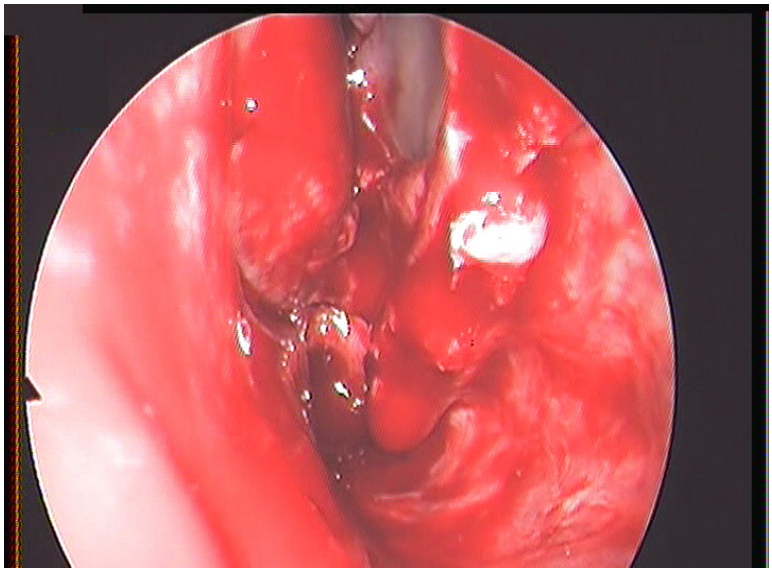


Fig 19: Image showing final step of inferior turbinoplasty

POST OPERATIVE FOLLOW UP:

- The patients who underwent surgery are followed up every 1st weekly, 2nd weekly, 4th weekly, 8th weekly, and on 3rd and 6th months and the healing process is assessed thereof.

POST OPERATIVE ENDOSCOPIC VIEW: (after 6 months)

Fig 20: Status Post Inferior Turbinectomy:

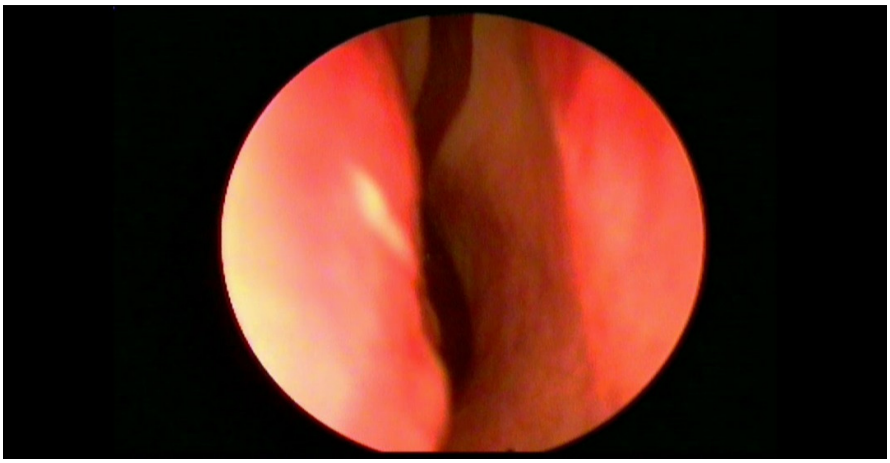
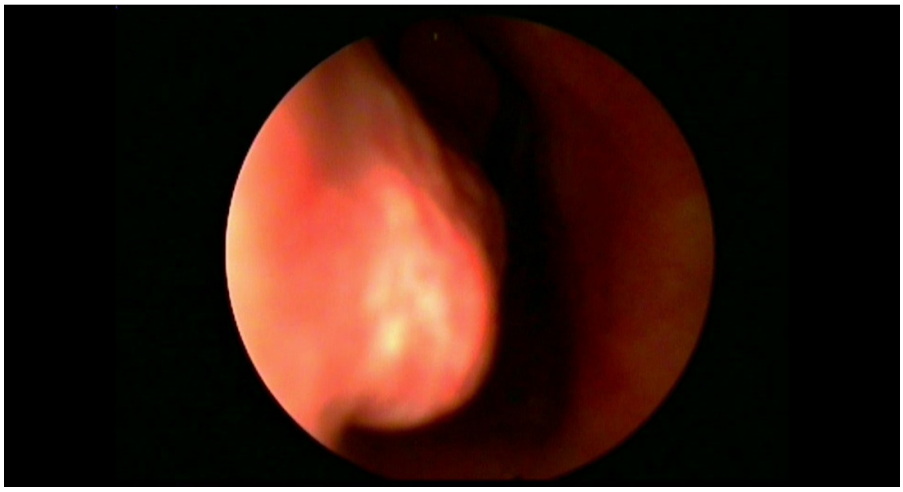


Fig 21: Status Post Inferior Turbinoplasty:



5. RESULTS AND INTERPRETATION

Results were analyzed by questionnaire based on information addressing both the pre-operative and post-operative status of the nasal airway of the patients and associated any symptoms like dryness of nose, throat dryness.

5.1 DISTRIBUTION PARAMETERS

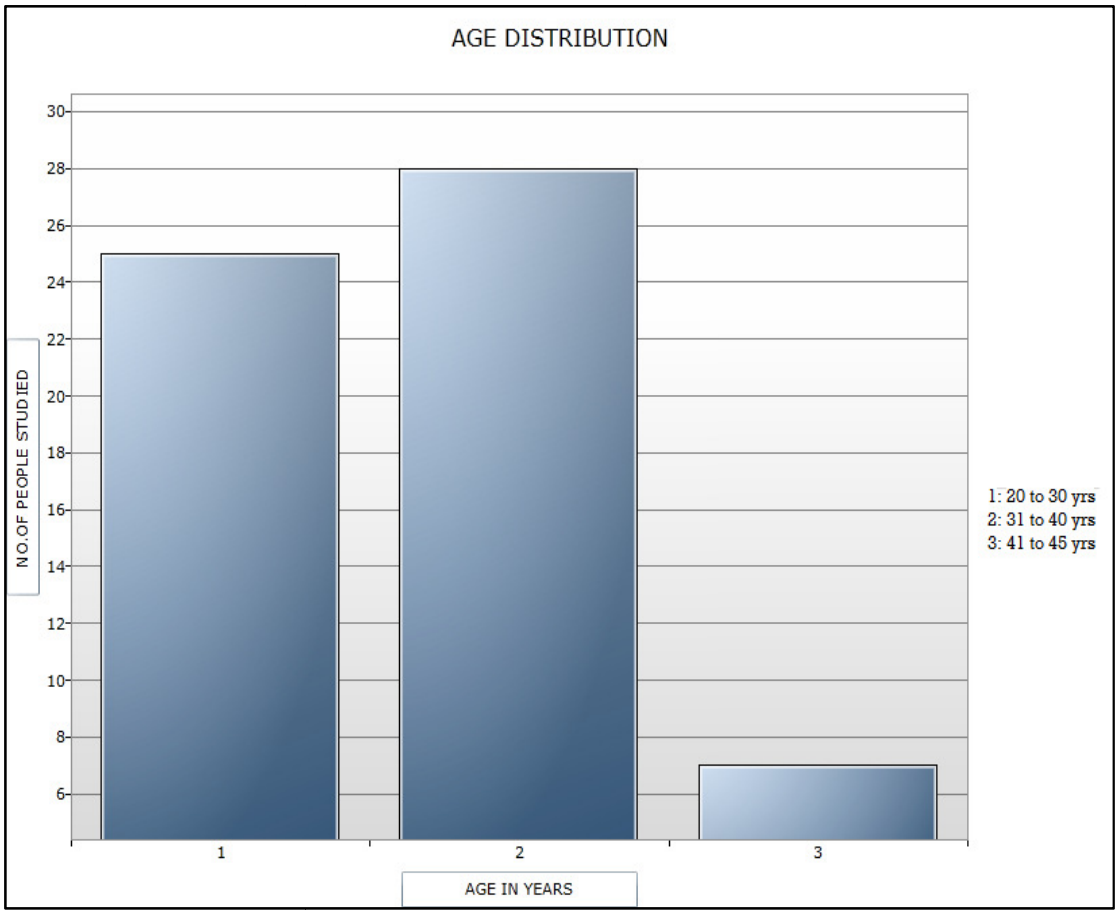
AGE WISE DISTRIBUTION

AGE	FREQUENCY	PERCENT
Group 1	25	41.67%
Group 2	28	46.67%
Group 3	7	11.67%
Total	60	100.00%

SEX WISE DISTRIBUTION

SEX	FREQUENCY	PERCENT
Male	31	51.67%
Female	29	48.33%
Total	60	100.00%

AGE DISTRIBUTION



The patients were stratified according to their age into 3 groups to study in detail the compliance and healing process in detail as

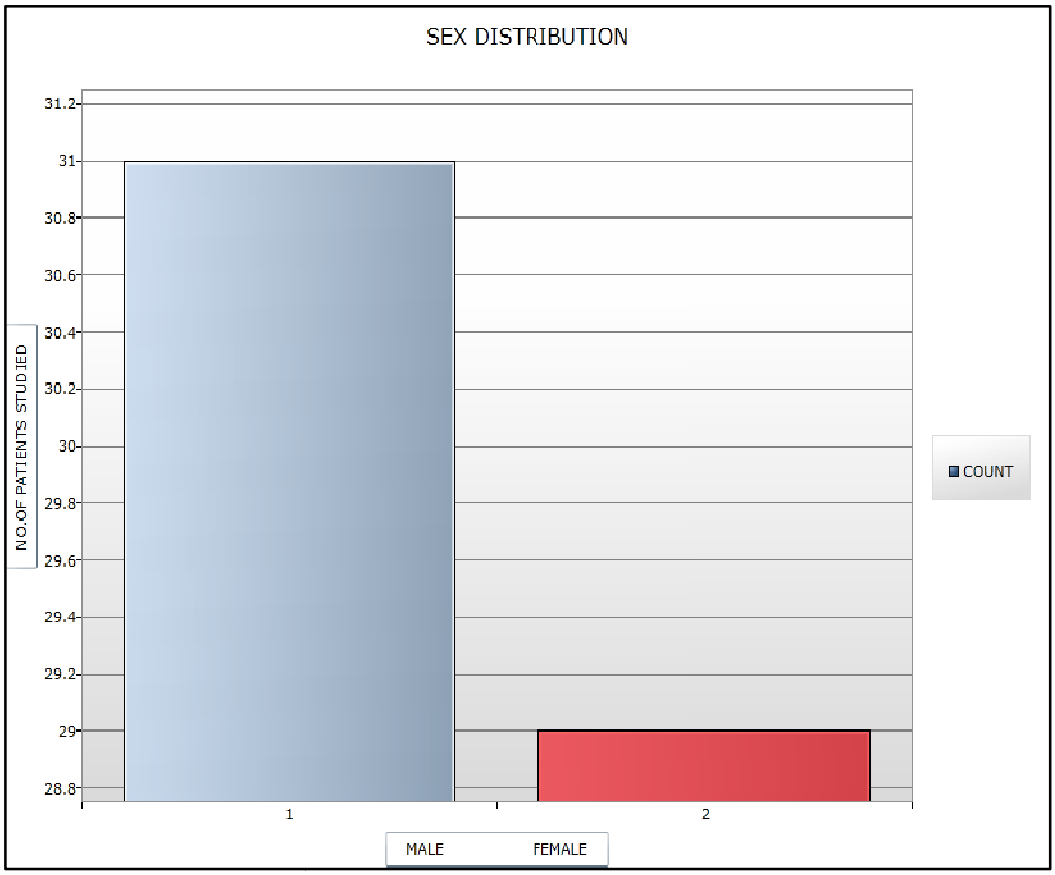
Group 1: 20 to 30 years

Group 2: 31 to 40 years

Group 3: 41 to 45 years

There were 25, 28 and 7 people in these 3 groups respectively.

SEX DISTRIBUTION



The patients were stratified according to their sex into 2 groups to study in detail the distribution pattern of the disease in detail as

Group 1: Male

Group 2: Female

There were 31 and 29 male and female patients respectively.

AGE – SEX DISTRIBUTION

A) FEMALE:

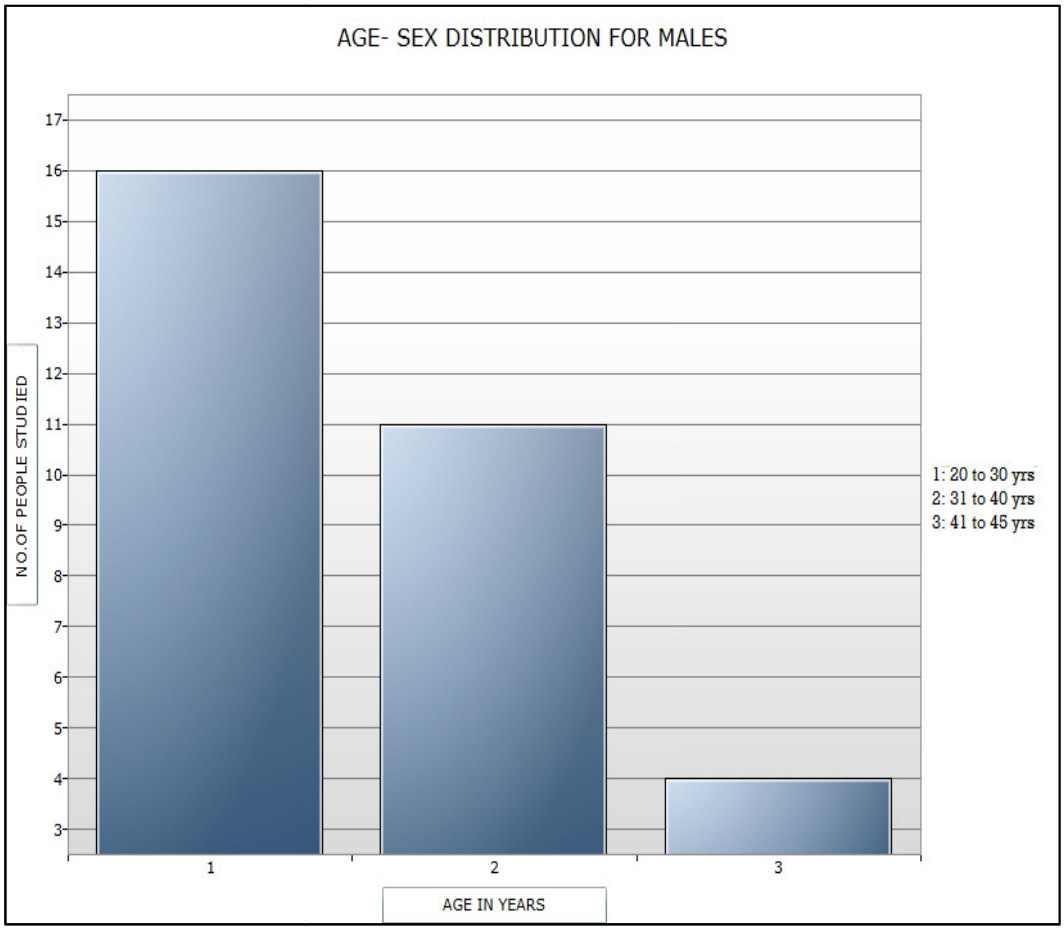
AGE	Frequency	Percent
Group 1	9	31.03%
Group 2	17	58.62%
Group 3	3	10.34%
Total	29	100.00%

B) MALE

AGE	Frequency	Percent
Group 1	16	51.61%
Group 2	11	35.48%
Group 3	4	12.90%
Total	31	100.00%

AGE – SEX DISTRIBUTION FOR MALE

To evaluate and find out the age group that is victimized the most, this graph is constructed.

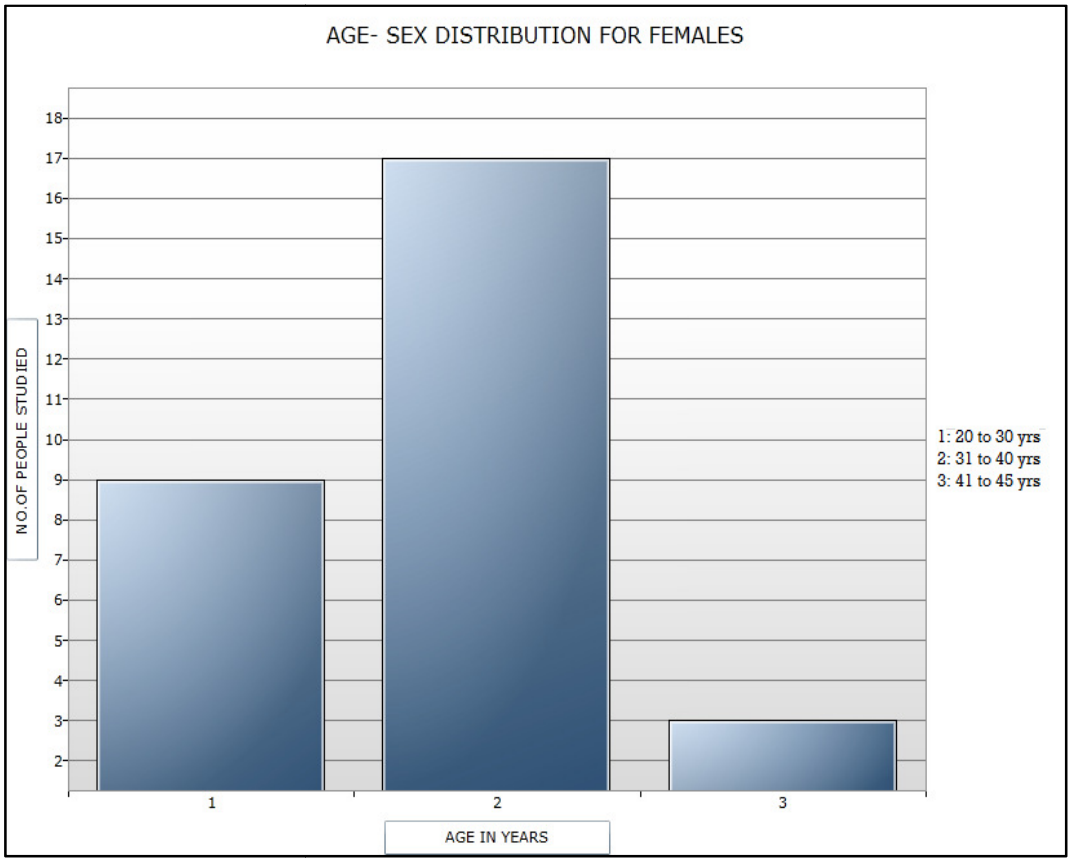


51.61% of the males are in between 20 and 30 years of age, 35.48% of the males are in the Group 2 of age strata viz. between 31 and 40 years of age. 12.90% of the males are in the in the age of 41 to 45 years.

The commonest presenting group in males comprises of individuals between 20 and 30 years of age.

AGE – SEX DISTRIBUTION FOR FEMALES

To evaluate and find out the age group that is victimized the most, this graph is constructed.



31.03% of the females are in between 20 and 30 years of age, 58.62% of the females are in the Group 2 of age strata viz. between 31 and 40 years of age. 10.34% of the females are in the in the age of 41 to 45 years.

The commonest presenting group in females comprises of individuals between 31 and 40 years of age.

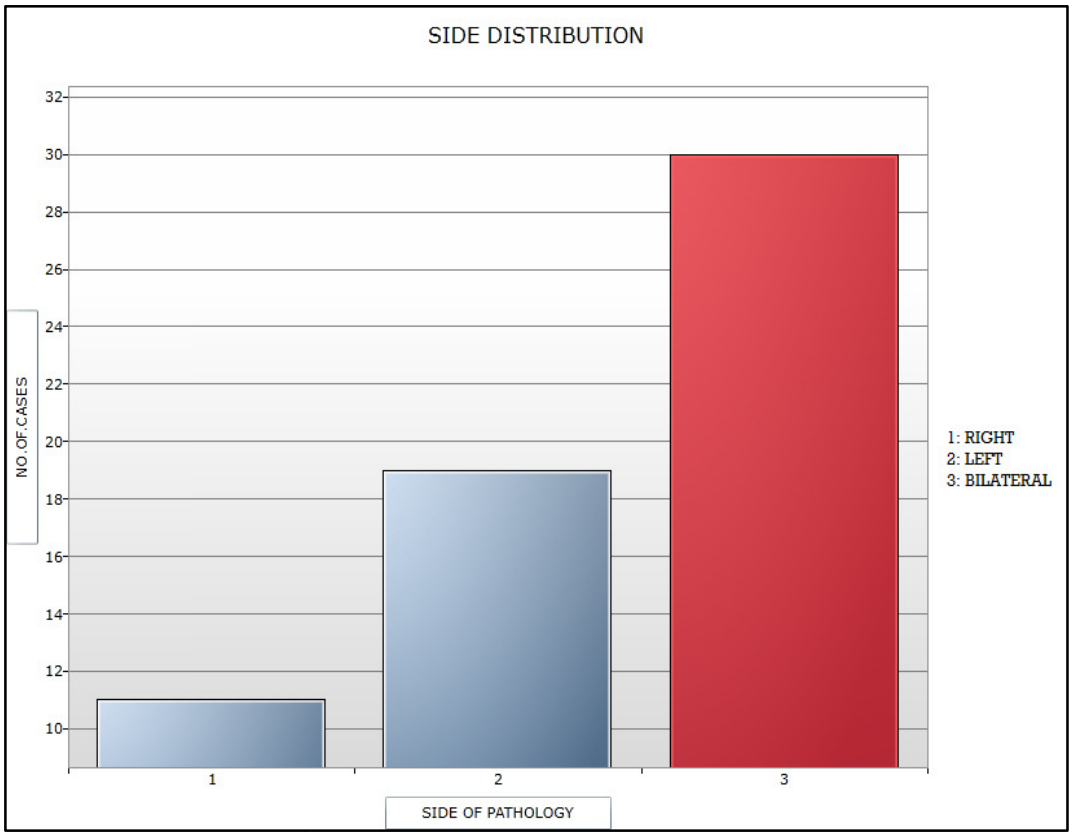
SIDE DISTRIBUTION

SIDE	FREQUENCY	PERCENT
RIGHT	11	18.33%
LEFT	19	31.67%
BILATERAL	30	50.00%
Total	60	100.00%

SEX - SIDE ASSOCIATION

	SIDE			
SEX	RIGHT	LEFT	BILATERAL	TOTAL
MALE	5	6	20	31
FEMALE	6	13	10	29

SIDE DISTRIBUTION



The patients were stratified according to their side of presentation into 3 groups to study in detail the distribution pattern of the side of the disease in detail as

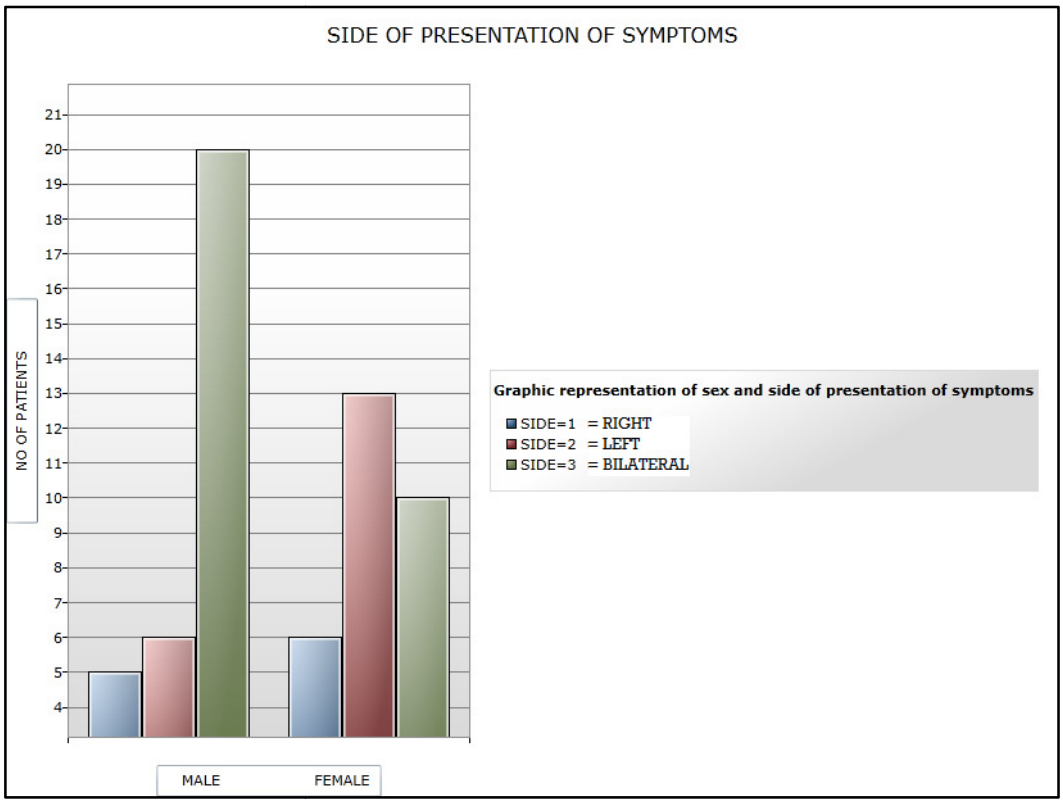
Group 1: Right- sided pathology, Group 2: Left- sided pathology and Group 3: Bilateral presentation. There were 11 and 19 and 30 patients that accounted for 18.33%, 31.67% and 50.00% respectively in Group 1, 2 and 3.

The disease is bilaterally distributed, in higher percent among the patients studied.

SEX AND SIDE ASSOCIATION

To study the side of prevalence of the disease among the sexes, these two parameters were clubbed and their association was studied.

The results are tabulated below.



5 males showed right sided pathology, 6 males showed left sided pathology and 10 males showed bilateral pathology. 6 females showed right sided pathology, 13 females showed left sided pathology, 20 females showed bilateral pathology.

Thus, this confirms that bilateral presentation (50% in total) of the disease is the most common distribution in the study population with respect to sex.

SEX AND SYMPTOM DISTRIBUTION:

The two most commonly presenting complains of the patients were:

1. Nasal Obstruction only
2. Nasal Obstruction associated with Allergic Rhinitis also.

The mode of distribution is analyzed as follows:

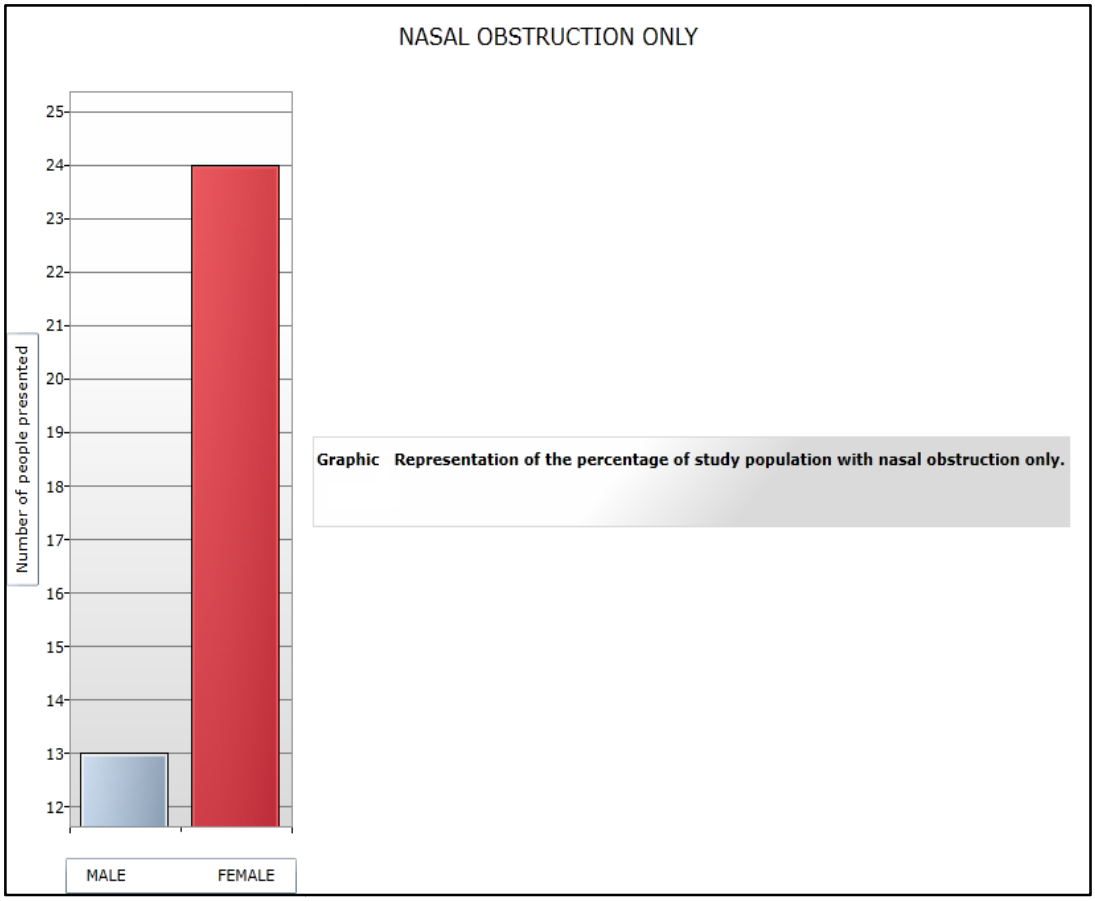
A) Percentage of population with Nasal Obstruction alone

SEX	FREQUENCY	PERCENT
MALE	13	35.14%
FEMALE	24	64.86%
Total	37	100.00%

B) Percentage Of Population With Nasal Obstruction With Allergic Rhinitis:

SEX	FREQUENCY	PERCENT
1	18	78.26%
2	5	21.74%
Total	**23**	**100.00%**

A) Percentage of population with Nasal Obstruction alone as the presenting complaint:

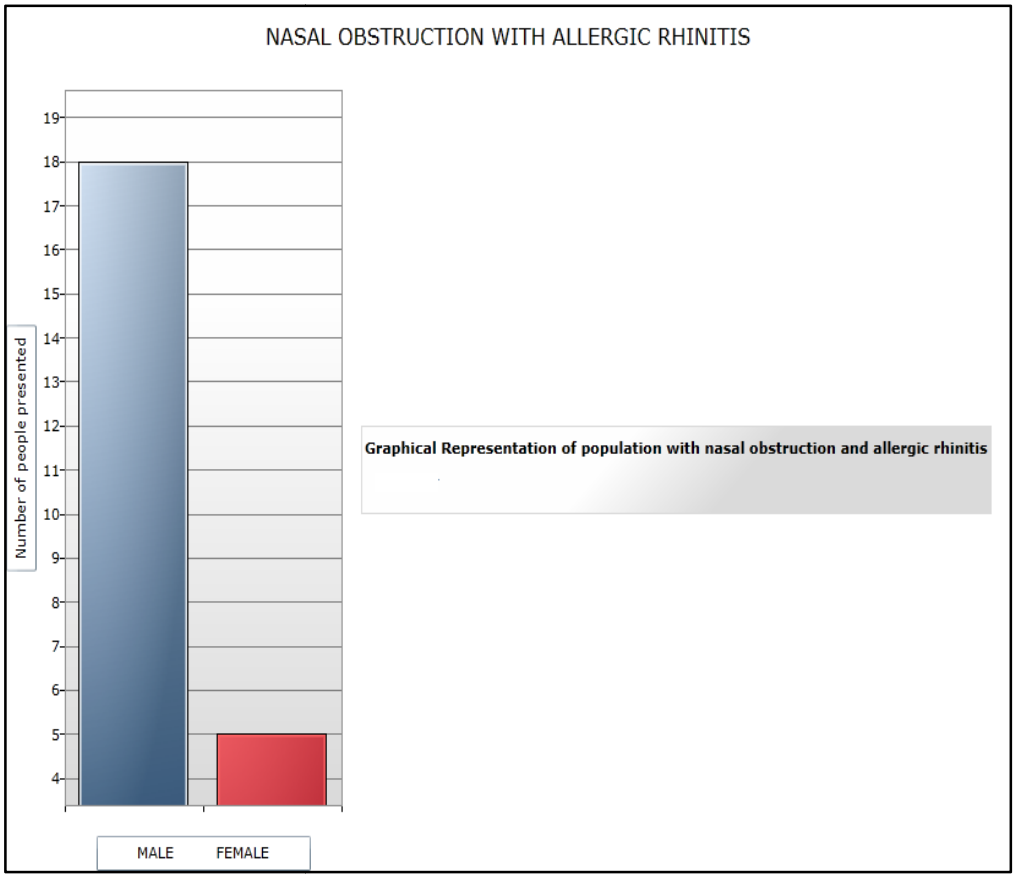


Graphic Representation of the percentage of study population with nasal obstruction only.

Out of the total males under study, 13 presented with nasal obstruction alone and

Out of the total females under study, 24 females presented with the same complaint which accounts for 35.14% and 64.86% respectively

B) Percentage of population with Nasal Obstruction along with allergic rhinitis also as the presenting complaint:



Out of the total males under study, 18 presented with nasal obstruction along with allergic rhinitis also and out of the total females under study, only 5 females presented with the same complaint which accounts for 78.26% and 21.74% respectively.

Nasal obstruction was the commonest presenting complaint in the males whereas it was associated with allergic rhinitis in the females

SYMPTOM – AGE DISTRIBUTION:

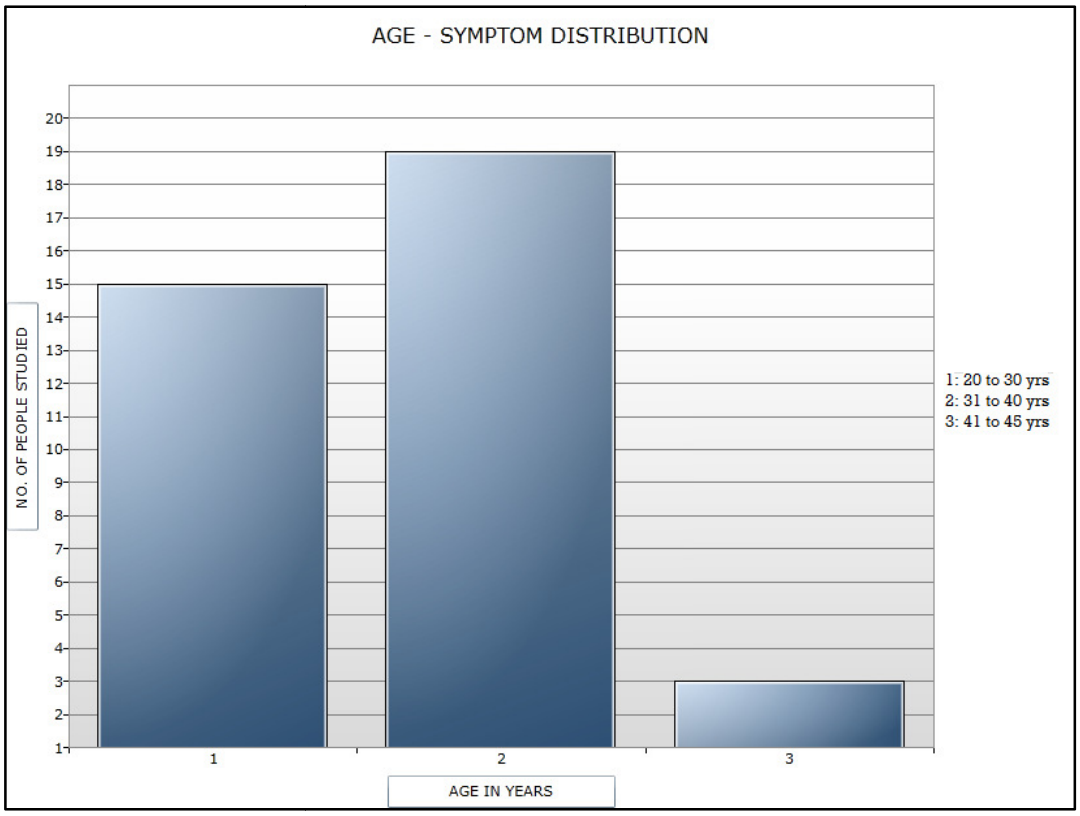
Only Nasal Obstruction

AGE	Frequency	Percent
Group 1	15	40.54%
Group 2	19	51.35%
Group 3	3	8.11%
Total	37	100.00%

Nasal Obstruction and Rhinitis

AGE	Frequency	Percent
Group 1	10	43.48%
Group 2	9	39.13%
Group 3	4	17.39%
Total	23	100.00%

FREQUENCY OF STUDY POPULATION PRESENTING WITH ONLY NASAL OBSTRUCTION BEING STRATIFIED BY AGE

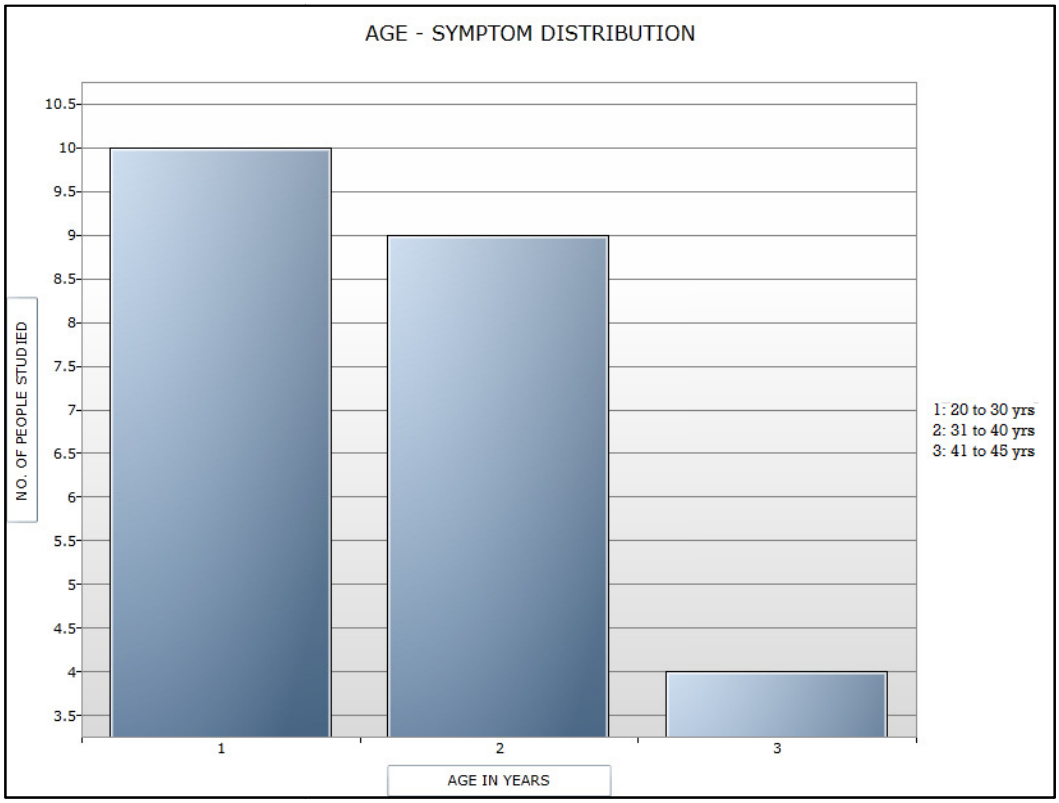


For the sake of finding out the age specific complaint, this distribution is being put.

In those who presented with Nasal obstruction only as their complaint,

15 in number equaling to 40.54% were in 20 to 30 years of age. 19 people of age group 31 to 40 years accounting to 51.35%. A sum of 8.11% i.e. 3 members were in the age group of 41 to 45 years.

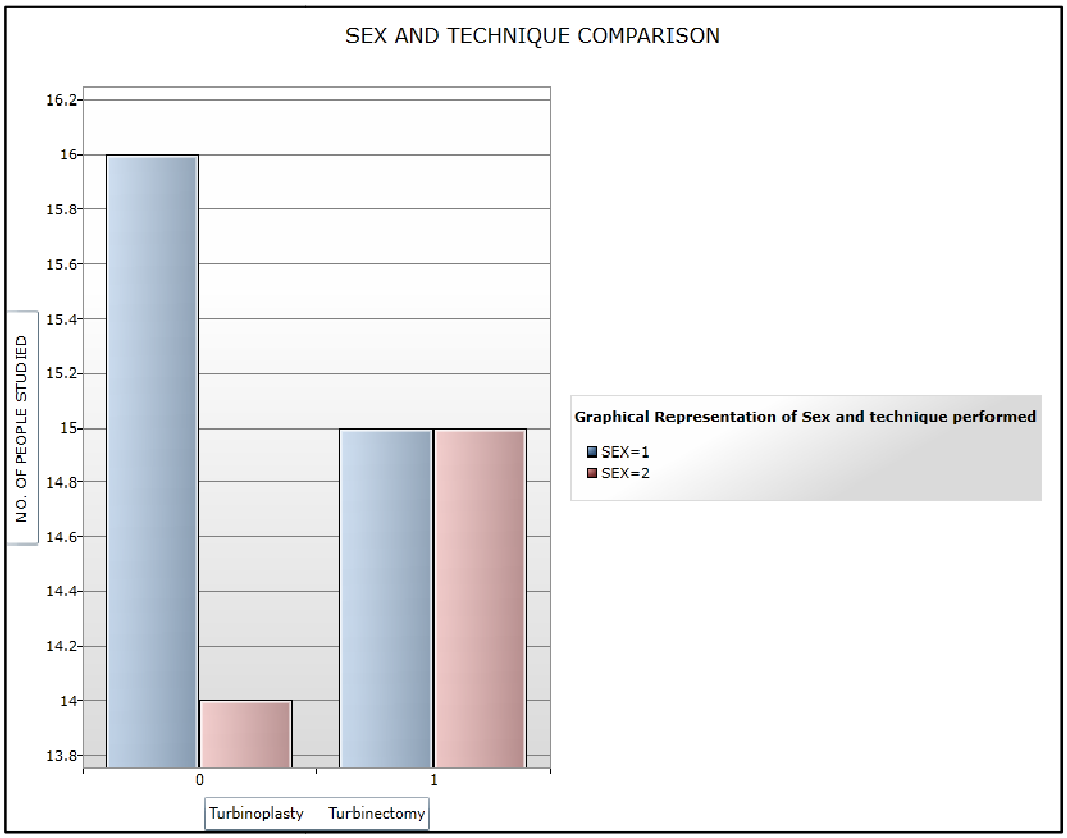
FREQUENCY OF STUDY POPULATION PRESENTING WITH NASAL OBSTRUCTION WITH ASSOCIATED ALLERGIC RHINITIS BEING STRATIFIED BY AGE:



In those who presented with Nasal obstruction with associated allergic rhinitis as their complaint, 10 in number equaling to 43.48% were in 20 to 30 years of age. 9 people of age group 31 to 40 years were about 39.13%. A sum of 17.39% i.e. 4 members were in the age group of 41 to 45 years.

INFERENCE: Nasal Obstruction was common in Group 2 and nasal obstruction with allergic rhinitis was common in Group 1.

SEX – TECHNIQUE DISTRIBUTION



Out of 30 cases of Inferior Turbinectomy performed, about 16 males and 14 females were benefited.

Out of 30 cases of Micro- debrider assisted Inferior Turbinoplasty, equal proportion of males and females i.e. 15 in number were benefited.

The purpose of this bar chart is to calculate the no. of males and females undergoing the procedures.

AGE – RESULTS DISTRIBUTION

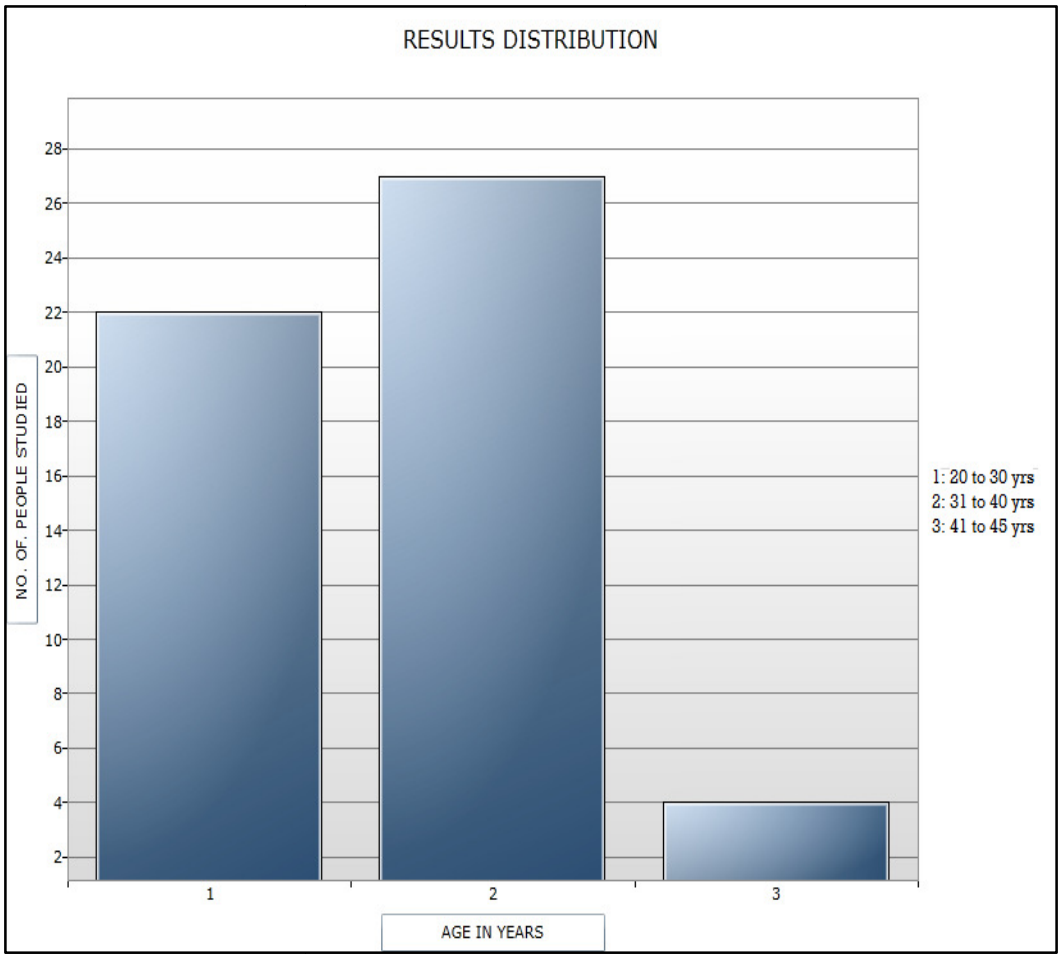
PATIENTS WHO'S SYMPTOMS REGRESSED WITH SURGERY

AGE	Frequency	Percent
Group 1	22	41.51%
Group 2	27	50.94%
Group 3	4	7.55%
Total	53	100.00%

PATIENTS IN WHOM THE RESIDUAL DISCOMFORT PERSISTED

AGE	Frequency	Percent
Group 1	3	42.86%
Group 2	1	14.29%
Group 3	3	42.86%
Total	7	100.00%

DISTRIBUTION OF PATIENTS WHO'S SYMPTOMS REGRESSED WITH SURGERY

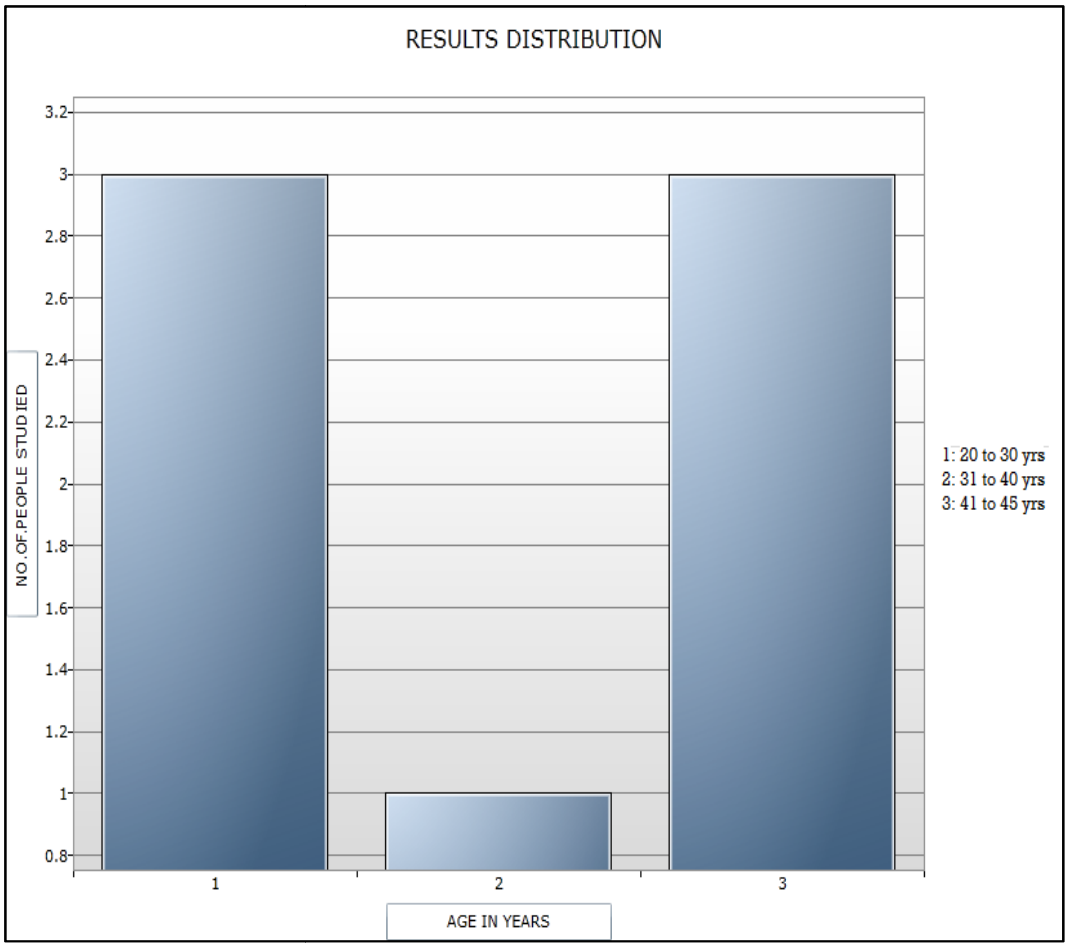


In Group 1, 22 patients were benefited by the surgeries that accounts to 41.51%.

In Group 2, 27 patients were benefited by the surgeries accounting to 50.94%.

In Group 3, only 04 patients were benefited by the surgeries accounting to 07.55%.

DISTRIBUTION OF PATIENTS IN WHOM RESIDUAL DISCOMFORT WAS PRESENT EVEN AFTER SURGERY



In Group 1, about 03 people had residual discomfort accounting to 42.86%

In Group 2, only one had residual discomfort accounting to 14.29%

In Group 3, 03 patients were with residual discomfort accounting to 42.86%

INFERENCE: Better surgical compliance was observed in patients with age of 31 to 40 years, whereas poor compliance was seen with people of 40 to 45 years

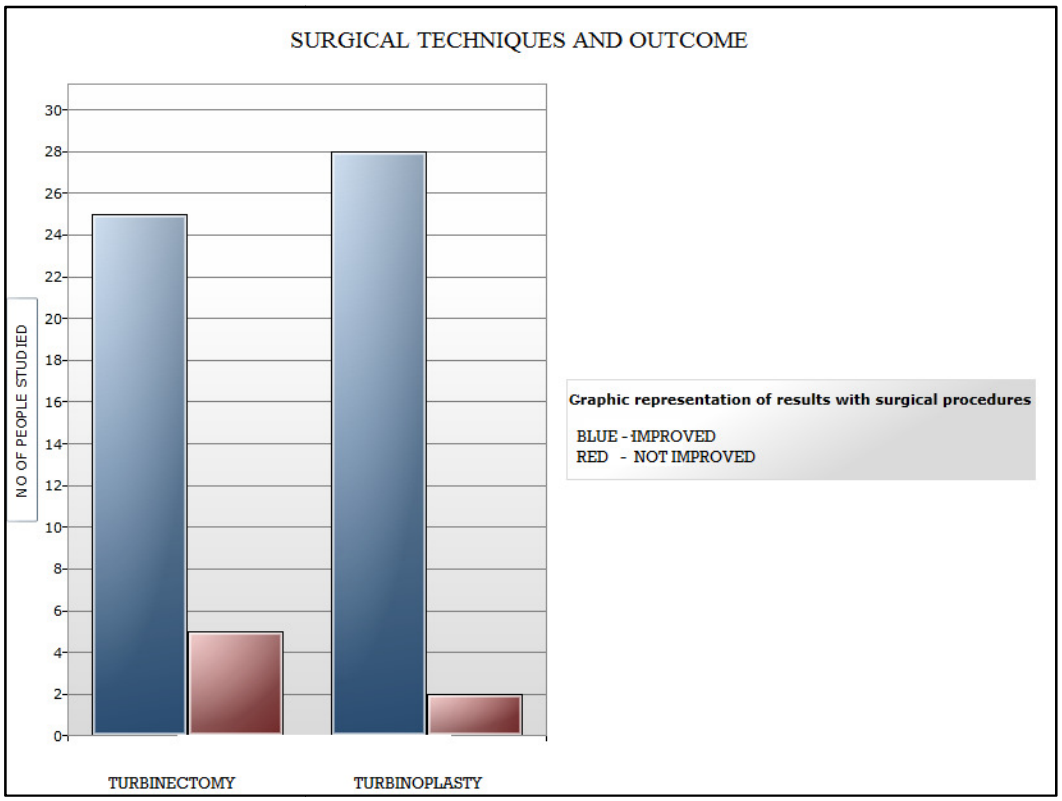
5.2 TECHNIQUES AND RESULTS

TECHNIQUE	SYMPTOMS	
	IMPROVED	NOT IMPROVED
INFERIOR TURBINECTOMY	25	5
INFERIOR TURBINOPLASTY	28	2

5.3 SURGERY AND OVERALL OUTCOME

RESULTS	FREQUENCY	PERCENT
IMPROVED	53	88.33%
NOT IMPROVED	7	11.67%

THE OUTCOME OF THE STUDY WITH RESPECT TO THE SURGICAL EFFICACY OF THE TWO TECHNIQUES:



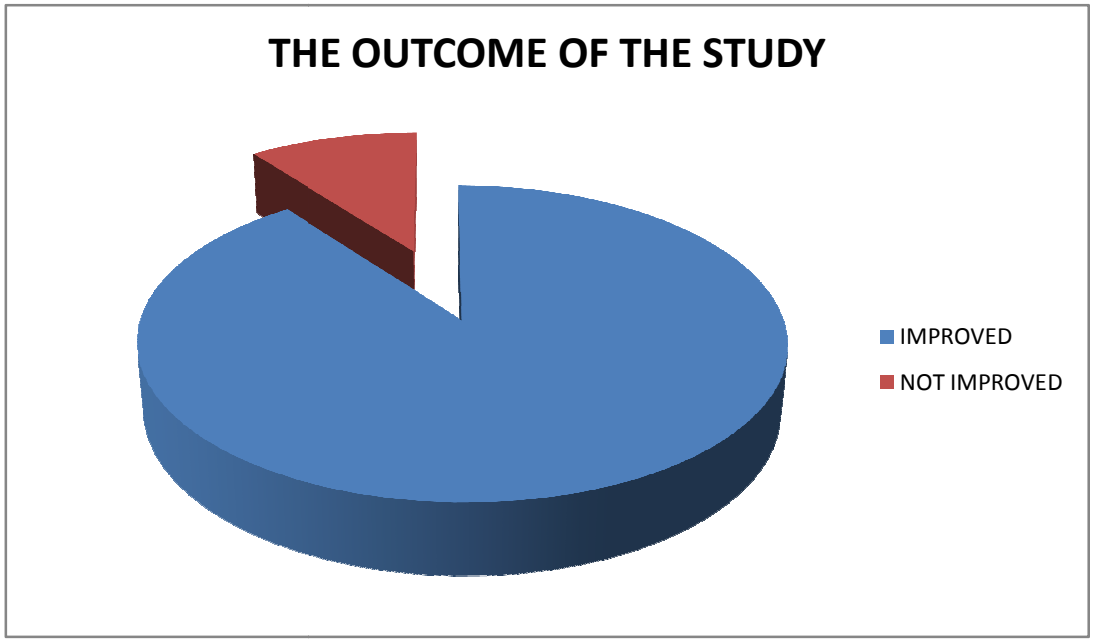
This is a comparative graph showing the outcome of the study in comparison to the two techniques in toto.

5.4 OUTCOME ANALYSIS

- Out of 60, Overall success rate of relieving of nasal obstruction at the end of 6 months of follow up was 93% (53/60) although 2 patients complained still have some mild obstruction.
- None of them reported of worsening of nasal obstruction after the procedures. Symptoms of rhinorrhea were not completely relieved by many patients after the operation.

THE OVERALL EFFICACY OF THE STUDY

Total number of patients benefited by the study: 53



SINGLE TABLE ANALYSIS

STATISTICAL TESTS	1-tailedp		2-tailed p
Chi-square - uncorrected	1.4555		0.2276442907
Chi-square - Mantel-Haenszel	1.4313		0.2315586983
Chi-square - corrected (Yates)	0.6469		0.4212237757
Mid-p exact		0.1316499067	

INTERPRETATION

THE CALCULATED MEAN P –VALUE IS 0.1316499067 AND

SINCE IT IS GREATER THAN 0.05,

THE NULL HYPOTHESIS IS ACCEPTED AND THE ALTERNATE HYPOTHESIS IS REJECTED.

"There is no significant difference between the outcomes of the two techniques as such"

6. DISCUSSION

This is a prospective study conducted in 60 patients. Inferior turbinate is an important anatomical structure in the inferior part of nose. It is a separate bone. It gets development from maxillo- turbinal projection during 5th month of intra uterine life which contributes to about 50% of nasal resistance during inspiration. It is a part of internal nasal valve boundary. Inferior turbinate mucosa is lined by pseudo-stratified ciliated columnar epithelium as a whole except in the anterior part. Muco-ciliary action is towards the naso- pharynx. Any chemical irritants or known case of allergic mucosa leads to pathological enlargement of inferior turbinate which subsides with anti-allergic medication and avoidance of irritants. If it does not subside even after 6 months course of medicine, typically patients having symptoms due to inferior turbinate hypertrophy without having any ostiomeatal complex disease, had been taken for surgical procedure. Various techniques were used in the past days. Initially they used steroid injection, then with due advances in surgical field, cryotherapy, conventional turbinectomy without endoscope, electro cautery both mono-polar and bi-polar, radio frequency method, then micro debrider assisted, inferior turbinoplasty, laser and coblator technique are employed.

Our study involved two different techniques in two groups of patients of same age group viz., one group underwent endoscopic inferior turbinectomy and another underwent endoscopic micro debrider assisted turbinoplasty.

POST INFERIOR TURBINOPLASTY:

Inferior turbinoplasty was performed in 30 patients of whom 25 patients had complete recovery from symptoms without any complication during our study period; 7 patients had post- operative bleeding on the next day during pack removal, which was

subsided by packing intra-nasally with oxy-metazoline decongestant nasal pack. 3 patients had throat irritation and dryness on the first week of follow up which subsided spontaneously during further follow up. 4 patients had nasal crusting in the operated field on the first week which was removed during endoscopic examination.

POST INFERIOR TURBINECTOMY:

Inferior Turbinectomy was done in 30 patients of whom 4 patients had bleeding from operated area after removing nasal pack on the next day which got subsided by nasal decongestant pack. 8 patients had edema of the nasal mucosa till the end of second week. 6 patients had symptomatic reduction of swelling after treatment with anti-allergic medications. 2 had edema of left over mucosa and rhinitis till the end of 6 months of post- operative follow up. They were known asthmatic patients with previous history of nebulization during their childhood period, with mild obstruction which was comparatively lesser in intensity to the pre-operative nasal obstruction. 4 patients had synechiae formation between inferior turbinate mucosa and septum on the first week of follow up which was released during endo- cleaning using Freer's septal elevator. During further follow up, they did not have any complaints and synechiae subsided. In our study of inferior turbinoplasty at the end of 6 months follow up, no one had dryness of nose. 28 patients had good symptomatic recovery as well as healing effect was complete.

7. CONCLUSION

This prospective study was conducted totally in 60 patients.

30 out of 60 underwent inferior turbinectomy in which 25 patients (95%) recovered completely without any symptoms at the end of 6 months of follow up. 5 patients had mild nasal obstruction and dryness of nose.

Inferior turbinoplasty was done in 30 patients of whom 28 (98%) completely recovered. Only 2 patients had edema of mucosa and rhinitis till the end of 6 months of post-operative follow up.

The Corrected p - value between the two techniques is 0.1316499067 which is greater than 0.05 and hence the difference between them is not significant. But when comparing the clinical status post operatively, Inferior turbinoplasty can be considered in the place of inferior turbinectomy. Hence keeping an eye on the above mentioned anatomy, physiology of inferior turbinate, thereby the functional importance and significance of inferior turbinate so as keeping the remaining mucosa of inferior turbinate is good for future outcome as well as good nasal function and better quality of life.

8. LIMITATIONS

In this study, we have limitations such as

1. Age restriction of not taking more than 45 years of age group into consideration and
2. Patients with co-morbid ostiomeatal complex involvement (mostly suggestive of chronic sinusitis)

9. FUTURE SCOPE OF THIS STUDY

- If the above mentioned limitations are excluded, this study can be extended and conducted in patients above 45 years of age and parameters like the sequence of healing process, compliance and adherence to the surgery in the elderly age group can be studied.
- If we take inferior turbinate hypertrophy with chronic sinusitis into consideration, it will considerably increase the number of study population and the relevance between the association of the two and its relation with surgical outcome can also be studied.
- This study can also be conducted in a case control format where, among two like groups with similar parameters, the responsive symptomatic patients under medical therapy can be compared with the patients undergoing surgery for the same complaints and the results between the efficacies of the two can be studied.

***

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S/N	*NAME*	*Age/ Sex*	*Complaints*	*Side Of ITH*			*Pre op DNE*	*CT PNS*	*Surgery*	*Post op DNE*	*Result*
				RT	*LT*	*B/L*					
1	CHANDRA	28/F	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
2	GANESAN	33/M	Nasal obstruction and allergic rhinitis		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
3	KANNAIYAN	27/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Dryness	Symptomatic
4	MEGALA	35/F	Nasal obstruction	+			Mild DSL, RIGHT ITH	Mild DSL, RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
5	SHANTHI	20/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic

6	KARTHICK	27/M	Nasal obstruction	+			Mild DSL, RIGHT ITH	Mild DSL, RIGHT ITH	Inferior turbinectomy	Normal	Asymptomatic
7	PALANI	40/M	Nasal obstruction			+	Mild DSL, RIGHT ITH	Mild DSL, RIGHT ITH	Inferior turbinectomy	Normal	Asymptomatic
8	SANGEETHA	31/F	Nasal obstruction		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
9	RAJESH	37/M	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
10	MAHESH	25/M	Nasal obstruction		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinectomy	Dryness	Symptomatic
11	JAYA	27/F	Nasal obstruction	+			Mild DSL, RIGHT ITH	Mild DSL, RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
12	SUMATHI	36/F	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic

13	KUMAR	23/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
14	SHARMILA	32/F	Nasal obstruction and allergic rhinitis	+			Mild DSL, RIGHT ITH	Mild DSL, RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
15	VIGNESH	28/M	Nasal obstruction		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
16	RAMAYA	42/M	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinectomy	Dryness	Symptomatic
17	MURUGAMMAL	38/F	Nasal obstruction		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
18	TAMILSELVAN	27/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic

19	SARAVANAN	29/M	Nasal obstruction		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
20	KAVITHA	34/F	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
21	JOTHI	37/F	Nasal obstruction	+			RIGHT ITH	RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
22	KATHIRAVAN	40/M	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
23	BHARATHI	40/F	Nasal obstruction and allergic rhinitis		+		Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
24	LOGANATHAN	44/M	Nasal obstruction			+	Mild DSR with left rhinitis	Mild DSR with left rhinitis	Inferior turbinoplasty	Normal	Asymptomatic

25	KALPANA	29/F	Nasal obstruction and allergic rhinitis	+			B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
26	SANKAR	25/M	Nasal obstruction and allergic rhinitis			+	Mild DSR, LEFT ITH	Mild DSR, LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
27	KANNAN	25/M	Nasal obstruction and allergic rhinitis			+	Mild DSR WITH LEFT ITH	Mild DSR WITH LEFT ITH	Inferior turbinoplasty	Dryness	Symptomatic
28	DEVI	33/F	Nasal obstruction and allergic rhinitis		+		Mild DSR with left rhinitis	Mild DSR with left rhinitis	Inferior turbinectomy	Normal	Asymptomatic
29	MOHAMMED	37/M	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
30	MARY	42/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic

31	THANGAM	27/M	Nasal obstruction	+			Mild DSL WITH right ITH	Mild DSL WITH right ITH	Inferior turbinectomy	Normal	Asymptomatic
32	SABEENA	31/F	Nasal obstruction		+		Mild DSR WITH LEFT ITH	Mild DSR WITH LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
33	MAHESHWARI	25/F	Nasal obstruction			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
34	RAJINI	37/M	Nasal obstruction and allergic rhinitis		+		Mild DSR with left rhinitis	Mild DSR with left rhinitis	Inferior turbinoplasty	Normal	Asymptomatic
35	IBRAHIM	29/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
36	PRIYA	34/F	Nasal obstruction		+		Mild DSR with left ITH	Mild DSR with left ITH	Inferior turbinectomy	Normal	Asymptomatic

37	ELIZABETH	40/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
38	SELVAKUMAR	22/M	Nasal obstruction	+			MILD DSL/ RIGHT ITH	MILD DSL/ RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
39	RAMAN	43/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
40	PREMA	36/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
41	HAZEENA	26/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
42	MURUGAN	32/M	Nasal obstruction and allergic rhinitis	+			MILD DSL/RIGHT ITH	MILD DSL/RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic

43	SHEELA	40/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
44	VINOTH	27/M	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
45	ABDULLAH	36/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
46	KALA	27/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
47	SHARMA	21/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
48	RANI	33/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic

49	NASAR	44/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
50	VIGNESH	35/M	Nasal obstruction and allergic rhinitis	+			MILD DSL/RIGHT ITH	MILD DSL/RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
51	AMMU	27/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
52	THOMAS	38/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
53	INNAIYULAH	23/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
54	LATHA	39/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic

55	RAMESH	28/M	Nasal obstruction and allergic rhinitis	+			DSL/RIGHT ITH	DSL/RIGHT ITH	Inferior turbinoplasty	Normal	Asymptomatic
56	BALAJI	32/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic
57	DHANAM	43/F	Nasal obstruction and allergic rhinitis		+		MILD DSR/LEFT ITH	MILD DSR/LEFT ITH	Inferior turbinectomy	Normal	Asymptomatic
58	KANNIAMMAL	42/F	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinoplasty	Normal	Asymptomatic
59	PONNI	33/F	Nasal obstruction		+		MILD DSR/LEFT ITH	MILD DSR/ LEFT ITH	Inferior turbinoplasty	Normal	Asymptomatic
60	PRABHAKARAN	27/M	Nasal obstruction and allergic rhinitis			+	B/L ITH	B/L ITH	Inferior turbinectomy	Normal	Asymptomatic

RT - Right; LT – Left; B/L – Bilateral; ITH – Inferior turbinate Hypertrophy; DSR/DSl – Deviated Septum Right/ Left

PROFORMA

NAME: AGE / SEX:

OCCUPATION: OP / IP.No:

ADDRESS: DOA:

DOS:

DOD:

I. CHIEF COMPLAINTS:

C/o nasal block.

II. HISTORY OF PRESENTING ILLNESS:

H/o nasal block

	DURATION	AGG FAC	REL FAC
RIGHT			
LEFT			

H/o nasal bleed

H/o loss of smell

H/o nasal discharge

H/o sneezing

H/o facial pain / headache

H/o post nasal discharge

H/o snoring

H/o mouth breathing

H/o hard of hearing

H/o ear ache

H/o vertigo

H/o tinnitus

H/o throat pain

H/o dysphagia

PAST HISTORY:

H/o allergy

H/o any medical illness

H/o previous surgery in nose/ ear/ throat

H/o any other surgery

H/o trauma

FAMILY HISTORY:

GENERAL EXAMINATION:

a) General condition.

b)

Anemia	Jaundice	Cyanosis	Clubbing	Pedal edema	GLINE

c) Vitals

SYSTEM EXAMINATION:

A. CVS
B. RS
C. CNS
D. P/A

LOCAL EXAMINATION:

EXAMINATION OF NOSE:

- External framework
- Vestibule
- Septum

A) ANTERIOR RHINOSCOPY:

	Inferior turbinate	Inferior meatus	Middle turbinate	Middle meatus	Septum	Floor
RIGHT						
LEFT						

B) 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						

C) COLD SPATULA TEST
D) COTTON WOOL TEST
E) COTTLE'S TEST

EXAMINATION OF EAR:

- Pinna
- Pre auricular region
- Post auricular region
- External auditory canal
- Tympanic membrane

EXAMINATION OF THROAT:

- Oral cavity
- Oropharynx
- IDL findings

INVESTIGATIONS:

- CBC, RFT, Grouping and typing
- Urine routine
- HIV, Hep B
- X-ray PNS
- CT PNS
- Oto endoscopy
- DNE
- VLS

SURGERY:

- ✓ Procedure:
- ✓ Anesthesia:
- ✓ Approach:
- ✓ DNE findings:
- ✓ Technique:

FOLLOW UP CHART

	CLINICAL EXAMINATION	DNE FINDINGS
1ST WEEK		
2ND WEEK		
4TH WEEK		
6TH WEEK		
3RD MONTH		
6TH MONTH		

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : A study on Turbinectomy Vs Turbinoplasty

Principal Investigator : Dr.K. Gomathy

Designation : PG in M.S.(E.N.T)

Department : Department of E.N.T
Government Stanley Medical College,
Chennai-10

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 06.03.2012 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, 13/12/13
IEC, SMC, CHENNAI

தகவல் படிவம்

தங்களுக்கு செய்த பரிசோதனைகள் மூலம் தங்கள் மூக்கில் நோய் ITH INFERIOR TURBINATE HYPERTROPHY இருப்பது தெரிய வந்துள்ளது. இந்த நோயைப் பற்றியும், இதற்கான அறுவை சிகிச்சையின் விளைவுகள் பற்றியும் ஆய்வு மேற்கொள்ளப்பட உள்ளது. இதில் தங்கள் நோய் மற்றும் அறுவை, சிகிச்சை குறித்த விவரங்களைப் பயன்படுத்த விருப்புகிறோம்.

தாங்கள் விருப்பினால் மருத்துவ ஆய்விலிருந்து எப்பொழுது வேண்டுமானாலும் விலகிக்கொள்ளலாம்.

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

ஆய்வாளரின் கையொப்பம்

ஆய்வாளரின் பெயர்

இடம் :

நான் :

சுய ஒப்புதல் படிவம்

ஆராய்ச்சி நிலையம் : காது, மூக்கு, தொண்டை பிரிவு
ஸ்டான்லி மருத்துவ கல்லூரி
மற்றும் மருத்துவமனை
சென்னை - 600 001.

பங்கு பெறுபவரின் பெயர் :

பங்கு பெறுபவரின் வயது :

பங்கு பெறுபவரின் எண் :

மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது எனது ஹிச்ஐ நோய் பற்றிய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. நான் எனக்கு நடக்கும் அறுவை சிகிச்சையை இவ்வாய்விற்கு பயன்படுத்த தன்னிச்சையாக சம்மதிக்கிறேன். எக்காரணத்தினாலும் எந்தக் கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்லிருந்து விலகிக் கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.

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

பங்கேற்பவரின் கையொப்பம் : இடம் :

கட்டை விரல் ஒப்பம் : நாள் :

பங்கேற்பவரின் பெயர்

மற்றும் விலாசம் :

ஆய்வாளரின் கையொப்பம் :

ஆய்வாளரின் பெயர் :

A Dissertation on

A COMPARATIVE STUDY ON THE EFFICACY AND OUTCOME OF

CONVENTIONAL INFERIOR TURBINECTOMY

AND MICRO- DEBRIDER ASSISTED INFERIOR TURBINOPLASTY

Submitted to the

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

in partial fulfillment of the regulations

for the award of the degree of

MASTER OF SURGERY BRANCH IV

(OTORHINOLARYNGOLOGY)