EFFECT OF COMPLETELY OCCLUSIVE NASAL PACK VERSUS NASAL PACK WITH AIRWAY ON EUSTACHIAN TUBE FUNCTION AND ARTERIAL BLOOD GAS- A RANDOMISED CONTROLLED TRIAL

By

DR. HITHYSHREE.N

DISSERTATION SUBMITTED TO

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In partial fulfillment of the requirements for the degree of

MASTER OF SURGERY

IN

OTORHINOLARYNGOLOGY

Under the guidance of

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The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the synopsis entitled **"Effect of completely occlusive nasal pack versus nasal pack with airway on eustachian tube function and arterial blood gas - a randomised controlled trial."** being investigated by **Dr.Hithyshree N,** Dr.S.M.Azeem Mohiyuddin & Dr.Vishnuvardhan.V[1] in the Departments of ENT & Anesthesiology[1] at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

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ABSTRACT

BACKGROUND:
Nose pack is a common procedure in otorhinolaryngology used to manage epistaxis & support nasal structures post-surgery. While effective, the occlusion caused by nose pack can impact respiratory function & Eustachian tube function, potentially leading to complications such as hypoxia & Eustachian tube dysfunction. This study compares the results of totally occlusive nose pack & nose pack with tube on these parameters.

OBJECTIVES:
1. To document the effect of totally occlusive anterior nasal pack on ET tube function & arterial blood gas.
2. To document the effect of anterior nasal pack with airways on ET tube function & arterial blood gas.
3. To compare the effects of totally occlusive anterior nasal pack & nasal pack with airways on Eustachian tube function & arterial blood gas analysis

METHODS :
This r & omized controlled study was conducted over 1 year & 8 months at RL Jalappa Hospital & Research Centre. Patients aged 18-60 years requiring nose pack for epistaxis or post-nasal surgery were included. Patients were assigned into groups: A (totally occlusive nasal packs) & Group B (nasal packs with airways). Tympanometry & arterial blood gas (ABG) analysis were conducted pre- & post-packing. Secondary assessments included monitoring oxygen saturation, blood pressure, pulse rate, & signs of nasal obstruction or bronchospasm

ANALYSIS:
The study had 62 individuals , equally distributed between the two groups with no difference of age or gender ratio. Group A showed a more pronounced effect on reducing middle ear ventilation & altering ABG parameters compared to Group B. Specifically, Group A had higher incidences of hypoxia & Eustachian tube dysfunction.

CONCLUSION:
Nose pack with tube appears to mitigate some of the adverse effects on Eustachian tube function & arterial blood gases compared to totally occlusive nose pack. These findings suggest that incorporating an airway in nose pack could enhance patient safety & comfort, especially in those with pre-existing respiratory or cardiac conditions.

INTRODUCTION

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DR. HITHYSHREE.N

LIST OF ABBREVIATIONS

OMC- Osteomeatal complex

FESS- Functional Endoscopic Sinus Surgery

CRS- Chronic Rhinosinusitis

NP- Nasal polyposis

DNS- Deviated Nasal Septum

ABG- Arterial blood gas

pH- Potential of hydrogen

PaO2- Partial pressure of oxygen

PaCO2- Partial pressure of carbon dioxide

HCO3- Bicarbonate

SaO2- Arterial oxygen saturation

CO2- Carbon dioxide

COPD- Chronic Obstructive Pulmonary disease

ARDS- Acute respiratory distress syndrome

SpO2- Saturation of peripheral oxygen

daPa- Decapascals

ABSTRACT

BACKGROUND:

Nasal packing is a common procedure in otorhinolaryngology used to manage epistaxis and support nasal structures following surgery. While being effective, the occlusion caused by nasal packing can impact on oxygen saturation and Eustachian tube function. This study compares the effects of totally occlusive nasal packing and nasal packing with an airway on Arterial blood gas and Eustachian tube function.

OBJECTIVES:

1. To document the effect of totally occlusive anterior nasal pack on Eustachian tube function and arterial blood gas.
2. To document the effect of anterior nasal pack with airways on Eustachian tube function and arterial blood gas.
3. To compare the effects of totally occlusive anterior nasal pack and nasal pack with airways on Eustachian tube function and arterial blood gas analysis.

METHODS:

This randomized controlled study was conducted over 1 year and 8 months at RL Jalappa Hospital and Research Centre. Patients aged 18-60 years requiring nasal packing for epistaxis or following nasal surgery were included. Patients were randomly assigned to two groups: Group A (totally occlusive nasal packs) and Group B (nasal packs with airways). Tympanometry, arterial blood gas (ABG) analysis and oxygen saturation monitoring was done pre- op, post- op day 1 with nasal packing.

RESULTS:

The study included 62 patients, equally distributed between the two groups with no significant differences in age or gender distribution. Patients with totally occlusive nasal packshowed a more pronounced effect on reducing middle ear ventilation and altering arterial blood gas parameters and more negative effect on oxygen saturation compared to patients with airway pack.

CONCLUSION:

Nasal packing with an airway appears to mitigate some of the adverse effects on Eustachian tube function and arterial blood gases compared to totally occlusive nasal packing. These findings suggest that incorporating an airway in nasal packing could enhance patient safety and comfort, especially in those with pre-existing respiratory or cardiac conditions.

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INTRODUCTION

INTRODUCTION

Nasal packing is a standard procedure in Otorhinolaryngology following nasal surgeries, management of epistaxis and nasal trauma. Its primary roles in the healing process are to prevent adhesions, minimize bleeding, and stabilize nasal structures. Considerations such as the extent of bleeding, the patient's medical history, the surgeon's preference, and the length of time the packing is expected to last significantly affect the choice of nasal packing material and method[1].

Out of the packing methods, two popular approaches are commonly used: totally occlusive nasal packing and nasal packing with an airway. Nasal packing is the process ofinserting packing material into the nasal cavity in order to exert pressure against the bleeding vessels and achieve total hemostasis. It can also lead to potential complications such as nasal mucosal injury, sinusitis, discomfort and critically compromise nasal airflow[2]. Obstruction of nasal airflow raises concerns regarding its impact on Eustachian tube function and arterial blood gas parameters. Eustachian tube dysfunction characterized by impaired ventilation and equalization of pressure between the middle earand nasopharynx, can result in symptoms such as otalgia, aural fullness, and hearing impairment. Furthermore, alterations in arterial blood gas parameters, includingoxygenation and carbon dioxide levels, may occur due to impaired nasal air circulation.[1, 2,3]

In patients with compromised cardiac or respiratory functions even a minor adverse effect on arterial blood gases can result in major problems like requiring ventilator support or cardiac failure especially right sided cardiac failure.

In contrast, nasal packing with an airway involves the placement of packing material supplemented with an airway, such as a nasal trumpet or a fenestrated pack. This technique allows maintenance of nasal airflow, thereby potentially mitigating the adverse effects on Eustachian tube function and arterial blood gas parameters associated with completely occlusive packing. However, concerns have been raised regarding the efficacy of this method in achieving hemostasis, as the presence of an airway may compromise the pressure exerted on the bleeding vessels [3,4].

The debate surrounding the choice between completely occlusive nasal packing and nasal packing with an airway underscores the need for evidence-based research to elucidate their respective effects on Eustachian tube function and arterial blood gas parameters. Addressing this gap in knowledge is essential for optimizing patient care and outcomes following nasal surgery or trauma.

This study aims to investigate the effect of completely occlusive nasal packing versus nasal packing with an airway on Eustachian tube function and arterial blood gas parameters through a randomized controlled trial. By comparing these two packing techniques, we seek to provide valuable insights into their respective advantages, limitations, and impact on patient outcomes. The findings of this study have the potential to inform clinical practice guidelines and optimize the management of patients undergoing nasal surgery or requiring nasal packing for epistaxis or trauma.

AIM OF THE STUDY

AIM

The aim of this study is to investigate the effects of completely occlusive nasal pack versus nasal pack with airway on Eustachian tube function and arterial blood gas parameters in patients requiring nasal packing for epistaxis or following nasal surgeries.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Historical perspective

Ancient Practices: Nasal packing finds its roots in ancient civilizations where various materials were used to address nasal conditions. Ancient Egyptian, Greek, and Roman historical records mention the usage of nasal dressings and tampons to prevent epistaxis and promote healing[5].

Medieval and Renaissance Era: During the medieval and Renaissance periods, nasal packing continued to be a common practice. Local hemostatic agents such as hot irons and cautery were employed to control bleeding. Nasal tampons made of cotton soaked in vinegar or wine were also used to staunch nosebleeds[6].

19th Century: The 19th century witnessed advancements in surgical techniques and the emergence of modern nasal packing materials. Surgeons began experimenting with various substances, including sponge, gauze, and absorbent cotton, for nasal packing purposes [7].

20th Century: The development of synthetic materials in the 20th century revolutionized nasal packing. Merocel, a compressed polyvinyl acetate sponge, was introduced in the 1960s and became widely adopted for nasal packing due to its absorbency and ease of use[8].

Modern Era: In recent decades, there has been a shift towards minimally invasive techniques and targeted interventions in nasal surgery and epistaxis management. Biodegradable materials such as gelatin foam and synthetic polymers are increasingly utilizedfor nasal packing, offering temporary support during tissue healing [9].

Current Practices:

Contemporary nasal packing techniques prioritize patient comfort, effectiveness, and safety. Surgeons may employ absorbable packing materials impregnated with vasoconstrictors or hemostatic agents to achieve rapid hemostasis and promote tissue healing. Nasal airway splints or stents may also be used temporarily to maintain nasal patency post-surgery [10].

The history of nasal packing reflects the ingenuity of medical practitioners over centuries in managing nasal conditions. From ancient remedies to modern innovations, nasal packing continues to play a crucial role in achieving therapeutic objectives while ensuring patient comfort and safety.

Embryology of nose

During first four weeks, nasal cavity is identified as olfactory or nasal placode. Olfactory pit is formed by sinking of placode and deepens to form nasal sac. Frontonasal process and nasal fold fuse together as the maxillary process of first arch grows anteriorly and medially. In doing so, the nasal pits are sealed up, forming primordial nasal cavity[11]. Initially, bucco-nasal membrane divides mouth from the primitive nasal cavity, this becomes thinner as the nasal sac grows posteriorly and finally disintegrates to form primitive choana. Mesenchymal expansions of medial nasal folds forms the floor anterior to the choana, generating the premaxilla that gives rise to upper lip near filtrum and adjoining area and medial crus of lower lateral cartilages[11,12].

In order to join the lateral nasal process around the nasomaxillary groove, the maxillary process also grows ventrally from the end of the mandibular process. The ectoderm in this

region canalizes to form the nasolacrimal duct. Nasal bones, upper lateral cartilages, and interal crus of lower lateral cartilage is formed by lateral nasal folds. With fusion of maxilla and frontonasal processes, the palate starts to form anteriorly[13, 14] .

The frontonasal process in the roof of oral cavity forms the midline ridge that forms the nasal septum which extends posteriorly to opening of Rathke's pouch. The palatal process develops medially toward the septum and toward one another from the lateral maxillary mesoderm. Everywhere but a midline dehiscence—the location of the future incisive canal fusion is complete. It divides the oral cavity from the nasal cavity and nasopharynx, which also form the uvula and soft palate[13, 14].

Anatomy of nose

External nose

It is pyramidal in shape with base pointing downwards and root above. Anterior nares or two nostrils split the base and are spaced apart by nasal septum. External nose terminates on both sides in a rounded eminence, the alae nasi which serves as the outer boundary of nostril. Nasal bone joins the frontal bone above and frontal process of maxilla laterally to form the bridge. The external structure is completed by upper and lower lateral cartilages and septal cartilage[14, 15].

The compressors and dilators of the ala nasi, which are supplied by the facial nerve, are the main muscles of the external nose. Blood supply id from ophthalmic and maxillary arteries .The venous drainage is by ophthalmic and anterior facial veins, while the submandibular and

pre-auricular lymph nodes receive lymphatic drainage. Ophthalmic and maxillary divisions of the trigeminal nerve are the two upper divisions that provides sensory supply to the skin of external nose[14, 15].

Nasal cavity:

The olfactory region, respiratory region, and nasal vestibule are the three sections that make up each nasal cavity. The nasal vestibule, which is most anterior, runs from the nasal valve posterosuperiorly to the nostril anteriorly inferiorly[14, 15].

The nasal valve is located between the septum medially and the caudal end of the upper alar cartilage laterally. The skin of the limen nasi contains sweat, sebaceous glands, and hair follicles, marking the demarcation line. This area is significant because the nasal cavity is the narrowest here, confined to a triangular form with around 0.3 cm on each side. The superior turbinate and its higher portion together [15, 16].

The superior turbinate and its upper portion comprise the olfactory region, which covers an area of 10 cm^2. The respiratory region is made up of the remaining nasal cavity, which has a surface area of up to 120 cm^2 [15, 16].

Nasal septum

It divides the nasal cavity into two equal compartments, composed of both cartilage and bone. Squamous epithelium covers the septum, differing from the lateral walls of the nasal cavity. The anterior portion of the septum contains erectile tissue and contributes to the upper lateral cartilages, shaping the middle third of the nose. The bony segment of the septum is pneumatized, and its overexpansion has the potential to obstruct airflow. Components of the septum include cartilage, bone, squamous epithelium, erectile tissue, and upper lateral cartilages[17].

The quadrangular (septal) cartilage, situated at the most anterior part of the septum, encompasses the Kiesselbach plexus[18].

Attachments of the septal cartilage[18]:-

Superior: Nasal bone

Inferior: Anterior nasal spine of the maxilla

Posterior-Superior: Perpendicular plate of the ethmoid

Posterior-Inferior: Vomer and maxillary crest.

<u>Bony septum[19]</u>:-

Perpendicular Plate of the Ethmoid: A vertical projection extending from the cribriform plate of the ethmoid to the septal cartilage.

Vomer: Positioned inferior and slightly posterior to the perpendicular plate of the ethmoid, attached inferiorly to the nasal crest of the maxilla and palatine bone.

Nasal Crest of the Maxilla and Palatine Bone: Together, these bones provide the inferior support for the septal cartilage.

Anterior Nasal Spine of the Maxilla: Formed by paired maxillary bones, this bony projection is located anterior to the piriform aperture and is palpable at the superior portion of the philtrum of the upper lip[19].

<u>Lateral wall of nose</u>

Lateral wall of nasal cavity features three medially projecting, inferiorly curved bones known as conchae. Middle and superior conchae are part of ethmoid bone, while the inferior concha is a separate bone. A variant known as supreme concha may also exist. These conchae are referred to as turbinates, increasing the nasal cavity's surface area to enhance air humidification, warming, and filtering.

The turbinates create four channels, with three designated as meatuses and the fourth being the sphenoethmoidal recess[17, 19-21].

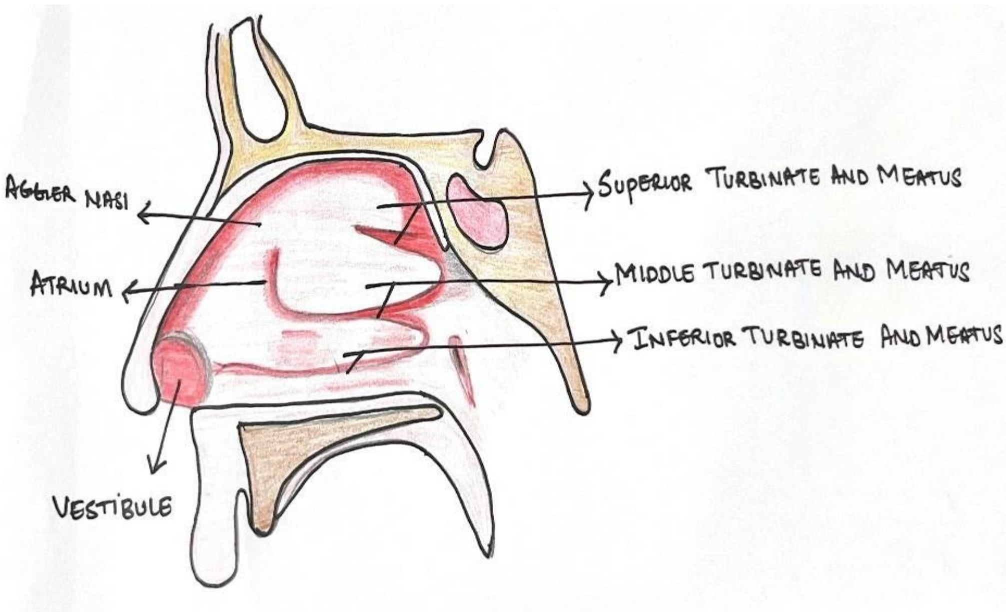
Bones contributing to the lateral wall of the nasal cavity include:- Ethmoid bone

-Perpendicular plate of the palatine bone

-Medial plate of the pterygoid process of the sphenoid bone

-Medial surface of the lacrimal and maxillary bones

-Inferior concha.



<u>Fig 1: Structures on lateral wall of nose</u>

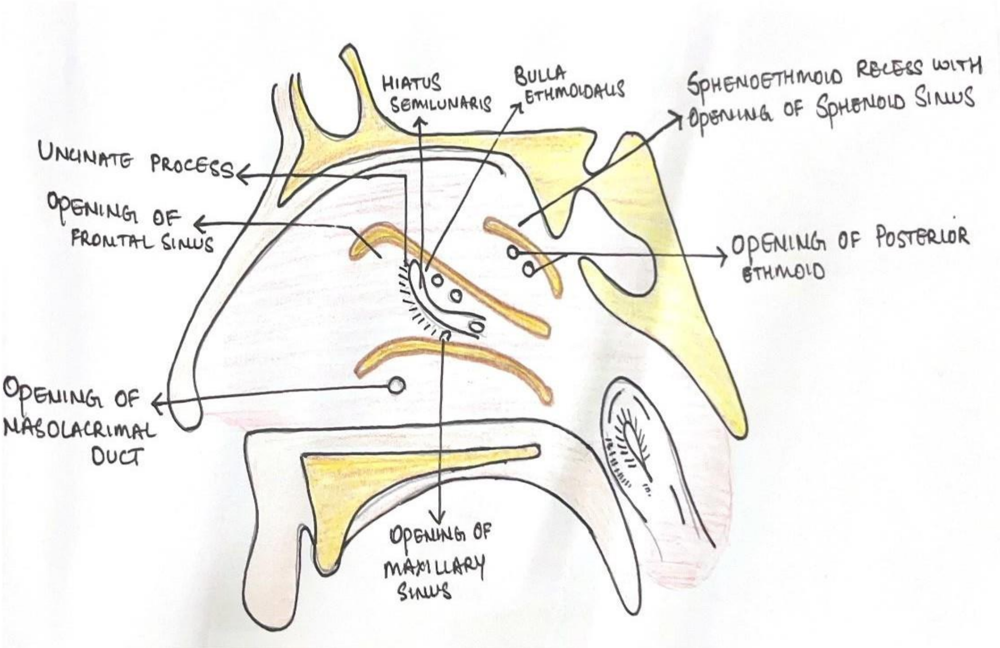


Fig 2: Lateral wall of nose with turbinates removed showing openings of various sinuses

Anatomical features associated with the nasal cavity:- Sphenoethmoidal Recess: Positioned between the superior turbinate and the nasal cavity roof, serving as the drainage site for the sphenoid sinus.

Meatuses[17,19,21]:

- Superior Meatus: Located beneath the superior turbinate, above the middle turbinate, and functions as the drainage site for the posterior ethmoid sinus.

- Middle Meatus: Positioned below the middle turbinate, above the inferior turbinate, and serves as the drainage site for the frontal, anterior ethmoid, and maxillary sinuses.

- Inferior Meatus: Found beneath the inferior turbinate and above the nasal cavity floor, facilitating the drainage of tears from the lacrimal sac into this meatus via Hasner's valve.

Anatomical structures in the nasal region[17, 19-21]

Limen Naris: Mucosal ridge marking the posterior boundary of the nasal vestibule and the anterior boundary of the nasal cavity proper.

- Agger Nasi Cells: Anterior part of anterior ethmoid air cells, situated anterior and superior to the basal lamella of the middle turbinate, forming the frontal recess.

- Frontal Recess: Space between the posterior wall of agger nasi cells and the middle turbinate.

- Uncinate Process: Crescent-shaped bone, part of ethmoid, attached to lacrimal bone, inferior turbinate, and superiorly to the lamina papyracea, protecting the sinuses of the infundibulum.

- Lamina Papyracea: Thin bone separating the orbit and the ethmoid air cells.

- Ethmoid Infundibulum: Pyramidal-shaped channel at the anterior portion of the semilunar hiatus, draining the maxillary, anterior ethmoid, and frontal sinuses.

- Semilunar Hiatus: Space between the uncinate process and the ethmoid bulla, serving as an outlet for the ethmoid infundibulum.

- Ethmoid Bulla: Located anterior to the semilunar hiatus, superior to the ethmoid infundibulum, where the middle ethmoidal air cells open into the nasal cavity.

- Ostiomeatal Complex (OMC): Area lateral to the middle turbinate housing the ostia of the frontal, maxillary, and anterior ethmoid sinuses.

- Sphenopalatine Foramen: Connects the nasal cavity to the pterygopalatine fossa, posterior to the middle turbinate in the posterior portion of the superior meatus. It contains the sphenopalatine artery, nasopalatine branch of the maxillary nerve and posterior superior lateral nasal nerves.

Blood Supply and Lymphatics[22-27]:

The nasal cavity receives a rich blood supply from both the internal and external carotid arteries, facilitating functions such as air warming and humidification. The internal carotid artery gives rise to the ophthalmic artery, which further branches into the anterior andposterior ethmoid arteries and the dorsal nasal artery. These branches supply various regions of the nasal cavity, including the lateral nasal wall, superior turbinate, and the external nose.

The external carotid artery branches into the maxillary artery and facial artery. The maxillary artery further divides into the descending palatine artery, supplying the palate and nasal floor, and the sphenopalatine artery, which enters the nasal cavity to provide blood to the lateral nasal wall and turbinates.

The facial artery gives rise to branches like the superior labial artery, lateral nasal artery, and angular artery, supplying the external nose. Kiesselbach's Plexus, located in the anterior nasal septum, serves as a common site for epistaxis.

Woodruff's Plexus, an anastomosis between the sphenopalatine artery and ascending pharyngeal artery, is found on the lateral wall of the nasal cavity, posterior to the middle and inferior turbinates.

Venous drainage mirrors arterial distribution, with maxillary branches draining into the cavernous sinus or pterygoid plexus, and veins of the anterior nasal cavity draining into the facial vein. Infections in the region between the oral commissure and nasal bridge pose a risk of intracranial extension.

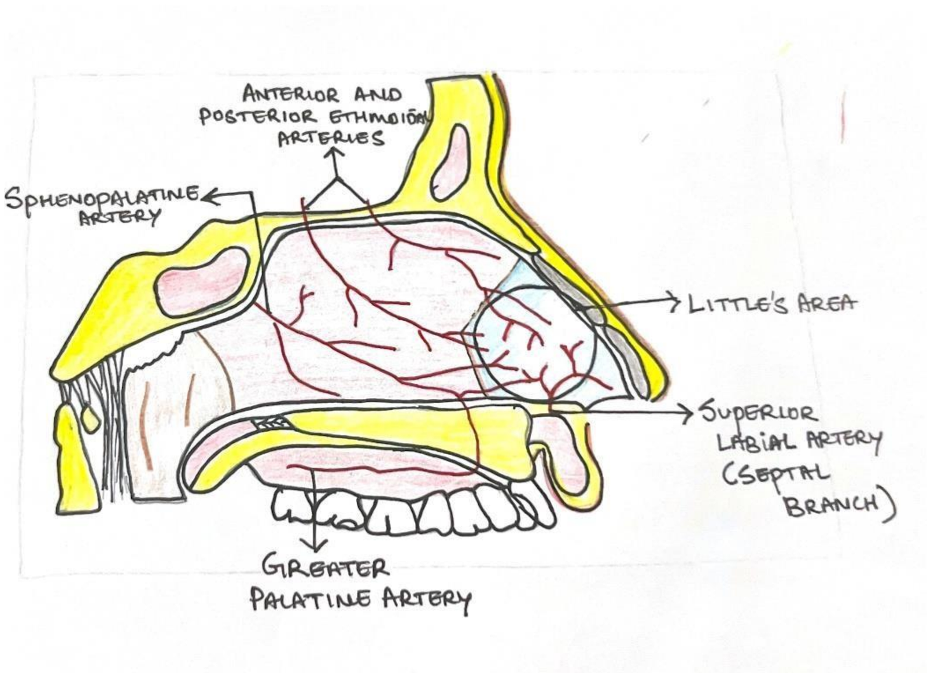


Fig 3: Blood supply of nasal cavity

Lymphatic drainage routes differ for the anterior and posterior nasal cavity. The anterior portion drains to submandibular lymph nodes in level Ib, while the posterior nasal cavity and paranasal sinuses drain into upper cervical and retropharyngeal lymph nodes. Swift treatment is crucial to prevent the extension of infections in this area.

Nerves[22-30]:

The olfactory nerve is responsible for transmitting signals from the nasal cavity to the brain, allowing for the sense of olfaction. The olfactory epithelium, located in the superior part of the nasal cavity, contains sensory cilia projecting through the cribriform plate to the olfactory bulb. Signals then pass through the olfactory nerve proper to a network of secondary neurons for processing before reaching the brain.

The trigeminal nerve provides sensory innervation to both the external and internal nose, with its branches - ophthalmic, maxillary, and mandibular. These branches, along with sympathetic and parasympathetic fibers, supply their target tissues, including the nose and nasal cavity.

Ophthalmic Branches: The nasociliary branch of the ophthalmic nerve gives off the anterior and posterior ethmoid nerves. The anterior ethmoid supplies the nasal tip, anterosuperior nasal cavity, and anterior superior nasal septum. The posterior ethmoid supplies the posterosuperior nasal cavity. The supratrochlear and infratrochlear branches supply the nasal dorsum.

Maxillary Branches: The maxillary branches innervate the nose and nasal cavity, branching in or near the pterygopalatine fossa before entering the nasal cavity. The infraorbital nerve, an external nasal branch, supplies the malar and lateral nose. The nasopalatine nerve traverses the nasal septum, entering the incisive canal to supply the posterior and inferior nasal septum and mucosa posterior to the incisors. The greater palatine nerve follows the greater palatine artery, supplying the posterior lateral wall of the nasal cavity. Other branches include the posterior superior lateral nasal nerve, posterior superior medial nasal nerve, and superior alveolar nerve, providing innervation to various areas of the nasal cavity.

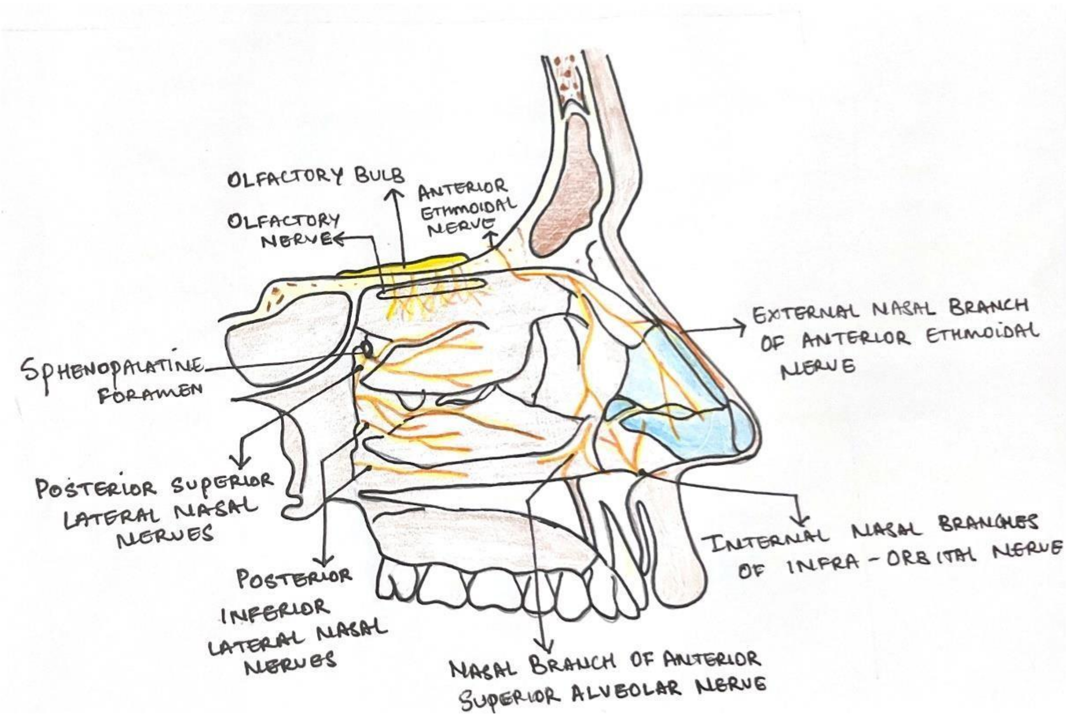


Fig 4: Nerve supply of nasal cavity

Physiology of nose

The nasal cavity serves several crucial functions, including humidifying and warming inspired air, filtering out minute particles and debris, and facilitating mucociliary clearance. Additionally, nasal cavity aids in draining secretions from paranasal sinuses and capturing odor-bearing particles, directing them to olfactory recesses.

Respiratory Region:

The respiratory region of the nasal cavity plays a vital role in conditioning inhaled air by humidifying, warming, and filtering it. Covered by respiratory epithelium and mucous cells, this region, which constitutes the major portion of the nasal cavity, ensures that air reaching the lower respiratory tract is close to body temperature. The neurovascular supply regulates nasal airflow by controlling blood volume in erectile tissue.

Under normal conditions, sympathetic signals maintain nasal cavity uncongested. Particles that surpass the nasal vestibule are trapped in the mucosa, and the muco-ciliary system, consisting of ciliated pseudostratified columnar epithelium, facilitates their movement at a rate of one centimeter per minute toward the nasopharynx for expulsion. The nasal mucus acts as a protective barrier against inhaled pathogens as it contains Immunoglobulin A, lysozymes, and lactoferrin, actively contributing to the host's defense[18,31].

Olfactory Region:

Olfaction relies on the transportation of odor-bearing particles to the olfactory epithelium, positioned at the top of the nasal cavity, through either orthonasal or retronasal airflow. Odorants captured in the nasal mucus bind to odorant binding proteins, aiding in their concentration and solubilization. These particles subsequently attach to olfactory receptors on cilia, initiating specific signals transmitted through the cribriform plate to synapse withneurons in the olfactory bulb. Signals then pass through the olfactory nerve to secondary neurons for higher processing before reaching the brain.[18,31].

Eddy currents refer to circular currents induced in a conductor when subjected to a changing magnetic field. In nasal physiology, eddy currents are swirls of air generated by intricate geometry and convoluted surfaces of nasal passages. These swirling motions result from the interaction between the airflow and complex nasal anatomy, leading to intricate patterns of air movement[32].

Role of Eddy Currents in Nasal Physiology[33]:

-It facilitates the mixing of inspired air with the air already present within the nasal cavity, promoting efficient distribution of airflow and enhancing the exchange of gases.

-Turbulent Flow Regulation: While laminar airflow prevails in the central region of the nasal passages, eddy currents induce controlled turbulence in the peripheral regions. This turbulence aids in optimizing gas exchange and enhancing olfactory function.

-Mucosal Conditioning: The swirling motion of air generated by eddy currents promotes intimate contact between inspired air and the mucosal surfaces of the nasal cavity, facilitating effective humidification, warming, and filtration of the air.

-Disruptions in nasal airflow dynamics, including alterations in eddy currents, may contribute to the pathogenesis of nasal disorders such as chronic rhinosinusitis, nasal polyps, and nasal congestion.

Indications for nasal packing[34, 35]

In the emergency department, nasal packing becomes necessary for anterior epistaxis when bleeding persists despite attempts with direct pressure, vasoconstrictive medications, or cautery. Additionally, nasal packing can be employed for achieving hemostasis during or after surgical procedures.

Contraindications[34, 35]

In the emergency department, nasal packing for anterior epistaxis is not recommended in cases of basilar skull fractures and significant facial or nasal bone fractures. Relative contraindications include hemodynamic instability necessitating emergency blood transfusion and airway compromise requiring intubation. However, after stabilization, anterior nasal packing is considered permissible for managing patients with anterior epistaxis.

Types of Nasal packs [36, 37]

- **Merocel Packing:** Merocel is a synthetic, expandable nasal packing material composed of polyvinyl acetate and polyvinyl alcohol. It is widely used due to its ease of insertion, ability to absorb blood, and biocompatibility. Studies have reported favorable outcomes with Merocel packing in achieving hemostasis and preventing postoperative adhesions in nasal surgery. However, complications such as mucosal trauma, nasal pain, and retention of packing material have been reported.

- **Gauze Packing:** Traditional gauze packing is commonly employed for its cost-effectiveness and availability. However, it is associated with a higher risk of mucosal trauma, discomfort, and retained packing material compared to synthetic alternatives). Despite its drawbacks, gauze packing remains a viable option in settings with limited resources.

- **Foley Catheter Packing:** Foley catheters have been repurposed for nasal packing due to their flexibility and ability to conform to nasal anatomy. They are often used in conjunction with an inflatable balloon to exert pressure on bleeding vessels. Foley catheter packing has shown promise in achieving hemostasis in cases of refractory epistaxis or postoperative bleeding. However, concerns regarding the risk of nasal mucosal injury and retained packing material have been raised.

 Nasal Packing with Airway: Nasal packing with an airway, such as a nasal trumpet or a fenestrated pack, allows for the maintenance of nasal airflow while providing hemostasis. This technique aims to mitigate complications associated with completely occlusive packing, such as Eustachian tube dysfunction and impaired nasal ventilation. Singh et al. conducted a comparative study between totally occlusive nasal packing and nasal packing with an airway in the management of epistaxis, reporting favorable outcomes with the latter in terms of patient comfort and nasal airflow.

 Completely Occlusive Nasal Packing: Completely occlusive nasal packing involves the insertion of packing material to achieve complete hemostasis by exerting pressure on bleeding vessels. While effective in controlling bleeding, this technique is associated with complications such as nasal mucosal injury, sinusitis, and impaired nasal ventilation. The adverse effects of completely occlusive packing on Eustachian tube function and arterial blood gas parameters highlight the need for alternative packing techniques that allow fornasal airflow.

Epistaxis

Epistaxis, or nosebleed, is a common nasal emergency, leading to approximately 1.7 emergency department visits per 1000 patients annually. Typically, anterior epistaxis is a benign, self-limited occurrence resolved by direct pressure application. Pediatric and elderly populations, often affected by nose picking, foreign body insertion, friable mucosa, or anticoagulant use, are most prone to epistaxis. In young and middle-aged adults, intranasal drug use, whether pharmaceutical (e.g., intranasal steroids) or recreational (e.g., cocaine), is a common cause. Winter months increase the incidence, especially in dry indoor environments. If direct pressure fails to stop bleeding, vasoconstrictive agents, silver nitrate cautery, or nasal packing may be employed for hemostasis[38].

The primary arterial source for anterior epistaxis is the Kiesselbach plexus located on the antero inferior nasal septum. Comprising branches from the ophthalmic and maxillary arteries, including the anterior ethmoidal, sphenopalatine, superior labial, and greater palatinearteries. A majority (over 90%) of epistaxis cases originate from the anterior nasal septum, with potential hazardous bleeding occurring posteriorly. Posterior arterial epistaxis poses greater management challenges, diagnosed after ruling out anterior sources.

Managing posterior epistaxis involves lengthier packing and extended post-procedure monitoring. The internal maxillary artery's terminal branches, such as the sphenopalatine, posterior lateral nasal, and posterior septal arteries, commonly contribute to posterior arterial epistaxis.

Posterior venous epistaxis may stem from the Woodruff plexus, a submucosal venous network on the posterolateral nasal cavity wall. Epistaxis often signals an underlying medical issue like coagulopathy or platelet dysfunction. Identifying and correcting such hematologic problems enhance hemostatic intervention success. Atraumatic causes, includinghypertension followed by thrombocytopenia and other platelet abnormalities like thrombasthenia, aspirin use, chemotherapy can contribute to bleeding. Controlling blood pressure, administering fresh frozen plasma or platelets, and specific interventions like vitamin K for warfarin overdose or desmopressin in von Willebrand disease may be necessary in certain cases.[39-43].

Septoplasty

Septoplasty is a commonly performed surgical procedure aimed at correcting deviated nasal septum, which can cause nasal obstruction, difficulty breathing, and other related symptoms. Indications for septoplasty include symptomatic Deviated nasal septum causing nasal obstruction, recurrent sinusitis, epistaxis, and snoring.[44]

Several surgical techniques are employed in septoplasty, ranging from traditional submucosal resection to more minimally invasive approaches such as endoscopic septoplasty. Endoscopic septoplasty offers advantages including improved visualization, reduced intraoperative bleeding, and potentially faster recovery times compared to conventional techniques. [45]

Outcome measures following septoplasty include subjective improvement in nasal obstruction, objective measures such as nasal airflow, and patient-reported quality of life assessments.

Common complications include postoperative hemorrhage, septal perforation, synechae formation, and persistent nasal obstruction.

Emerging trends in septoplasty include the use of adjunctive procedures such as septal cartilage preservation techniques, powered instrumentation, and tissue bioengineering to optimize surgical outcomes and reduce the likelihood of revision surgery.[46, 47]

Functional endoscopic sinus surgery (FESS)

Functional endoscopic sinus surgery (FESS) has emerged as a cornerstone in the management of chronic sinusitis and other sinonasal disorders. With its minimally invasive approach and precise surgical techniques, FESS offers patients relief from symptoms such as nasal congestion, facial pain, and reduced sense of smell, improving their quality of life significantly.[48, 49] The rationale behind FESS is to remove tissue that is blocking the Osteo Metal Complex (OMC) and facilitate drainage while preserving the normal mucous membrane and non- obstructing architecture.[50]

FESS is indicated for patients with chronic sinusitis that has not responded to medical management, nasal polyps, fungal sinusitis, mucoceles, and selected sinonasal tumors. These conditions can cause significant discomfort and impair quality of life, affecting breathing, sleep, and overall well-being.

Complications of FESS are relatively uncommon but can occur, particularly in cases involving extensive disease or revision surgery. Common complications include postoperative bleeding, synechiae formation, anosmia, and orbital or intracranial injury. Careful intraoperative technique, meticulous hemostasis, and adherence to anatomical landmarks are essential in minimizing the risk of complications. [48,49]

Eustachian tube:

Eustachian tube, also referred to as the pharyngotympanic tube or auditory tube, was named after the Italian anatomist Bartolomeo Eustachi. It connects the nasopharynx to the middle ear.[51,52].

Location: The Eustachian tube stretches from the anterior wall of the middle ear to the lateral wall of the nasopharynx. It opens in nasopharynx 1-1.25 cm behind and a little below the posterior end of inferior turbinate.[52]

Structure:

The Eustachian tube, approximately 35 to 38 millimeters (mm) long in adults, comprises two main parts: the bony (osseous) part and the cartilaginous part.

Bony Part: This section, about one-third of the tube's length(about 12mm), starts at the tympanic orifice in the bony wall of the middle ear. It is rigid and enclosed by bone, located closest to the middle ear.

Cartilaginous Part: Making up the remaining two-thirds of the tube(about 24mm), this part extends to the nasopharyngeal orifice, where the tube opens into the nasopharynx. It is more flexible and consists of cartilage and connective tissue, responsible for the tube's opening and closing function crucial for equalizing air pressure.

Cartilage of the tube forms medial wall, roof and part of lateral wall. Elastin is situated in the roof at the junction of medial and lateral laminae and helps the medial laminae to regain its original position of closure.

Components:

1. Lumen: The tube's interior passage varies in diameter, being narrowest at the isthmus, the junction between the bony and cartilaginous parts.
2. Ostmann's Fat Pad: A collection of fatty tissue surrounding the tube, offering padding and support, especially around the nasopharyngeal orifice.Muscles: The tensor veli palatini and the levator veli palatini are associated with the Eustachian tube. The tensor veli palatini, activated during swallowing or yawning, aids in opening the Eustachian tube, facilitating air movement to equalize pressure in the middle ear.

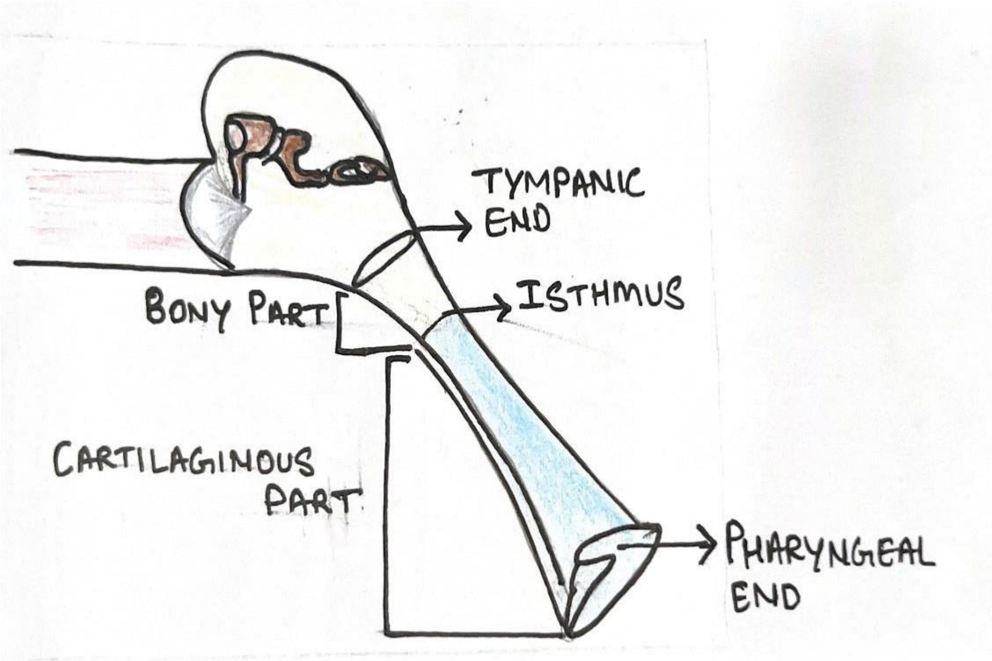


Fig 5: Horizontal section through the eustachian tube showing bony and cartilaginous parts,isthmus, tympanic and pharyngeal ends.

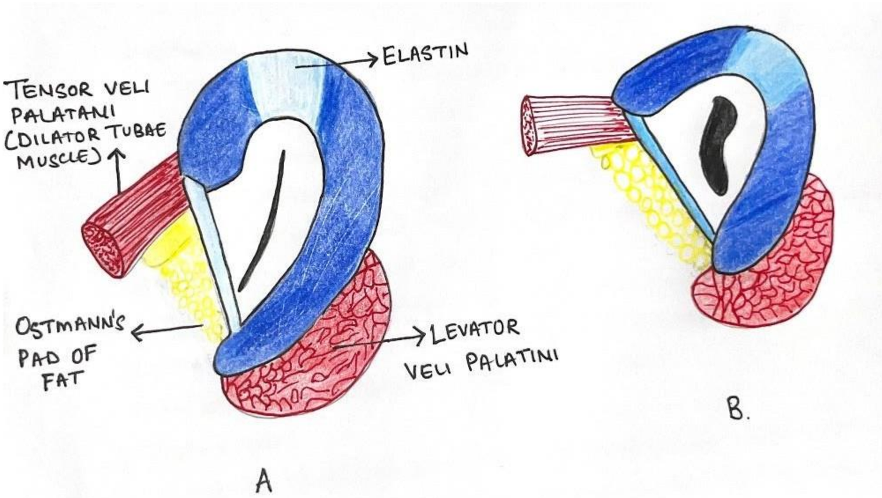


Fig 6: Vertical section through eustachian tube.

Cartilage of the tube forms medial wall, roof and part of lateral wall. Elastin is situated in the roof at the junction of medial and lateral laminae and helps the medial laminae to regain its original position of closure. (A) Eustachian tube is closed in resting position. (B) Tube is open when tensor veli palatini (dilator tubae) muscle contracts.

Blood Supply and Lymphatics:

It is provided by various arteries from external carotid, including the ascending pharyngeal branch and two branches from the maxillary artery, namely the middle meningeal artery and the artery to pterygoid canal.

Venous drainage returns to the pterygoid venous plexus, while lymphatics drain into the retropharyngeal lymph nodes.[53]

Nerves:

Motor innervation to the muscle attachments of the Eustachian tube involves the pharyngeal plexus of the vagus nerve (cranial nerve X) and the mandibular branch of the trigeminal nerve (Cranial nerve V). Cranial nerve X innervates the levator veli palatini and salpingopharyngeus muscles, while the mandibular branch of cranial nerve V supplies the tensor tympani and tensor veli palatini muscles. Sensory innervation to the Eustachian tube, middle ear, and pharynx is governed by the trigeminal nerve.

The pharyngeal ostium is influenced by pharyngeal branch of maxillary nerve and the spine from the cartilage branch area originating from the mandibular nerve. The osseous portion of the bone is affected by the tympanic plexus arising from the glossopharyngeal nerve.[54]

Function: The Eustachian tube serves several critical functions vital for the health and proper functioning of the middle ear:

1. Pressure Equalization: Its primary role is to balance air pressure on both sides of the eardrum (tympanic membrane). By allowing air to flow in and out of the middle ear, the Eustachian tube ensures that the eardrum can vibrate freely, facilitating proper sound transmission and preventing discomfort caused by pressure imbalances.

2. Protection: The Eustachian tube acts as a barrier, safeguarding the middle ear from infections and foreign substances. By connecting the middle ear to the nasopharynx, it helps prevent the entry of nasal secretions, pathogens, and particles into the middle ear. However, this connection can also provide a route for infections to reach the middle ear, especially in children with shorter and more horizontally oriented tubes.

3. Drainage: It assists in draining fluids, mucus and exudates, from the middle ear into the nasopharynx. Effective drainage prevents fluid accumulation (effusion), which can lead to

middle ear infections (otitis media) and impact hearing. Maintaining proper drainage ensures a clean and dry middle ear environment, reducing the risk of infection and inflammation.

4. Ventilation: The Eustachian tube facilitates the ventilation of the middle ear space, allowing for the continuous exchange of air. This ventilation is essential for refreshing the air within the middle ear, supplying oxygen, and removing carbon dioxide. Regular opening of the Eustachian tube, typically during swallowing or yawning, supports this air exchange process and helps maintain optimal middle ear health.

Clinical significance:

The Eustachian tube plays a vital role in maintaining middle ear health and auditory function, and dysfunction of this structure can lead to various common and potentially serious clinical conditions.

One prevalent issue associated with Eustachian tube dysfunction is otitis media, whichinvolves infection or inflammation of the middle ear. This condition is especially common in children due to the anatomical characteristics of their Eustachian tubes, making them more prone to blockage and infection. Symptoms may include ear pain, fever, and hearing loss. Eustachian tube dysfunction can also cause a sensation of fullness, discomfort, and hearing impairment due to the inability to equalize middle ear pressure. This can be particularly noticeable during changes in altitude, such as during flights or when diving underwater. Chronic Eustachian tube dysfunction may lead to long-term hearing loss, tinnitus, and vertigo.

Effect of nasal packing on Eustachian tube function [55,56]

- **Mechanical Obstruction:** Nasal packing material can physically block the opening of Eustachian tube, hindering its ability to open and close properly. This obstruction can disrupt the normal pressure regulation within the middle ear.

- **Increased Nasal Resistance:** Nasal packing may increase nasal resistance, making it more difficult for air to flow through the nasal passages. This increased resistance can affect airflow dynamics within the nasopharynx and Eustachian tube, potentially impairing Eustachian tube function.

- **Mucosal Inflammation:** The presence of nasal packing can trigger an inflammatory response in the nasal cavity, leading to mucosal swelling and congestion. This inflammation can extend to the opening of the Eustachian tube, further compromising its function by narrowing the passage or impairing its ability to open and close effectively.

- **Secretion Accumulation:** Nasal packing may stimulate increased nasal secretions, which can accumulate in the nasal cavity and obstruct the opening of the Eustachian tube. Excessive mucus production can interfere with the normal clearance mechanisms of the Eustachian tube, potentially leading to fluid accumulation in the middle ear and predisposing to conditions such as otitis media.

- **Prolonged Pressure Effects:** Prolonged use of nasal packing can exert pressure on the surrounding nasal tissues, including the structures around the Eustachian tube. This sustained pressure may cause tissue edema or displacement, affecting the patency and function of the Eustachian tube.

Tympanometry [57, 58]

Tympanometry is a valuable diagnostic tool used in audiology and otolaryngology to assess middle ear function. It measures the mobility of the tympanic membrane and the impedance of the middle ear system. Tympanometric curves are graphical representations of middle ear impedance plotted against variations in air pressure within the ear canal. These curvesprovide valuable insights into middle ear function and are classified into different types basedon their characteristic shapes.

One of the most commonly encountered tympanometric curves is Type A, characterized by a sharp peak within normal pressure range. Type A curves are indicative of normal middle ear function, suggesting adequate mobility of the tympanic membrane and optimal middle ear pressure.

Type B tympanometric curves exhibit a flat shape, indicating absence of peak pressure and limited mobility of the tympanic membrane. This pattern is associated with conditions such as middle ear effusion, tympanic membrane perforation, or excessive cerumen obstructing the ear canal.

Type C tympanometric curves feature a peak shifted towards negative pressure values, suggesting eustachian tube dysfunction or negative middle ear pressure.

Arterial Blood Gas analysis:

Blood gas analysis is a vital diagnostic tool used to assess the partial pressures of gases in blood and determine acid-base balance. By analyzing arterial blood samples, healthcare providers can gain valuable insights into respiratory, circulatory, and metabolic disorders. This analysis provides key information on oxygenation status, carbon dioxide levels, pH balance, bicarbonate levels, and other electrolyte concentrations.

Interpretation of blood gas results helps clinicians diagnose conditions such as respiratory acidosis or alkalosis, metabolic acidosis or alkalosis, hypoxemia, hypercapnia, and electrolyte imbalances. Overall, blood gas analysis plays a crucial role in guiding treatment decisions and managing patients with various physiological disturbances.[59]

Blood gas analysis can be conducted using blood samples obtained from various locations within the circulatory system, including arteries, veins, or capillaries.

Arterial blood gas (ABG) analysis specifically focuses on blood drawn from an artery, providing critical insights into the partial pressure of oxygen (paO2) and carbon dioxide (paCO2).

pO2 indicates the level of oxygenation, while PaCO2 reflects ventilation status, aiding in the assessment of both acute and chronic respiratory failure.

Factors such as hyperventilation, hypoventilation, and acid-base balance influence paCO2.

While pulse oximetry and end-tidal carbon dioxide monitoring offer non-invasivealternatives for assessing oxygenation and ventilation respectively, ABG analysis remains thegold standard diagnostic tool.[60,61,62]

When evaluating acid-base balance in arterial blood gas (ABG) analysis, pH and paCO2 are directly measured by most ABG analyzers. The serum bicarbonate (HCO3) and base deficit or excess are calculated using a derivative of the Hasselbach equation. However, this calculation may result in a discrepancy from the measured value due to unaccounted blood

CO_2. The measured HCO_3 utilizes a strong alkali that releases all CO_2 in serum, including dissolved CO_2, carbamino compounds, and carbonic acid.

The calculation only considers dissolved CO_2, while a standard chemistry analysis typically measures "total CO_2," resulting in a difference of around 1.2 mmol/L.

Critically ill patients may exhibit a more significant difference between ABG and measured values, highlighting the complexity of interpreting acid-base balance in such cases.[63,64,65]

Procedure:

The preferred specimen for arterial blood gas sampling is whole blood, which is obtained either via arterial puncture or from an indwelling arterial catheter. After collection, thearterial blood sample should be promptly placed on ice and analyzed without delay tominimize the risk of inaccurate results.[66]

The variances in measured blood gas values between arterial and venous blood are most notable for paO_2, as obtaining arterial samples primarily serves clinical purposes related to paO_2 assessment. Typically, PAO_2 is around 60 mm Hg lower in venous blood after oxygen is released in the capillaries, whereas $paCO_2$ is 2 to 8 mm Hg higher in venous blood. pH is usually only slightly lower by 0.02 to 0.05 pH units in a venous sample.[67,68]

Accurate specimen collection is crucial for obtaining precise blood analysis results for gas and pH measurements. It's common practice to place indwelling catheters with heparin locks for both short- and long-term intravenous therapies. Inadequate flushing of the lock can lead to unpredictable effects on measured quantities, often resulting in abnormal, non-physiological results.[69,70].

Sample should be collected anaerobically using lyophilized heparin anticoagulant in sterile syringes ranging from 1 to 3 mL. Evacuated lithium heparin sample tubes (vacuum tubes) intended for plasma collection are unsuitable for analysis due to the presence of significant oxygen, which can affect the accuracy of whole blood PAO_2 measurements. Syringes with lyophilized heparin are preferred over those containing liquid heparin, as liquid heparin may introduce atmospheric PAO_2 and $PACO_2$ values that dilute the sample, particularly when the syringe isn't fully filled.[71]

Anaerobic collection techniques ensure that blood is not exposed to atmospheric air, which has a much lower $PACO_2$ compared to blood. Exposure to air can decrease the CO_2 content and $paCO_2$ of blood, leading to an increase in blood pH. Additionally, blood exposed to atmospheric air absorbs oxygen due to the higher paO_2 levels in the environment. Even small bubbles in the needle and syringe hub dead space can cause errors in blood gas results, although this can be minimized by immediately ejecting any resulting bubbles after drawing the sample and vigorously mixing the sample before analysis.[72,73]

<u>ABG components include the following [59]</u>

pH = measured acid-base balance of the blood

paO_2 = measured the partial pressure of oxygen in arterial blood

$paCO_2$ = measured the partial pressure of carbon dioxide in arterial blood

HCO_3 = calculated concentration of bicarbonate in arterial blood

Base excess/deficit = calculated relative excess or deficit of base in arterial blood

SaO_2 = calculated arterial oxygen saturation (unless a co-oximetry is obtained, in which case it is measured)Before performing an arterial blood gas (ABG) procedure on either upper extremity, it's essential to conduct a modified Allen test to ensure adequate collateral blood flow. This test can also be supplemented by pulse oximetry and duplex ultrasound for further assessment.

The radial artery is commonly used for ABG sampling due to its superficial location and easy palpability over the radial styloid process, with the femoral artery being another option.

During the modified Allen test, the patient flexes the selected upper extremity at the elbow and clenches a raised fist for 30 seconds. Pressure is applied over both the ulnar and radial arteries to occlude blood flow. After 5 seconds, the patient unclenches the fist, causing the palm to appear pale, white, or blanched. Subsequently, pressure over the ulnar artery is released while maintaining compression on the radial artery. Adequate ulnar collateral blood flow is indicated if the palm returns to its original color within 10 to 15 seconds. Similarly, radial collateral blood flow is assessed by maintaining pressure on the ulnar artery and releasing pressure on the radial artery. If the palm fails to return to its normal color, it suggests inadequate collateral blood flow, making it unsafe to puncture the radial artery for ABG sampling. This procedure ensures patient safety and helps prevent complications associated with insufficient collateral circulation.[74]

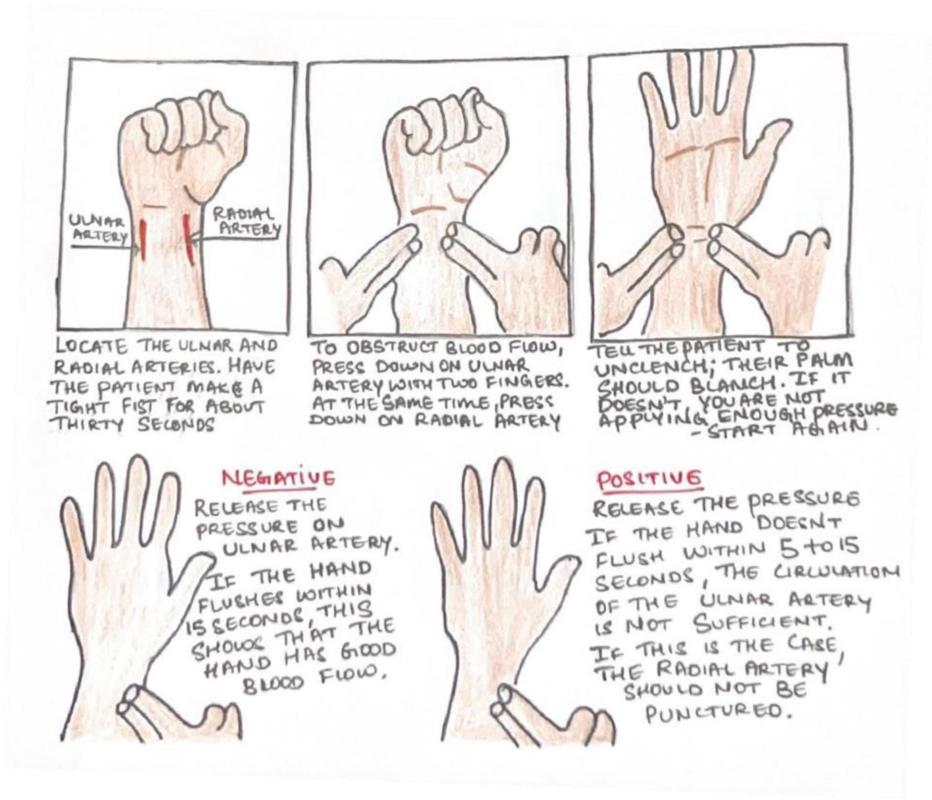


Fig 7: Modified Allen test

Critical Findings:

An acceptable normal range of ABG values of ABG components is the following, noting that the range of normal values may vary among laboratories and in different age groups from neonates to geriatrics:[75, 76]

pH (7.35-7.45)

PaO2 (75-100 mm Hg)

PaCO2 (35-45 mm Hg)

HCO3 (22-26 mEq/L)

Base excess/deficit (-4 to +2)

SaO2 (95-100%)

Arterial blood gas interpretation should be approached systematically to understand the severity, acute or chronic nature, and the metabolic or respiratory origin of abnormalities.

The Romanski method provides a simplified approach for all levels of healthcare providers.[77,78]

1. Assess pH: Determine if acidemia (pH < 7.35) or alkalemia (pH > 7.45) is present. If the pH falls within the normal range (7.35-7.45), use a pH of 7.40 as a cutoff point. For instance, classify a pH of 7.37 as acidosis and a pH of 7.42 as alkalemia.

2. Evaluate Respiratory and Metabolic Components: Review the PaCO2 and HCO3 levels, respectively. PaCO2 indicates whether the acidosis or alkalemia stems primarily from respiratory or metabolic factors. A PaCO2 > 40 with a pH < 7.4 suggests respiratory acidosis, while a PaCO2 < 40 with a pH > 7.4 suggests respiratory alkalosis, often due to hyperventilation from anxiety or compensatory mechanisms for metabolic acidosis.

3. Check for Compensation: Look for evidence of compensation for the primary acidosis or alkalosis by examining the value (paCO2 or HCO3) inconsistent with the pH.

4. Assess PaO2: Lastly, examine PaO2 for any abnormalities in oxygenation. This systematic approach aids in identifying acid-base disorders, determining their primary causes, and recognizing the presence of compensation.

Clinical Significance:

Arterial blood gas (ABG) monitoring remains the gold standard for assessing oxygenation, ventilation, and acid-base status, serving as a crucial tool in confirming and calibrating non-invasive monitoring techniques.

It is frequently performed in intensive care units and emergency rooms, particularly in cases of severe sepsis, acute respiratory failure, and acute respiratory distress syndrome.[79,80]

Respiratory Failure -It is a critical condition characterized by the inability of the respiratory system to maintain adequate gas exchange, leading to abnormal levels of oxygen and/or carbon dioxide in the blood

Types of Respiratory Failure:

1. Hypoxemic Respiratory Failure (Type I): It is characterized by low arterial oxygen tension (paO2) (< 60 mmHg) despite normal or low arterial carbon dioxide tension (PaCO2).

- Causes: Common causes include conditions that impaired oxygen diffusion (e.g., pneumonia, acute respiratory distress syndrome), ventilation-perfusion (V/Q) mismatch (e.g., pulmonary embolism), and shunting of blood away from ventilated areas (e.g., intracardiac shunts).

2. Hypercapnic Respiratory Failure (Type II):It is characterized by elevated arterialcarbon dioxide tension (paCO2) (> 45 mmHg) with or without hypoxemia.
    - Causes: Common causes include conditions that impair ventilation (e.g., chronic obstructive pulmonary disease [COPD], neuromuscular disorders, central respiratory depression).
3. Combined Respiratory Failure (Type I and II):
    - Pathophysiology: Combined respiratory failure involves simultaneous hypoxemic and hypercapnic respiratory failure, often seen in patients with severe underlying lung disease.
    - Causes: Conditions such as COPD exacerbation, acute on chronic respiratory failure, or acute respiratory distress syndrome (ARDS) with underlying lung pathology can lead to combined respiratory failure.

Calculation of the alveolar-arterial (A-a) oxygen gradient assists in pinpointing the cause of hypoxemia, such as hypoventilation, shunt, ventilation/perfusion (V/Q) mismatch, or impaired diffusion. Additionally, the oxygenation index (OI) and the paO2/FiO2 (P/F) ratio are commonly used in ICUs to assess oxygenation, with the OI being particularly valuable in neonatal and pediatric populations.[81,82]

The paCO2 reflects pulmonary ventilation and is a sensitive marker of ventilatory failure, especially in the presence of supplemental oxygen. Calculating the pulmonary dead space and assessing acid-base balance are also essential components of ABG interpretation, aiding in understanding overall lung function and identifying respiratory and metabolic abnormalities, respectively.[83]

<u>Effect of nasal obstruction on blood gases:[84,85,86,87]</u>

The nose serves as the primary route of breathing in humans, facilitating functions such as humidification, warming, and filtration of inspired air. Under normal conditions, the nasal airway contributes to over 50% of total airway resistance, with the anterior portion of the nose being a significant contributor. However, this resistance can increase in pathological conditions.

Nasal resistance varies from side to side due to nasal mucosal changes in nasal turbinates, leading to a cyclic pattern known as the nasal cycle, observed in approximately 80% of adults. This cycle plays a role in respiratory defense mechanisms. Oral breathing secondary to nasal obstruction can lead to changes in respiratory mechanics and arterial blood gases. Permanent unilateral nasal obstruction may significantly increase total airway resistance due to the nasal cycle.

Simple nasal obstruction has been associated with hypoxemia and alterations in respiratory function tests. Nasal packing, a common practice after nasal surgeries, has been linked to hypoxemia and/or hypercapnia in some studies. Surgical correction of nasal obstruction is standard in rhinolaryngology practice and may improve physiological changes in pulmonary function and arterial blood gases associated with nasal obstruction.

Nasal packing, commonly used after nasal surgeries, can lead to both local and systemic complications.[88-91]

1. Respiratory Complications: Nasal packing can compromise respiration, leading to hypoxemia. Factors contributing to this include aspiration of blood, sedation, and exacerbation of pulmonary dysfunction, particularly in elderly patients. Acute anemia resulting from blood loss during packing can worsen tissue hypoxia, potentially leading to fatal consequence
2. Airway Obstruction: Bulky postnasal packs can overfill the nasopharynx and depress the soft palate, further compromising the airway and impeding breathing.
3. Disturbance in Breathing Patterns: Mouth breathing, which replaces nasal breathing post-packing, can disturb pulmonary ventilation, leading to acid-alkaline imbalances. Rapid, shallow mouth breathing can exacerbate hypoxia, creating a vicious cycle of respiratory distress.
4. Thoracic Movement and Circulatory Changes: Mouth breathing diminishes thoracic movement, affecting pulmonary circulation, reducing vital capacity, and lowering blood oxygen levels.
5. Sleep-Disordered Breathing: Nasal packing can induce or worsen sleep-disordered breathing, increasing the frequency, duration, and number of obstructive events during sleep.

OBJECTIVES OF STUDY

1. To document the effect of totally occlusive anterior nasal pack on Eustachian tube function and arterial blood gas.
2. To document the effect of anterior nasal pack with airways on Eustachian tubefunction and arterial blood gas.
3. To compare the effect of totally occlusive anterior nasal pack and nasal pack with airways on Eustachian tube function and arterial blood gas analysis

MATERIALS &
METHODS

MATERIALS AND METHODS

SOURCE OF DATA: All patients with epistaxis who required bilateral anterior nasal pack and patients who underwent nasal surgeries and required post-operative nasal packing at RL Jalappa Hospital and Research Centre, affiliated to Sri Devaraj Urs Medical college, Tamaka, Kolar.

STUDY DESIGN: Randomised controlled study

STUDY DURATION: 1 year 10months

STUDY PERIOD: JULY 2022 TO MAY 2024

SAMPLE SIZE:

Was estimated by using the difference in Mean pre-op and Post-op HCO3 between nasal pack with airway group and totally occlusive nasal pack Group from the study Ehab Zeyyan et. al. as -0.47 ± 0.51 and -1.51 ± 1.49.[1]

Using these values at 95% Confidence limit and 95% power sample size of 28 was obtained in each group by using the below mentioned formula and Med calc sample size software.

With 10% nonresponse sample size of 28 + 2.8 ≈ 31 cases were included in each group.

Sample Size Estimation Formula:

$$N = \frac{2\ SD^2(Z\ \alpha/2 + Z\ \beta)^2}{d^2}$$

- Where Z α/2 is the critical value of the Normal distribution at α/2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96).

-Z β is the critical value of the Normal distribution at β (e.g. for a power of 80%, ß is 0.2 and the critical value is 0.84),

-SD is the standard deviation from previous study population variance, and

-d is the difference between two mean.

INSTITUTIONAL ETHICS COMMITTEE NUMBER -

SDUMC/KLR/IEC/322/2022-23

CLINICAL TRIAL REGISTRY OF INDIA NUMBER-

CTRI/2024/04/065366

INCLUSION CRITERIA:

All patients aged between 18- 60 years who underwent nasal surgeries and patients with epistaxis who required bilateral anterior nasal packing

EXCLUSION CRITERIA:

1. Patients with mucociliary disorders
2. Patients requiring posterior nasal pack
3. Patients who have received radiation to nasopharynx or the surrounding areas
4. Very obese patients with history of obstructive sleep apnea
5. Patients with impaired cardiac functions.
6. Patients with pre existing lung pathologies like COPD

METHOD OF COLLECTION OF DATA

Oral and written informed consent was taken from all the patients for taking part in the study. Patients with epistaxis who required nasal packing and patients who underwent nasal surgeries were included in the study after applying inclusion and exclusion criteria. Patients were

randomly divided into two groups- Group A and Group B by randomised computer generator numbers. Tympanometry and arterial blood gas analysis was done prior to nasal surgery or prior to nasal pack insertion in case of epistaxis. Patients of group A were packed with totally occlusive nasal packs. Patients of group B were packed with nasal pack with airways. Tympanometry and arterial blood gas analysis was repeated for all patients with the nasal pack insitu. Patients were monitored for oxygen saturation by pulse oximeter. Patients were also assessed for nasal obstruction and bronchospasm with the nasal pack in situ in cases with hypersensitive airway disorders and findings were documented and this was considered as a secondary objective.

Fig 8. Nasal pack with airway

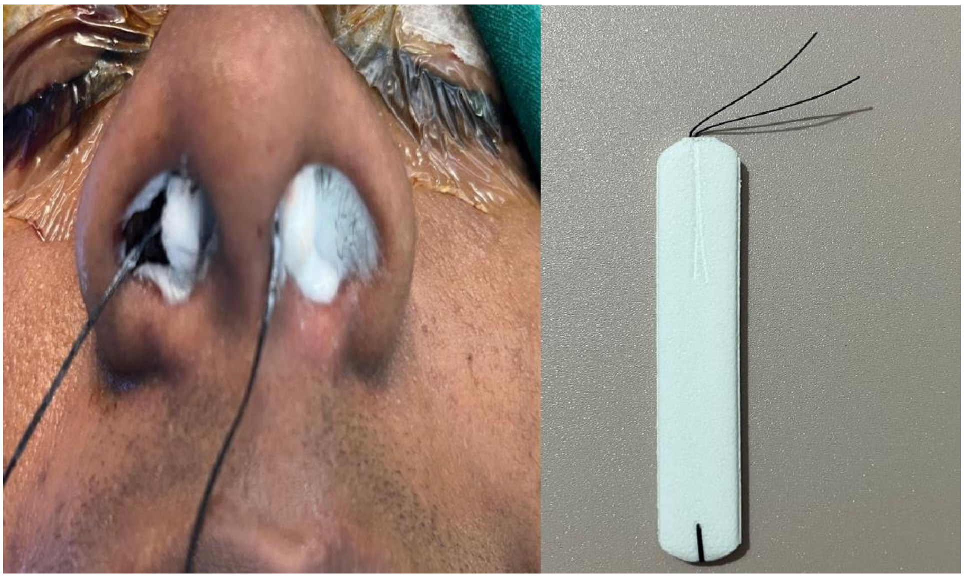


Fig 9. Completely occlusive nasal pack

Statistical analysis:

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. **Chi-square test or Fischer's exact test** (for 2x2 tables only) was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. **Independent t test** was used as test of significance to identify the mean difference between two variables.

Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs

P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS

RESULTS

Gender distribution among the two groups				
	Group A		Group B	
	n	%	n	%
Female	12	38.7%	12	38.7%
Male	19	61.3%	19	61.3%

Table 1:- Distribution of subjects according to sex among the group

Group A and Group B each have 38.7% females and 61.3% males, indicating equal gender distribution in both groups.

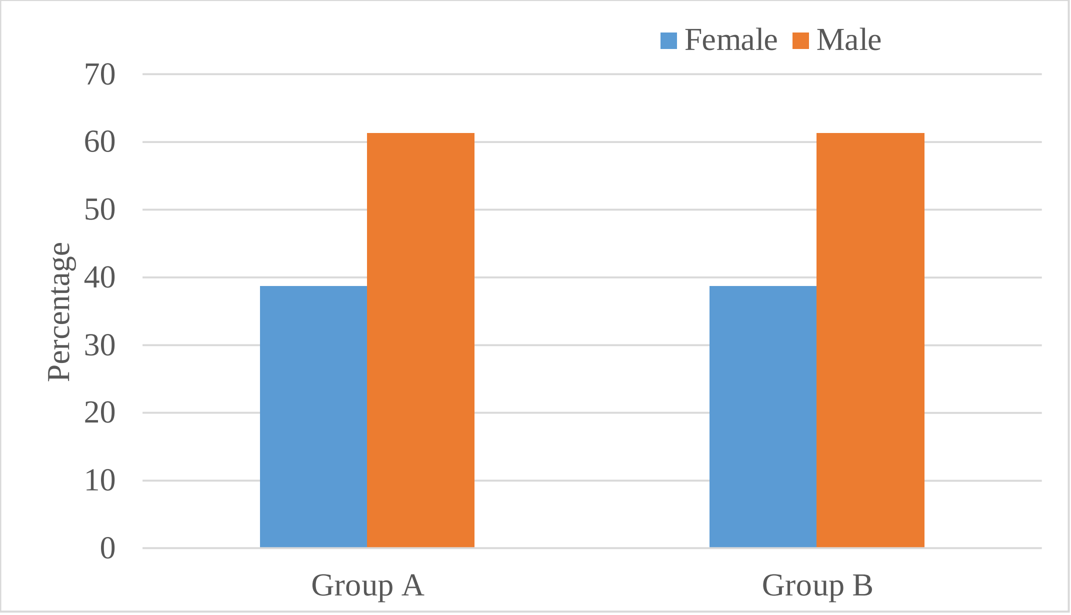


Figure 10:- Graph showing Distribution of subjects according to sex among the two groups

The graph illustrates an identical distribution of males and females in both groups with 38.7% females and 61.3% males in each group.

Age in years		
	Mean	Std. Deviation
Group A	33.84	12.512
Group B	34.94	11.535

Table 2:- Comparison of mean age among groups

Group A has a mean age of 33.84 years with a standard deviation of 12.512, while Group B has a mean age of 34.94 years with a standard deviation of 11.535.

Implication: There is no statistically significant difference in age between the two groups.

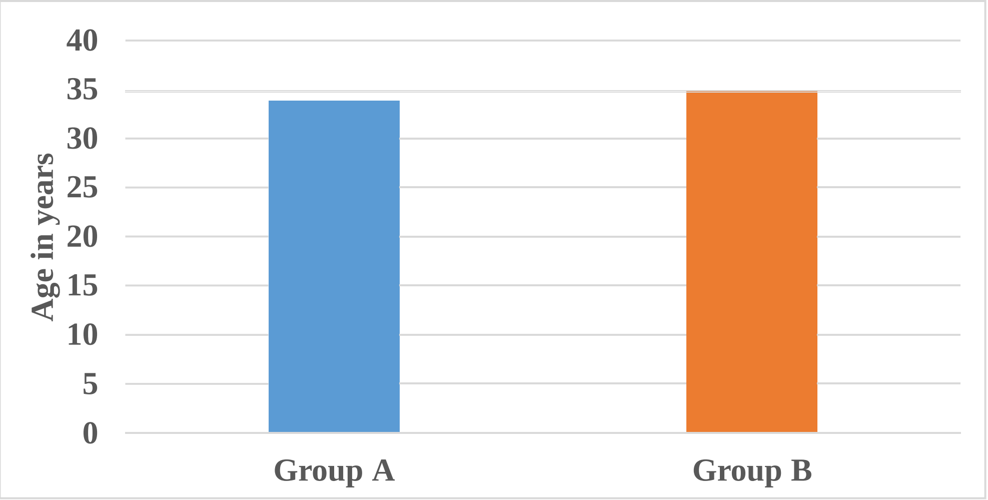


Figure 11:- Graph showing Comparison of mean age among groups

The graph visually represents the comparison of mean age between Group A and Group B.

Group A has a mean age of 33.84 years while Group B has a mean age of 34.94 years.

Diagnosis				
	Group A		Group B	
	n	%	n	%
CRS + NP	4	12.9%	1	3.2%
DNS	16	51.6%	26	83.9%
Nasal polyposis	6	19.4%	3	9.7%
Others	4	12.9%	1	3.2%
Recurrent epistaxis	1	3.2%	0	0%

Table 3:- Distribution of subjects according to diagnosis among the two groups

Group A: CRS + NP (12.9%), DNS (51.6%), Nasal polyposis (19.4%), others (12.9%), Recurrent epistaxis (3.2%). Group B: CRS + NP (3.2%), DNS (83.9%), Nasal polyposis (9.7%), others (3.2%), Recurrent epistaxis (0%).

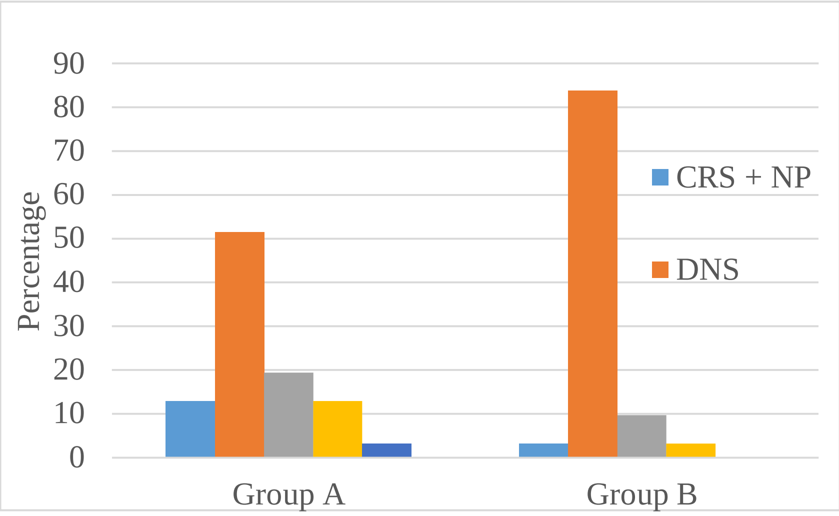


Figure 12:- Graph showing Distribution of subjects according to diagnosis among the group

This figure visually represents the distribution of subjects according to different diagnoses in both Group A and Group B. Group A- CRS + NP (12.9%), DNS (51.6%), Nasal polyposis (19.4%), Others (12.9%), Recurrent epistaxis (3.2%). Group B- CRS + NP (3.2%), DNS (83.9%), Nasal polyposis (9.7%), Others (3.2%), Recurrent epistaxis (0%).

Treatment				
	Group A		Group B	
	n	%	n	%
FESS	10	32.3%	4	12.9%
FESS + SEPTOPLASTY	2	6.5%	8	25.8%
POLPECTOMY	2	6.5%	0	.0%
SEPTOPLASTY	15	48.4%	18	58.1%

Table 4:- Distribution of subjects according to treatment among the group

Group A: FESS (Functional Endoscopic Sinus Surgery) - 10 subjects (32.3%), FESS + SEPTOPLASTY - 2 subjects (6.5%), POLPECTOMY - 2 subjects (6.5%), SEPTOPLASTY - 15 subjects (48.4%).

Group B: FESS - 4 subjects (12.9%), FESS + SEPTOPLASTY - 8 subjects (25.8%), SEPTOPLASTY - 18 subjects (58.1%). There is no significant difference found between groups with respect to treatment.

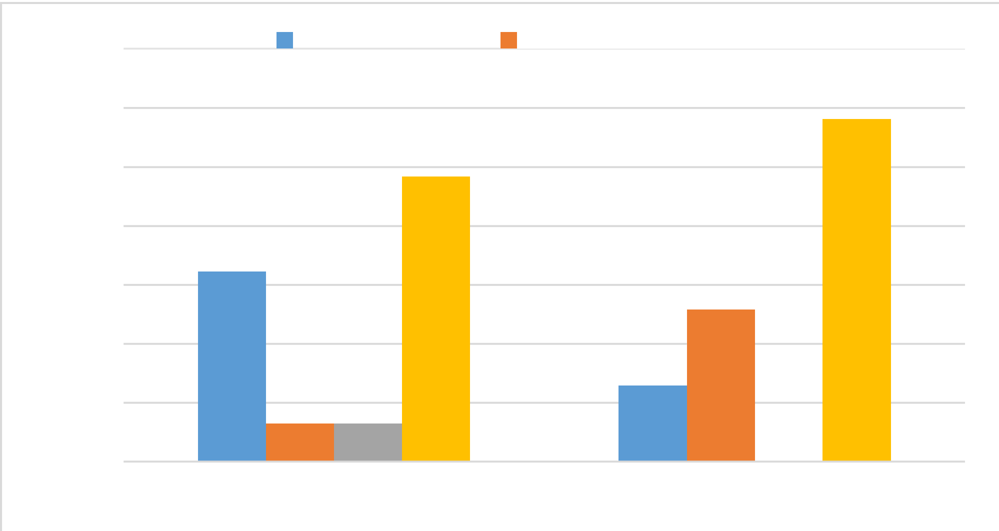


Figure 13:- Graph showing Distribution of subjects according to treatment among the group

This figure visually represents the distribution of subjects according to different treatments in both Group A and Group B in percentage.

Group A: FESS- 32.3%, FESS + SEPTOPLASTY -6.5%, POLPECTOMY - 6.5%, SEPTOPLASTY -48.4%.

Group B: FESS - 12.9%, FESS + SEPTOPLASTY - 25.8%, SEPTOPLASTY - 58.1%.

pH										
	Preop					Post op Day 1 with nasal pack insitu				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	7.42	7.42	0.12	0.029	0.224	7.42	7.42	0.1	0.028	0.324
B	7.43	7.43	0.10	0.028		7.44	7.44	0.10	0.029	

Table 5:- Comparison of mean difference in pre op pH and Post op pH among two groups

Pre-op: Group A has a mean pH of 7.42 with a range from 7.30 to 7.54 and a standard deviation of 0.029. Group B has a mean pH of 7.43 with a range from 7.33 to 7.53 and a standard deviation of 0.028. **Post op Day 1 with nasal pack in situ**: Group A has a mean pH of 7.42 with a range from 7.32 to 7.52 and a standard deviation of 0.028. Group B has a mean pH of 7.44 with a range from 7.34 to 7.54 and a standard deviation of 0.029.There is no statistically significant difference in preoperative and postoperative pH levels between Group A and Group B, as indicated by the p-values (0.224 and 0.324 respectively).

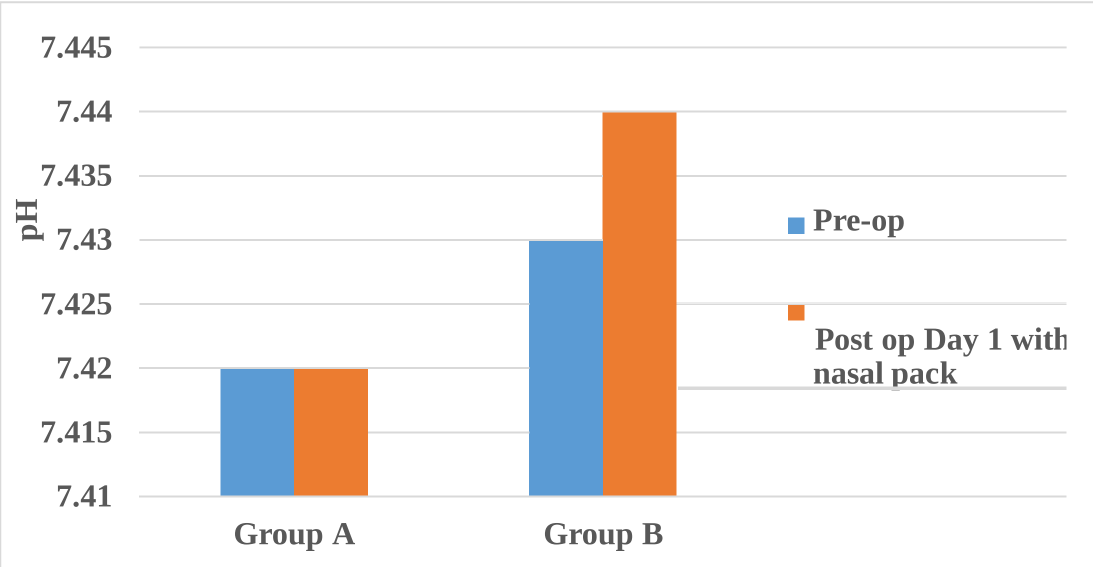


Figure 14:- Graph showing Comparison of mean difference of pre op pH and Post op pH among the two groups

- **Pre-op**: Group A has a mean pH of 7.42 and Group B has a mean pH of 7.43 .
- **Post op Day 1 with nasal pack in situ**: Group A has a mean pH of 7.42 and Group B has a mean pH of 7.44.

  There appears to be a difference in mean postoperative Day 1 with nasal pack in situ pH levels but not statistically significant between Group A and Group B .

paO2										
	Preop					Post op Day 1 with nasal pack insitu				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	90.06	90.1	34.7	1.72	0.68	90.5	90.2	26.2	1.58	0.071
B	90.3	90.4	25.4	1.86		91.3	91.5	26	1.78	

Table 6:- Comparison of mean difference in pre paO2 and Post paO2 among two groups

Pre-op: Group A has a mean paO2 of 90.06 mmHg with a median of 90.1 mmHg, ranging from 55.6 to 124.3 mmHg, and a standard deviation of 1.72 mmHg. Group B has a mean paO2 of 90.3 mmHg with a median of 90.4 mmHg, ranging from 64.9 to 90.3 mmHg, and a standard deviation of 1.86 mmHg.

Post op Day 1 with nasal pack in situ: Group A has a mean paO2 of 90.5 mmHg with a median of 90.2 mmHg, ranging from 64.3 to 90.5 mmHg, and a standard deviation of 1.58 mmHg. Group B has a mean paO2 of 91.3 mmHg with a median of 91.5 mmHg, ranging from 65.3 to 91.5 mmHg, and a standard deviation of 1.78 mmHg.

□There is a no statistically significant difference between Group A and Group B in the mean difference postoperative paO2 levels, as indicated by the p-values (0.071).

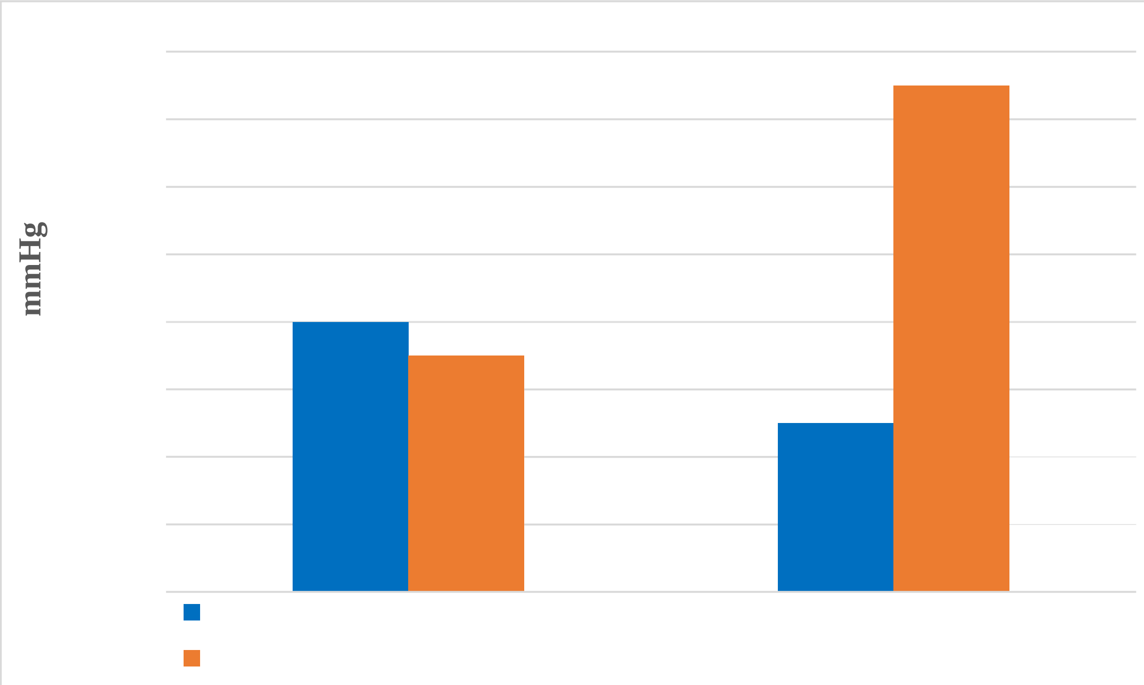


Figure 15:- Graph showing Comparison of mean difference in pre op paO2 and Post op paO2 among groups

Pre- op - Group A has a mean paO2 of 90.06 mmHg and Group B has a mean paO2 of 90.3 mmHg.

Post op Day 1 with nasal pack in situ: Group A has a mean paO2 of 90.5 mmHg and Group B has a mean paO2 of 91.3 mmHg.

It visually confirms the statistical significance showing that Group B exhibits a higher mean difference in paO2 levels compared to Group A postoperatively with nasal pack in situ.

PACO2										
	Preop					Post op Day 1 with nasal pack insitu				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	33.5	32.9	6.9	1.86	0.59	32.6	30.8	6	1.90	0.464
B	33.0	32.8	7.3	1.86		33	32.8	8.5	1.96	

Table 7:- Comparison of mean difference in pre PACO2 and Post PACO2 among groups.

Preop: Group A has a mean PACO2 of 33.5 mmHg with a median of 32.9 mmHg, ranging from 26.6 to 40.3 mmHg, and a standard deviation of 1.86 mmHg. Group B has a mean PACO2 of 33.0 mmHg with a median of 32.8 mmHg, ranging from 25.7 to 41.0 mmHg, anda standard deviation of 1.86 mmHg.

Post op Day 1 with nasal pack in situ: Group A has a mean PACO2 of 32.6 mmHg with a median of 30.8 mmHg, ranging from 26.6 to 38.6 mmHg, and a standard deviation of 1.90 mmHg. Group B has a mean paCO2 of 33.0 mmHg with a median of 32.8 mmHg, ranging from 24.5 to 41.3 mmHg, and a standard deviation of 1.96 mmHg.

There is no statistically significant difference between Group A and Group B in the mean difference of preoperative and postoperative paCO2 levels, as indicated by the p-values (0.59 for preop and 0.464 for post op).

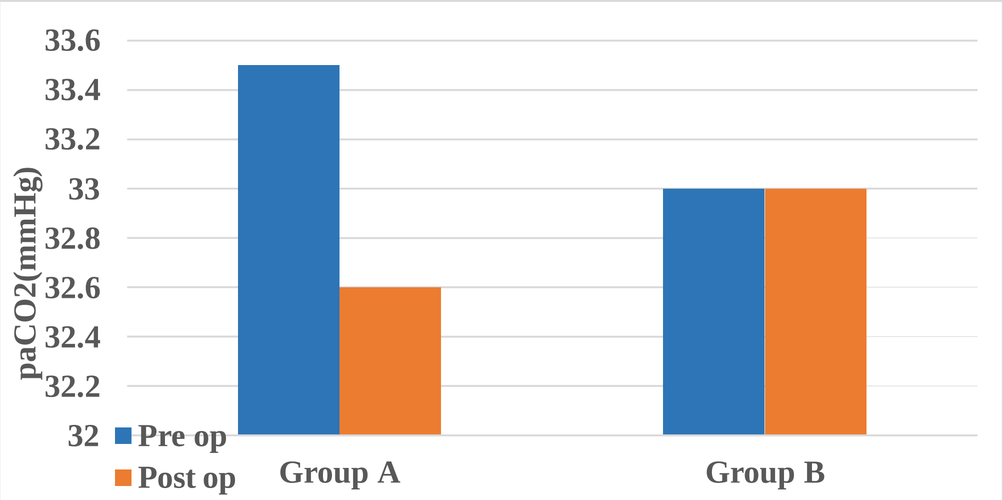


Figure 16:- Graph showing Comparison of mean difference in pre paCO2 and Post paCO2 among groups

Preop: Group A has a mean paCO2 of 33.5 mmHg and Group B has a mean paCO2 of 33.0 mmHg . **Post op Day 1 with nasal pack in situ**: Group A has a mean paCO2 of 32.6 mmHg and Group B has a mean paCO2 of 33.0 mmHg.

HCO3										
	Preop					Post op Day 1 with nasal pack insitu				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	24.6	24.5	4.6	1.16	0.803	30.6	30.8	3.6	1.05	0.901
B	24.7	24.6	3.2	1.13		23.8	23.8	3.2	1.08	

Table 8:- Comparison of mean difference in pre HCO3 and Post HCO3 among two groups

Preop: Group A has a mean HCO3 level of 24.6 mmol/L with a median of 24.5 mmol/L, ranging from 20.0 to 28.6 mmol/L, and a standard deviation of 1.16 mmol/L. Group B has a mean HCO3 level of 24.7 mmol/L with a median of 24.6 mmol/L, ranging from 21.5 to 27.7 mmol/L, and a standard deviation of 1.13 mmol/L.

Post op Day 1 with nasal pack in situ: Group A has a mean HCO3 level of 30.6 mmol/L with a median of 30.8 mmol/L, ranging from 27.0 to 34.6 mmol/L, and a standard deviationof 1.05 mmol/L. Group B has a mean HCO3 level of 23.8 mmol/L with a median of 23.8 mmol/L, ranging from 20.6 to 27.0 mmol/L, and a standard deviation of 1.08 mmol/L.

There is no statistically significant difference between Group A and Group B in the mean difference of preoperative and postoperative HCO3 levels, as indicated by the p-values (0.803 for preop and 0.901 for post op).

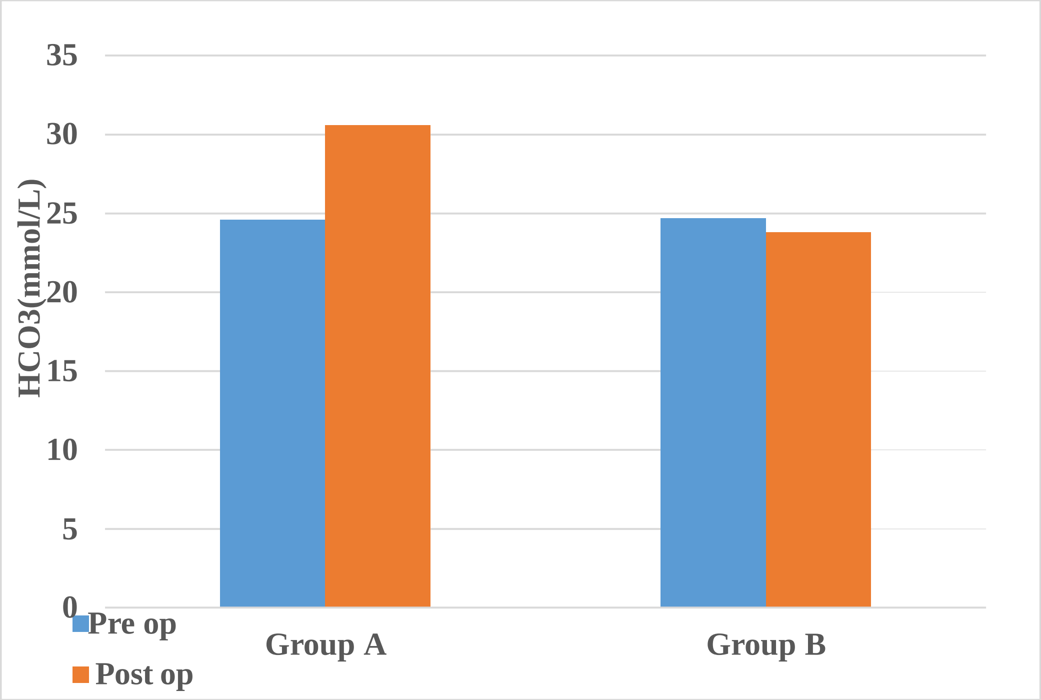


Figure 17:- Graph showing Comparison of mean difference in pre HCO3 and Post HCO3 among groups

Preop: Group A has a mean HCO3 level of 24.6 mmol/L and Group B has a mean HCO3 level of 24.7 mmol/L.

Post op Day 1 with nasal pack in situ: Group A has a mean HCO3 level of 30.6 mmol/L and Group B has a mean HCO3 level of 23.8 mmol/L.

SpaO2										
	Preop					Post op Day 1 with nasal pack insitu				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	97.9	97	7	1.63	0.9261	94.4	94	5.6	1.5	<0.01
B	97.2	97	6.7	1.54		96.2	96	6.7	1.65	

Table 9:- Comparison of mean difference in pre SpO2 and Post SpO2 among groups

Preop: Group A has a mean SpO2 of 97.9% with a median of 97%, ranging from 90.9% to 99%, and a standard deviation of 1.63%. Group B has a mean SPO2 of 97% with a median of 97.1%, ranging from 90.5% to 99%, and a standard deviation of 1.54%.

Post op Day 1 with nasal pack in situ: Group A has a mean SpO2 of 94.4% with a median of 94.0%, ranging from 88.8% to 100.0%, and a standard deviation of 1.5%. Group B has a mean SPO2 of 96.2% with a median of 96.0%, ranging from 89.5% to 96%, and a standard deviation of 1.65%. There is a statistically significant difference between Group A and Group B in the mean difference of preoperative and postoperative SPO2 levels, as indicated by the p-value (<0.01).

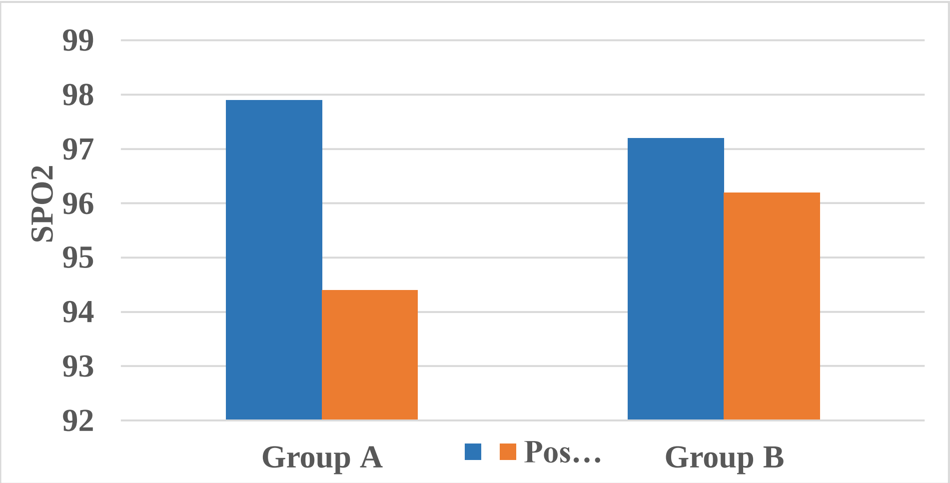


Figure 18:- Graph showing Comparison of mean difference in pre SPO2 and Post SPO2 among groups

Preop: Group A has a mean SpO2 of 97.9% and Group B has a mean SPO2 of 97%

Post op Day 1 with nasal pack in situ: Group A has a mean SpO2 of 94.4% and Group B has a mean SPO2 of 96.2%

Tympanometry

Pre op				
Curve	Group A		Group B	
	Right ear	Left ear	Right ear	Left ear
A	21	28	24	26
C	10	3	7	5
Post op Day 1 with Nasal pack insitu				
A→A	15	24	21	25
A→C	6	4	3	1
C→A	4	2	4	3
C→C	6	1	3	2
Post op - One week after Nasal pack removal				
A→A	19	27	25	28
A→C	0	0	0	0
C→A	9	4	6	3
C→C	3	1	0	0

Table 10:- Comparison of Tympanometry curves in both the groups

It represents the distribution of tympanometric curves for both Group A and Group B across different time points: preoperative, postoperative with nasal pack in situ, and one week after nasal pack removal.

Pre op- Group A- 21 subjects had type A curve on right side, 28 had type A curve on left side, 10 had type C on right side and 3 had type C on left side. Group B- 24 subjects had type A curve on right side, 26 had type A curve on left side, 7 had type C on right side and 5 had type C on left side.

Post op Day 1 with nasal pack insitu- Group A Right ear- 15 patients had no change in type A curve, 6 patients had change from A to C, 4 had change from C to A and 6 had no change in C type curve. Left ear- 24 patients had no change in type A curve, 4 patients had change from A to C, 2 had change from C to A and 1 had no change in C type curve.

Group B Right ear- 21 patients had no change in type A curve, 3 patients had change from A to C, 4 had change from C to A and 3 had no change in C type curve. Left ear- 25 patients had no change in type A curve, 1 patients had change from A to C, 3 had change from C to A and 2 had no change in C type curve.

Post op one week- after pack removal- Group A Right ear- 19 patients had no change in type A curve, no patient had change from A to C, 9 had change from C to A and 3 had no change in C type curve. Left ear- 27 patients had no change in type A curve, no patient had change from A to C, 4 had change from C to A and 1 had no change in C type curve.

Group B Right ear- 21 patients had no change in type A curve, no patient had change from A to C, 6 had change from C to A and no patients had type C curve. Left ear- 28 patients had no change in type A curve, no patient had change from A to C, 3 had change from C to A and no patients had type C curve.

30% of the patients showed improvement in the tympanogram immediately after surgery.

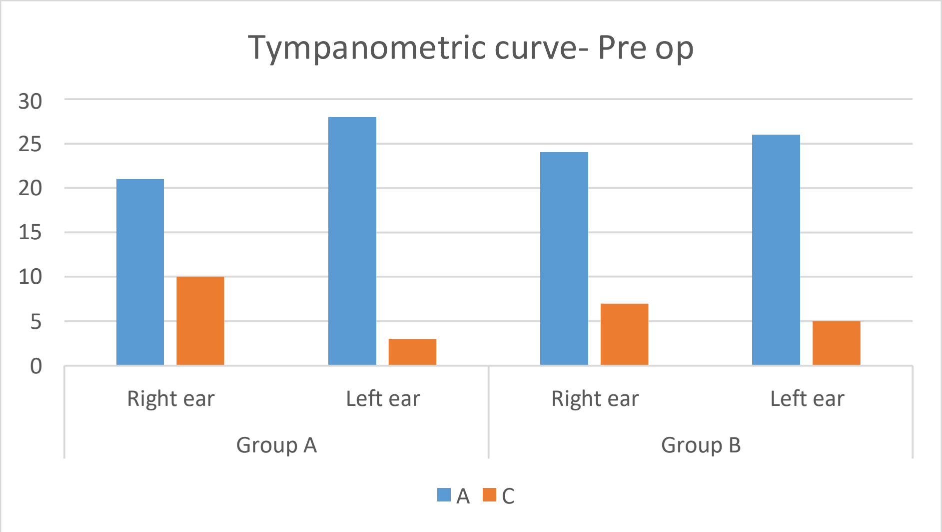


Figure 19- The graph depicts the comparison of tympanometric curves between the two group preoperatively

Group A- 21 subjects had type A curve on right side, 28 had type A curve on left side, 10 had type C on right side and 3 had type C on left side. Group B- 24 subjects had type A curve on right side, 26 had type A curve on left side, 7 had type C on right side and 5 had type C on left side.

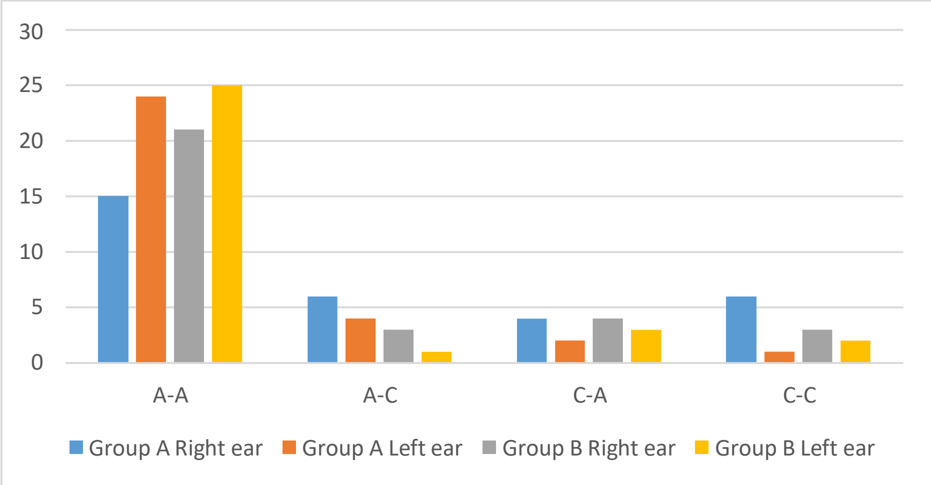


Figure 20- The graph depicts the comparison of change in tympanometric curves between the two groups on post op day 1 with nasal pack insitu.

Group A Right ear- 15 patients had no change in type A curve, 6 patients had change from A to C, 4 had change from C to A and 6 had no change in C type curve. Left ear- 24 patients had no change in type A curve, 4 patients had change from A to C, 2 had change from C to A and 1 had no change in C type curve.

Group B Right ear- 21 patients had no change in type A curve, 3 patients had change from A to C, 4 had change from C to A and 3 had no change in C type curve. Left ear- 25 patients had no change in type A curve, 1 patients had change from A to C, 3 had change from C to A and 2 had no change in C type curve.

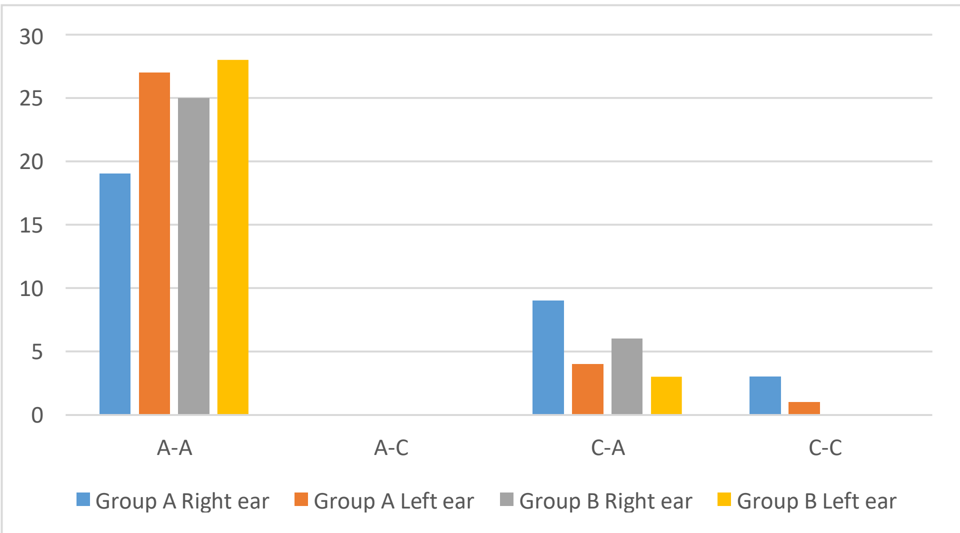


Figure 21- The graph depicts the comparison of change in tympanometric curves between the two groups on post op one week after removal nasal pack.

Group A Right ear- 19 patients had no change in type A curve, no patient had change from A to C, 9 had change from C to A and 3 had no change in C type curve. Left ear- 27 patients had no change in type A curve, no patient had change from A to C, 4 had change from C to A and 1 had no change in C type curve.

Group B Right ear- 21 patients had no change in type A curve, no patient had change from A to C, 6 had change from C to A and no patients had type C curve. Left ear- 28 patients had no change in type A curve, no patient had change from A to C, 3 had change from C to A and no patients had type C curve.

Tympanometric Peak pressure(daPa)

Pre-operatively										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	-76	-57	203	55.3	0.22	-55	-54	201	55	0.79
B	-60	-56	200	43.8		-56	-54	162	40	

Table 11- Tympanometric peak pressure values (in daPa) pre-operatively for both Group A and Group B

Group A: The mean tympanometric peak pressure for the right ear is -76 daPa with a median of -57 daPa and a standard deviation of 55.3. For the left ear, the mean is -55 daPa with a median of -54 daPa and a standard deviation of 55. **Group B**: The mean tympanometric peak pressure for the right ear is -60 daPa with a median of -56 lapa and a standard deviation of 43.8. For the left ear, the mean is -56 daPa with a median of -54 daPa and a standard deviation of 40.

The p-values for both ears are 0.22 and 0.79, respectively showing no statistical significance between the two groups.

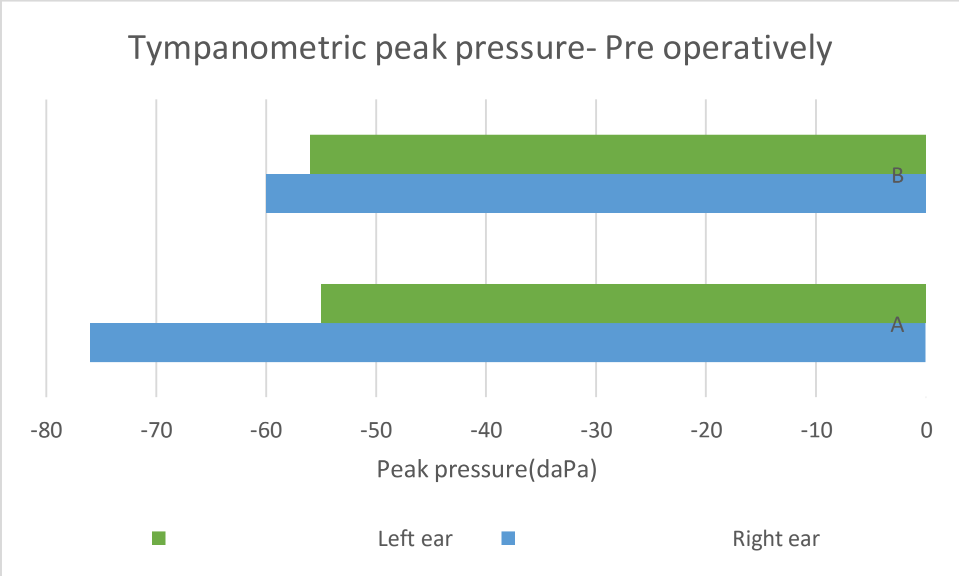


Figure 22- Graph showing comparison of mean difference between Group A and Group B preoperatively

Group A: The mean tympanometric peak pressure for the right ear is -76 daPa and left ear is -55 daPa .

Post op Day 1 with nasal pack insitu										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	-67	-32	193	58	0.038	-29	-21	77	31	0.09
B	-29	-21	77	31		-28	-19	61	31	

Table 12- Tympanometric peak pressure values (in daPa) on Post op Day 1 with nasal pack

Group B: The mean tympanometric peak pressure for the right ear is -60 daPa and left ear is -56 daPa

Group A: The mean tympanometric peak pressure for the right ear is -67 daPa with a median of -32 daPa and a standard deviation of 58. For the left ear, the mean is -29 daPa with a median of -21 daPa and a standard deviation of 31. **Group B-** The mean tympanometric peak pressure for the right ear is -29 daPa with a median of -21 daPa and a standard deviation of 31. For the left ear, the mean is -28 daPa with a median of -19 daPa and a standard deviation of 31.

There is statistically significant difference between the two groups on right side with p- value 0.038 and on left side there is a difference but not statistically significant

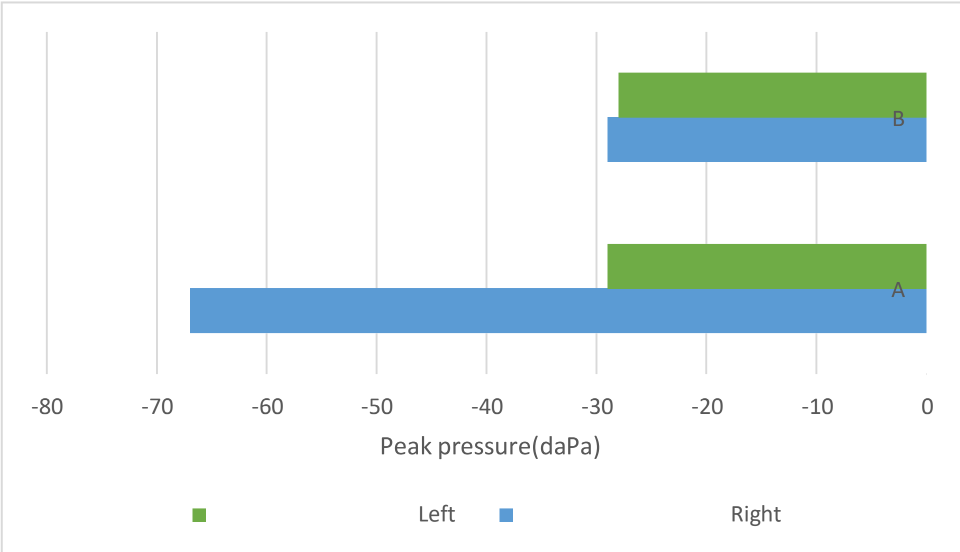


Figure 23- Graph showing comparison of mean difference between Group A and Group B on post op day 1 with nasal pack

Group A: The mean tympanometric peak pressure for the right ear is -67 daPa and left ear is -29 daPa

Group B- The mean tympanometric peak pressure for the right ear is -29 daPa and left ear is -28daPa

Post op- One week after pack removal										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	-20	-10	117	31	0.0558	-44	-35	105	31	0.2570
B	-25	-22	40	12		-11	-10	50	12	

Table 13- Tympanometric peak pressure values (in daPa) Post op- One week after pack removal.

Group A: The mean tympanometric peak pressure for the right ear is -20daPa with a median of -10 daPa and a standard deviation of 31. For the left ear, the mean is -44 daPa with a median of -35 da pa and a standard deviation of 31. **Group B-** The mean tympanometric peak pressure for the right ear is -25 daPa with a median of -22 daPa and a standard deviationof 12. For the left ear, the mean is -11da pa with a median of -10 daPa and a standard deviation of 12.

There is no statistically significant difference between the two groups as the p values are 0.0556 and 0.247 respectively

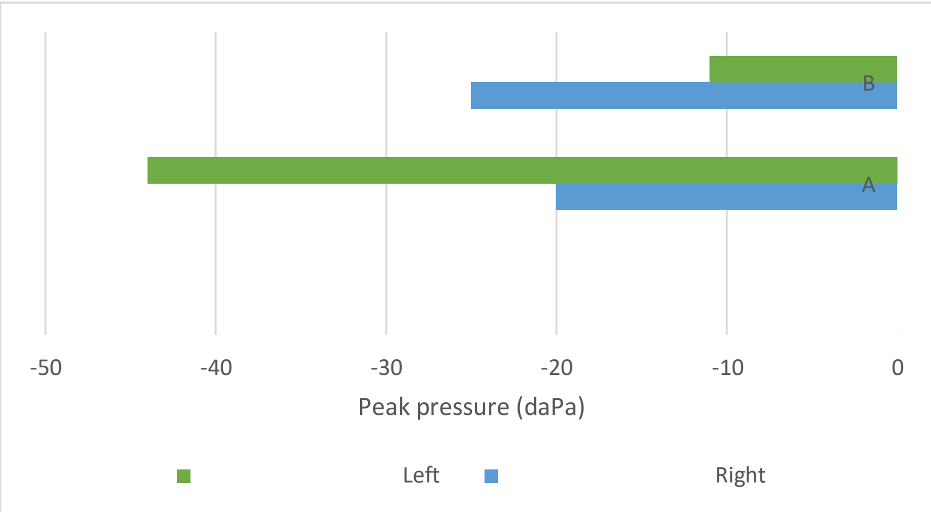


Figure 24- Graph showing comparison of mean difference in tympanometric peak pressure between Group A and Group B on post op one week after nasal pack removal.

Group A: The mean tympanometric peak pressure for the right ear is -20daPa and left ear is -44 daPa.

Group B- The mean tympanometric peak pressure for the right ear is -25 daPa and left ear is -11daPa

Pre-operatively										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	0.94	0.98	0.8	0.2	0.44	0.96	1	0.74	0.18	0.18
B	0.98	0.98	0.86	0.19		1.01	1.02	0.62	0.15	

Static admittance/ Compliance (mmho)

Table 14 -_Static admittance (mmho) pre-operatively in Group A and Group B

Group A: The mean static admittance for the right ear is 0.94mmho with a median of 0.98 mmho and a standard deviation of 0.2. For the left ear, the mean is 0.96 with a median of 1mmho and a standard deviation of 0.18. **Group B**- The mean static admittance for the right ear is 0.98 mmho with a median of 0.98 mmho and a standard deviation of 0.19. For the left ear, the mean is 1.01 mmho with a median of 1.02 mmho and a standard deviation of 0.15mm

There is no statistically significant difference between the two groups.

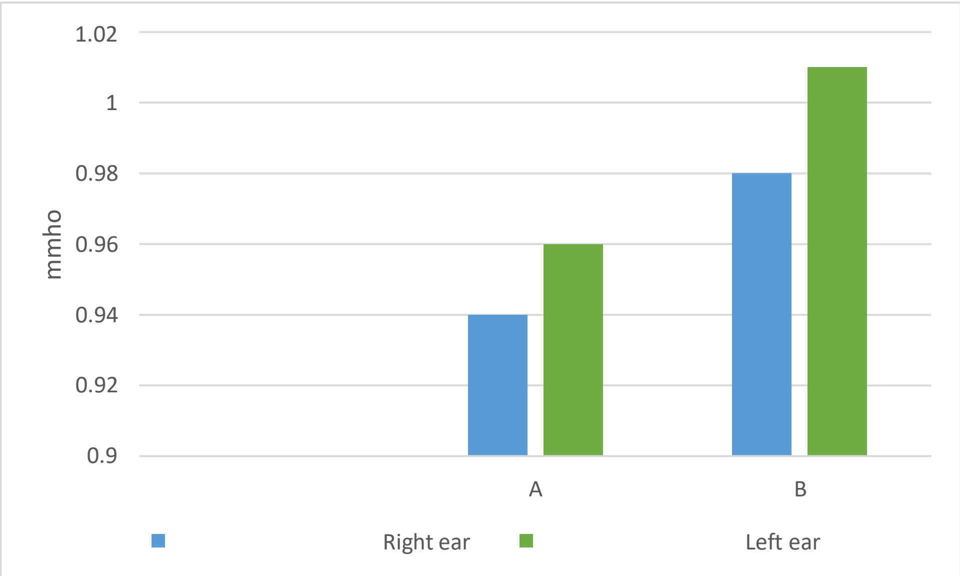


Figure 25- Graph showing comparison of mean difference in static admittance between Group A and Group B pre operatively

Group A: The mean static admittance for the right ear is 0.94 mmho and left ear is 0.96 mmho

Group B- The mean static admittance for the right ear is 0.98 mmho and left ear is 1.01 mmho

Post op Day 1 with nasal pack insitu										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	0.93	0.98	0.82	0.2	0.215	1	1	0.66	0.18	0.89
B	0.98	0.98	0.86	0.19		1.01	1.02	0.62	0.15	

Table 15 - Static admittance (mmho) on Post op Day 1 with nasal pack insitu in Group A and Group B

Group A: The mean static admittance for the right ear is 0.93 mmho with a median of 0.98 mmho and a standard deviation of 0.2. For the left ear, the mean is 1 with a median of 1mmho and a standard deviation of 0.18. **Group B-** The mean static admittance for the right ear is 0.98 mmho with a median of 0.98 mmho and a standard deviation of 0.19. For the left ear, the mean is 1.01 mmho with a median of 1.02 mmho and a standard deviation of 0.15.

There is no statistically significant difference between the two groups.

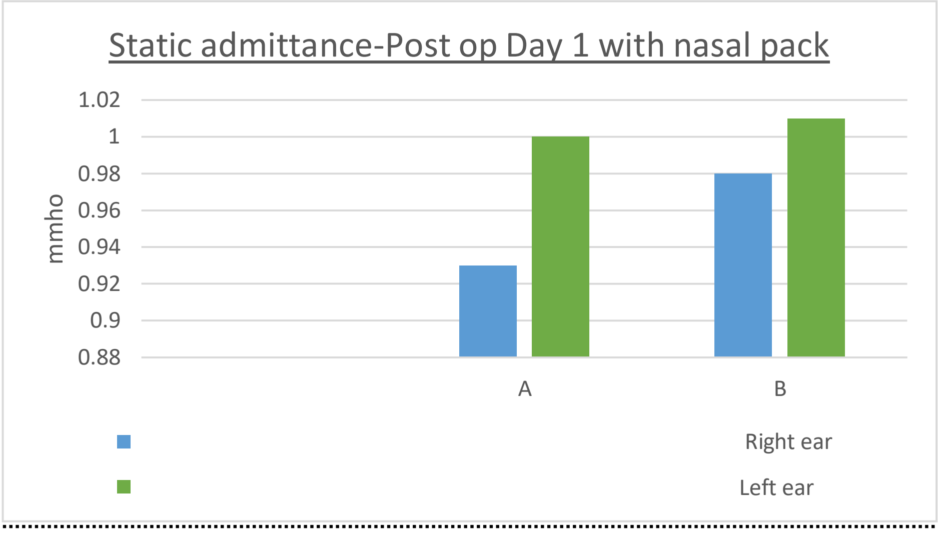


Figure 26- Graph showing comparison of mean difference in static admittance between Group A and Group B on post op day 1

Group A: The mean static admittance for the right ear is 0.93 mmho and left ear is 1 mmho

Group B- The mean static admittance for the right ear is 0.98 mmho and left ear is 1.01 mmho

Post op- One week after pack removal										
	Right					Left				
Group	Mean	Median	Range	Standard Deviation	p-value	Mean	Median	Range	Standard Deviation	p-value
A	0.96	0.98	0.82	0.18	0.603	0.98	0.98	0.62	0.16	0.41
B	0.98	0.98	0.62	0.16		0.94	0.98	0.8	0.21	

Table 16- Static admittance Post op- One week after pack removal

Group A: The mean static admittance for the right ear is 0.96 mmho with a median of 0.98 mmho and a standard deviation of 0.18. For the left ear, the mean is 0.98 with a median of 0.98 mmho and a standard deviation of 0.16.

Group B- The mean static admittance for the right ear is 0.98 mmho with a median of 0.98 mmho and a standard deviation of 0.16. For the left ear, the mean is 0.94 mmho with a median of 0.98 mmho and a standard deviation of 0.21.

There is no statistically significant difference between the two groups.

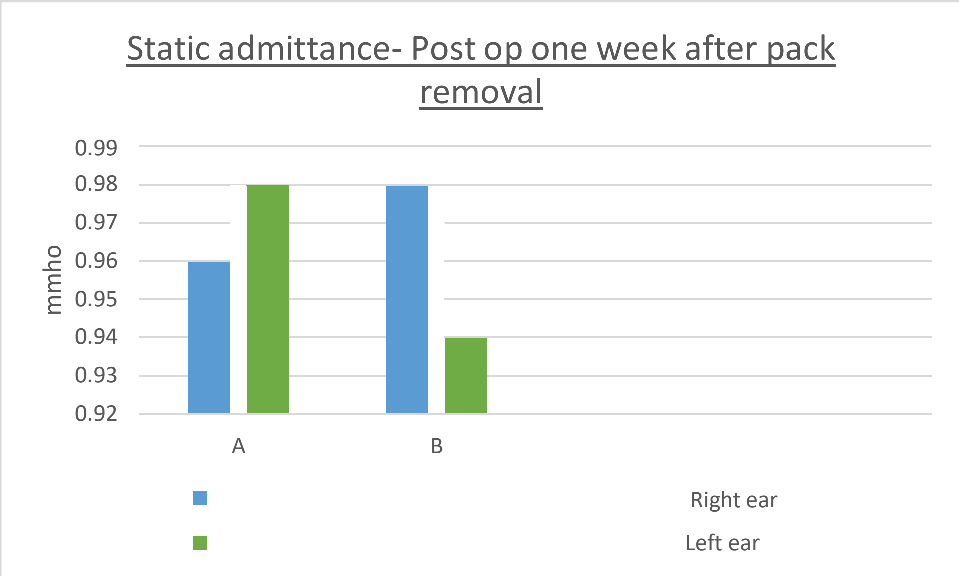


Figure 27- Graph showing comparison of mean difference in static admittance between Group A and Group B on post op one week after nasal pack removal.

Group A: The mean static admittance for the right ear is 0.96 mmho and left ear is 0.98mmho

Group B- The mean static admittance for the right ear is 0.98 mmho and left ear is 0.94mmho

DISCUSSION

DISCUSSION

Nasal packing plays an important role in various clinical scenarios in Otorhinolaryngology practice. It is highly effective in achieving hemostasis in cases of epistaxis and following nasal surgeries it helps in preventing adhesions, minimize bleeding, and stabilize nasal structures. It can also cause complications such as injury to nasal mucosa, physically blockthe opening of Eustachian tube, increase nasal resistance making it more difficult for air to flow through the nasal passages, and it can also compromise respiration and lead to hypoxemia.[1]

Arterial blood gas parameters are crucial indicators of respiratory function and metabolic balance.[92] Tympanometric peak pressure is an important measure in assessing Eustachian tube function and middle ear pressure regulation and static admittance, measured as peak compliance or conductance during tympanometry, provides insights into the compliance of the tympanic membrane and ossicles.[93]

In our study we aimed to compare arterial blood gas analysis, saturation of peripheral oxygen and Tympanometry between the two groups: one with completely occlusive nasal packing (Group A) and another with nasal pack with an airway (Group B).

No statistical difference was noted in the distribution of gender, age, diagnosis and treatment between the two groups suggesting that the groups were well-matched in terms of basic demographic characteristics, reducing the potential for confounding factors influencing the study outcomes and enhancing the comparability of the groups and generalizability of the study findings to populations with similar diagnostic profiles. Irrespective of diagnosis, the findings on Eustachian tube function and SpO_2 depends on the nature of the nasal packing and duration of nasal packing. The distribution of treatments across the groups suggests that both groups received similar types of interventions, minimizing the potential for treatment- related biases in the study outcomes.

The results of our study showed that patients with nasal pack with airway exhibited a slightly higher mean paO_2 postoperatively compared to patients with totally occlusive nasal pack, although this difference was not statistically significant ($p = 0.071$).

Similarly Leena et al.[94] had conducted a study on 110 patients out of which 19 patients were packed with nasal pack with ventilation tube and others with conventional pack. The study showed that there was significant hypoxemia after nasal packing but decrease in paO_2 was insignificant in patients having nasal pack with airway. This indicates a trend towards better oxygenation with nasal packing using an airway, potentially due to maintained nasal airflow.

Our study showed no statistically significant difference in pH, $paCO_2$ and HCO_3 levels between the groups preoperatively or on postoperatively with nasal pack. This indicates that neither packing method significantly altered metabolic balance.

In the study conducted by Leena et al.[94] there was no significant change in $paCO_2$ and pH except in patients with chronic obstructive pulmonary disease. They had also compared the hemoglobin levels which showed no significant difference.

Zeeyan et al.[1] had conducted a study on 39 patients compared the effects of totally occlusive nasal packs and nasal pack with airway on cardiac functions and arterial blood gases. Their results showed that patients with totally occlusive pack showed no change in pH, paO_2 and oxygen saturation but $paCO_2$ and HCO_3 values were decreased. They attributed the decrease in $paCO_2$ levels as a result of increased exhalation of CO_2 due to hyperventilation and increased respiratory rate as the patients had mouth breathing due to acute nasal obstruction. As a compensatory mechanism there will be reduced excretion of ammonium in kidney which in turn reduced the levels of HCO_3. However this was not seen in our study.

Our study showed statistically significant decrease in SpO_2 levels in both groups on postoperative Day 1 with nasal pack compared to preoperative levels. Group A had a more significant decrease than Group B ($p < 0.01$), suggesting that nasal packing with an airway reduces the severity of decrease in oxygen saturation when compared to completely occlusive packing.

Afifa et al.[95] had compared the effects of nasal packing using a Nasopore nasal packing with and without an airway tube on post-operative pain, SpO_2, nasal obstruction, and difficulty in breathing complaints in their 70 patients. Results showed that the postoperative pain at two and 12 hours compared between the two groups had a significant difference. In Group-A, the average SpO_2 decreased > 4% from baseline in 5.7% patients, and 37% in Group-B.

In our study Tympanometry showed that preoperatively, both groups typically displayed Type A tympanometric curves, indicating normal middle ear pressure regulation. However, postoperatively with nasal pack, Group A exhibited a statistically significant increase in the proportion of Type C curves compared to Group B ($p < 0.05$). There was a significant improvement one week after the pack removal.

A study by Huseyin DE et al.[96] aimed to compare the incidence of Eustachian tube dysfunction following nasal packing without an airway and nasal pack with an airway on 56 patients. In the group that had nasal pack with airway, decreased middle ear pressure was detected in 28.5% of patients. Conversely, in the group that received nasal pack without airway, decreased middle ear pressure was detected in 48.2% of patients. In 17 ears, negative middle ear pressure returned to normal values 24 hours after nasal removal. In 15 ears, normalization occurred within 5 days, and in the remaining 11 ears, it took 6 weeks. However in our study normalization was seen almost in all patients one week after pack removal.

Pragadeeswaram K et al.[97] had conducted a study on 60 patients to assess if anterior nasal packing affects middle ear pressure. Pre-operatively both ears in all the patients showed type a tympanometry, which implied normal Eustachian tube function. Out of 60 patients who underwent nasal surgeries, 40 had abnormal impedance tympanograms immediately after surgery with nasal pack. 26 patients had abnormal impedance tympanogram after packremoval. These patients were treated with nasal decongestants and antibiotics which were routinely prescribed as a post-operative prophylaxis. One week after pack removal these patients recorded a normal tympanogram which was similar to our study.

In a study conducted by Prajakta J et al.[98] they had compared the effects of Nasal Packing Using Merocel Pack and Merocel Pack with Tube on Middle Ear Pressure and Hearing Threshold on 60 patients. Significant difference in middle ear pressure was observed betweenthe two groups post-operatively. Hearing Threshold (Pure Tone Audiometry) showed more patients with Merocel Pack with Tube had normal hearing thresholds post-operatively compared to those without Tube. Higher acoustic reflex threshold was noted in patients with Merocel Pack with Tube post-operatively. On Tympanometry, more patients with Merocel Pack with Tube showed Type A.

We also compared the static admittance in our study, pre-operatively both groups typically exhibited normal static admittance values, reflecting normal middle ear compliance. Postoperatively with nasal pack, Group A showed a decrease in static admittance compared to Group B, although this difference was not statistically significant. However other studies did not make this observation.

Table 17. Showing comparison of various studies

Comparison of various studies				
Reseacher	Participants	Intervention	Variables compared	Results
Our study	62 patients	Completely occlusive nasal pack and nasal pack with airway	paO2	Slightly higher in patients with airway pack
			pH, paCO2 and HCO3	No significant difference
			SpO2	Significant decrease in patients with completely occlusive nasal pack
			Tympanometry curve Pre-operatively	Mostly Type A
			Post operatively	Significant increase in Type C curve in totally occlusive nasal pack
			One week after pack removal	Mostly Type A
			Middle ear Peak pressure	Slightly significant difference post operatively with pack No statistically significant diffence one week after pack removal
			Static admittance	No statistically significant difference
Leena et al.	110 patients	Nasal pack with and without airway	paO2	Statistically significant difference noted (p = <0.001)
			pH, paCO2 and HCO3, Hb	No statistically significant difference
Zeeyan et al.	39 patients	Totally occlusive nasal packs and nasal pack with airway	pH, paO2, SpO2	No statistically significant difference
			paCO2, HCO3	Decreased in patients with totally occlusive nasal pack
Afifa et al.	70 patients	Nasopore nasal packing with and without airway	SpO2	>4% decrease from baseline in 5.7% of patients with airway pack and in 37% patients nasal pack without airway
Huseyin D et al.	56 patients	Nasal pack with and without airway	Middle ear pressure	Significant difference noted with nasal pack in situ and it returned to normal in almost all patients by 6 weeks after pack removal
Pragadeeswaram K et al.	60 patients	Completely occlusive nasal pack	Tympanometry curve	Post operatively 45% of patients showed Type A, 26.7% showed Type B and 28.3% showed Type C. All patients had Type A curve one week after pack removal.
Prajakta J et al.	60 patients	Merocel pack with and without tube	Middle ear pressure	Significant difference noted post operatively
			Pure tone Audiometry	Patients with nasal pack with tube showed normal Audiogram
			Acoustic reflex threshold	Higher acoustic reflex threshold noted in patients with nasal pack with tube

SUMMARY

SUMMARY

Nasal packing is one of the common procedures in Otorhinolaryngology practice used to manage epistaxis and following nasal surgeries to minimize bleeding, prevent adhesions and support the nasal structures. It can also cause complications including discomfort, pain, infections, Eustachian tube obstruction and can also compromise oxygen saturation.

This study aims to assess the effects of totally occlusive nasal packing and nasal packing with airways on Eustachian tube function and arterial blood gas parameters, and to compare the outcomes between these two types of nasal packing.

It is a randomized control trial conducted over a period of 1 year and 10 months. Patients aged 18-60 years requiring nasal packing for epistaxis or post-nasal surgery were included in the study. Individuals with pre-existing conditions that could independently affect respiratory function or Eustachian tube function were excluded.

Objectives

1. To document the effect of totally occlusive anterior nasal pack on Eustachian tube function and arterial blood gas.
2. To document the effect of anterior nasal pack with airways on Eustachian tube function and arterial blood gas.
3. To compare the effects of totally occlusive anterior nasal pack and nasal pack with airways on Eustachian tube function and arterial blood gas analysis.

Patients were randomly assigned to two groups: Group A received totally occlusive nasal packing, while Group B received nasal packing with airways. Arterial blood gas analyses were conducted before the surgery and post operatively with nasal pack and saturation of peripheral oxygen saturation was monitored. Tympanometry was performed pre operatively, post-operative day 1 with nasal pack and one week after pack removal.

The study included 62 patients, evenly split between the two groups. Both groups were identical in terms of age, gender, diagnosis and treatment received.

Findings showed that there was no statistically significant variation in pH levels between the two groups before or after surgery with nasal pack. The group that had nasal pack with airway exhibited slightly higher paO_2 ($p=0.071$) showing better oxygenation with nasal pack with an airway, potentially due to maintained nasal airflow.

There was no statistically significant difference in $paCO_2$, HCO_3 between the two groups. There was significant decrease in SpO_2 in patients with totally occlusive nasal pack on post-operative day 1 with nasal pack and it was corrected immediately after nasal pack removal.

Tympanometry showed that preoperatively both groups displayed TypeA tympanometric curves indicating normal middle ear pressure regulation and postoperatively with nasal pack patients with completely occlusive pack exhibited a statistically significant increase in the proportion of Type C curves compared to nasal pack with airway ($p < 0.05$). There was a significant improvement one week after the pack removal.

Postoperatively patients with totally occlusive nasal pack showed a decrease in static admittance compared to patients with nasal pack with airway, although this difference was not statistically significant.

The results showed that totally occlusive nasal pack had more negative effect on oxygen saturation and eustachian tube dysfunction.

CONCLUSION

CONCLUSION

1. This study highlights the impact of totally occlusive nasal pack and nasal pack with airway on Eustachian tube function and arterial blood gases.
2. Findings suggest that nasal packing with airways can enhance patient safety by minimizing the risk of hypoxia which are critical considerations especially in patients with pre-existing respiratory or cardiac conditions.
3. It showed nasal packing with airway has a protective effect on middle ear pressure and Eustachian tube function.
4. Totally occlusive nasal packing is effective but nasal pack with airway helps in maintaining the therapeutic effects of nasal packing while reducing the risk of adverse effects, hence providing a safer alternative.
5. There is need for further research with larger sample size and multi institutional studies to validate the results and modify the clinical guidelines.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Zeyyan E, Bajin MD, Aytemir K, Yılmaz T. The effects on cardiac functions and arterial blood gases of totally occluding nasal packs and nasal packs with airway. Laryngoscope. 2010;120(11):2325-30.

2. Clark DW, Del Signore AG, Raithatha R, Senior BA. Nasal airway obstruction: prevalence and anatomic contributors. Ear Nose Throat J. 2018;97:173-6.

3. Kotler R, Wahl K, Lee KJ. Solving the problem of post-operative airway obstruction in nasal/sinus surgery. Arch Otolaryngol Rhinol. 2020;3:91-7.

4. Yan M, Zheng D, Li Y, Zheng Q, Chen J, Yang B. Biodegradable nasal packings for endoscopic sinonasal surgery: a systematic review and meta-analysis. PLoS One. 2014;9 doi:10.1371/journal.pone.0115458.

5. Kumar S, Nair PP, Prasanna LC. Nasal packing with X-shaped rubber splint: a new technique. Otolaryngol Head Neck Surg. 2013;148(1):129-30.

6. Mishra A, David J. Efficacy of anterior nasal packing in maxillofacial trauma patients with epistaxis: a prospective randomized controlled trial. Indian J Otolaryngol Head Neck Surg. 2006;58(1):63-7.

7. Jankowski R, Geoffron S, Potier A, Gallet P, Chays A. Vascular loops in nasal septum: a common anatomical variant for epistaxis. Eur Arch Otorhinolaryngol. 2013;270(3):1067-71.

8. Sharma S, Sharma S, Bist SS, Sharma S, Pachauri R. A randomized controlled trial comparing non-adherent with adherent, absorbable nasal packing following endoscopic sinus surgery. Clin Otolaryngol. 2017;42(5):1101-6.

9. Genc S, Ozcan M, Polat S, Dere H. Endonasal silicone stenting for prevention of nasal adhesions. Eur Arch Otorhinolaryngol. 2016;273(5):1249-54.

10. Hwang SH, Choi JW, Kim JW, Kim DW, Rhee CS, Lee CH. Early removal of silicone splints with or without nasal packing leads to similar outcomes in septoplasty. Am J Rhinol Allergy. 2019;33(5):505-11.

11. Stammberger H, Lund VJ. Anatomy of nose and paranasal sinuses. In:Gleason M, editor. Scott Brown's Otolaryngology and Head and Neck surgery. 7th ed. Great Britain. Hodder Arnold 2008;1315-43.

12. Stammberger H. Special endoscopic anatomy of the lateral nasal wall and ethmoidal sinuses. Functional Sinus Surgery. BC Decker Philadelphia. 1991:49-87.

13. Stammberger H. Secretion transportation.In Hawke M, editor. Functional endoscopic sinus surgery: The Messerklinger technique. 1st ed. .BC.Decker Philadelphia.1991:17-48.

14. Virchow H .Die anthropologische Untersuchung der Nase. Zeitschrift Ethnologic.1912;44:289-337

15. Gray hstandring S. The anatomical basis of clinical practice. 14th ed. SPAIN: Churchill Livingstone; 1858.

16. Cain RB, Lal D. Update on the management of chronic rhinosinusitis.IDR.2013; 6:1.

17. Oneal RM, Beil Jr RJ, Schlesinger J. Surgical anatomy of the nose. Otolaryngol Clin North Am. 1999;32(1):145-81.

18. Converse JM. The cartilaginous structures of the nose. Ann Otol Rhinol Laryngol. 1955;64(1):220-9.

19. AlJulaih GH, Sharma P, Lasrado S. StatPearls. Treasure Island (FL): StatPearls Publishing; Aug 14, 2023. Internet.

20. Cappello ZJ, Minutello K, Dublin AB. StatPearls. Treasure Island (FL): StatPearls Publishing; Feb 11, 2023. Internet. Anatomy, Head and Neck, Nose Paranasal Sinuses.

21. Galarza-Paez L, Marston G, Downs BW. StatPearls. Treasure Island (FL): StatPearls Publishing; Jul 24, 2023. Internet. Anatomy, Head and Neck, Nose.

22. Widdicombe J. Microvascular anatomy of the nose. Allergy. 1997;52(40 Suppl):7-11.

23. MacArthur FJ, McGarry GW. The arterial supply of the nasal cavity. Eur Arch Otorhinolaryngol. 2017 Feb;274(2):809-815.

24. Krulewitz NA, Fix ML. Epistaxis. Emerg Med Clin North Am. 2019 Feb;37(1):29-39.

25. Chiu TW, Shaw-Dunn J, McGarry GW. Woodruff's plexus. J Laryngol Otol. 2008 Oct;122(10):1074-7.

26. Creighton F, Bergmark R, Emerick K. Drainage Patterns to Nontraditional Nodal Regions and Level IIB in Cutaneous Head and Neck Malignancy. Otolaryngol Head Neck Surg. 2016 Dec;155(6):1005-1011.

27. Pan WR, Suami H, Corlett RJ, Ashton MW. Lymphatic drainage of the nasal fossae and nasopharynx: preliminary anatomical and radiological study with clinical implications. Head Neck. 2009 Jan;31(1):52-7.

28. Gomez Galarce M, Yanez-Siller JC, Carrau RL, Montaser A, Lima LR, Servian D, Otto BA, Prevedello DM, Naudy CA. Endonasal anatomy of the olfactory neural network: Surgical implications. Laryngoscope. 2018 Nov;128(11):2473-2477.

29. Konstantinidis I, Gartz I, Gerber JC, Reden J, Hummel T. Anatomy of the nasal cavity determines intranasal trigeminal sensitivity. Rhinology. 2010 Mar;48(1):18-22.

30. Huff T, Weisbrod LJ, Daly DT. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Nov 9, 2022. Neuroanatomy, Cranial Nerve 5 (Trigeminal).

31. Lafci Fahrioglu S, VanKampen N, Andaloro C. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Jan 30, 2023. Anatomy, Head and Neck, Sinus Function and Development.

32. Lindemann J, Leiacker R, Rettinger G, Keck T. Nasal mucosal temperature during respiration. *Clin Otolaryngol.* 2002 Aug; 27(4): 135-139.

33. Naftali S, Rosenfeld M, Wolf M, Elad D. The air-conditioning capacity of the human nose. *Ann Biomed Eng.* 2005 Jun; 33(6): 545-553.

34. Zhou AH, Chung SY, Sylvester MJ, Zaki M, Svider PS, Hsueh WD, et al. To Pack or Not to Pack: Inpatient Management of Epistaxis in the Elderly. Am J Rhinol Allergy. 2018 Nov; 32 (6):539-545.

35. Iqbal IZ, Jones GH, Dawe N, Mamais C, Smith ME, Williams RJ et al. Intranasal packs and haemostatic agents for the management of adult epistaxis: systematic review. J Laryngol Otol. 2017 Dec; 131 (12):1065-1092.

36. Genc S, Ozcan M, Polat S, Dere H. Endonasal silicone stenting for prevention of nasal adhesions. Eur Arch Otorhinolaryngol. 2016;273(5):1249-54.

37. Hwang SH, Choi JW, Kim JW, Kim DW, Rhee CS, Lee CH. Early removal of silicone splints with or without nasal packing leads to similar outcomes in septoplasty. Am J Rhinol Allergy. 2019;33(5):505-11.

38. Pallin DJ, Chng YM, McKay MP, Emond JA, Pelletier AJ, Camargo CA. Epidemiology of epistaxis in US emergency departments, 1992 to 2001. Ann Emerg Med. 2005 Jul;46(1):77-81.

39. Viducich RA, Blanda MP, Gerson LW. Posterior epistaxis: clinical features and acute complications. Ann Emerg Med. 1995 May;25(5):592-6.

40. Tunkel DE, Anne S, Payne SC, Ishman SL, Rosenfeld RM, Abramson PJ, et al. Clinical Practice Guideline: Nosebleed (Epistaxis). Otolaryngol Head Neck Surg. 2020 Jan;162(1_suppl):S1-S38.

41. Leadon M, Hohman MH. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Mar 1, 2023. Posterior Epistaxis Nasal Pack.

42. Kasperek ZA, Pollock GF. Epistaxis: an overview. Emerg Med Clin North Am. 2013 May;31(2):443-54.

43. Morosanu CO, Humphreys C, Egerton S, Tierney CM. Woodruff's plexus-arterial or venous? Surg Radiol Anat. 2022 Jan;44(1):169-181.

44. Rhee JS, Weaver EM, Park SS, Baker SR, Hilger PA, Kriet JD, et al. Clinical consensus statement: diagnosis and management of nasal valve compromise. Otolaryngol Head Neck Surg. 2017; 156

45. Rudmik L, Soler ZM, Mace JC, Schlosser RJ, Smith TL. Economic evaluation of endoscopic septoplasty: a randomized controlled trial. Laryngoscope. 2017;127(1):15-21.

46. Albathi M, Abusalih N, Alotaibi N, Saleh W. Update on the surgical management of deviated nasal septum. Laryngoscope Investig Otolaryngol. 2020;5(1):47-55.

47. Hwang PH, Han JK, Bilstrom E, Huang D, Nayak JV, Patel ZM, et al. Endoscopic septoplasty. Otolaryngol Head Neck Surg. 2019;160(3):409-18.

48. Hathorn I, Habib A, Manji J. Complications of endoscopic sinus surgery: a 15-year experience. J Laryngol Otol. 2018;132(5):420-5.

49. Hopkins C, Browne JP, Slack R, Lund V, Topham J, Reeves B, et al. Complications of surgery for nasal polyposis and chronic rhinosinusitis: the results of a national audit in England and Wales. Laryngoscope. 2015;125(2):399-407.

50. Al-Mujaini A, Wali U, Alkhabori M. Functional endoscopic sinus surgery: indications and complications in the ophthalmic field. Oman Med J. 2009 Apr;24(2):70-80.

51. Kobayashi T, Morita M, Yoshioka S, Mizuta K, Ohta S, Kikuchi T, et al. Diagnostic criteria for Patulous Eustachian Tube: A proposal by the Japan Otological Society. Auris Nasus Larynx. 2018 Feb;45(1):1-5.

52. Jufas N, Rubini A, Soloperto D, Alnoury M, Tarabichi M, Marchioni D, Patel N. The protympanum, protiniculum and subtensor recess: an endoscopic morphological anatomy study. J Laryngol Otol. 2018 Jun;132(6):489-492.

53. Szymanski A, Agarwal A. Anatomy, Head and Neck, Ear Eustachian Tube [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2024 Apr 12]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482338/#article-21403.r3

54. Falcon RT, Rivera-Serrano CM, Miranda JF, Prevedello DM, Snyderman CH, Kassam AB, et al. Endoscopic endonasal dissection of the infratemporal fossa: Anatomic relationships and importance of eustachian tube in the endoscopic skull base surgery. Laryngoscope. 2011 Jan;121(1):31-41

55. McCurdy JA Jr. Effects of nasal packing on eustachian tube function. Arch Otolaryngol. 1977 Sep;103(9):521-3.

56. Salvinelli F, Casale M, Greco F, D'Ascanio L, Petitti T, Di Peco V. Nasal surgery and eustachian tube function: effects on middle ear ventilation. Clin Otolaryngol. 2005 Oct;30(5):409-13.

57. Wong JM, de Alarcon A, Lambert EM, Buchman CA, Matrka L. Outcomes of tympanostomy tube placement in children as measured by tympanometry. Otolaryngol Head Neck Surg. 2018;159(1):165-71.

58. Hatzopoulos S, Goudakos J, Tsaligopoulos M, Drossos T, Kandiloros D, Nikolopoulos T. Multifrequency tympanometry: the effects of age and otologic disease. Ear Hear. 2020;41(5):1299-1305.

59. Gattinoni L, Pesenti A, Matthay M. Understanding blood gas analysis. Intensive Care Med. 2018 Jan;44(1):91-93. doi: 10.1007/s00134-017-4824-y. Epub 2017 May 11.

60. Ziegenfuß T, Zander R. Understanding blood gas analysis. Intensive Care Med. 2019 Nov;45(11):1684-1685. doi: 10.1007/s00134-019-05688-w. Epub 2019 Aug 7.

61. Boemke W, Krebs MO, Rossaint R. [Blood gas analysis]. Anaesthesist. 2004 May;53(5):471-92; 493-4.

62. Zisquit, J., Velasquez, J., & Nedeff, N. (2022). Allen Test. In *PubMed*. Treasure Island, FL: StatPearls Publishing. Retrieved April 12, 2024, from https://www.ncbi.nlm.nih.gov/books/NBK507816

63. Kumar V, Karon BS. Comparison of measured and calculated bicarbonate values. Clinical chemistry. 2008 Sep:54(9):1586-7. doi: 10.1373/clinchem.2008.107441.

64. Kim Y, Massie L, Murata GH, Tzamaloukas AH. Discrepancy between Measured Serum Total Carbon Dioxide Content and Bicarbonate Concentration Calculated from Arterial Blood Gases. Cureus. 2015 Dec 7:7(12):e398. doi: 10.7759/cureus.398.

65. Dev SP, Hillmer MD, Ferri M. Videos in clinical medicine. Arterial puncture for blood gas analysis. The New England journal of medicine. 2011 Feb 3:364(5):e7

66. Malatesha G, Singh NK, Bharija A, Rehani B, Goel A. Comparison of arterial and venous pH, bicarbonate, PCO2 and PO2 in initial emergency department assessment. Emergency medicine journal : EMJ. 2007 Aug:24(8):569-71

67. Magnet FS, Majorski DS, Callegari J, Schwarz SB, Schmoor C, Windisch W, et al Capillary PO (2) does not adequately reflect arterial PO(2) in hypoxemic COPD patients. International journal of chronic obstructive pulmonary disease. 2017:12():2647-2653. doi: 10.2147/COPD.S140843.

68. Hill S, Moore S. Arterial blood gas sampling: using a safety and pre-heparinised syringe. British journal of nursing (Mark Allen Publishing). 2018 Jul 26:27(14):S20-S26.

69.Higgins C. The use of heparin in preparing samples for blood-gas analysis. MLO: medical laboratory observer. 2007 Oct:39(10):16-8, 20; quiz 22-3

70. Jiang HX. [The effect of dilution and heparin on the blood gas analysis]. Zhonghua jie he he hu xi za zhi = Zhonghua jiehe he huxi zazhi = Chinese journal of tuberculosis and respiratory diseases. 1992 Aug:15(4):225-7, 255-6

71. Sood P, Paul G, Puri S. Interpretation of arterial blood gas. Indian journal of critical care medicine : peer-reviewed, official publication of Indian Society of Critical Care Medicine. 2010 Apr:14(2):57-64. doi: 10.4103/0972-5229.68215. Epub

72. Dukić L, Kopčinović LM, Dorotić A, Baršić I. Blood gas testing and related measurements: National recommendations on behalf of the Croatian Society of Medical Biochemistry and Laboratory Medicine. Biochemia medica. 2016 Oct 15:26(3):318-336

73. Knowles TP, Mullin RA, Hunter JA, Douce FH. Effects of syringe material, sample storage time, and temperature on blood gases and oxygen saturation in arterialized human blood samples. Respiratory care. 2006 Jul:51(7):732-6

74. Jubran A. Pulse oximetry. Critical care (London, England). 2015 Jul 16:19(1):272.

75. Cowley NJ, Owen A, Bion JF. Interpreting arterial blood gas results. BMJ (Clinical research ed.). 2013 Jan 16:346():f16. doi: 10.1136/bmj.f16.

76. .Larkin BG, Zimmanck RJ. Interpreting Arterial Blood Gases Successfully. AORN journal. 2015 Oct:102(4):343-54

77. Rogers KM, McCutcheon K. Four steps to interpreting arterial blood gases. Journal of perioperative practice. 2015 Mar:25(3):46-52

78. Romanski SO. Interpreting ABGs in four easy steps (continuing education credit). Nursing. 1986 Sep:16(9):58-64

79. ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND, Caldwell E, Fan E, Camporota L, Slutsky AS. Acute respiratory distress syndrome: the Berlin Definition. JAMA. 2012 Jun 20:307(23):2526-33. doi: 10.1001/jama.2012.5669.

80. Pediatric Acute Lung Injury Consensus Conference Group. Pediatric acute respiratory distress syndrome: consensus recommendations from the Pediatric Acute Lung Injury

Consensus Conference. Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies. 2015 Jun:16(5):428-39.

81. Rawat M, Chandrasekharan PK, Williams A, Gugino S, Koenigsknecht C, Swartz D, Ma CX, Mathew B, Nair J, Lakshminrusimha S. Oxygen saturation index and severity of hypoxic respiratory failure. Neonatology. 2015:107(3):161-6

82. Kurt OK, Alpar S, Sipit T, Guven SF, Erturk H, Demirel MK, Korkmaz M, Hayran M, Kurt B. The diagnostic role of capnography in pulmonary embolism. The American journal of emergency medicine. 2010 May:28(4):460-5

83. Wagner PD. The physiological basis of pulmonary gas exchange: implications for clinical interpretation of arterial blood gases. The European respiratory journal. 2015 Jan:45(1):227-43.

84. Stewart M, Ferguson BJ, Fromer L. Epidemiology and burden of nasal congestion. Int J Gen Med. 2010;3:37.

85. Chandra RK, Patadia MO, Raviv J. Diagnosis of nasal airway obstruction. Vol. 42, Otolaryngologic Clinics of North America. Elsevier; 2009. p. 207–25.

86. Geurkink N (1983) Nasal anatomy, physiology, and function. J Allergy Clin Immunol 72(2):123–128.

87. Bista M. Effects of bilateral nasal packing on oxygen saturation and blood pressure. J Nepal Med Assoc [Internet]. 2017 [cited 2021 Jan 30];56(208): 442–6.

88. Sedwick JD, Lopez AB, Gajerwski BJ, et al. Caudal septoplasty for treatment of septal deviation: aesthetic and functional correction of the nasal base. Arch Facial Plast Surg 2005;7(3): 158-162.

89. Fairbanks DN. Complications of nasal packing. Otolaryngol Head Neck Surg 1986;94(3):412-415. 5.

90. Ogura JH, Togawa K, Dammkoehler R. Nasal obstruction and the mechanics of breathing: physiologic relationships and the effects of nasal surgery. Arch Otolaryngol 1966;83(2):135-150.

91. Drettner B. Pathophysiological relationship between upper and lower airways. Ann Otol Rhinol Laryngol 1970;79(3):499-505.

92. Castro D, Patil SM, Zubair M, et al. Arterial Blood Gas. [Updated 2024 Jan 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK536919/

93. Casale J, Shumway KR, Hatcher JD. Physiology, Eustachian Tube Function. [Updated 2023 Mar 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532284/

94. Goel L, Goel HC, Naik A. Impact of nasal packing on arterial blood gases and acid base balance. The Pharma Innovation Journal. 2016;5(1):106-8.

95. Jamil A, Hameed HA, Sidiqqui AH, Farrukh MS. Comparison of complete nasal packing with and without integrated airways. Pak J Med Sci. 2023;39(5).

96. Dere H, Ercan İ, Celikkanat S, Özdem C. A COMPARISON OF THE EFFECT OF NASAL PACKING WITH AND WITHOUT AIRWAY ON EUSTACHIAN TUBE DYSFUNCTION. Marmara Med J. 2016;15(2):108-10.

97. Pragadeeswaran K, Yadavkrishnan RP, Raja RV. Anterior nasal packing: does it affect middle ear pressure? Int J Otorhinolaryngol Head Neck Surg. 2020;6(7):1316-9.

98. Keluskar, Prajakta & Burse, Kiran. (2019). Nasal Packing Using Merocel Pack and Merocel Pack with Tube to Study its Effects on Middle Ear Pressure and Hearing Threshold. MVP Journal of Medical Sciences. 6. 189-194.

ANNEXURE

PROFORMA

DATE:

1. BASIC DATA

Name:

Age/Sex:

Address:

Mobile No:

Date of Admission:

UHID NO:

Date of Surgery:

Date of Discharge

2.CHIEF COMPLAINTS:

Nasal obstruction

Nasal bleeding

Headache

Mouth breathing

Nasal discharge

Snoring

3.HISTORY OF PRESENTING ILLNESS

Onset: Insidious/Sudden

Duration of symptoms:

4.PRE EXISTING SYTEMIC ILLNESS

Diabetes/ Hypertension/Thyroid disorder/Bronchial asthma/Tuberculosis/

anaemia / malnutrition/others

5..EXAMINATION OF NOSE

External appearance:

Columella:

Vestibule:

Nasal cavity:

Turbinates-

Airway- Clear/Obstructed

Spur- Present/ Absent

Nasal septum:

Midline/deviated to right/deviated to left

5.DIAGNOSIS-

6. SURGERY PERFORMED:

FESS/ SEPTOPLASTY/ FESS +SEPTOPLASTY

7. TYPE OF NASAL PACK INSERTED –

Totally occlusive nasal pack / Nasal pack with airways

8.INVESTIGATIONS-

ARTERIAL BLOOD GAS ANALYSIS

	PRE-OP	POST-OP WITH NASAL PACK
pH		
PO2		
PACO2		
HCO3		

TYMPANOMETRY

MIDDLE EAR PRESSURE	PRE OP	POST OP DAY 1 WITH NASAL PACK	POST OP ONE WEEK AFTER PACK REMOVAL
Right			
Left			

PATIENT INFORMATION SHEET

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH,

TAMAKA, KOLAR - 563101.

Name of the study – "Effect of completely occlusive nasal pack versus nasal pack with airway on eustachian tube function and arterial blood gas- a randomised controlled trial"

We are inviting patients with epistaxis and patients undergoing nasal surgeries to take part in this study, however based on criteria list, eligible participants will be chosen among the interested ones. Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you agree to participate in this study, you will have to undergo Tympanometry and arterial blood gas analysis. By participating in this research you will contribute in evaluating the impact nasal pack with airways on eustachian tube function and arterial blood gas analysis. However, patients in the future may benefit as a result of knowledge gained from this study. You will not be charged extra for any of the procedures performed during the research study. Your participation in this study will not put you at any risk. All information collected from you will be strictly confidential & will not be disclosed to any outsider. This information collected will be used for research purpose. This information will not reveal your identity & this study have been reviewed by institutional ethical committee.

There is no compulsion to participate in this study, further you are at the liberty to withdraw

from the study at anytime if you wish to do so. Your treatment aspect will not be affected if you not wish to participate. The cost for the investigations and nasal pack will be borne by me. You are required to sign only if you voluntarily agree to participate in proposed study. This document will be stored safely in Department of Otorhinolaryngology and strict confidentiality will be maintained. A copy of this document will be given to you for your information.

Principal Investigator's Name : Dr Hithyshree N

Mobile Number : 9886143406

Email Id : drhithyshree@gmail.com

ಶ್ರೀ ದ'ೀವರ಺ಜ್ ಅರಸ್ ಉನ್ನತ ಶ್ಷಣ ಮತತು ಸ಼ಂಶ'cೀಧನ್ ಕ'ೀಂದ್ರ

ತಮಕಾ, ಕ'cೀಲಾರ - 563101.

ರ'cೀಗಿಯ ಮ಺ಹಿತ ಿ ಹ಺ಳ'

ಅಧಯಯನ಄ದ್ ಹ'ಸರತ - "ಯತಸ್಺ಸಿಯನ್ ಟ್ಯುಬ್ ಕ಺ಯಯು ಮತತು ಅಪಧಮನಿಯ ರಕ್ುದ್ ಅನಿಲದ಄ ಮೀಲ' ಗ಺ಳ಄ದ಺ರಿಯನ್ನು ಹ'cಂದಿರತವ ಮcಗಿನ್ ಪ್಺ಕ್ ವ಄ರತದ್ಧ ಸ಼ಂಪ಼ಣಯವಾಗಿ ಮತಚ್ತುವ ಮcಗಿನ್ ಪ್಺ಕ಄ನ್ ಪರಿಣಾಮ- ಯ಺ದ಄ೃಚ್ಛಿಕ಄ ನಿಯ಼ಂತರಣ ಪರಯ಄ಗ"

ಈ ಅಧಯಯನ್ದ಄ ಉದದ಄ಶವು ಮ಼ೌಲಯಮ಺ಪನ಄ ಮ಺ಡತವುದ್ತ. ಈ ಅಧಯಯನ್ದ಄ ಪ್಺ಲ'cೂ಄ಲತ ಎಪಿಸ್಺ಕ್ಸಿಸ಄ ಹ'cಂದ಄ರತವ ರ'cೀಗಿಗಳ಄ು ಮತತು ಮcಗಿನ್ ಶಸರಚ್ಕಿತ್಄ಗ' ಒಳ್ಗ಺ಗತವ ರ'cೀಗಿಗಳ಄ನ್ನು ನ಺ವು ಆಹ಺ನಿಸತತಿದ'ದೀವ', ಆದಾಗ್ಯ ಮ಺ನ್ದ಼ಂಡಗಳ಄ ಪಟ್ಟಿ಺ಯನ್ನು ಆಧರಿಸ಄, ಅರ್ಹ ಭ಺ಗವಹ಄ಸತವವರನ಄ು ಆಸಕ್ುರಲ್ಲಿ ಆಯ್ಕ಄ ಮ಺ಡಲಾಗತತುದ'. ಈ ಸ಼ಂಶ'cೀಧನ'ಯಲ್ಲಿ ನ಄ಮಮ ಭ಺ಗವಹಿಸತವಿಕ'ಯು ಸ಼ಂಪ಼ಣಯವಾಗಿ ಸ಺ಯ಼ಂಪ್'ರೀರ಄ತವಾಗಿದ'. ಭ಺ಗವಹಿಸಬ'ೀಕ'cೀ ಬ'ೀಡವ಄ ಎ಼ಂಬತದ್ತ ನ಄ಮಮ ಆಯ್ಕ಄. ಈ ಅಧಯಯನ಄ದ್ಲ್ಲಿ ಭ಺ಗವಹಿಸಲತ ನೀವು ಸಮ್ಮತಿಸ಄ದ್ರ', ನೀವು ಟ'e಼ಂಪನ'cೀಮಟ್ಟರ ಮತತು ಸಿರ'ೀರಿಯಲ್ ರಕ್ುದ್ ಅನ಄ಲ ವಿಶ'ಿೀಷಣ'ಗ' ಒಳ್ಗ಺ಗಬ'ೀಕ಺ಗತತುದ'. ಈ ಸ಼ಂಶ'cೀಧನ'ಯಲ್ಲಿ ಭ಺ಗವಹಿಸತವ ಮcಲಕ಄ ನೀವು ಯತಸ್಺ಸಿಯನ್ ಟ್ಯುಬ್ ಕ಺ಯಯು ಮತತು ಅಪಧಮನಿಯ ರಕ್ುದ್ ಅನಿಲ ವಿಶ'ಿೀಷಣ'ಯ ಮೀಲ' ವ಺ಯತಮ಺ಗಯಗಳ್ ಪರಭಾವದ್ ಮcಗಿನ್ ಪ್಺ಕ್ ಅನ್ನು ಮ಼ೌಲಯಮ಺ಪನ಄ ಮ಺ಡಲತ ಕ'cಡತಗ' ನ಄ೀಡತತಿ಄ೀರಿ. ಆದಾಗcೂ, ಈ ಅಧಯಯನ್ದ಼ಂದ್ ಪಡ'ದ಄ ಜ್಺ನ್ದ್ ಪರಿಣಾಮವ಺ಗಿ ಭವಿಷ್ಯದ್ಲ್ಲಿ ರ'cೀಗಿಗಳ಄ು ಪರಯ಄ೀಜನ಄ ಪಡ'ಯಬರ್ತದ್ತ. ಸ಼ಂಶ'cೀಧನ಺ ಅಧಯಯನ಄ದ್ ಸಮಯದ್ಲ್ಲಿ ನ್ನ'ಸ಄ದ್ ಯ಺ವುದ'ೀ ಕ಺ಯಯುವಿಧಾನ್ಗಳಿಗ' ನಿಮಗ' ಹ'ಚ್ಚುವರ಄ ಶತಲ಄ ವಿಧಿಸಲ಺ಗತವುದಿಲ಄. ಈ ಅಧಯಯನ್ದ್ಲ್ಲಿ ನಿಮ್ಮ ಭ಺ಗವಹಿಸತವಿಕ'ಯು ನಿಮಗ' ಯ಺ವುದ'ೀ ಅಪ್಺ಯವನ್ನು಼ಂಟ್ತ ಮ಺ಡತವುದ಄ಲ಄. ನಿಮ಄ಂದ್ ಸ಼ಂಗರಹ಄ಸಲ಺ದ್ ಎಲಾ಄ ಮ಺ಹಿತಿಯು ಕ್ಟ್ಟ಺ನಿಟ಺ಗಿ ಗ಼ೌಪ್ಯವ಺ಗಿರತತುದ' ಮತತು ಯ಺ರ಄ಗc ಬಹಿರ಼ಂಗಪಡಿಸಲಾಗತವುದ಄ಲ಄. ಸ಼ಂಗರಹಿಸ಄ದ್ ಈ ಮ಺ಹಿತಿಯನ್ನು ಸ಼ಂಶ'cೀಧನಾ ಉದದ'ೀಶಕ಺ಗಿ ಬಳ಄ಸಲಾಗತತುದ'. ಈ ಮ಺ಹಿತಿಯು ನಿಮಮ ಗತರತತನ್ನು ಬಹಿರ಼ಂಗಪಡಿಸತವುದಿಲ಄ ಮತತು ಈ ಅಧಯಯನ಄ವನ್ನು ಕ'ೀಂದರ ನ'ೀತ಄ಕ್ ಸಮ್ಮಿತಿಯು ಪರಿಶ'ೀಲ್ಲಸಿದ'. ಯ಺ವುದ'ೀ ಹ'ಚ್ಚಿನ಄ ಸಪಷ಄ೀಕ'ರಣಕ಺಄ಗಿ ನೀವು ಪರಧ಺ನ್ ತನಿಖ಺ಧಿಕ಺ರಿ ಡಾ. ಹಿತಿಶ್ರೀ ಎನ್ ಅವರನ್ನು ಸ಼ಂಪಕ್ಸಯಸಬರ್ತದ್ತ. ಈ ಅಧಯಯನ್ದ್ಲ್ಲಿ ಭ಺ಗವಹಿಸಲತ ಯ಺ವುದ'ೀ ಒತ್಺ಯವಿಲ಄, ಮತಂದ' ನೀವು ಹಿ಼ಂತ್'ಗ'ದ್ತಕ'cಳ಄ುವ ಸ್಺ತ಼ಂತ್ರಯದ್ದಿದ'ೀರಿ.ನೀವು ಯ಺ವುದ'ೀ ಸಮಯದ್ಲ್ಲಿ ಅಧಯಯನ಄ದ಄ಲ್ಲಿ ಮತಂದ್ತವರಿಯಲತ ನಿರ಺ಕರಿಸಿದ಄ರ' ನಿಮಮ ಚ್ಕಿತ್಄ಯ ಅ಼ಂಶವು ಪರಿಣಾಮ ಬ಄ೀರತವುದಿಲ಄. ತನಿಖ'ಯ ವ'ಚ್ುವನ್ನು ನ಺ನ'ೀ ಭರಿಸತತ್'ುೀನ'. ಉದ'ದೀಶ್ತ ಅಧಯಯನ್ದ್ಲ್ಲಿ ಭ಺ಗವಹಿಸಲತ ನೀವು ಸ಺ಯ಼ಂಪ್'ರ಄ರಣ'ಯ಼ಂದ್ ಒಪಿಪಕ'cಂಡರ' ಮ಺ತರ ನೀವು ಸಹಿ ಮ಺ಡಬ'ೀಕ಺ಗತತುದ'. ಈ ಡ಺ಕ್ಯುಮ಼ಂಟ್ ಅನ್ನು ಒಟ'cೀರಿನ'cೀಲ಺ರಿ಼ಂಗ'cೀಲಜಿ ವಿಭಾಗದ಄ಲ್ಲಿ ಸತರಕ್ಷಿತ ಲ಺ಕರ್಄ನ್ಲ್ಲಿ ಸ಼ಂಗರಹಿಸಲಾಗತತುದ' ಮತತು ಕ್ಟ್ಟ಺ನಿಟ಺ದ್ ಗ಼ೌಪಯತ್'ಯನ್ನು ಕ಺ಪ಄಺ಡಿಕ'cಳ಄ಳಲ಺ಗತತುದ'. ನಿಮಮ ಮ಺ಹಿತಿಗ಺ಗಿ ಈ ಡ಺ಕ್ಯುಮ಼ಂಟ಄ನ್ ನ್ಕಲ್ನ್ನು ನಿಮಗ' ನೀಡಲಾಗತತುದ'.

ಪರಧಾನ್ ತನಿಖಾಧಿಕಾರಿಯ ಹ'ಸರತ: ಡಾ. ಹಿತಿಶ್ರೀ ಎನ್ಮೊಬ'ೀಲ್ ಸ಼ಂಖ'ೂ : 9886143406

ಇಮೀಲ್ ಐಡಿ: **drhithyshree@gmail.com**

INFORMED CONSENT FORM

Name of the study - "Effect of completely occlusive nasal pack versus nasal pack with airway on Eustachian tube function and arterial blood gas- a randomised controlled trial"

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I give consent voluntarily to participate as a participant in this research.

Print Name of Participant___________________

Signature of Participant____________________Date_________________

For illiterate -

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness______________________AND Thumb print of participant

Signature of witness________________________Date_________________________

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant with the best of my ability. I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and tothe best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher taking the consent_________________________

Signature of Researcher taking the consent___________________________

Date____________

Principal Investigator's Name : Dr. Hithyshree N

Mobile Number : 9886143406 Email Id : drhithyshree@gmail.

ಶ್ರೀ ದ'ೀವರ಻ಾಜ್ ಅರಸ್ ಉನ್ನತ ಶ್ಕಣ ಮತತು ಸ಻ಂಶ'ೆ಼ೀಧನ್

ಕ'ೀ಻ಂದರ಼ತಮಕಾ, ಕ'ೆ಼ೀಲಾರ - 563101.

<u>ಮ಻ಾಹಿತ ಿ ನೀಡ಼ಿದ ಒಪಪ಼ಿಗ' ನ್ಮ ೂನ'</u>

ಅಧಯಯನ಼ದ್ ಹ'ಸರತ - "ಯತಸ್಻ಾಸಿಯನ್ ಟ್ಯಬ್ ಕ಻ಾಯಯ ಮತತು ಅಪಧಮನಿಯ ರಕ್಻ಾದ್ ಅನಿಲದ಼ ಮೀಲ' ಗ಻ಾಳ಼ಿದ಻ಾರಿಯನ್ನ ಹ'ೂ಻ಂದಿರತವ ಮ಼ೆಗಿನ್ ಪ್಻ಾಕ್ ವ಼ಿರತದ್ಧ ಸ಻ಂಪ಻ೂಣಯವಾಗಿ ಮತಚ್ತುವ ಮ಼ೆಗಿನ್ ಪ್಻ಾಕ಼ನ್ ಪರಿಣಾಮ- ಯ಻ಾದ಼ೃಚ್ಛಿಕ ನಿಯ಻ಂತರಣ ಪರಯ಼ಿಗ". ನ಻ಾನ್ತ ಮೀಲ್ಲನ್ ಮ಻ಾಹಿತಿಯನ್ನ ಓದ಼ಿದ'ದೀನ' ಅಥವ಻ಾ ಅದ್ನ್ನ ನ್ನಗ' ಓದ್ಲಾಗಿದ'. ಅದ್ರ ಬಗ'ೆ ಪರಶ್ನ'ಗಳ಼ನ್ತ ಕ'ೀಳ್ಲತ ನ್ನಗ' ಅವಕ಻ಾಶ ಸಿಕ್ಕ಼ಿದ' ಮತತ಻ು ನ಻ಾನ್ತ ಕ'ೀಳಿದ಼ ಯ಻ಾವ಻ುದ'ೀ ಪರಶ್'ಗಳಿಗ' ನ್ನಗ಼ ತೃಪಿಗ' ಉತುರಿಸಲ಻ಾಗಿದ'. ಈ ಸ಻ಂಶ'ೆ಼ೀಧನ'ಯಲ್ಲಿ ಪ್಻ಾಲ'ೆ಼್಻ುಳವವನಾಗಿ ಭ಻ಾಗವಹ಼ಿಸಲತ ನ಻ಾನ್ತ ಸ಻ಾಯ಻ಂಪ್'ರೀರಣ'ಯ಻ಂದ್ ಸಮಮತಿಸತತ಼಻ೀನ'.

ಭ಻ಾಗವಹಿಸತವವರ ಹ'ಸರನ್ತ ಮತದಿರಸ಼ಿ__________________

ಭಾಗವಹಿಸತವವರ ಸಹಿ____________________ದಿನಾಂಕ್ ________________

<u>ಅನ್ಮರಸಥರರಿಗ'</u> -

ಸ಻ಂಭ಻ಾವ ಭ಻ಾಗವಹಿಸತವವರಿಗ' ಒಪಿಪಗ'ಯ ನ಼ಮ಼ೆನ'ಯ ನಿಖರವ಻ಾದ್ ಓದ್ತವಿಕ'ಯನ್ತ ನ಻ಾನ್ತ ನ'ೆ಼ೀಡಿದ'ದೀನ' ಮತತು ವಯಕ್ತಿಗ' ಪರಶ್'ಗಳ಼ನ್ತ ಕ'ೀಳ್ಲತ ಅವಕ಻ಾಶವಿದ'. ವ಻ುಕ್ತಿಯತ ನೀಡ಼ಿದ಻ಾದನ' ಎ಻ಂದ್ತ ನ಻ಾನ್ತ ದ್಻ೃಢೀಕರ಼ಿಸತತ್'಻ೀನ' ಮತಕ್಻ುವ಻ಾಗಿ ಒಪಪ಼ಿಗ'.

ಸ್಻ಾಕ್ಷಿಯ ಹ'ಸರನ್ತ ಮತದಿರಸ಼ಿ____________________ಮತತ ಭಾಗವಹಿಸತವವರ ಹ'ಬ'಼ರಳ್಻ು

ಮತದ'ರ ಸ್಻ಾಕ್ಷಿಯ ಸಹಿ__________________ದಿನಾಂಕ್__________________________

ಒಪಿಪಗ'ಯನ್ತ ತ್'ಗ'ದ್ತಕ'ೆ಼ಳ಼಻ುವ ಸ಻ಂಶ'ೆ಼ಧಕ಼/ವ಻ುಕ್ತಿಯ ಹ'ೀಳಿಕ'

ಸ಻ಂಭ಻ಾವ ಭ಻ಾಗವಹಿಸತವವರಿಗ' ನ್ನ್ನ ಸ್಻ಾಮಥಯಯದ್ ಅತತಯತ಻ುಮ ಮ಻ಾಹ಼ಿತಿಯ಻ಂದಿಗ' ನ಻ಾನ್ತ ಮ಻ಾಹಿತ಼ಿ ಹ಻ಾಳ'ಯನ್ತ ನಿಖರವಾಗಿ ಓದಿದ'ದೀನ'. ಅಧ಻ುಯನ್ದ಼ ಕ್ತರ಼ಿತತ ಪರಶ್ನ'ಗಳ಼ನ್ತ ಕ'ೀಳ಼ಲತ ಭ಻ಾಗವಹಿಸತವವರಿಗ' ಅವಕ಻ಾಶ ನೀಡಲ಻ಾಗಿದ' ಎ಻ಂದ಼ತ ನ಻ಾನ್ತ ದ಼ೃಢೀಕರ಼ಿಸತತ್'಻ೀನ' ಮತತ ಭ಻ಾಗವಹ಼ಿಸತವವರತ ಕ'ೀಳ಼ಿದ್ ಎಲಾ಼ ಪರಶ್'ಗಳಿಗ' ಸರ಼ಿಯ಻ಾಗಿ ಮತತು ನ಼ನ್ನ ಸ್಻ಾಮಥ಻ುಯಕ಼ ತಕ಼್಻ಂತ್' ಉತುರಿಸಲ಻ಾಗಿದ'. ವ಻ುಕ್಻ುಯ ಸಮಮತಿಯನ್ನ ನೀಡತವ಻ಂತ್' ಒತ್಻ಾ಻ುಯಸಲಾಗಿಲ಼ ಮತತ಻ು ಒಪಪ಼ಿಗ'ಯನ್ನ ಮತಕ್಻ುವ಻ಾಗಿ ಮತತ ಸಾಯಂಪ್'ರೀರಣ'ಯಂದ್ ನೀಡಲಾಗಿದ' ಎಂದ್ತ ನಾನ್ತ ದ್಻ೃಢೀಕ಻ರಿಸತತ್'಻ೀನ'.

ಈ ಪರತಿಯನ್ತ ಭ಻ಾಗವಹ಼ಿಸತವವರಿಗ' ಒದ್ಗಿಸಲಾಗಿದ'.

ಸಮಮತಿಯನ್ನ ತ್'ಗ'ದ಼ತಕ'ೆ಼ಳ಼಻ುಳವ ಸ಻ಂಶ'ೆ಼ೀಧಕರ ಹ'ಸರನ್ತ ಮತದ಼ಿಸಿ______________________

ಒಪಿಪಗ'ಯನ್ತ ತ್'ಗ'ದ್ತಕ'ೆ಼ಳ಼಻ುವ ಸ಻ಂಶ'ೆ಼ಧಕ್ರ ಸಹಿ__________________________

ದಿನಾಂಕ್__________

ಪರಧಾನ಼ ತನಿಖ಻ಾಧಿಕ಻ಾರಿಗಳ್ ಹ'ಸರತ: ಡಾ. ಹ಼ಿತಿಶ್ರೀ .ಎನ್ ,ಮೊಬ'ೈಲ್ ಸ಻ಂಖ್ಯ : 9886143406

MASTER CHART

KEY TO MASTERCHART

UHID- Unique Hospital Identification Number

DNS- Deviated nasal septum

NP- Nasal polyposis

CRS- Chronic Rhinosinusitis

FESS- Functional Endoscopic Sinus Surgery

pH- Potential of hydrogen

paO2- Partial pressure of oxygen

paCO2- Partial pressure of carbon dioxide

HCO3- Bicarbonate

SpO2- Saturation of peripheral oxygen

MASTERCHART

Serial No.	UHID NO.	AGE	GENDER	DIAGNOSIS	TREATMANT	GROUP	Arterial Blood gas analysis								SPO2			Tympanometry: Right									Tympanometry: Left								
							ph		PO2		PCO2		HCO3					pre op			post op day 1 with nasal pack			post op one week after pack removal			pre op			post op day 1 with nasal pack			post op one week after pack removal		
							pre op	post op	pre op	post op	pre op	post op	pre op	post op	pre op	post op with nasal pack	post op after pack removal	Tympanometric Pk Pr(da pa)	curve	Static admittance	Tympanometric Pk Pr(da pa)	curve	Static admittance (mmho)	Tympanometric Pk Pr(da pa)	curve	Static admittance (mmho)	Tympanometric Pk Pr(da pa)	curve	Static admittance (mmho)	Tympanometric Pk Pr(da pa)	curve	Static admittance (mmho)	Tympanometric Pk Pr(da pa)	curve	Static admittance (mmho)
1	197803	27	MALE	CRSwNP	FESS	A	7.43	7.41	89.1	83.6	36.4	39.4	23.8	24.4	99	95	99	3	A	1.2	-3	A	0.66	-5	A	1.08	-43	A	1.2	-21	A	1.06	-15	A	1.1
2	186327	47	MALE	DNS TO LEFT	SEPTOPLASTY	A	7.39	7.4	91.2	90.4	34.2	30.2	24.5	23.8	99	96	96	-50	A	0.75	-29	A	1.12	-25	A	0.88	-58	A	1.08	-11	A	1.2	-9	A	0.98
3	186901	28	FEMALE	DNS TO LEFT	SEPTOPLASTY	A	7.41	7.42	89.2	86.5	34.6	32.4	23.6	22.4	98	94	95	-37	A	1.2	-21	A	0.86	-20	A	1.08	-55	A	1.1	-9	A	1.2	-9	A	1.2
4	157840	28	FEMALE	DNS TO RIGHT	FESS + SEPTOPLASTY	B	7.46	7.47	78.5	90	37.9	32.9	26.8	23.8	98	97	97	-53	A	0.8	-21	A	1.26	-22	A	1.1	-112	C	0.96	-63	A	0.88	-38	A	0.66
5	165352	29	MALE	CRSwNP	FESS	B	7.42	7.4	90.2	89.2	37.5	33.6	24.3	23.9	98	97	99	-56	A	0.65	-11	A	0.46	-10	A	0.98	-55	A	1.18	-19	A	0.98	-10	A	1.26
6	152951	28	MALE	DNS TO LEFT	SEPTOPLASTY	B	7.47	7.49	110.2	113.8	32.4	32	28.3	23.6	97	97	96	-28	A	0.86	-12	A	0.88	-10	A	0.98	-31	A	1.08	-9	A	0.98	-9	A	0.66
7	156969	18	FEMALE	DNS TO RIGHT WITH LEFT ITH	SEPTOPLASTY	A	7.48	7.41	90.2	91.3	30.4	31.4	27.3	23.7	98	94	94	-102	C	1.2	-100	C	0.68	-75	A	0.89	5	A	1	-1	A	0.66	1	A	1.1
8	155335	39	MALE	DNS TO RIGHT	SEPTOPLASTY	B	7.44	7.47	90.2	92.1	32.5	23.8	23.4	23.8	98	98	99	-65	A	0.86	-29	A	0.96	-20	A	1.03	-160	C	0.88	-56	A	0.46	-20	A	1.2
9	156754	42	FEMALE	DNS TO RIGHT	SEPTOPLASTY	B	7.42	7.47	91.3	92.1	33.6	30.8	22.8	23.7	98	96	97	-57	A	0.89	-11	A	1.12	-10	A	0.64	-31	A	1.2	-11	A	1.16	5	A	0.88
10	168763	43	MALE	CRSwNP	FESS	A	7.39	7.43	91.3	90.1	31.3	29.5	24.5	22.6	97	98	96	-32	A	1.2	-17	A	1.06	-13	A	1.08	-11	A	1.03	-5	A	1.2	3	A	0.98
11	186432	41	MALE	DNS TO LEFT WITH SPUR	SEPTOPLASTY	B	7.47	7.47	86.6	92.6	30.2	30.3	28.4	22.4	97	96	98	-31	A	1.1	-9	A	1.2	-14	A	0.8	2	A	1.2	-5	A	1.02	5	A	1.2
12	165042	32	FEMALE	CRSwNP	FESS	A	7.42	7.42	88.9	90.2	34.5	30.4	24.5	23.5	96	94	94	-98	A	1	-21	A	0.98	-15	A	1.2	-56	A	0.8	-13	A	0.98	7	A	0.96
13	176074	18	FEMALE	DNS TO RIGHT	SEPTOPLASTY	B	7.43	7.42	91	92.3	30.4	29.5	24.3	23.9	96	97	98	-130	C	0.42	-73	A	0.88	-40	A	1.04	-42	A	0.98	-11	A	1.1	-7	A	0.66
14	228319	37	MALE	RIGHT RHINOLITH	RHINOLITH REMOVAL	B	7.38	7.4	86.5	90.4	34.2	30.6	27.3	23.6	95	95	97	-62	A	1.12	-20	A	0.98	-21	A	1.2	-43	A	0.98	-32	A	1.08	-28	A	0.98
15	118579	17	MALE	DNS TO RIGHT WITH LEFT ITH	SEPTOPLASTY	A	7.43	7.46	89.3	91.4	30.4	29.5	23.6	22.3	97	91	98	-57	A	0.94	-106	C	0.94	-64	A	0.98	-50	A	0.8	-110	C	0.68	-90	A	0.86
16	225670	34	FEMALE	BILATERAL NASAL MASS UNDER EVALUATION	FESS	A	7.44	7.41	87.9	90.9	32.5	27.5	23.4	21.6	99	93	99	-196	C	0.87	-112	C	1.06	-47	A	0.86	-37	A	1.04	-23	A	1.02	-17	A	1.2
17	224426	52	MALE	DNS TO RIGHT	SEPTOPLASTY	B	7.41	7.4	90.4	93.1	34.2	30.6	23.6	24.4	96	95	98	-56	A	0.84	-21	A	0.78	-24	A	1	-17	A	1.12	-3	A	1	1	A	0.86
18	236486	49	FEMALE	BILATERAL NASAL POLYPOSIS	FESS	B	7.44	7.42	91.2	92.4	32.1	30.4	27.4	23.6	94	96	96	-62	A	1.1	-29	A	0.98	-22	A	0.94	-62	A	1.04	-23	A	0.89	-16	A	0.98
19	252296	26	MALE	DNS TO LEFT WITH BILATERAL ITH	SEPTOPLASTY + INFERIOR TURBINECTOMY	B	7.46	7.46	91.3	91.6	37.9	34.5	22.8	23.7	99	97	98	-210	C	0.98	-55	A	0.8	-48	A	0.87	-43	A	1.12	-38	A	1.02	-20	A	0.88
20	248137	58	FEMALE	B/L MAXILLARY SINUSITIS	FESS	A	7.4	7.39	91.3	88.4	34.6	35.2	27.3	23.6	97	93	95	-58	A	1.26	-196	C	0.56	-110	C	0.42	-62	A	0.98	-113	C	1.2	-95	A	1.2
21	232670	45	MALE	RECURRENT EPISTAXIS	ANTERIOR NASAL PACKING	A	7.4	7.38	89.4	90.2	29.6	24.8	24.4	23.8	96	92	97	-159	C	0.76	-137	C	1.28	-58	A	1.1	-62	A	1.09	-21	A	0.98	-14	A	1.06
22	257043	50	MALE	DNS TO RIGHT WITH BILATERAL NASAL POLYPOSIS	FESS + SEPTOPLASTY	B	7.4	7.38	89.2	90.6	30.4	29.5	22.6	23.6	98	96	98	-55	A	1.1	-33	A	0.86	-34	A	0.76	-56	A	0.98	-17	A	1.18	-9	A	0.46
23	238350	58	MALE	DNS TO LEFT WITH BILATERAL MAXILLARY SINUSITIS	FESS + SEPTOPLASTY	A	7.39	7.38	89.8	88.6	32.9	33.6	23.6	24.4	94	92	99	-200	C	0.66	-146	C	1.12	-110	C	1.12	-43	A	0.98	-19	A	0.98	-12	A	1.2
24	377489	19	MALE	DNS TO RIGHT WITH BILATERAL MAXILLARY SINUSITIS	FESS+ SEPTOPLASTY	A	7.45	7.44	91.4	92.4	32.8	27.9	27.8	24.6	98	92	98	-18	A	0.78	-13	A	1.12	-9	A	1	-167	C	1.04	-52	A	0.98	-10	A	1.04
25	257043	50	FEMALE	DNS TO RIGHT WITH BILATERAL NASAL POLYPOSIS	FESS + SEPTOPLASTY	B	7.45	7.44	90.2	93.4	32.5	27.5	29.5	24.6	97	95	96	-17	A	0.98	-3	A	0.98	-10	A	1.26	-62	A	1.2	-11	A	1.2	-4	A	1.16
26	171936	22	MALE	DNS TO LEFT WITH SPUR	SEPTOPLASTY	B	7.38	7.4	91.4	92.6	30.5	29.5	24.3	22.3	98	97	98	-32	A	0.96	-11	A	1.08	-10	A	0.66	-142	C	0.64	-54	A	0.98	-30	A	1.03
27	291057	24	FEMALE	DNS TO RIGHT	SEPTOPLASTY	B	7.43	7.41	90.7	89.6	37.4	33.4	24.7	24	99	97	95	-50	A	0.86	-16	A	0.98	-20	A	1.2	-60	A	1	-52	A	1	-30	A	0.64
28	254128	25	FEMALE	DNS TO RIGHT	SEPTOPLASTY	B	7.42	7.42	90.2	91.4	32.7	31.4	23.6	22.4	98	97	97	-56	A	1.2	-17	A	1.21	-20	A	0.98	-62	A	1.02	-52	A	1.2	-30	A	0.98
29	254219	25	FEMALE	DNS TO RIGHT	SEPTOPLASTY	A	7.39	7.4	90.2	91.3	30.4	30.2	23.5	24.5	96	93	100	-103	C	0.66	-21	A	0.98	-10	A	0.84	-56	A	1	-12	A	0.88	-8	A	0.66
30	230152	42	FEMALE	LEFT NASAL POLYP	POLPECTOMY	A	7.42	7.43	90.3	86.4	37.5	33.4	23.6	24.2	98	93	99	-40	A	0.98	-59	A	0.86	-28	A	0.89	-17	A	0.46	-10	A	1	-18	A	1.04
31	258174	18	MALE	DNS TO RIGHT	SEPTOPLASTY	A	7.41	7.39	89.4	88.4	36.2	32.6	24.6	22.6	95	93	98	-36	A	1.2	-136	C	1.12	-40	A	1.1	-13	A	1	-13	A	0.86	-7	A	1.2
32	247861	26	MALE	DNS TO RIGHT	SEPTOPLASTY	A	7.43	7.4	89.2	89.6	34.5	24.5	23.4	21.6	97	94	97	-56	A	0.88	-21	A	1.24	-35	A	0.98	-67	A	0.98	-29	A	1.3	-10	A	0.86
33	282676	29	MALE	DNS TO LEFT	SEPTOPLASTY + BILATERAL PLANECTOMY	B	7.45	7.48	90.3	92.4	32.7	24.8	23.8	26.8	100	98	98	-70	A	1.06	-30	A	0.86	-40	A	1.2	-119	C	0.76	-64	A	0.88	-30	A	0.46
34	277805	18	FEMALE	DNS TO LEFT	SEPTOPLASTY	B	7.46	7.48	112	110.1	33.4	33	28.6	23.8	99	97	99	-10	A	1.04	-53	A	1.06	-16	A	1.2	-40	A	1.1	-16	A	1.08	-5	A	1.04
35	296941	55	MALE	DNS TO LEFT WITH CAUDAL DISLOCATION	SEPTOPLASTY	A	7.47	7.42	90.6	91.6	30.6	32.4	27.8	22.7	98	94	98	-102	C	0.86	-42	A	0.98	-30	A	0.86	-8	A	0.86	-2	A	0.98	4	A	0.98
36	241556	49	MALE	DNS TO RIGHT WITH ALLERGIC RHINITIS	SEPTOPLASTY +PLANECTOMY	A	7.44	7.43	91.3	91.6	32.5	27.5	26.8	23.6	97	92	99	-17	A	1.2	-11	A	1.05	-21	A	1.2	-196	C	0.56	-50	A	1.02	-30	A	1.08
37	297308	48	MALE	DNS TO LEFT WITH SINONASAL POLYPOSIS	FESS+ SEPTOPLASTY	B	7.4	7.46	80.4	90.1	37.9	32.7	27.1	23.6	98	97	98	-61	A	1.2	-28	A	0.86	-30	A	0.75	-160	C	0.98	-30	A	0.86	-15	A	0.8
38	279524	18	MALE	NASAL MASS UNDER EVALUATION	EXCISION OF THE MASS	A	7.38	7.4	91.4	90.6	34.6	30.8	24.8	23.6	99	96	97	-172	C	0.66	-132	C	0.64	-40	A	0.65	-52	A	1.04	-16	A	1.18	-9	A	1.2
39	247097	30	FEMALE	DNS TO LEFT WITH RIGHT ITH	SEPTOPLASTY	A	7.42	7.43	89.6	87.6	34.4	31.9	23.8	22.7	98	95	96	-27	A	0.98	-30	A	1.12	-20	A	0.8	-64	A	1.02	-15	A	1.2	-6	A	0.98
40	303469	52	FEMALE	DNS TO LEFT WITH SINONASAL POLYPOSIS	FESS + SEPTOPLASTY	B	7.41	7.46	92.1	92.4	33.4	30.9	23.1	23.8	99	96	98	-21	A	1.2	-21	A	1.2	-30	A	1.2	-29	A	1.08	-18	A	1.08	-12	A	1.09
41	253708	45	MALE	BILATERAL SINONASAL NASAL POLYPOSIS	FESS	B	7.48	7.46	87.6	92.4	31.2	30.8	28.6	22.8	98	96	97	-38	A	1.2	-16	A	0.98	-26	A	1.04	-8	A	1.12	-19	A	0.89	12	A	0.98
42	151319	55	FEMALE	BILATERAL NASAL POLYPOSIS	FESS	A	7.38	7.44	91.4	90.2	32.3	29.7	24.8	23.6	97	98	96	-28	A	0.98	-150	C	0.66	-52	A	0.96	-19	A	1.04	-10	A	1.1	-5	A	1.12
43	310103	21	MALE	DNS TO LEFT WITH SPUR WITH RIGHT MAXILLARY SINUSITIS	FESS + SEPTOPLASTY	B	7.46	7.43	91.1	92.6	30.4	30	24.8	24	96	97	99	-128	C	0.66	-21	A	1.1	-50	A	0.94	-54	A	1.12	-15	A	1.08	2	A	0.98
44	314308	39	MALE	BILATERAL SINONASAL NASAL POLYPOSIS	FESS	A	7.42	7.43	89.6	91.2	34.6	30.6	23.9	23.8	98	95	96	-67	A	0.88	-20	A	1.08	-32	A	0.89	-60	A	0.98	-18	A	0.98	-10	A	1.04
45	322745	31	MALE	DNS TO RIGHT WITH SINANASAL POLYPOSIS	FESS + SEPTOPLASTY	B	7.37	7.43	86.6	90.1	34.6	30.8	27.9	23.8	97	95	99	-54	A	1.2	-10	A	0.98	-20	A	0.87	-60	A	1.26	-52	A	1.2	-10	A	1.18
46	239937	51	MALE	DNS TO LEFT WITH BILATERAL SINUSITIS	FESS + SEPTOPLASTY	B	7.42	7.41	90.5	93.6	34.5	30.8	24.6	23.4	96	95	98	-50	A	0.98	-55	A	1.08	-48	A	0.84	-20	A	1.2	-8	A	1.04	2	A	1.1
47	326459	33	MALE	DNS TO LEFT	SEPTOPLASTY	B	7.42	7.43	91.3	92.6	32.4	30.8	28.4	24.2	94	96	98	-56	A	0.96	-30	A	1.2	-28	A	1.1	-45	A	1.1	-30	A	0.46	-10	A	1
48	288563	31	MALE	ALLERGIC FUNGAL SINUSITIS	SEPTOPLASTY + MMA	A	7.45	7.42	87.6	91.2	32.7	28	24.4	21.8	99	93	98	-165	C	0.46	-6	A	1.08	-51	A	0.82	-54	A	1.08	-32	A	0.64	-1	A	1.2

MASTERCHART

Serial No.	UHID NO.	AGE	GENDER	DIAGNOSIS	TREATMANT	GROUP	Arterial Blood gas analysis ph pre op	ph post op	PO2 pre op	PO2 post op	PCO2 pre op	PCO2 post op	HCO3 pre op	HCO3 post op	SPO2 pre op	SPO2 post op with nasal pack	SPO2 post op after pack removal	Tympanometry Right pre op Tympanometric Pk Pr(da pa)	Right pre op curve	Right pre op Static admittance	Right post op day 1 with nasal pack Tympanometric Pk Pr(da pa)	Right post op day 1 curve	Right post op day 1 Static admittance (mmho)	Right post op one week after pack removal Tympanometric Pk Pr(da pa)	Right post op one week curve	Right post op one week Static admittance (mmho)	Left pre op Tympanometric Pk Pr(da pa)	Left pre op curve	Left pre op Static admittance (mmho)	Left post op day 1 with nasal pack Tympanometric Pk Pr(da pa)	Left post op day 1 curve	Left post op day 1 Static admittance (mmho)	Left post op one week after pack removal Tympanometric Pk Pr(da pa)	Left post op one week curve	Left post op one week Static admittance (mmho)
49	310829	35	FEMALE	LEFT ANTROCHOANAL POLYP	FESS	A	7.44	7.48	89.3	91.4	30.6	29.8	23.8	22.9	98	91	96	-57	A	0.98	-27	A	0.88	-30	A	1.1	-49	A	0.88	-112	C	1.03	-102	C	1.12
50	330384	23	MALE	LEFT ANTROCHOANAL POLYP	POLPECTOMY + MMA	A	7.41	7.44	90.4	86.6	36.5	32.9	24.6	24.8	98	93	95	-36	A	1.16	-32	A	0.89	-40	A	1.12	-19	A	0.98	-29	A	0.8	-12	A	1.08
51	70737	35	MALE	DNS TO LEFT WITH SPUR	SEPTOPLASTY	B	7.43	7.46	91.4	91.5	36.9	34.8	23.8	24.6	99	98	97	-179	C	1.12	-80	A	0.98	-50	A	0.98	-12	A	0.98	-43	A	1.09	-15	A	1.03
52	280467	36	FEMALE	DNS TO LEFT	SEPTOPLASTY	A	7.42	7.41	90.1	90.1	34.2	32.6	25.2	25.2	99	94	99	-29	A	0.86	-37	A	1.03	-40	A	0.98	-17	A	0.66	-41	A	0.98	-9	A	0.96
53	314395	27	MALE	BILATERAL SINONASAL NASAL POLYPOSIS	FESS	A	7.41	7.39	89.6	90.4	30.6	27.8	24.8	24.2	97	92	96	-148	C	0.68	-139	C	0.64	-102	C	0.56	-56	A	0.66	-30	A	0.98	-12	A	1.08
54	352769	43	FEMALE	DNS TO LEFT	SEPTOPLASTY	B	7.42	7.38	90.1	90.2	31.4	30.2	23.6	23.8	98	97	94	-38	A	1.2	-43	A	0.98	-30	A	1.03	-62	A	0.96	-18	A	0.98	-16	A	0.8
55	345085	33	MALE	DNS TO LEFT WITH BILATERAL ITH	SEPTOPLASTY + BILATERAL TURBINOPLASTY	B	7.44	7.46	90.2	94.4	33.5	28.2	28.3	23.6	97	96	99	-19	A	0.88	-63	A	1.12	-40	A	1.02	-65	A	0.86	-18	A	0.98	-2	A	0.8
56	339438	24	MALE	DNS TO LEFT WITH ALLERGIC RHINITIS	SEPTOPLASTY +BILATERAL PLANECTOMY	A	7.45	7.38	91.5	89.2	34.8	36.2	27.8	23.8	96	93	97	-58	A	1.06	-162	C	0.8	-102	C	1.24	-64	A	1.2	-110	C	1.12	-110	C	0.88
57	386388	18	FEMALE	DNS TO RIGHT WITH BILATERAL ITH	SEPTOPLASTY + BILATERAL TURBINOPLASTY	B	7.43	7.41	89.5	90.1	34.7	31.5	23.6	22.6	99	94	96	-60	A	1.06	-32	A	1.09	-20	A	1.08	-56	A	0.66	-29	A	1.2	-12	A	1.1
58	343668	22	MALE	DNS TO RIGHT WITH ADENOID HYPERTROPHY	SEPTOPLASTY + ADENOID HYPERTROPHY	A	7.38	7.41	90.6	91.5	31.4	31.2	23.8	23.5	96	94	98	-116	C	0.98	-21	A	1.04	-20	A	1.12	-60	A	0.88	-16	A	1.04	-1	A	1.2
59	414693	46	FEMALE	BILATERAL SINONASAL NASAL POLYPOSIS	FESS	B	7.43	7.4	90.7	89.6	36.4	33.4	24.7	24.1	99	96	98	-28	A	0.86	-16	A	0.98	-10	A	0.96	-18	A	0.98	-19	A	1	-1	A	1.2
60	352769	37	MALE	CRS+NP	FESS	A	7.42	7.38	89.4	89.4	35.6	32.8	24.8	22.8	98	93	99	-67	A	1.14	-125	C	0.46	-110	C	0.87	-18	A	1.2	-16	A	1.12	-12	A	1.2
61	408552	31	FEMALE	DNS TO LEFT	SEPTOPLASTY	A	7.36	7.42	91.6	92.5	31.5	30.1	24.8	22.6	98	97	98	-40	A	0.98	-19	A	1.04	-15	A	1.12	-135	C	1.2	-43	A	0.87	-19	A	0.8
62	365143	20	MALE	DNS TO LEFT	SEPTOPLASTY	B	7.43	7.44	90.4	91.4	31.3	28.5	26.6	23.5	98	94	97	-60	A	1.28	-42	A	0.98	-30	A	0.86	-26	A	0.86	-38	A	1.1	-12	A	1.12