"NASAL PACKING AND TRANSFIXATION SUTURES IN SEPTOPLASTY: A COMPARATIVE STUDY"

By

Dr. PHILIP JOHN KOTTARAM

Dissertation submitted to

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH,
TAMAKA, KOLAR, KARNATAKA

In partial fulfilment
of the requirements for the degree of
Master of Surgery

in

OTORHINOLARYNGOLOGY

under the guidance of

Dr. VINAYA BABU S MBBS, MS (ENT)
ASSOCIATE PROFESSOR

DEPARTMENT OF OTORHINOLARYNGOLOGY,
SRI DEVARAJ URS MEDICAL COLLEGE,
TAMAKA, KOLAR.

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is a bonafide research work carried out by me under the guidance of

Dr. VINAYA BABU S MBBS, MS (ENT)

Associate Professor, Department of Otorhinolaryngology, Sri Devaraj Urs Medical College, Tamaka, Kolar.

DATE: Signature of the Candidate

PLACE: **Dr. PHILIP JOHN**

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH
TAMAKA, KOLAR, KARNATAKA.

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Signature of the Guide

Dr. VINAYA BABU S **MBBS,MS(ENT)**
Associate Professor,
Department of Otorhinolaryngology,
Sri Devaraj Urs Medical College,
Tamaka, Kolar

Date:
Place: Kolar

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH

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Dr. PHILIP JOHN KOTTARAM

under the guidance of

Dr. VINAYA BABU S. MBBS, MS (ENT),

Associate Professor,

Department of Otorhinolaryngology,

Sri Devaraj Urs Medical College,

Tamaka, Kolar

Dr. Khaja Naseeruddin MBBS,DLO, MS
Professor and Head,
Department of otorhinolaryngology
Sri Devaraj Urs Medical College
Tamaka, Kolar.

Date:

Place:

Dr.M.B. Sanikop MBBS, MS
Principal,
Sri Devaraj Urs Medical College
Tamaka, Kolar

Date

Place:

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH TAMAKA, KOLAR, KARNATAKA.

SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR

ETHICAL COMMITTEE CERTIFICATE

This is to certify that the Ethical committee of

Sri Devaraj Urs Medical College,Tamaka, Kolar,

has unanimously approved

Dr. PHILIP JOHN KOTTARAM

Post graduate student, in the department of Otorhinolaryngology at

Sri Devaraj Urs Medical College, Tamaka, Kolar, to take up the dissertation work titled

"NASAL PACKING AND TRANSFIXATION SUTURES IN SEPTOPLASTY: A COMPARATIVE STUDY"

to be submitted to the

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH, KOLAR.

Member secretary
Ethical committee

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Signature of the Candidate
Dr. PHILIP JOHN KOTTARAM,
Post Graduate student,
Departmentof Otorhinolaryngology,
Sri Devaraj Urs Medical college,
Tamaka, Kolar.

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Date Signature of the candidate

Place **Dr. PHILIP JOHN KOTTARAM**

List of abbreviations (in alphabetical order)

1	**A/R**	Anterior Rhinoscopy
2	**CS**	Conventional Septoplasty
3	**C.S.T**	Cold Spatula Test
4	**DNE**	Diagnostic Nasal Endoscopy
5	**DNS**	Deviated Nasal Septum
6	**ECG**	Electrocardiogram
7	**FESS**	Functional Endoscopic Sinus Surgery
8	**IDL**	Indirect Laryngoscopy
9	**PNS**	Paranasal Sinus
10	**Post op**	Post Operative
11	**Pre op**	Pre Operative
12	**SD**	Septal Deviation
13	**SMR**	Submucous Resection of Septum
14	**VAS**	Visual Analogue Scale

ABSTRACT

Background

Nasal packing following septoplasty is used to stabilize the nasal septum and to prevent post-operative complications. However packs by themselves are painful and have been implicated in the development of complications. Transseptal suturing is said to avoid most of the disadvantages of nasal packing while being readily available and affordable with minimal patient discomfort.

Objectives

1) To compare patient discomfort levels during the first two post operative days

   Using visual analogue scale.

2) To compare the efficacy of septal transfixation suturing against nasal packing in preventing immediate and early complications following septoplasty.

Materials & Methods

All adult patients aged 14 yrs or above undergoing septoplasty in our hospital for symptomatic deviated nasal septum were randomised into 2 groups of 30 each. Patients in both groups underwent septoplasty. Patients in group A post septoplasty underwent nasal packing, while patients in group B underwent closure of incision and stabilization of the septum with four separate mattress sutures using 4/0 vicryl. The degree of pain, nasal discomfort, watering from the eyes and dryness of throat were evaluated using various scales. The complications following septoplasty were documented.

Results and interpretation

The mean visual analogue score for pain in the packing and suturing group was 5.37 and 3.70 respectively and the difference was significant. Mean pain as well as discomfort scores were higher on post operative day 1. The mean nasal discomfort score was higher in the packing group than in the transfixation group. Higher scores of watering from the eyes and dryness of throat was observed within the packing group. Epixtasis was the only complication encountered, which was seen in the packing group.

Conclusion

Both methods are effective in preventing complications following septoplasty; however pain and discomfort levels are significantly lower in the suturing group. Transeptal suturing circumvents the pain associated with the insertion and removal of nasal pack, decreases post operative morbidity and can be safely recommended for patients undergoing septoplasty.

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INTRODUCTION

Septoplasty is one of the most widely performed surgery in patients with symptomatic septal deviation. Nasal packing following septoplasty is used to stabilize the nasal septum and to prevent post-operative complications such as bleeding, adhesion formation, septal hematoma and septal cartilage perforation.[1,2] However packs by themselves are painful on removal and can cause mucosal injury.

Packs themselves have been implicated in the development of complications such as aspiration, cardiovascular collapse and rarely toxic shock syndrome.[3] To circumvent the disadvantages of nasal packing various other methods of stabilization of the septum like intranasal splints and transfixation sutures have been devised but unfortunately none of them have been standardized.[1]

Among these methods transseptal suturing have been the most promising. It is said to avoid most of the disadvantages of nasal packing while being readily available and affordable with minimal patient discomfort.[4] In this study we intend to evaluate the advantages of transfixation suturing as a method of stabilization of the nasal septum over nasal packing in reducing postoperative patient discomfort and development of complications.

OBJECTIVE OF THE STUDY

1. To compare patient discomfort levels during the first two post operative days using visual analogue scale.

2. To compare the efficacy of septal transfixation suturing against nasal packing in preventing immediate and early complications following septoplasty.

REVIEW OF LITERATURE

Historical Review:

Written accounts describing correction of nasal septal deformities date back to the beginning of medical literature in the Egyptian papyri. The Edwin Smith papyrus suggests treating the broken nose by placing two plugs of linen coated with grease within each nostril and then applying stiff rolls of linen externally to fix the fracture. [5]

The earliest mention of septal deflections was made by Quelmalz (1757), who indicated the pressure of parturition and habitual nose picking as probable causes; he recommended treatment by pushing the cartilage back into its original position by daily pressure. [6]

The first serious surgical attempts on septal deformities appear to have started about the middle of the Nineteenth century. Langenbeck (1843), Dieffenbach (1845), Chassaignac (1851) advised shaving the most convex portion of the cartilage along with its covering mucoperichondrium.[7]

Freer and Killian in 1902 laid the foundation of modern septoplasty techniques with the submucous resection. The first description of submucous resection is given by Freer in 1902. Freer stated that the external nose did not need the support of the septal cartilage and that it could be totally removed without producing 'saddling'. He admitted that saddling of the dorsum in the supratip region was due to rough surgery, which had damaged, or partly removed the upper lateral cartilages. The operation he described merely fractured it back into position after weakening it by chisel cuts. [8]

Killian (1904) recognized the septum as being an important support structure of the nasal tip. He considered the septal cartilage to be essential for the support of the external nose. Killian developed the present day submucous resection by suggesting that to leave a 1-cm dorsal and caudal "L" strut of supporting septal cartilage. [6]

Fomon et al (1946) arbitrarily divided the septum into an anterior and a posterior part by an imaginary line extending from the nasal spine of the frontal bone to the nasal spine of the maxilla.[5] Deviations in the posterior part of the septum can be easily and effectively treated by the classic Killian submucous resection, whereas those in the anterior segments treated by a more conservative septoplasty technique.[9]

Cottle et al (1958) started elevating over the septal cartilage and worked upwards and backwards always keeping above the chondrovomerine junction. This step in the operation was called the production of the 'anterior tunnel'. The periosteum over the anterior nasal spine was incised and then elevated backwards on both sides over the premaxillary crest, then over the vomer again keeping below the chondrovomerine suture. These were the so-called 'inferior tunnels'. Finally under direct vision the anterior and inferior tunnels were united using a sharp dissector or knife. This is described as the 'maxilla-premaxilla' approach of Cottle.[10]

Maran (1974) described a method of septoplasty. The principle of the operation was to divide every attachment of the cartilaginous septum except for a mucosal flap on one side, which is enough to give it a blood supply, and should aim for maximum mobility and minimal removal of tissue. This surgery is ideal for cartilaginous deviations and also for anterior distortions of the septum.[6]

Following removal of the deviated cartilage or bony septum, a dead space exists. In order to reduce this dead space, and reduce the risk of developing a septal hematoma, surgeons have used various nasal packing and suturing techniques.[11]

While life-threatening risks associated with nasal packing have been documented, these have occurred with post nasal packs and have been attributed to naso-pulmonary reflex.[12,13,14]

Anterior nasal packing has not been associated with such severe complications.[13-16] The most common morbidity associated with anterior nasal packing in post septoplasty patients is postoperative pain.[17-19] Painful nasal pack is often the most uncomfortable aspect of septoplasty surgery for patients. Many methods have been described for eliminating the discomfort and pain caused by the procedure. These include wrapping the packs with gelfoam, blocking the sphenopalatine ganglion, moistening packs with topical local anesthetics, keeping the packs in the nose for shorter periods of time and using preemptive analgesia.[20-22]

However complications including worsening of sleep disordered breathing, postoperative infection and toxic shock syndrome have been reported.[23-24] Attempts have been made to limit the morbidity of nasal packing by limiting the duration of packing and altering packing materials.[25-27] Overall, the wide variety of packing materials and techniques complicates a clear assessment of the risks associated with postoperative septoplasty packing.

Illum and colleagues found decreased pain on removal when using gloved finger packs when compared with Merocel or hydrocortisone-oxytetracycline gauze packs with ventilation tubes.[27] Some authors have found rehydration of foam packs with topical anesthetic to lessen discomfort on pack removal.[28-29]

There have been few studies suggesting that nasal packing should not be used because of discomfort at the time of removal.[30] As an alternative application to nasal packing, different forms of haemostatic suturing techniques of the nasal septum have been described.[31,4]

Several suturing techniques have been described to approximate the mucosal flaps after septal procedures in order to reduce the complication rate. Many surgeons use interrupted sutures using absorbable suture materials to keep the flaps together.[31]

Bernstein L (1973) described the advantages of the hemitransfixation incision taken at the lower border of the septal cartilage and first described the use of transpetal suturing for approximation of septal flaps after septoplasty in canine pups.[32]

Gottschalk GH (1978) presented septal suturing as an improvement over intranasal packing and splints. He believed that by dispensing with intranasal packing, one stage septorhinoplasty can be done without fear of producing a widened dorsum from outward pressure of the packs. The sutures also increased the stability of the caudal portion of the septum during the healing process while minimizing postoperative patient discomfort and painful removal of the nasal packs.[33]

Sessions RB (1984) applied continuous mattress sutures from one side of the nasal cavity to the other, through the septal cartilage finally terminating at the most caudal end of the septum, closing the transfixation incision with the same suture. He used a No. 4-0 plain catgut suture on small straight cutting needle with a bayonet needle holder. He felt that with membrane approximation sutures, the result of membrane approximation is enhanced, a thinner septum is achieved sooner, minimal post operative morbidity, lesser nasal congestion, less risk of hematoma and mucous membrane lacerations occurring during septal surgery can be re-approximated with more precision and ease.[34]

Lee IN (1988) in 800 patients used a double armed 4-0 chromic suture with semicircular reverse cutting needles for septal suturing. One needle is gently straightened and transfixation sutures were placed at the posterior end of the columella and carried on along the inferior border of the septum as far as possible. He felt it obviates the need for nasal packing while greatly reducing patient discomfort.[35]

Nunez et al (1991) was the first to compare packing with transfixation suturing in 59 patients undergoing septoplasty. He compared their postoperative pain using a visual analogue scale and complications such as bleeding and adhesions. He found a significant difference in pain scores between the two groups.[18]

Ardehali et al (2009) compared nasal packing with transfixation suturing in 114 patients undergoing septoplasty for symptomatic deviated nasal septum. He stabilized the septum using four separate through and through mattress sutures with 4-0 vicryl in the transfixation group. These were place only in the accessible part of the septum to ensure closure of flap between the two mucosal flaps. Two patients in the packing group and one in the suturing developed a septal perforation. The incidence of purulent nasal secretions and mucosal adhesions was more common in the packing group. The average visual analogue score for pain in the postoperative period was 5 in the packing group and 2 in the non packing group and the results were significant.[4]

EMBRYOLOGY AND RELEVANT ANATOMY OF THE NASAL SEPTUM

Embryology

The development of the nose begins in the third week of fetal development when the sensory epithelium originating within the cranial ectoderm thickens.

During the fifth week, the lateral and medial nasal swellings appear as ridges. They surround the placodes, which become depressed to form the nasal pits (Moore, 1973). Deepening of these pits separates the frontonasal process into medial and lateral components (Fig 1). The medial component ultimately fuses to form the primitive nasal septum. Inferiorly, the paired maxillary processes of the first branchial arches grow anteriorly and medially to fuse with the medial nasal processes. During the sixth week of development the slit like epithelium-lined nasal pits begin to extend posteriorly, which thin out to form the bucconasal membrane, separating the nasal from the oral cavity. Subsequently rupture of this membrane forms the early choana.[36]

As the nasal cavity enlarge, the palatal processes derived from the lateral maxillary mesoderm, grow medially towards each other and the septum (Fig 2). The fusion between the palatal processes and the septum from anterior to posterior, separates the nasal and oral cavities and most posteriorly the nasopharynx and oral cavity.

Longitudinal strips of cartilage 7-15mm in length may be identified in the embryo, lying adjacent to the vomeronasal organ on either side of the septal cartilage. The superior part ossifies to form the perpendicular plate of the ethmoid and the vomer in the posteroinferior portion, leaving an anteroinferior quadrilateral

cartilaginous plate. Two ossification centers appear for the vomer at the eighth foetal week on either side of the cartilage, uniting to form a deep bony groove in which the cartilage sits. As growth continues part of the cartilage absorbs as the two bony lamellae fuse. By puberty, the lamellae are almost completely united with everted alae and an anterior groove as indications of the vomer's bilaminar origin.[36,37]

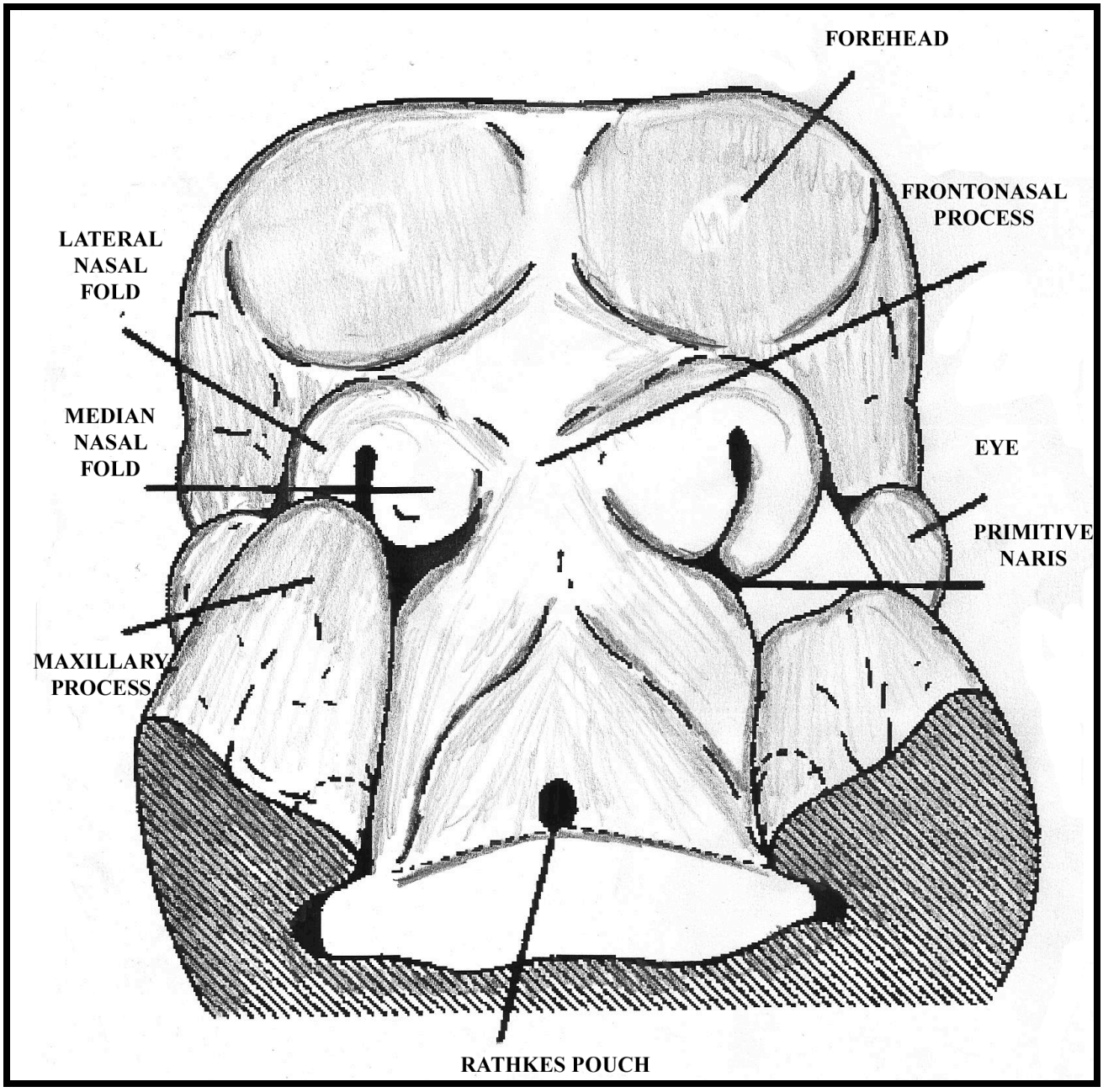


Figure 1: Development of the Nasal Folds

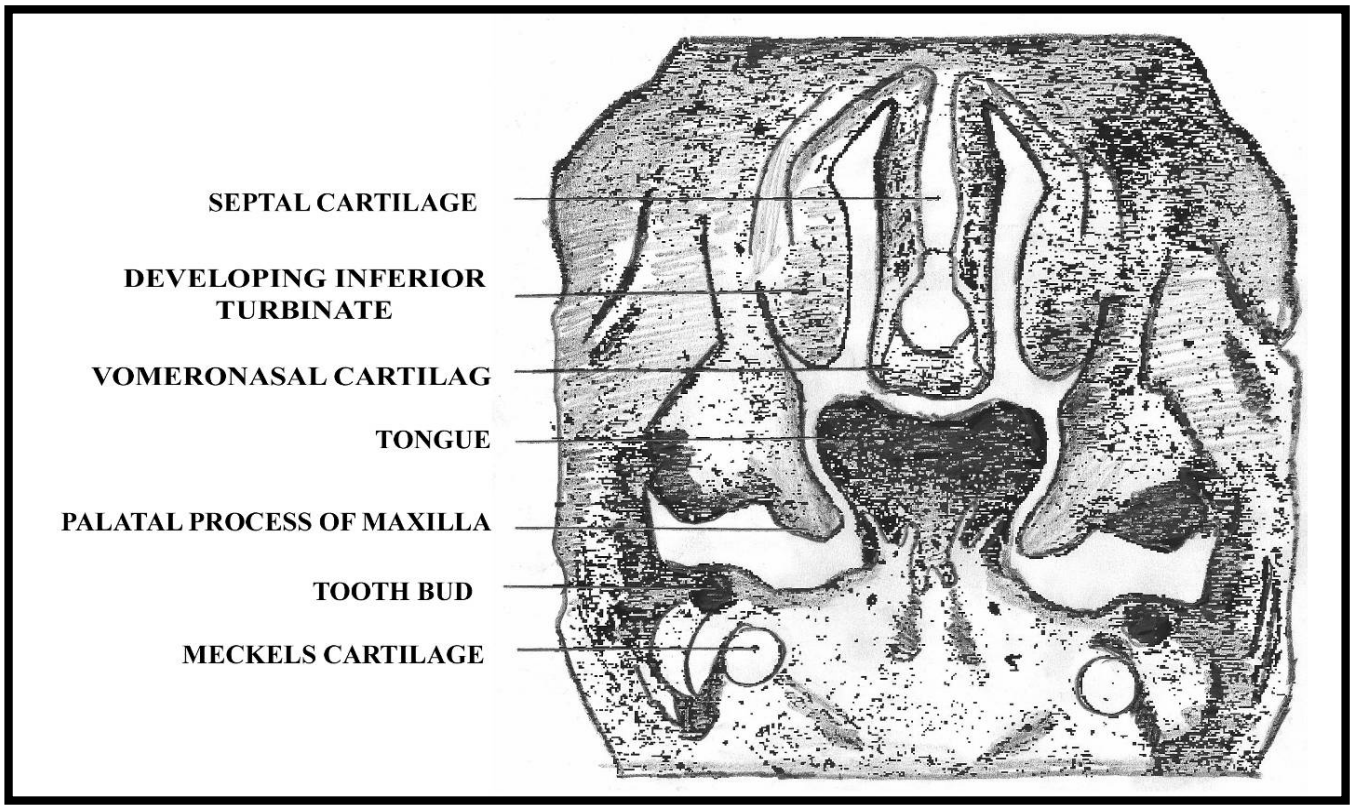


Figure 2: Development of the Primitive Septum

Anatomy of The Nasal Septum

The nasal septum is composed of a small anterior membranous portion, a cartilaginous portion and a bony portion comprising of the perpendicular plate of the ethmoid, the vomer and two bony crests of the maxilla and the palatine bone (Fig3).

The membranous part is very small and lies between the septal cartilage and columella. The cartilaginous portion is composed of a quadrilateral cartilage with a contribution from the lower and upper lateral alar cartilages forming the anterior nasal septum. Length of the cartilaginous portion is approximately 3.1cm. The quadrilateral cartilage is 3-4mm thick in its center but increases to 4-8mm anteroinferiorly, an area which has been termed the footplate. The upper margin of the cartilage also expands where it is connected to the upper lateral cartilages, forming the anterior septal angle, just cranial to the domes of the lower lateral cartilages.

The cartilage is bound firmly by collagenous fibres to the nasal bones, and to the perpendicular plate of the ethmoid and vomer, and where it sits inferiorly in the nasal crest of the palatine process of the maxilla, the fascial attachment effects a pseudoarthrosis. It abuts the maxillary spine at the inferior septal angle. Anteriorly it is attached by a thin membranous septum to the medial crura of the lower lateral cartilages.

The perpendicular plate forms the superior and anterior bony septum, is continuous above with the cribriform plate and crista galli, and abuts a variable amount of nasal bones.

The vomer forms the posterior and inferior nasal septum and articulates by its two alae with the rostrum of the sphenoid, thereby creating the vomerovaginal canals which transmit the pharyngeal branches of the maxillary artery.[38]

The inferior border of the vomer articulates with the nasal crest formed by the maxillae and palatine bones. The anterior border articulates with the perpendicular plate above and the quadrilateral cartilage inferiorly. The posterior edge of the vomer forms the posterior free edge of the septum.[38]

The nasal septum, and in particular the quadrilateral cartilage is of crucial importance in the development of the middle third of the face. The surface area of the septum measures between 30 and 35cm^2 in adults.

Deflections may develop at any of the septal articulations and spurs may also be found where the quadrilateral cartilage sends small processes between the ethmoid and vomer. Deviations were more often to the left than the right. Deflections are commoner in men than women; they are most likely to be acquired due to trauma than be congenital.[39]

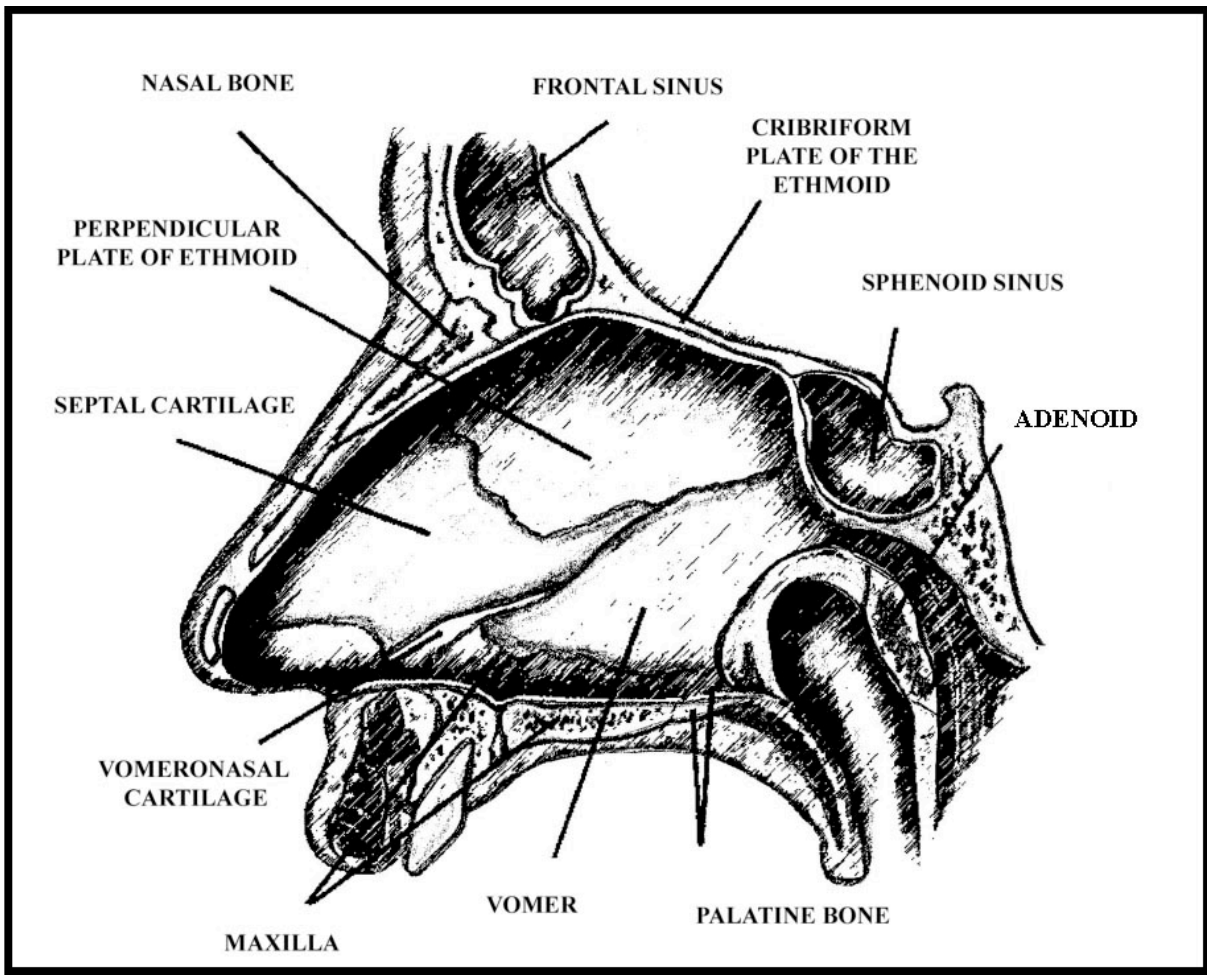


Figure 3: Anatomy of the Nasal Septum

Histology

The mucous membrane is predominantly respiratory with a small area of olfactory epithelium superiorly adjacent to the cribriform plate.

Respiratory epithelium is composed of ciliated and non-ciliated pseudostratified columnar cells, basal pluripotent stem cells and goblet cells (Fig 4). Each cell bears 300-400 microvilli, irrespective of the presence of cilia. The function is to increase surface area and thus prevent drying. The cilia are composed of the classical axonema of nine peripheral doublet and two central single microtubules. Each peripheral pair (A and B) connects to the next doublet and to the central microtubule with hexin links. The A microtubule bears an outer and inner dynein arm, composed of ATPase which can attach to the B microtubule leading to axonemal displacement and cilial beating.

Seromucinous glands are found in the submucosa and are important in mucus production. On the septum, goblet cells are also present. The septal mucosal surface is 1700$mm^2$with 8.5 glands/mm^2.

The olfactory epithelium spreads down from the cribriform plate into the upper septum. It is composed of receptor cells, supporting cells with microvilli and basal stem cells conferring on olfactory epithelium the capacity for regeneration. Each receptor cell has 17 cilia approximately. Dynein arms are not present, preventing linking between the microtubules and conventional beating. The sensory endings have a characteristic knob-like vesicular structure from which olfactory fibers join the axonal bundle.[38]

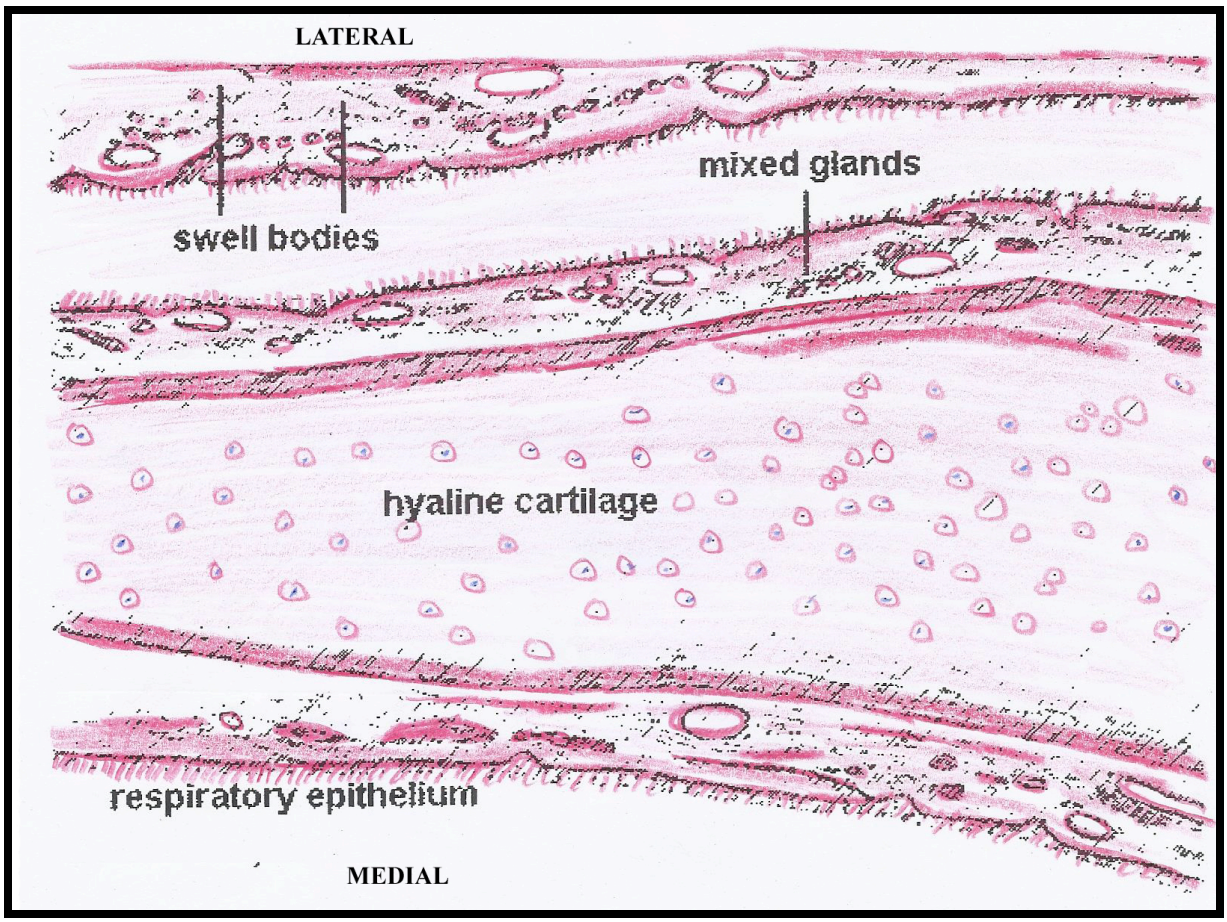


Figure 4: Histology of the Nasal Septum

Blood Supply

The external and internal carotid arteries are responsible for rich blood supply to the nose. The spheno-palatine artery (branch of the maxillary artery and thus external carotid artery) supplies the posteroinferior septum. The greater palatine artery (also a branch of the maxillary) supplies the anteroinferior portion entering the nasal cavity via the incisive canal. The superior labial branch of the facial artery contributes anteriorly, in particular to Kiesselbach's plexus (Fig 5), which is composed of unusually long capillary loops and is situated on the anterior septum - a common source of epistaxis.

The internal carotid artery supplies the septum superiorly via the anterior and posterior ethmoidal arteries and also contributes to Kiesselbach's plexus.

There is a sinusoid system in the nasal submucosa under autonomic control, which has been well described in relation to the turbinates but is also present on the septum adjacent to the inferior turbinate and on the most anterior septum. This anterior septal tubercle was first described by Morgagni and may be related to control of airflow into the olfactory cleft. A similar structure is seen on the posterior septum in two-thirds of individuals.

The cavernous venous system drains via the Sphenopalatine vessels into the pterygoid plexus posteriorly and into the facial veins anteriorly. Superiorly the ethmoidal veins communicate with the superior ophthalmic system and there may be direct intracranial connections through the foramen caecum into the superior sagittal sinus.[38,39]

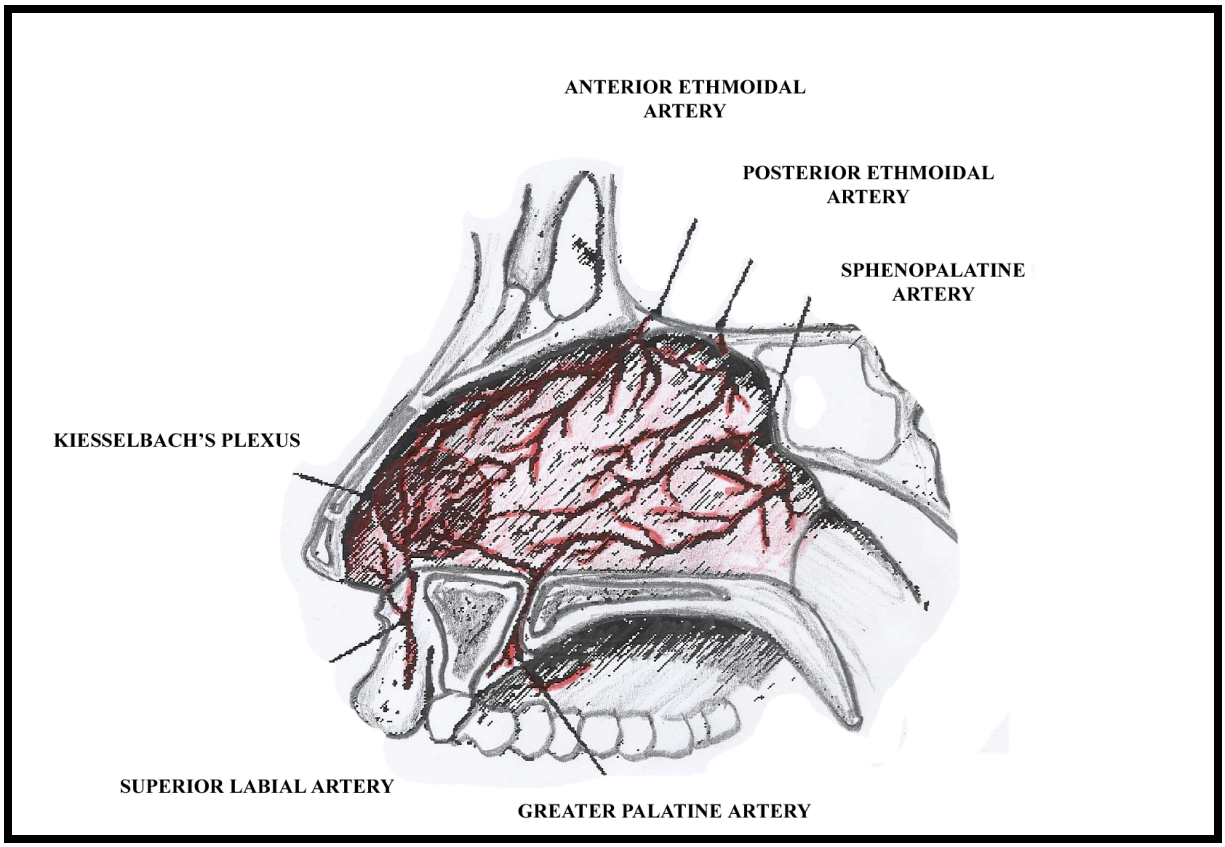


Figure 5: Blood Supply of the Nasal Septum

Nerve Supply

The maxillary division of the trigeminal nerve provides the sensory supply to the majority of the nasal septum. The nasopalatine nerve supplies the bulk of the bony septum, entering the nasal cavity via the sphenopalatine foramen, passing medially across the roof to the upper septum and running down and forwards to the incisive canal to reach the hard palate (Fig 6).

The anterior ethmoidal branch of the nasociliary nerve supplies the anterosuperior part of the septum and a smaller anteroinferior portion receives a branch from the anterior superior alveolar nerve. The posteroinferior septum also receives a small supply from the nerve to the pterygoid canal and a posterior inferior nasal branch of the anterior palatine nerve.

The sensory nerves are accompanied by postganglionic sympathetic fibers to blood vessels and postganglionic parasympathetic secretomotor fibers pass to glands with the branches from the pterygopalatine ganglion.

The olfactory epithelium covers the inferior surface of the cribriform plate spreading down to cover a variable area on the upper septum and adjacent lateral wall, over the medial surface of the superior concha. In the adult it covers an area approximately 2-5cm^2.[38]

Lymphatic drainage

The anterior septum drains with the external nose to the submandibular nodes while drainage is to the retropharyngeal and anterior deep cervical nodes posteriorly.

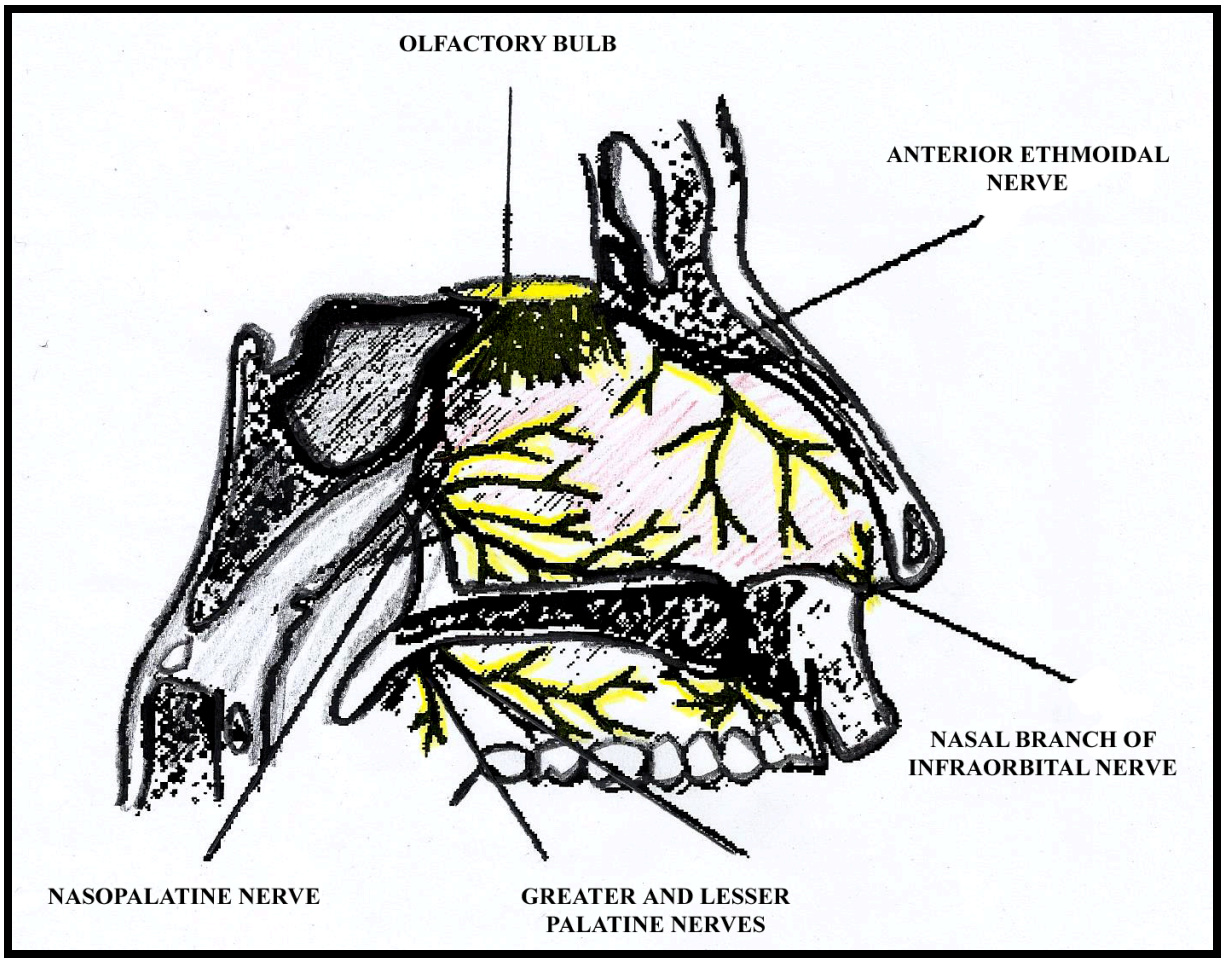


Figure 6: Nerve Supply of the Nasal Septum

Physiology of The Nose

The nose is a paired structure. It is divided coronally into two chambers. Together they act as a functional unit.

The functions of nose are

1. Respiration
    a) Heat exchange
    b) Humidification
    c) Filtration
    d) Nasal resistance
    e) Nasal fluids and ciliary functions
    f) Nasal neurovascular reflexes
    g) Voice modification
2. Olfaction

Nasal resistance and factors affecting pressure

The airflow and the sensation of the nose are very different from each other. Cold receptors sense airflow. The flow is usually turbulent, but is considered laminar at rest.

Gases flow faster through the choana. The nose has a variable cross section and so the pressure and velocity will alter continuously within the system. Because flow is turbulent in an irregular tube, the resistance is inversely proportional to the square of the flow rate. Pressures vary during the respiratory cycle and the rate is between 10 and 18 cycles a minute in adults at rest.[40]

During inspiration, the airflow is directed upwards and backwards from the nasal valve initially, mainly over the anterior part of the inferior turbinate. It then splits into two, below and over the middle turbinate, rejoining into the posterior choana. Air reaches the

other parts of the nose to a lesser degree. The velocity at the anterior valve is 12-18m sec^{-1} during quiet respiration (Fig 7).

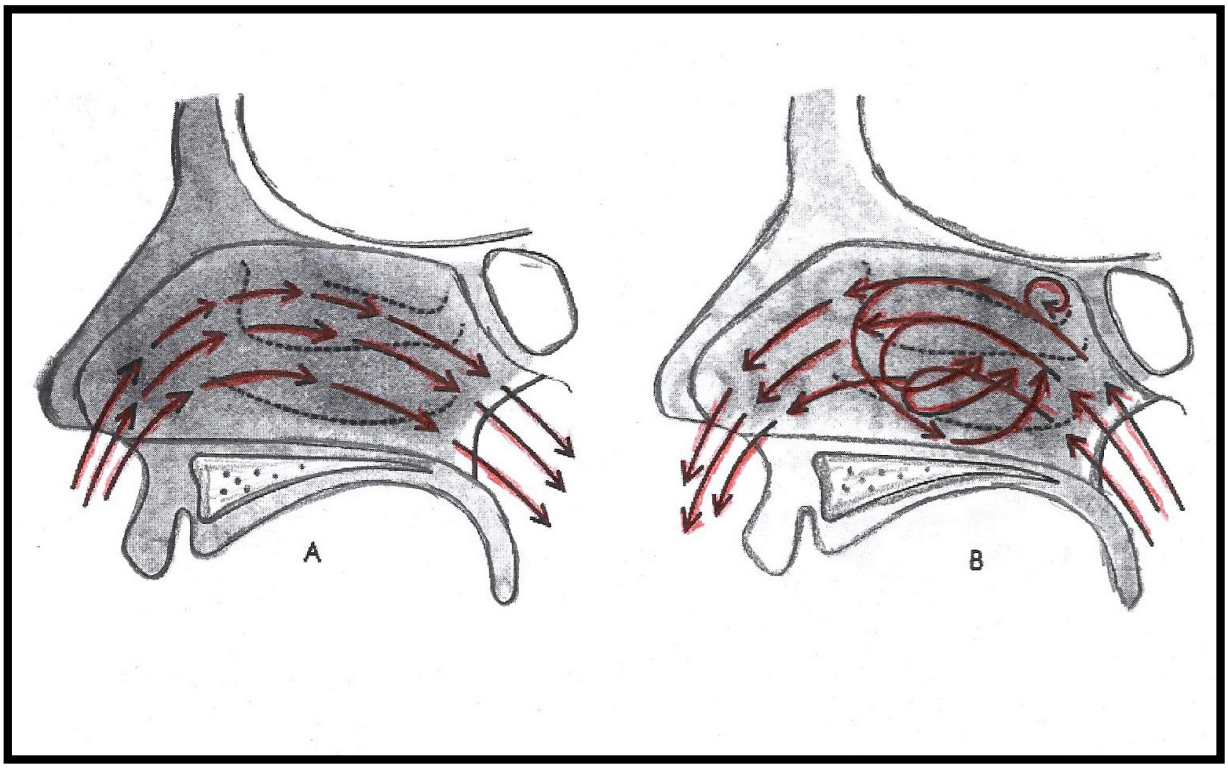
Expiration lasts longer than inspiration and is more turbulent. Extra pulmonary airflow is turbulent because the direction changes, the caliber varies markedly and the walls are not smooth. The surface area is enlarged by the turbinates and the microanatomy of the epithelium.

The nose accounts for up to half of the total airway resistance. The nasal resistance is produced by two resistors in parallel and each cavity has a variable value produced by the nasal cycle. The resistance is made up of two elements; one essentially fixed comprising the bone, cartilage and attached muscles, and the other variable, the mucosa. The nasal resistance is high in infants who are obligate nose breathers. Adults breathe preferentially through the nose at rest even though there is a significant resistance. During expiration, the positive pressure is transmitted to the alveoli.[41]

The septum in nasal function

The nasal vestibule distributes the air through the nose. The valve has the smallest cross-sectional surface of the upper respiratory tract. As a consequence the air flow is accelerated. After passing through the valve, the air enters the relatively wide nasal cavity. Due to the deceleration, vortices are created, which are necessary to bring the inspired air in contact with the mucous membranes. The mucous membranes heat and humidify the air.

During expiration, moisture is regained in the relatively cool vestibule. Thus, it is obvious that good function of the nose depends on healthy mucous membranes that will need a great deal of moisture and energy in the form of heat. This requires a rich blood supply.



(A) Inspiration **(B) Expiration**

Figure 7: Physiology of Nose

Etiology of Deviated Nasal Septum

Septal deviation though extremely common, is not usually severe enough to affect nasal function. Though majority of the people have a deviated nasal septum, only few suffer from nasal obstruction.

The causes of deviated nasal septum are:[6]

i. Developmental disturbances

- Unequal growth between the palate and the base of the skull may cause buckling
- High arched palate (adenoid hypertrophy) causes deviation of the septum
- Patients with cleft lip, cleft palate and with certain dental abnormalities can also cause deviated nasal septum

ii Trauma

- A lateral blow on the nose may cause displacement of the septal cartilage from the vomerine groove and nasal crest
- A crushing blow from the front may cause buckling, twisting and duplication of the septum.
- Birth Trauma

iii Impaired growth after trauma

iv Systemic diseases

v Racial factors

- Caucasians are affected more than Negros

Types of Deviated Nasal Septum

Deformity of the nasal septum can be classified into the following types:

i) **Spurs:** These are sharp angulations which may occur at the junction of the vomer below, with the septal cartilage and/or ethmoid bone above. This deformity is usually the result of vertical compression forces. Fracture through the cartilage may also produce this deformity. These fractures heal by fibrosis and increase the difficulty of flap elevation in this area.

ii) **Deviations:** These are characterized by a more generalized bulge. 'C' or 'S' - shaped deviations occur which can be either in the vertical or horizontal plane, and they usually involve both the cartilage and the bone.

iii) **Dislocation:** Here the lower border of the septal cartilage is usually displaced from its medial position and projects into one of the nostrils.[1,6]

Cottle Has Classified Septal Deviations Into Three Types:

1. **Simple deviations:** Here there is mild deviation of nasal septum, there is no nasal obstruction. This is the commonest condition encountered. It needs no treatment.

2. **Obstruction:** There is more severe deviation of the nasal septum, which may touch the lateral wall of the nose, but on vasoconstriction the turbinates shrink away from the septum. Hence surgery is not indicated even in these cases.

3. **Impaction:** There is marked angulation of the septum with a spur which lies in contact with lateral nasal wall. The space is not increased even on vasoconstriction. Surgery is indicated in these patients.[10]

MLADINA Classification:

1. **Type 1:** Unilateral vertical ridge in the area of nasal valve does not disturb the function of nasal valve.

2. **Type 2:** Similar to type 1 but more severe obstruction and disturbance of nasal valve.

3. **Type 3:** Unilateral vertical ridge at the level of the head of the middle turbinate.

4. **Type 4:** Defines two crest one at the level of the head of the middle turbinate and other on the opposite side in the valve area disturbing the function.

5. **Type 5:** Unilateral ridge on the base of the septum. Other side of the septum is Straight.

6. **Type 6:** Unilateral sulcus running through the caudal ventral part of the septum, on the other side there is a ridge with accompanying asymmetry of the nasal cavity.

7. **Type 7:** Mix of types from 1 to 6. [42]

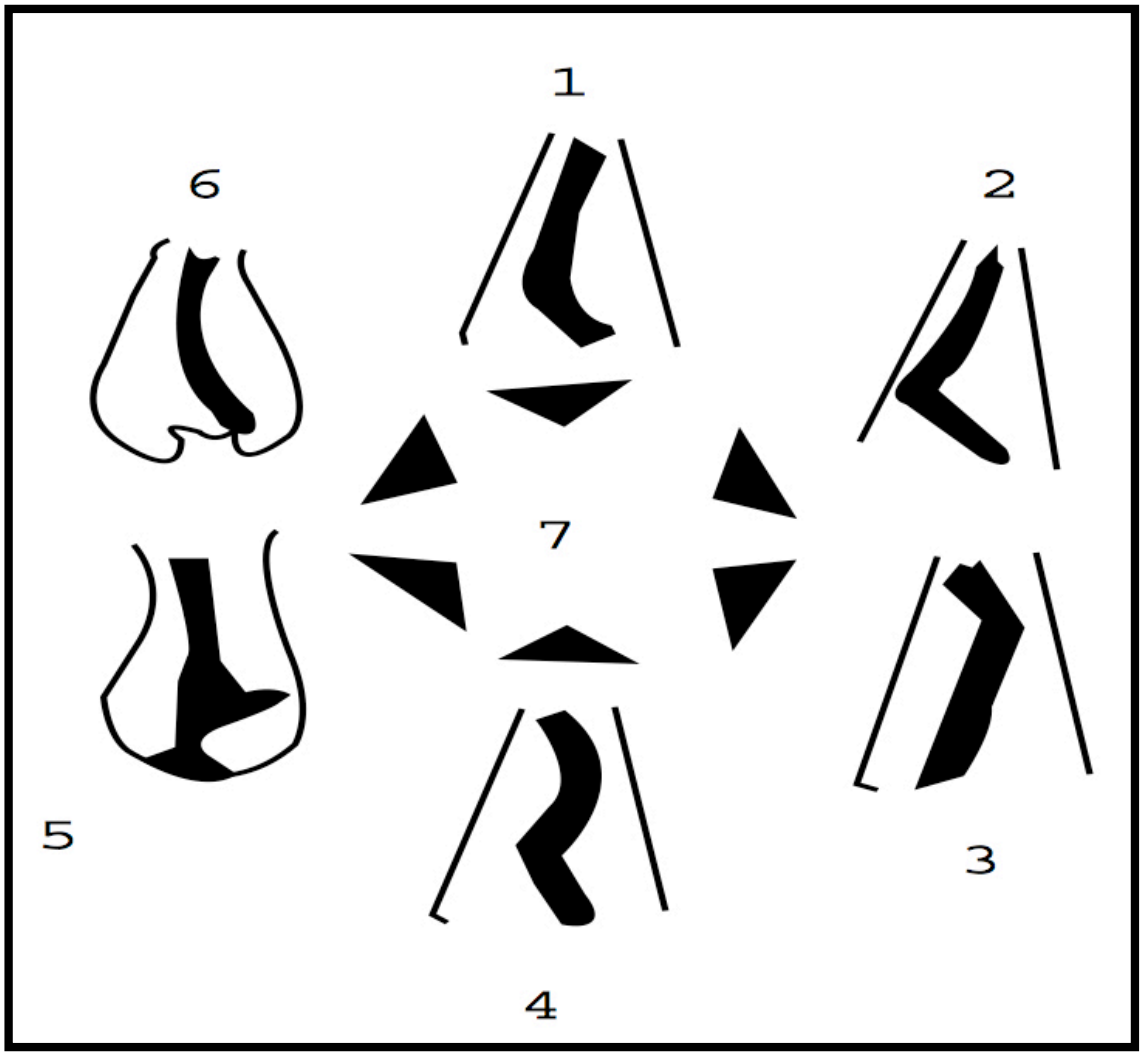


Figure 8: Maldina Classification

Effects of septal deviation:

Only the more severe deviations affect nasal function and therefore require treatment.

Nasal obstruction: This is found on the side of the deviation and is also present on the opposite side as a result of the hypertrophic changes in the turbinates.

Mucosal changes: The inspiratory air currents are often abnormally displaced and frequently become concentrated on small areas of nasal mucosa, producing an excessive drying effect. Crusting and separation of the crusts produces ulceration and bleeding. The protective mucous layer may then be lost and resistance to infection reduced. The mucosa around a septal deviation may become oedematous as a result of Bernoulli's principle, which states that when there is a flow of gas through a constriction lateral pressure drops which, in turn, predispose to mucosal oedema in the affected area, thus further increasing the obstruction.

Neurological changes: It is possible that the pressure exerted by septal deviations on adjacent sensory nerves can produce pain. This concept was first elaborated by Sluder and the resultant condition has been called 'anterior ethmoidal nerve syndrome'. In addition to their direct neurological effect, reflex changes may result from septal deformities which affect the nasopulmonary and nasal reflexes. The lateral wall of the nasal cavity is much more sensitive than the septum. The very severely impacted nasal septum can exert pressure on the more sensitive structures of the lateral nasal wall and cause referred trigeminal pain and chronic headache.

Epixtasis: In cases of deviated nasal septum, due to air currents on the roomy side, the mucosa dries up with crust formation. When these crusts are removed, it leads to bleeding.

Hyposmia: Some patients with deviated nasal septum complain of hyposmia, which is due to non accesibility of olfactory epithelium present in the roof of nasal cavity and upper septum adjacent to it to the air currents or due to mucosal edema around middle turbinate.[43]

Complications of Nasal Packing:

1) Related to pack insertion
    a) Pain
    b) Cardiovascular collapse
        i) Hypovolemic Shock
        ii) Nasovagal reflex
        iii) Reactions to lignocaine
    c) Trauma to the soft palate, nares, columella& mucosa
2) Related to maintaining pack
    a) Hypoxia and hypoxemia may lead to myocardial infarcts and cerebrovascular accidents
    b) Obstructive sleep apnoea
    c) Infection
        i) Local – Vestibulitis or sinusitis
        ii) General – Bacteraemia or toxic shock syndrome
    d) Eustachian tube obstruction
    e) Myospherulosis
    f) Dry mouth and sore throat
3) Related to pack removal
    a) Pain, Haemorrhage and trauma
4) Late Complications
    a) Secondary hemorrhage
    b) Adhesions
    c) Septal perforations
    d) Pack granuloma [12]

Evaluation

1) **History:** A thorough history taking is done and noted in the special proforma.

2) **Cold spatula test:** Is done to assess the nasal airway through misting of the tongue depressor placed below the nose.

3) **Anterior rhinoscopy:** Is done with Thudicum nasal speculum. Speculum is gently introduced into the nasal vestibule, and the blades opened to obtain a view of the nasal fossae. The examination include mucosa, nasal septum, changes in the nasal cavity and septum, the airway or lumen of nasal fossae, floor of nose and lateral wall of nose. Nasal septum is examined for deviations, spurs, any other septal pathology.

4) Posterior rhinoscopy: Is done with a Sinclair Thomson posterior rhinoscopy mirror to evaluate for any pathology in the post nasal area.

5) **Diagnostic nasal endoscopy:** Using rigid 0^0 4mm Karl Storz nasal endoscope with Storz camera connected to a monitor, diagnostic nasal endoscopy is performed. The deviation of the septum, spurs are noted.

6) **Radiology:** X-ray of paranasal sinuses, Water's view is done to assess the sinus for any infection.

MATERIALS AND METHODS

Methods:

All patients aged 14yrs presenting to the department of Otorhinolaryngology and Head and Neck Surgery of R L JALAPPA HOSPITAL AND RESEARCH CENTRE, TAMAKA, KOLAR with symptomatic deviated nasal septum and undergoing septoplasty from December 2011 – December 2012 were included in this study.

Written informed consent was obtained from all patients for surgery and for participation in the study.

These Patients were randomized into 2 groups based on a 4 block randomization method. The 2 groups, Group A and Group B were first grouped into 4 blocks, AABB, BBAA, ABAB and BABA. A series of random numbers were generated using computer software and based on the series, using the four blocks, the patients were randomized into the 2 groups. A minimum of 30 patients was included in each group (Fig 8).

Patients in both groups underwent septoplasty as described by Maurice cottle. Patients in group A after surgery underwent anterior nasal packing with soframycin and liquid paraffin soaked ribbon gauze of approximately 1 meter in length, while patients in group B underwent closure of the incision and stabilization of the nasal septum with four separate mattress sutures using 4/0 vicryl.

The patients were enquired about their nasal pain, nasal discomfort, watering from the eyes and dryness of throat, every morning 24hrs after the surgery, for the next 2 days. Assessment on the day of the surgery was avoided to prevent the confounding effects of operative analgesia. Patients were enquired about the degree of pain using a visual analogue score of 0 to 10 depending on the severity of pain, with 0 being no pain and 10 being most pain ever experienced (Fig 9). The patients were also asked to rate the discomfort they experienced due to nasal obstruction on a scale ranging from 0 (No discomfort) to

5 (severe discomfort) (Fig 10). The severity of other symptoms like watering from the eyes and dryness of the mouth and throat were evaluated using a 0 – 3 grading scale (0=Nil, 1=Mild, 2=Moderate, 3=Severe). In the packing group the pack was removed after 48hrs, all patients were reviewed at the end of the 1st, 2nd and 4th weeks post surgery. The complications of septoplasty such as epixtasis, hematoma or abscess were documented during these visits. The data collected was analyzed using the SPSS 12 software. Student 't'tests was used for testing the difference in proportion and Mann-Whitney U test was used to compare the significance of difference in the mean analogue scores. A p value less than 0.05 were considered statistically significant.

Sample size: 60 patients were included in the study with 30 patients in each group.

Randomization: Block randomization

Type of the study design: Prospective study

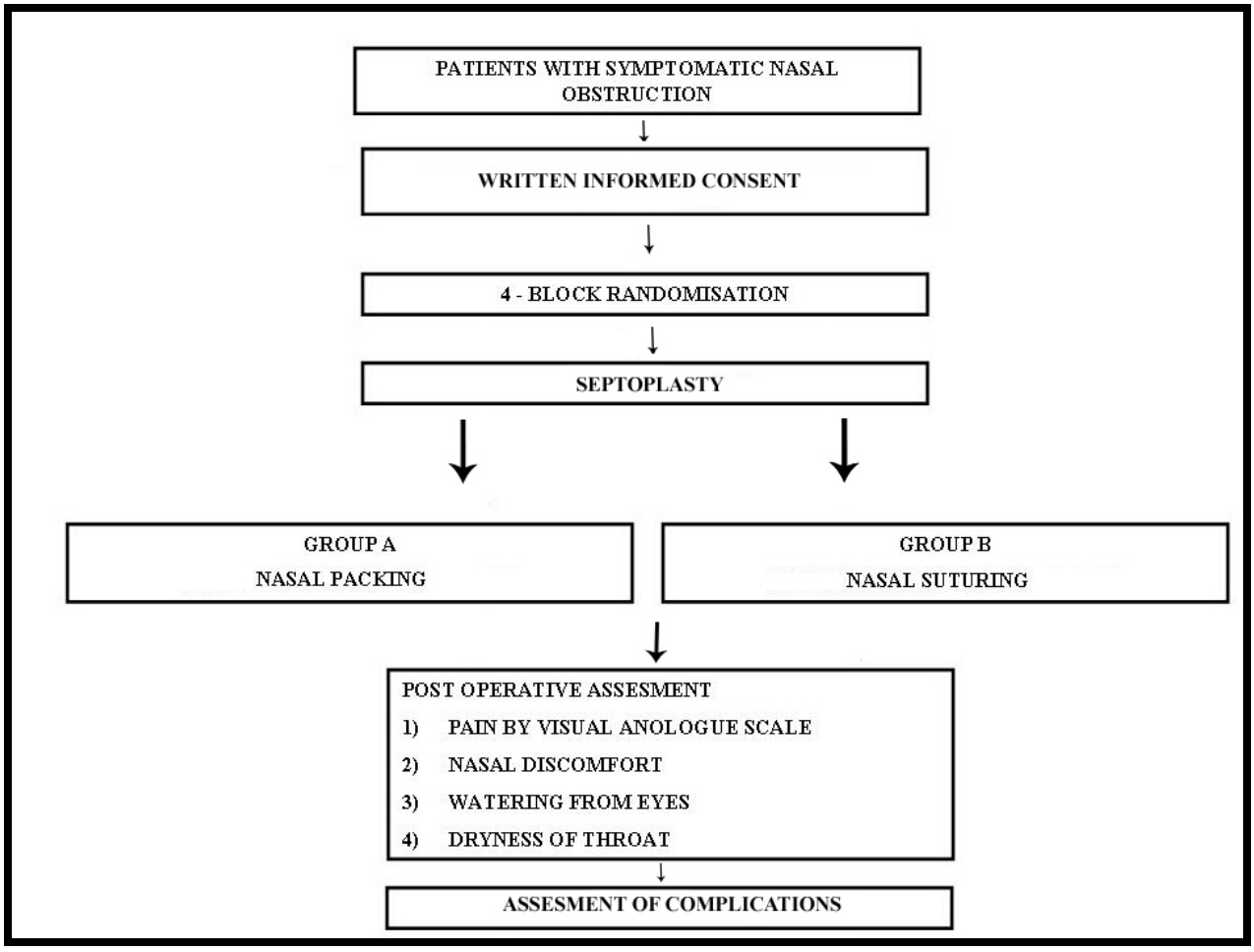


Figure 9: Study Protocol Flow Chart

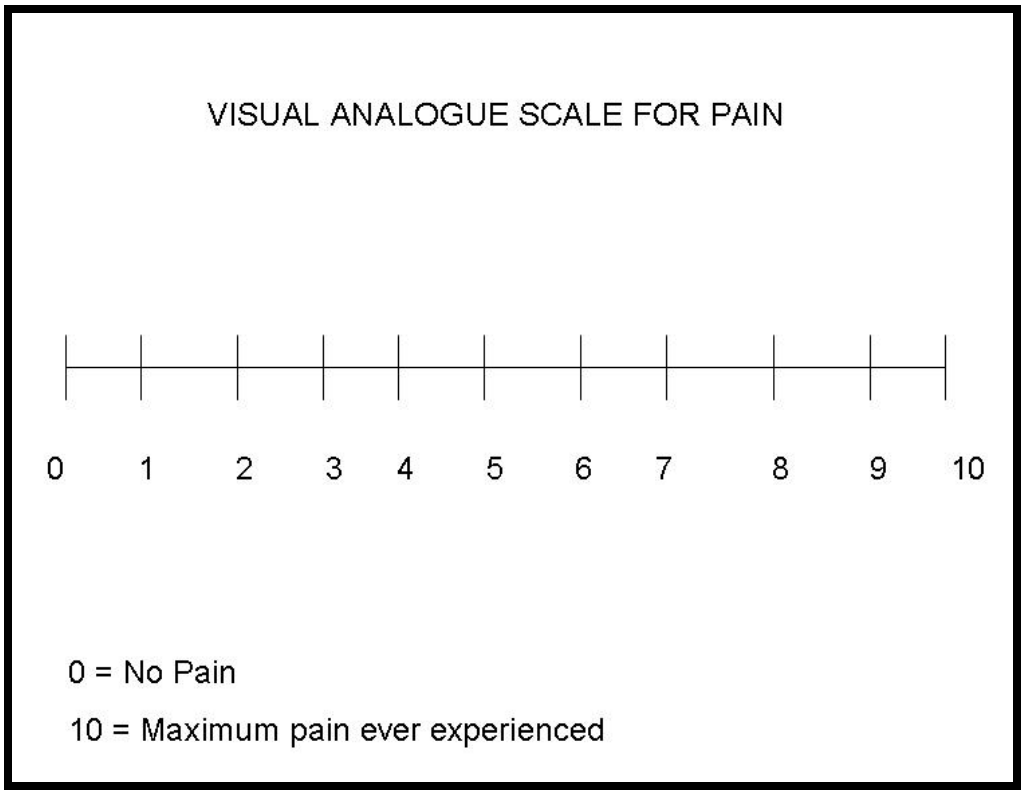


Figure 10: Visual Analogue Score for Pain Scale

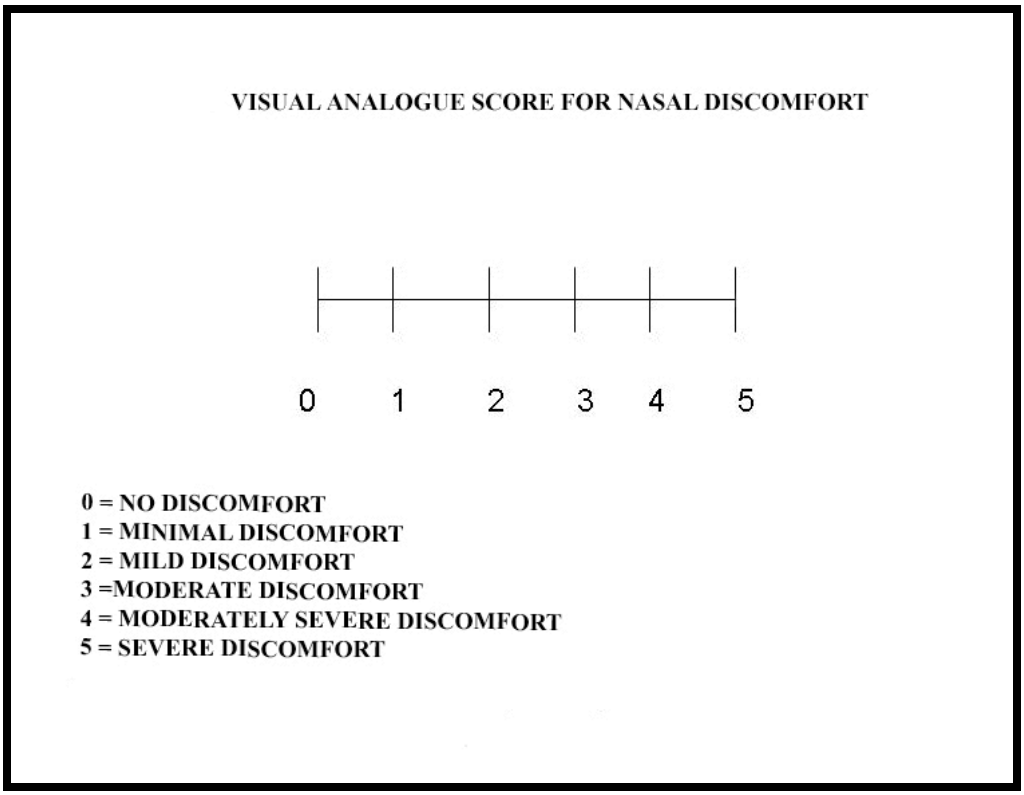


Figure 11: Visual analogue score for nasal discomfort

Inclusion criteria:

i. All patients aged 14 years and above, with symptomatic deviated nasal septum undergoing septoplasty.

Exclusion criteria:

i. Patients undergoing septoplasty along with other nasal procedures such as functional endoscopic sinus surgery (FESS), turbinectomy, endoscopic dacryocystorhinostomy, sino-nasal polypectomy.

ii. Patients who have undergone previous nasal septal surgery.

Method of collection of data:

Cases selected for the study were subjected to detailed history and a complete ENT examination. All patients underwent diagnostic nasal endoscopy before surgery and type of deviation was noted and any other concurrent nasal pathology was ruled out.

Deviation was classified as right and left, C or S shaped, anterior or posterior depending on the character of the septal deviation. Caudal dislocation, spurs, was identified along with lateral wall pathologies. Patients who presented to us with nasal discharge along with nasal obstruction and other allergic symptoms were given a course of anti allergic treatment for 4 weeks and were included in the study only if there was no relief of the nasal obstruction.

Cases were investigated in the following manner:

i) Haemoglobin, total leucocyte count, differential leucocyte count, bleeding time, clotting time, blood grouping and Rh typing.

ii) Urine for sugar, albumin and microscopy.

iii) Chest x-ray

iv) ECG

v) X-ray of paranasal sinuses-water's view to note the condition of paranasal sinuses.

A correlation was established between clinical features and radiological findings. After complete pre-operative assessment, patients were subjected to surgical intervention.

Pre-operative preparation:

Patients were prepared as follows:

i. Injection tetanus toxoid 0.5ml intramuscular was given.

ii. Xylocaine test dose of 0.1ml of 2% xylocaine was injected intradermally on the left forearm of the patient in supine position.

iii. Informed written consent of the patient was taken.

iv. Premedication was given to the patients, 45minutes prior to surgery in the form of a cocktail of 25mg promethazine, pethidine1.1-2.2 mg/kg and 0.6mg atropine intramuscularly.

v. Both nasal cavities were packed for about 10minutes prior to surgery with cotton strips soaked with 4% xylocaine and adrenaline (1: 30,000).

Instruments

- Thudicum nasal speculm, No. 15 blade with BP handle (No.3), Freer's elevator, Luc's forceps, killians self retaining nasal speculum, Mallet, Jenkins nasal gouge, Killian's bayonet shaped nasal gouge, Nasal suction and Needle holder.
- Headlight with a cold light source

Position of patient:

Patient is placed in supine position with head end of table raised and head was place in a head ring.

Figure 12: Instruments Required For Septoplasty

PROCEDURES

Technique of Septoplasty

Infiltration done with 2% xylocaine with adrenaline (1:2,00,000).Hemitransfixation incision is placed along the caudal border of the septum (using 15 number blade) preferably on the concave side.

Cartilaginous and bony septum exposed by elevating mucoperichondrial and periosteal flaps using Freer's elevator. The difficulties in flap elevation occur mainly at the junction of septal cartilage above with anterior nasal spine, premaxillary crest and vomer below, because the perichondrium encloses the cartilages in a complete envelope, which does not fuse with the periosteum forming inferior envelope. These are called anterior tunnel and inferior tunnels respectively. These tunnels are united using sharp dissector or knife and this is called Cottle's maxilla-premaxilla approach.[10]

Next an incision between the posterior part of the septal cartilage and the bony septum is made if needed. This is called a 'posterior chondrotomy'.

Mobilization and straightening: Then the inferior cartilaginous strip of 0.4cm is removed to achieve correction if necessary. Any deviated bony portion is removed with Luc's forceps or with a gouge (Fig 12). Cross hatch incisions are made on the concave side. The incision is closed using 4-0 vicryl suture. In the packing group (Group A) bilateral nasal cavities were packed with ribbon gauze of approximately 1 meter in length impregnated with liquid paraffin and soframycin ointment.

In the trans-septal suturing group the mucoperichondrial flaps were closed by four separate through and through mattress sutures with 4-0 vicryl. Polygalactin suture material with a curved cutting needle was employed due to its superior tensile strength and handling

properties. The needle is held in the needle holder so that the shaft of the needle and the natural curve is in the same plane as the handle of the needle holder (Fig 13). This is done so that the force of pushing the needle through the tissue is applied directly behind the needle. The needle was slightly straightened before application of the suture. These sutures were placed in the accessible part of the septum to ensure closure of the gap between the two mucosal flaps as shown in Fig 15.

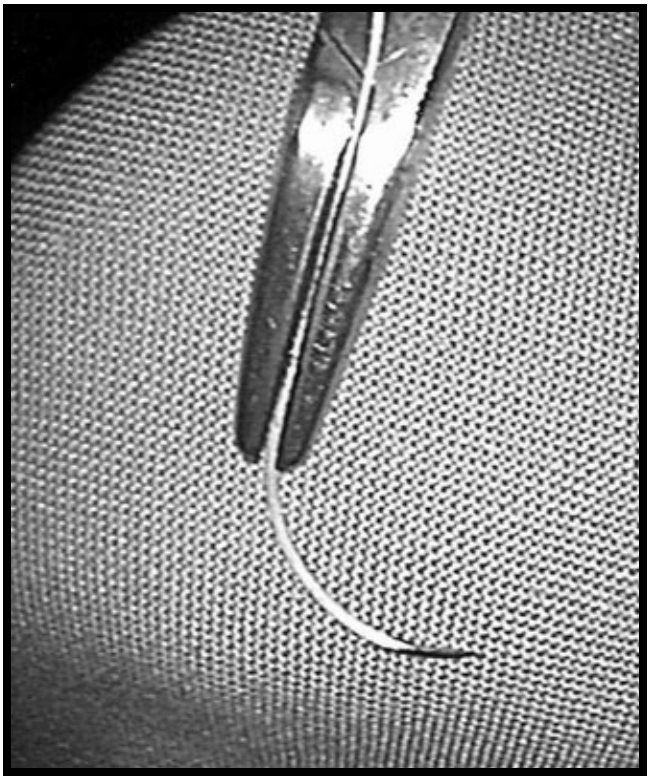


Figure 13: Technique of holding the needle

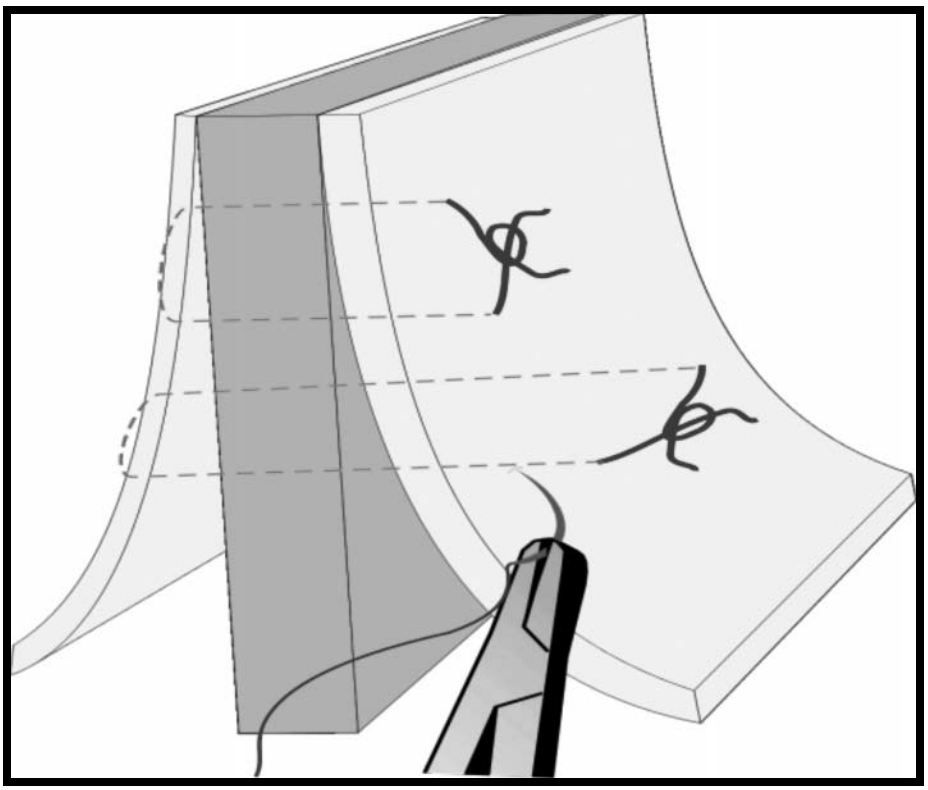


Figure 14: Passing the suture through the nasal septum

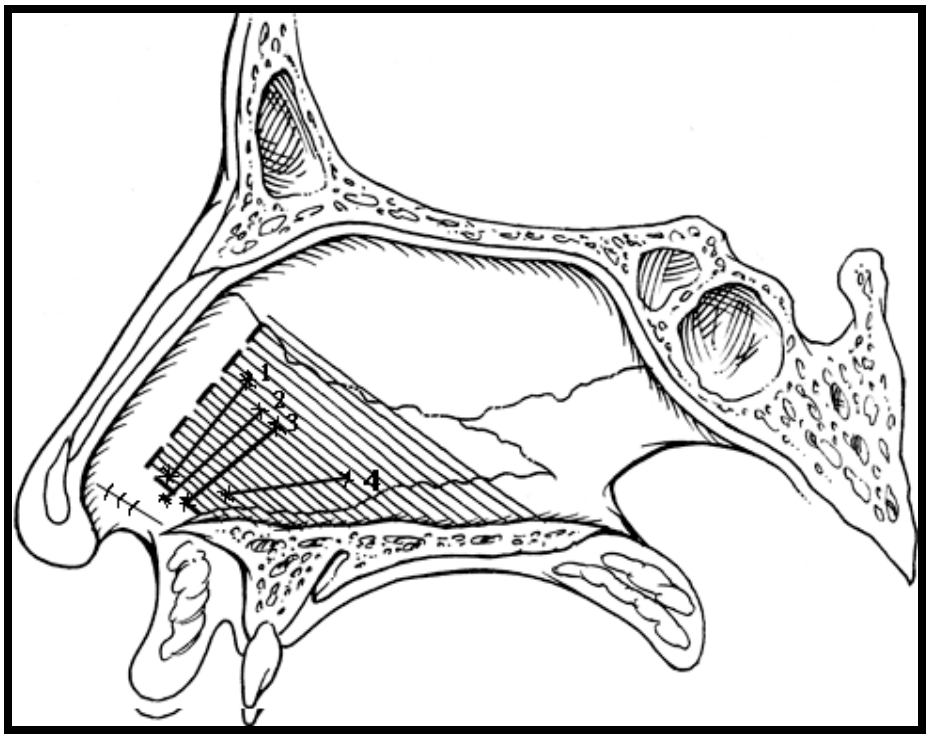


Figure 15: Placement of Trans-septal sutures

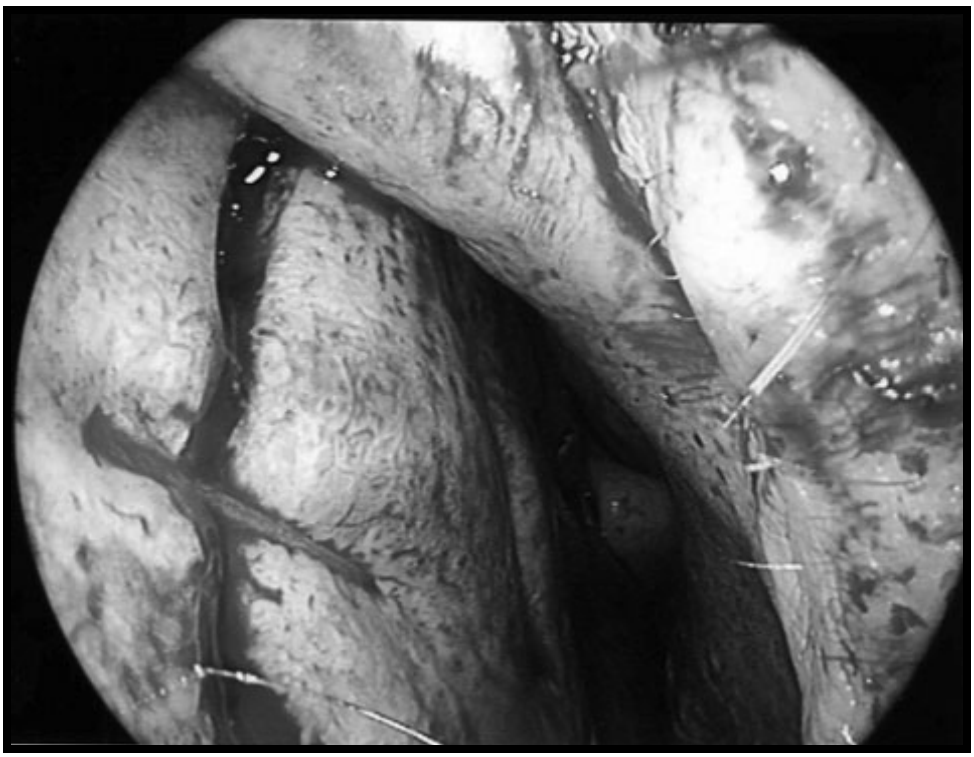


Figure 16: Suture position insitu

Figure 17: Surgeon Performing Septoplasty

Post-operative management:

All Patients were given antibiotics and antihistamines. All patients received the same amount of analgesia, a single intramuscular dose of diclofenac (1mg/kg/dose) on the day of surgery and diclofenac tablets twice daily for the next 3 days. Dosage of analgesia was standardized. Pack removal was done after 48 hours. Every morning during post operative day 1 and day 2 the following parameters were assessed.

1) Pain using a Visual Analogue Scale (0-10), with 0 being no pain and 10 being the most severe pain ever experienced.
2) Nasal discomfort on a scale of 0-5, with 0 being no discomfort, 1= minimal discomfort, 2= mild discomfort, 3= moderate discomfort, 4= moderately severe discomfort and 5 being severe discomfort.
3) Watering from the eye on a scale of 0-3, with 0 being no watering, 1= mild watering, 2= moderate watering and 3 being severe watering from the eyes
4) Dryness of the throat on a scale of 0-3, with 0 being no dryness of throat, 1= mild dryness, 2= moderate dryness and 3 being severe dryness of the throat.

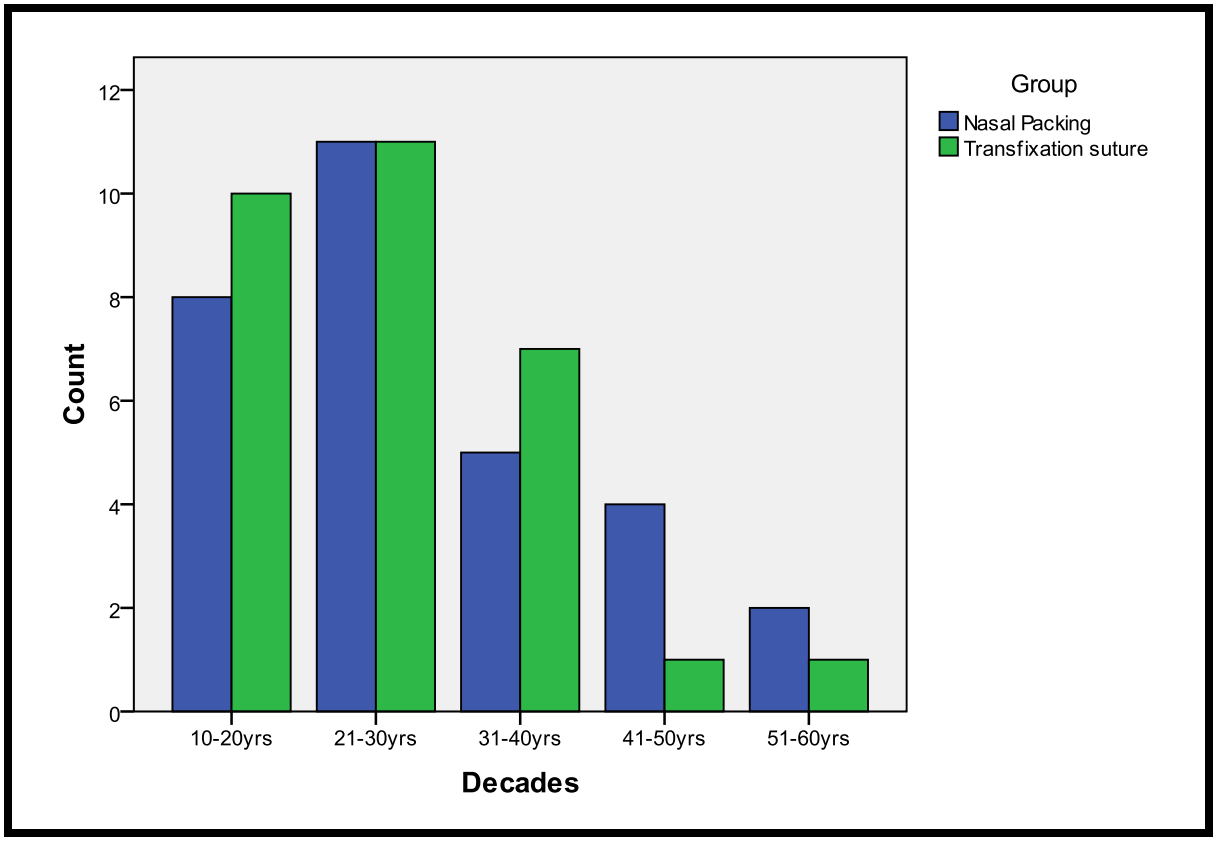
Follow up was done at the end of the 1^{st}, 2^{nd} and 4^{th} week post operatively. At each follow up visit, assessments of complications were done for epixtasis, septal haematoma and septal abscess.

The data collected was analyzed using the SPSS 12 software. Student 't'tests was used for testing the difference in proportion and Mann-Whitney U test was used to compare the significance of difference in the mean analogue scores. A p value less than 0.05 were considered statistically significant.

RESULTS

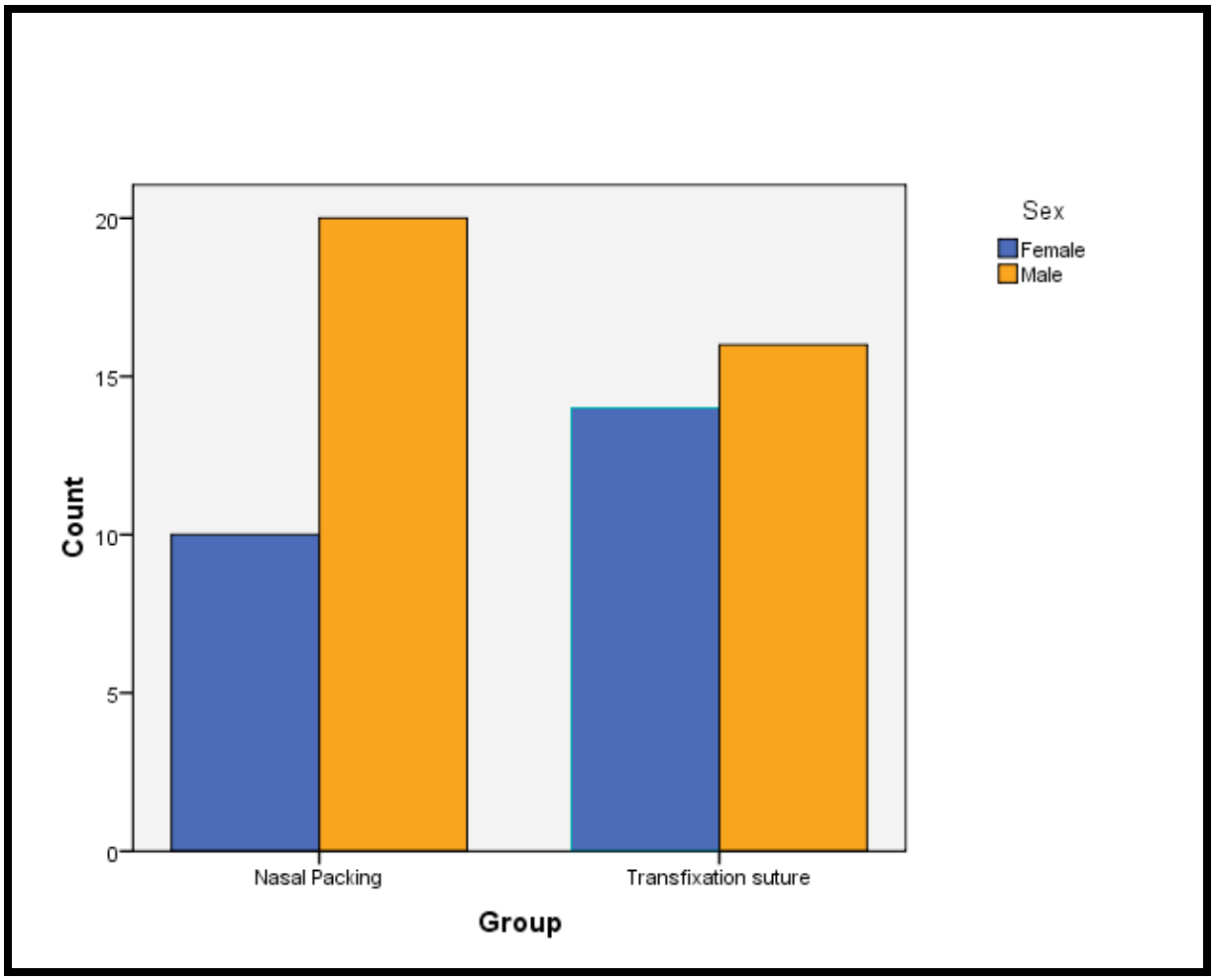
The present study was conducted from December 2011 to December 2012. During which 60 cases with symptomatic deviated nasal septum were studied.

In our study maximum numbers of patients were adults in the age group of 21-30yrs (36.7%). Patients belonging to the first decade were 30%, while in the 3rd, 4th, 5th and 6th decade was 20%, 8.3% and 5 % respectively. The youngest patient in the study was aged 14 yrs and the oldest was 55yrs.



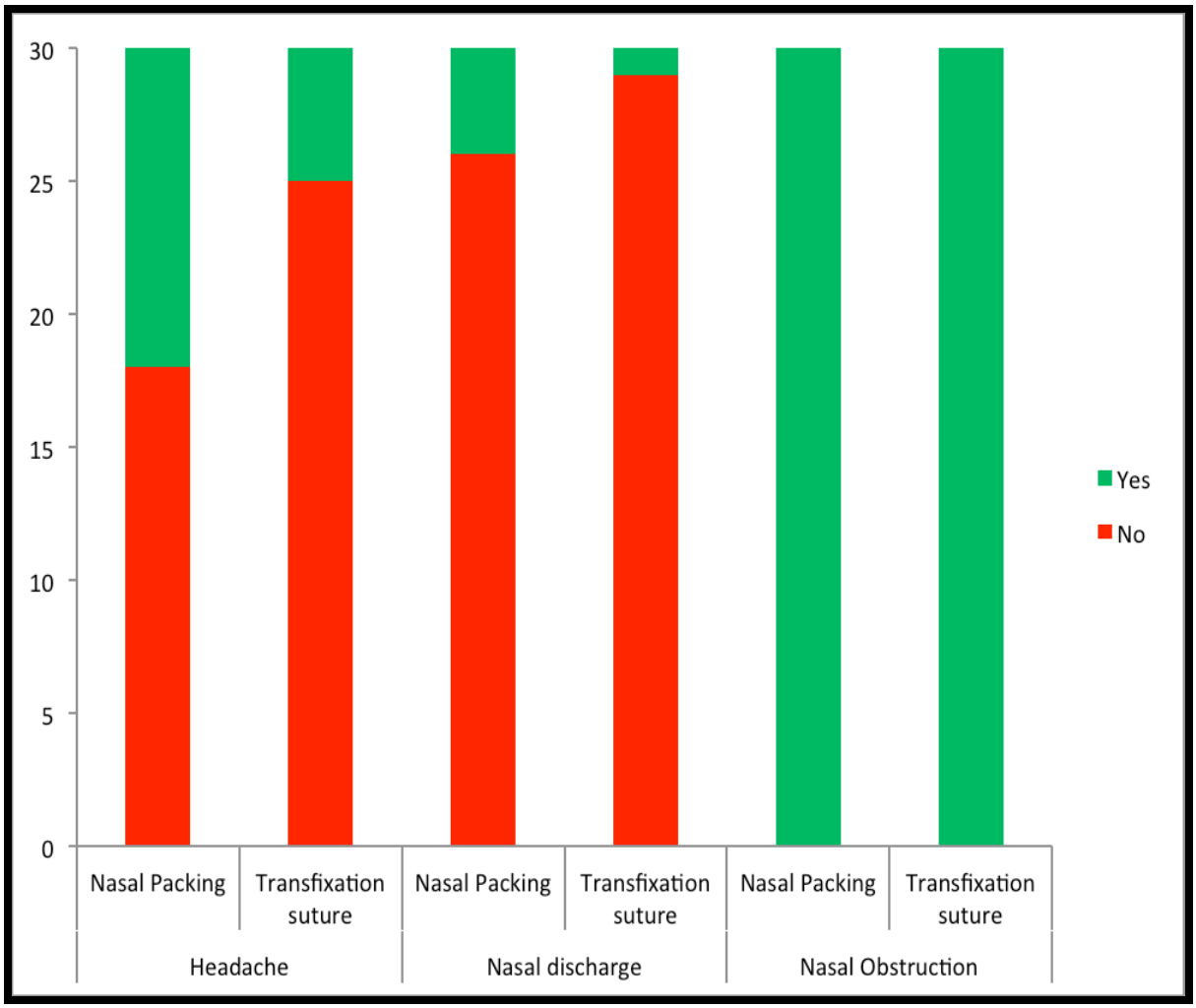
Graph 1: Age Distribution of Patients

In our study a males were more in number with 36 patients (60%) being males and 24 patients (40%) were females. In the packing group 33.3 % were females and 66.7% were males while in the suturing group 46.7% were males and 53.3% were females.



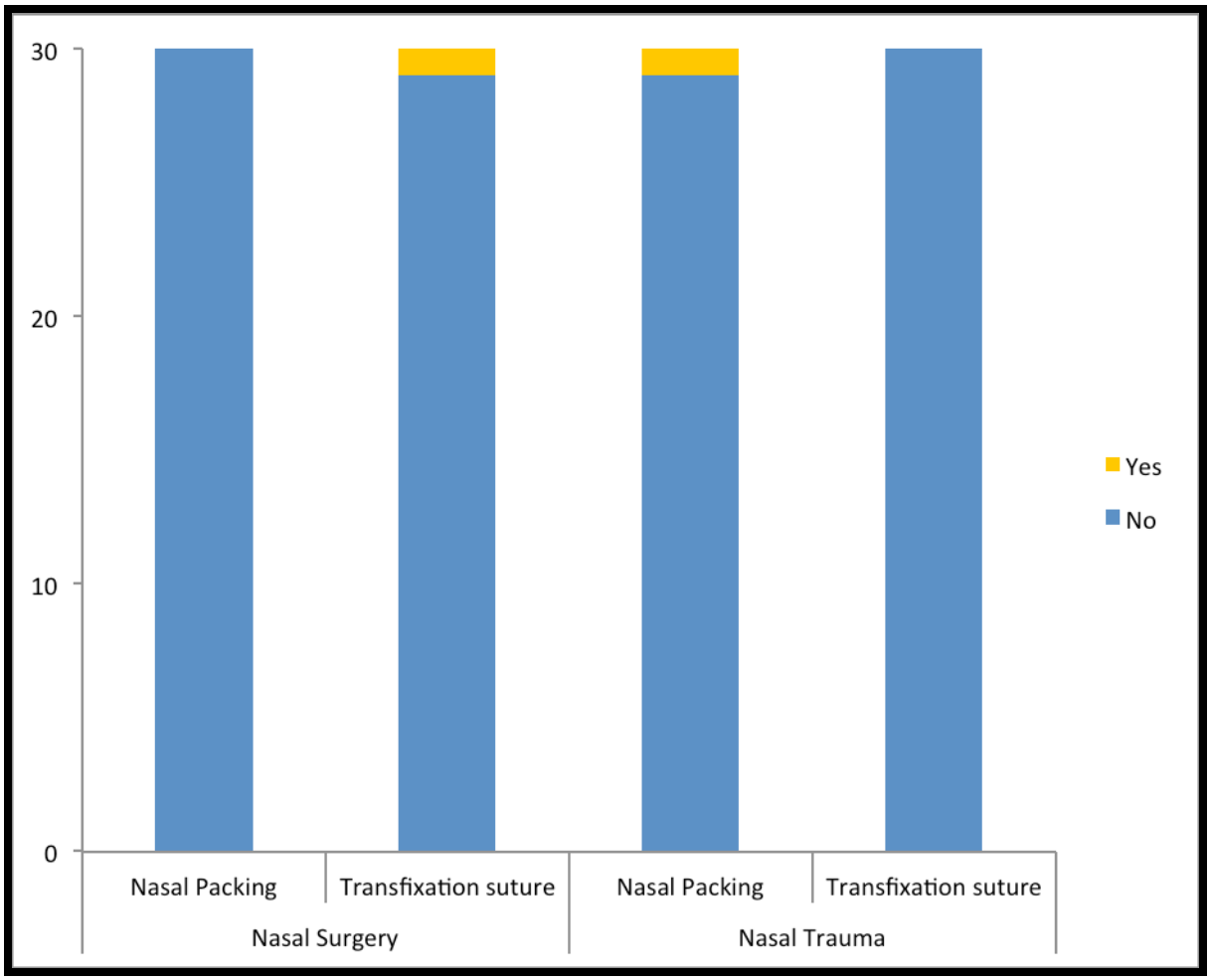
Graph 2 : Sex Distribution of Patients

Nasal obstruction was the most consistent symptom being present in all patients (100%) in both groups. Headache was the next common symptom seen in 17 patients (28.3%), 12 (20%) in the packing group and 5 (8.3%) in the suturing group. Nasal discharge was a rare symptom, being present in only 5 patients (8.3%), 4 patients in the packing group (6.7%) and 1 in the suturing group (1.7%).



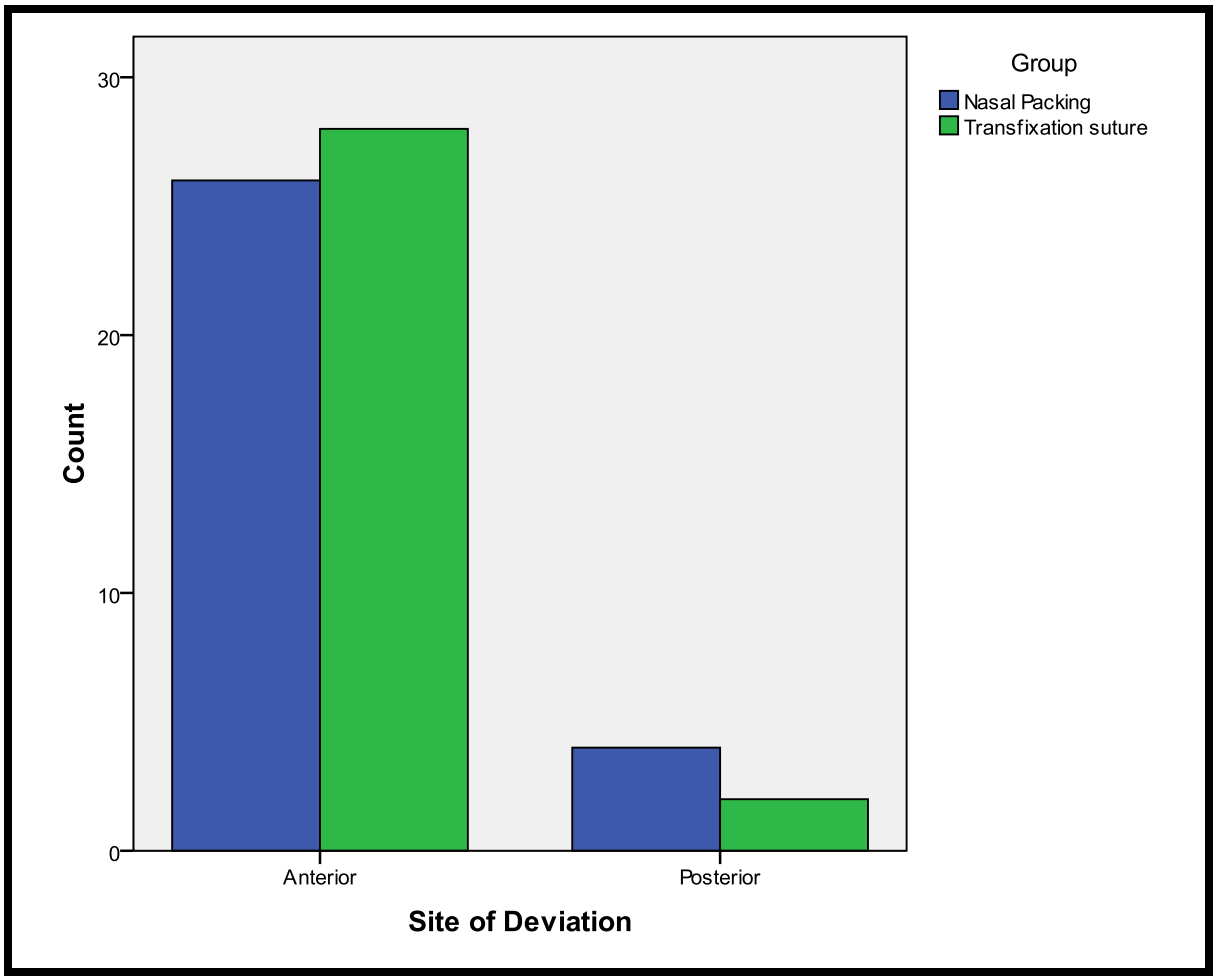
Graph 3: Presenting Symptoms

Only 1 patient (1.7%) had a previous history of nasal trauma and he was in the packing group.1 patient had a previous history of nasal surgery (1.7%) and he was in the tranfixation suture group. He had undergone nasal polypectomy with a snare 8 yrs back.



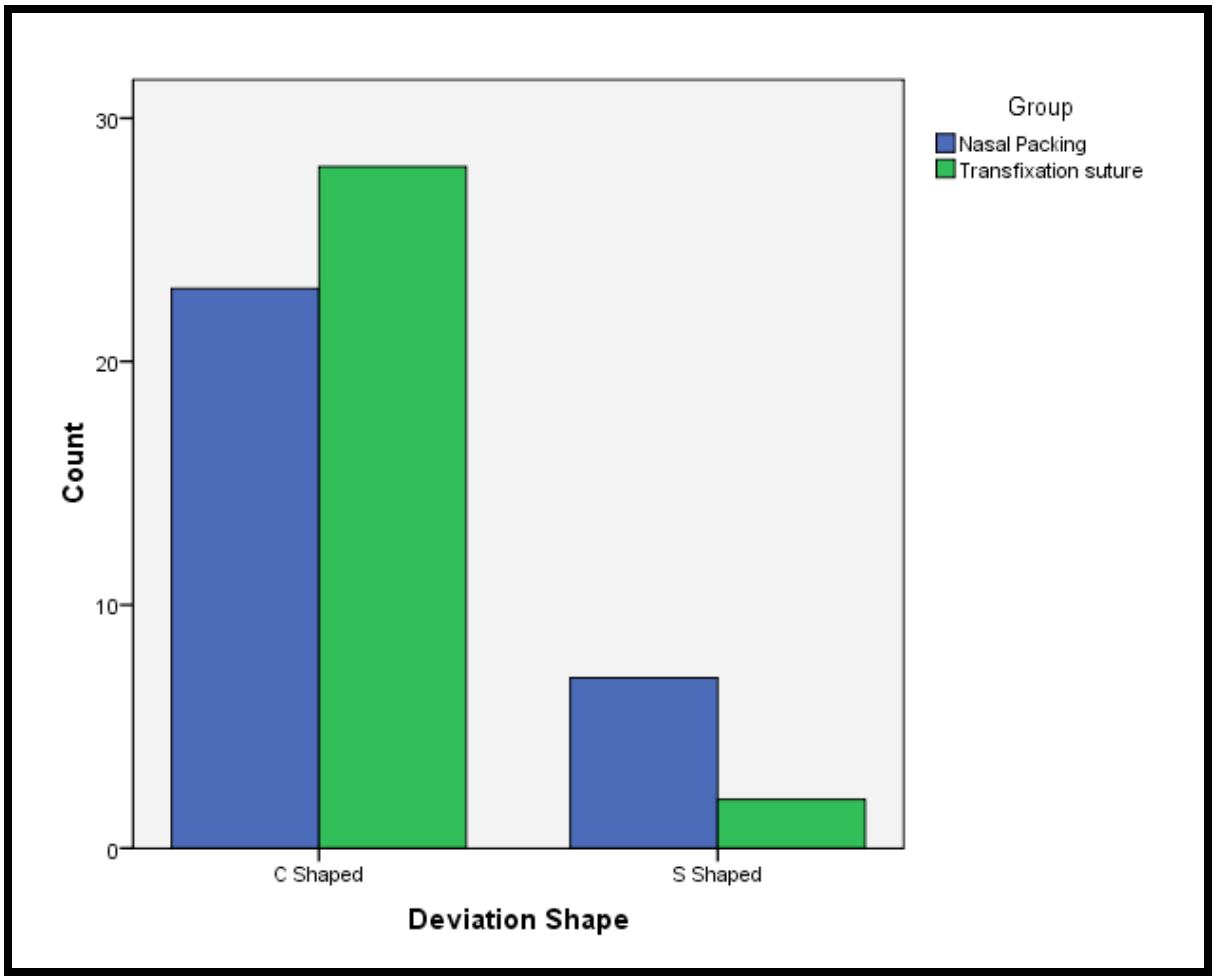
Graph 4: Patients with previous trauma or surgery to the nose

54 patients (90%) had an anterior septal deviation in relation to the cottle's line and 6 patients (10%) had a posterior septal deviation.



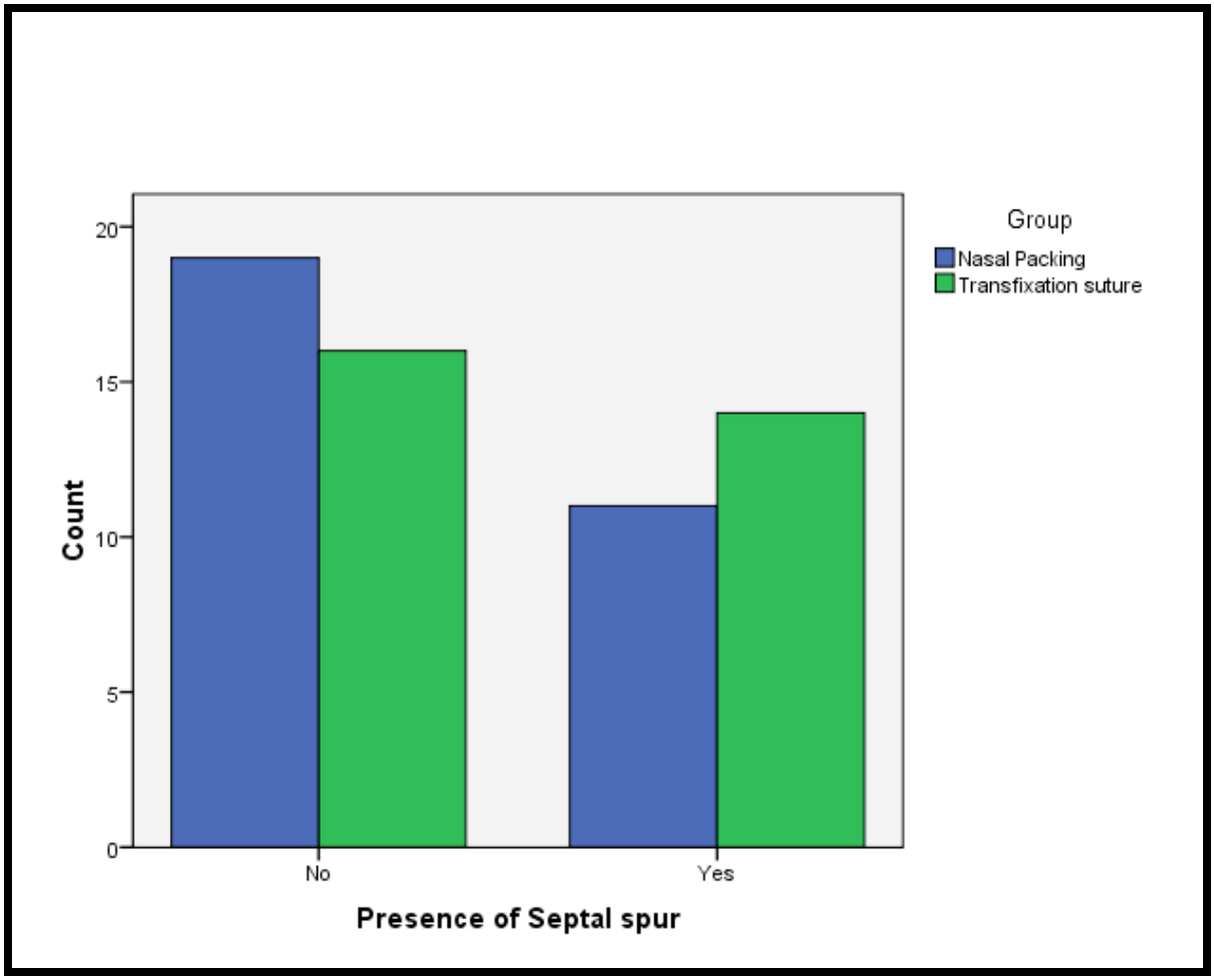
Graph 5: Distribution according to site of deviation

51 patients (85%) had a “C- Shaped” deviation of the nasal septum while 9 patients (15%) had an “S-Shaped” deviation of the nasal septum.



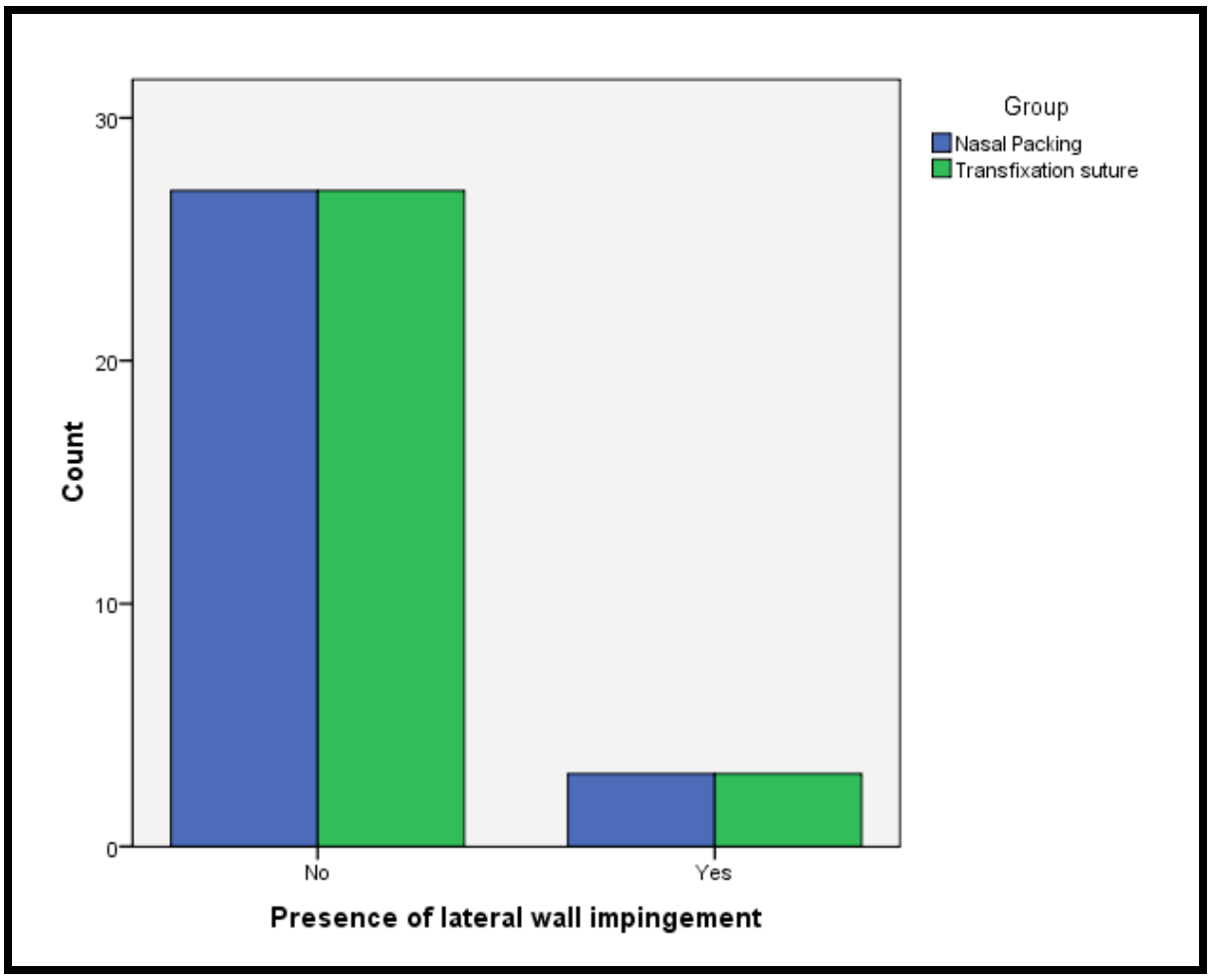
Graph 6: Distribution according to shape of deviation

25 patients (41.7%) had a septal spur on anterior rhinoscopic examination when compared to 35 patients (58.3%) without a spur. There was no significant difference between the two groups.



Graph 7: Presence of Septal Spur

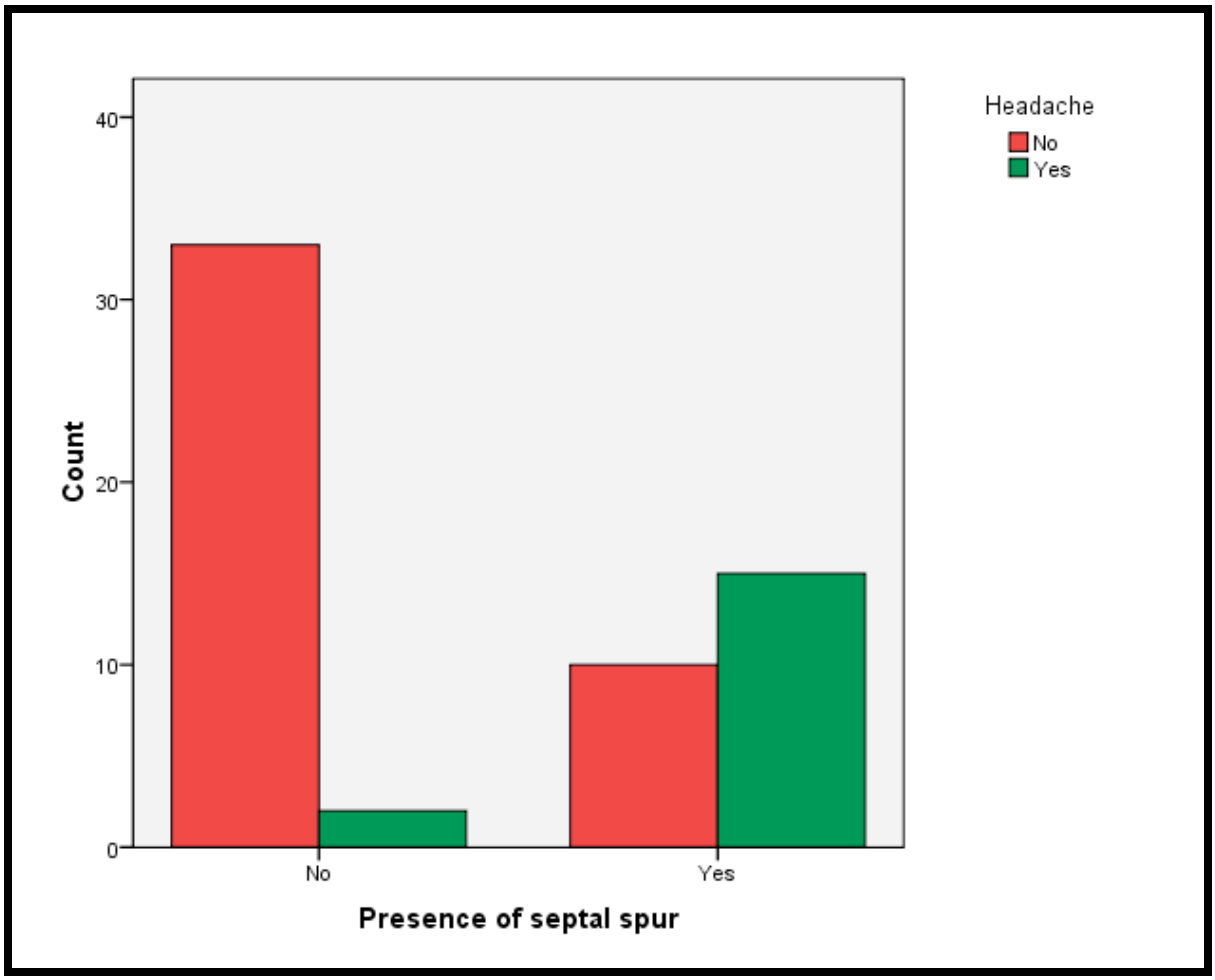
Presence of a grossly deviated septum impinging on the lateral wall was seen in only 6 patients (10%). It was equally divided between the two groups under study with 3 patients in each group.



Graph 8: Presence of lateral wall impingement

When comparing the symptom of headache with the presence of septal spur , it was found that 15 patients (88.23%) with headache had septal spur when compared with 2 (11.76%) patients with headache who had no evidence of septal spur. 10 patients (23.25%) with septal spur had no headache. The results were statistically significant with a p value less than 0.05.

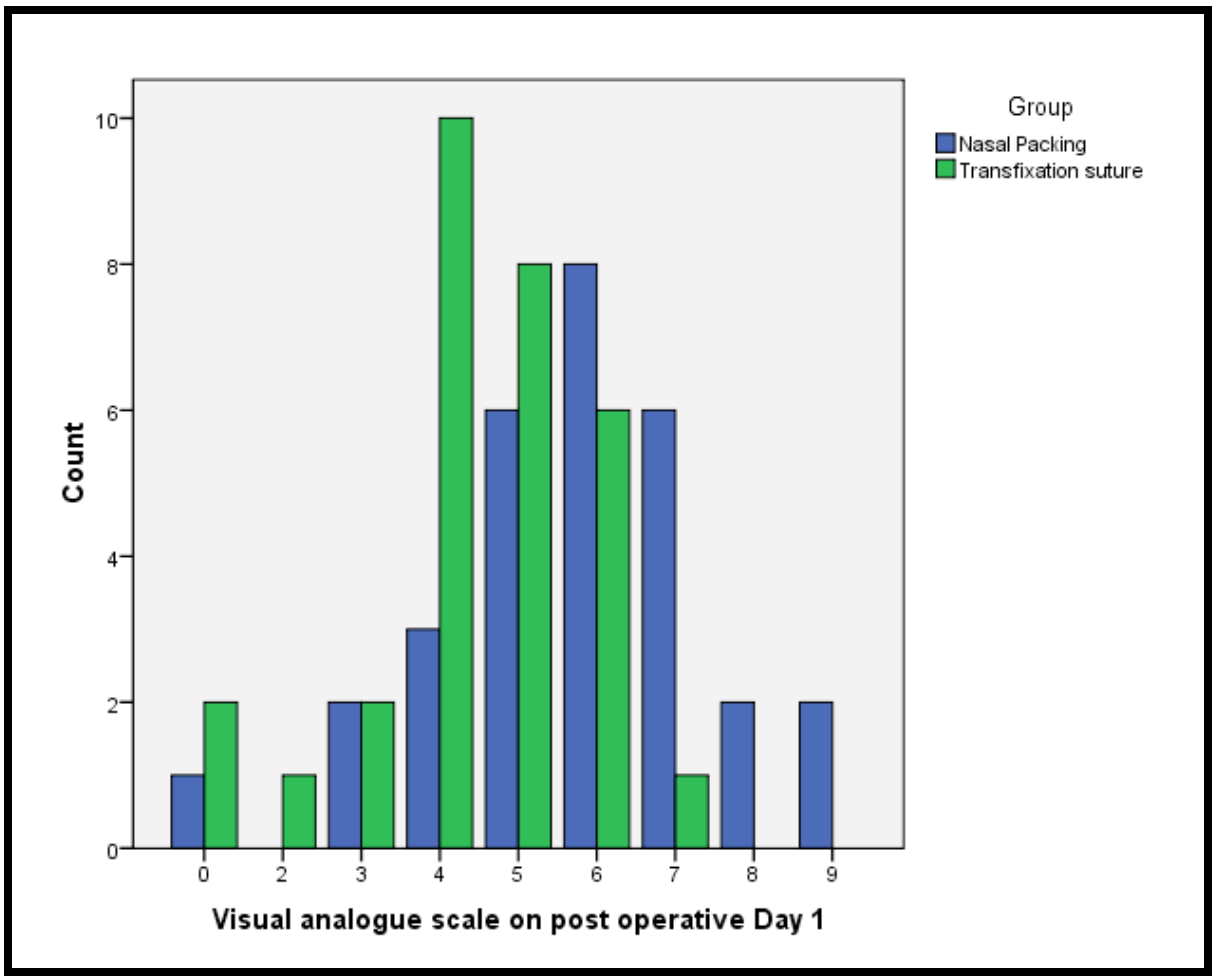
P value = 0.0001



Graph 9: Comparison of Headache with Septal Spur

The visual analogue scores for pain calculated for post operative day 1 showed a mean visual analogue score of 5.05, a median of 5 and a standard deviation of 1.863. Higher scores were observed in the packing group with 8 patients (26.7%) giving a score of 6 when compared with 10 patients (33.3%) giving a score of 4 in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

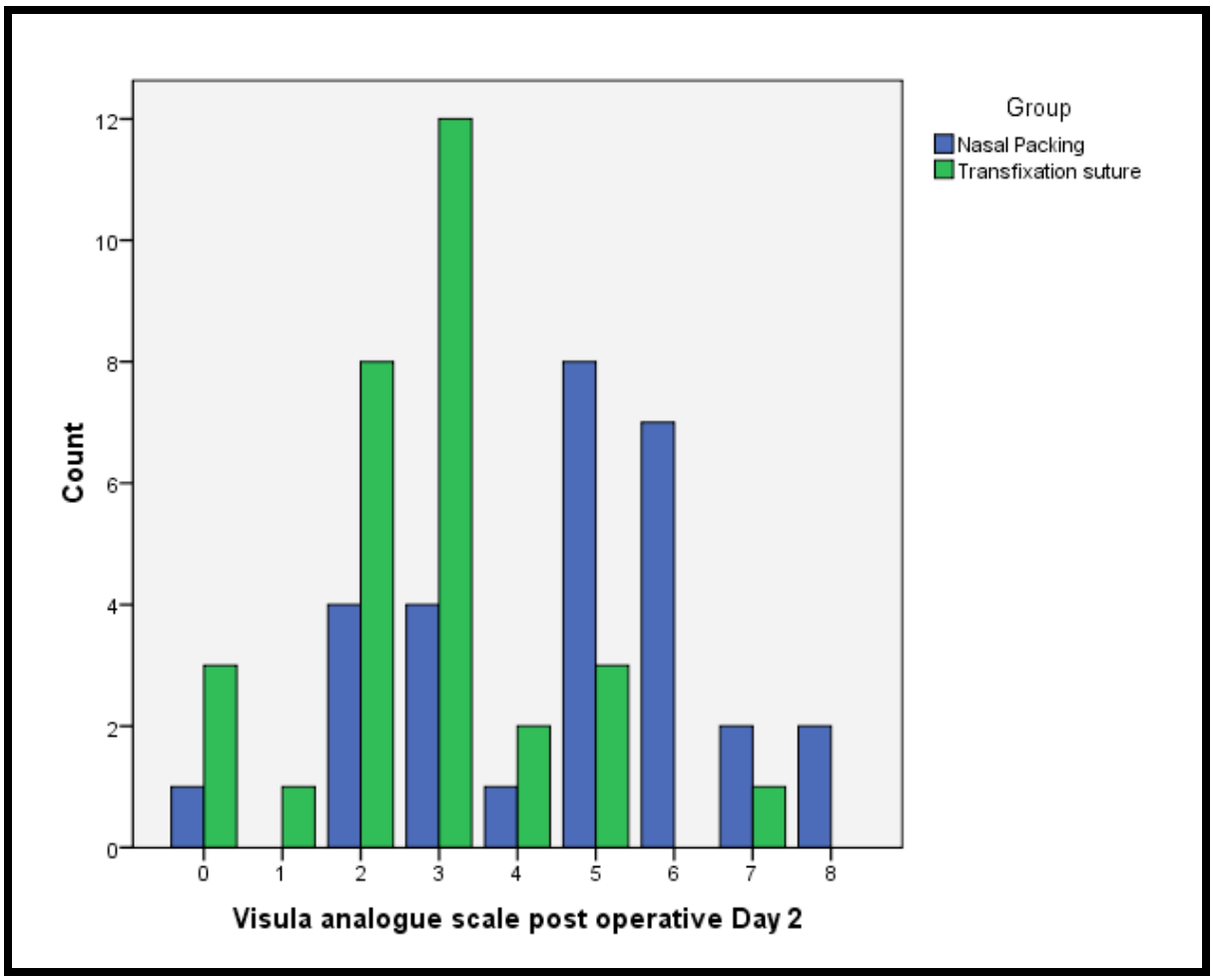
P value = 0.002



Graph 10: Visual Analogue Scale Post op Day 1

The visual analogue scores for pain calculated for post operative day 2 showed a mean visual analogue score of 3.71, a median of 3 and a standard deviation of 1.992. Higher scores were also observed here in the packing group with 8 patients (27.6%) giving a score of 5 when compared with 12 patients (40%) giving a score of 3 in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

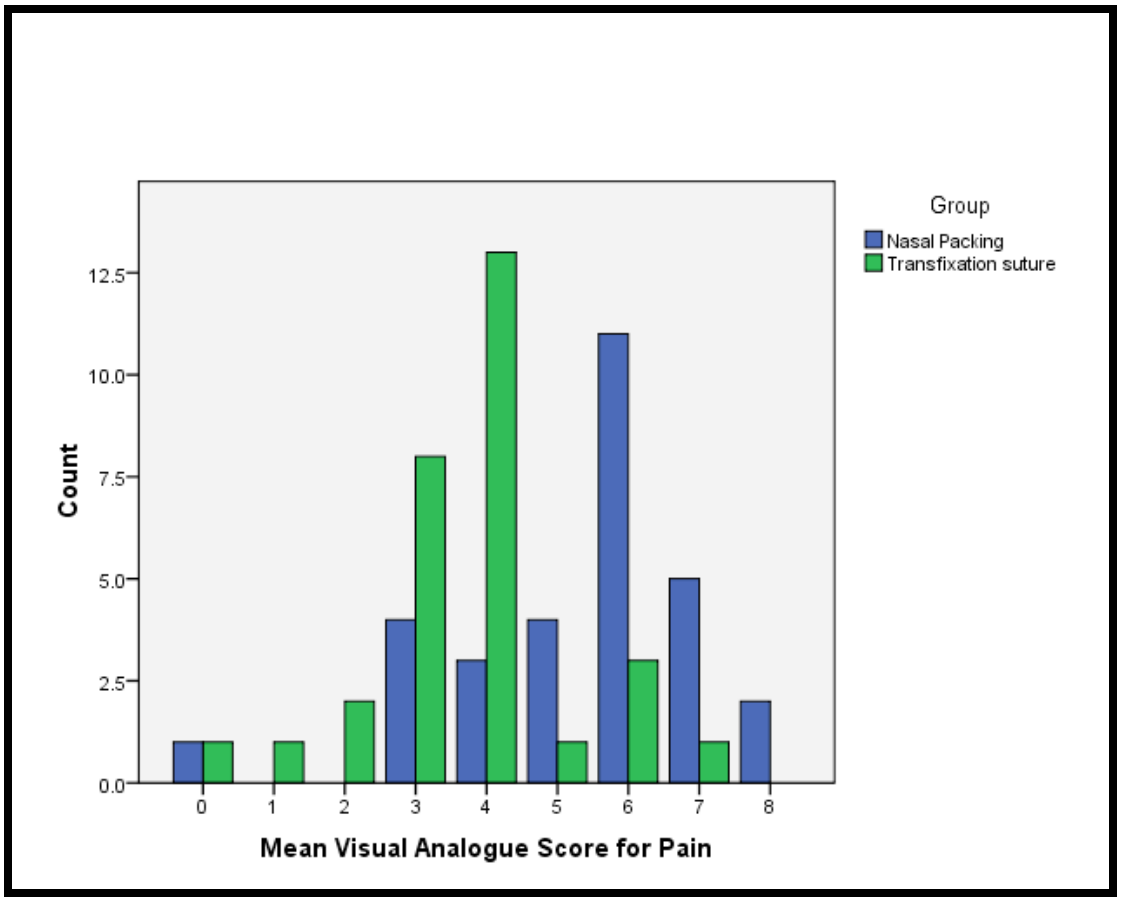
P value = 0.001



Graph 11: Visual Analogue Scale Post op Day 2

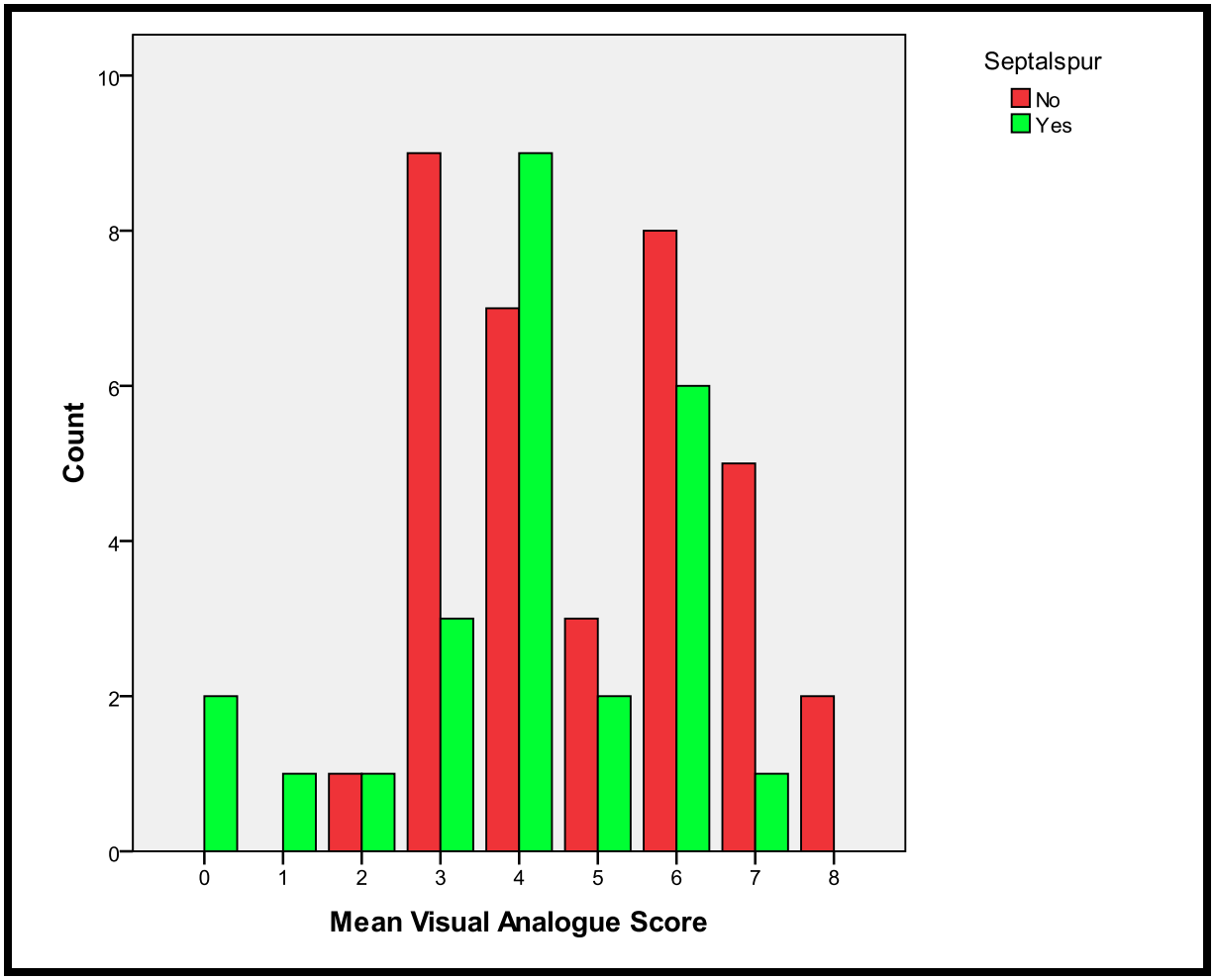
The mean visual analogue score for pain for the first two postoperative days in the nasal packing and suturing group was 5.37 and 3.70 respectively. The results were highly significant.

P value = 0.0001



Graph 12: Mean Visual Analogue Scale

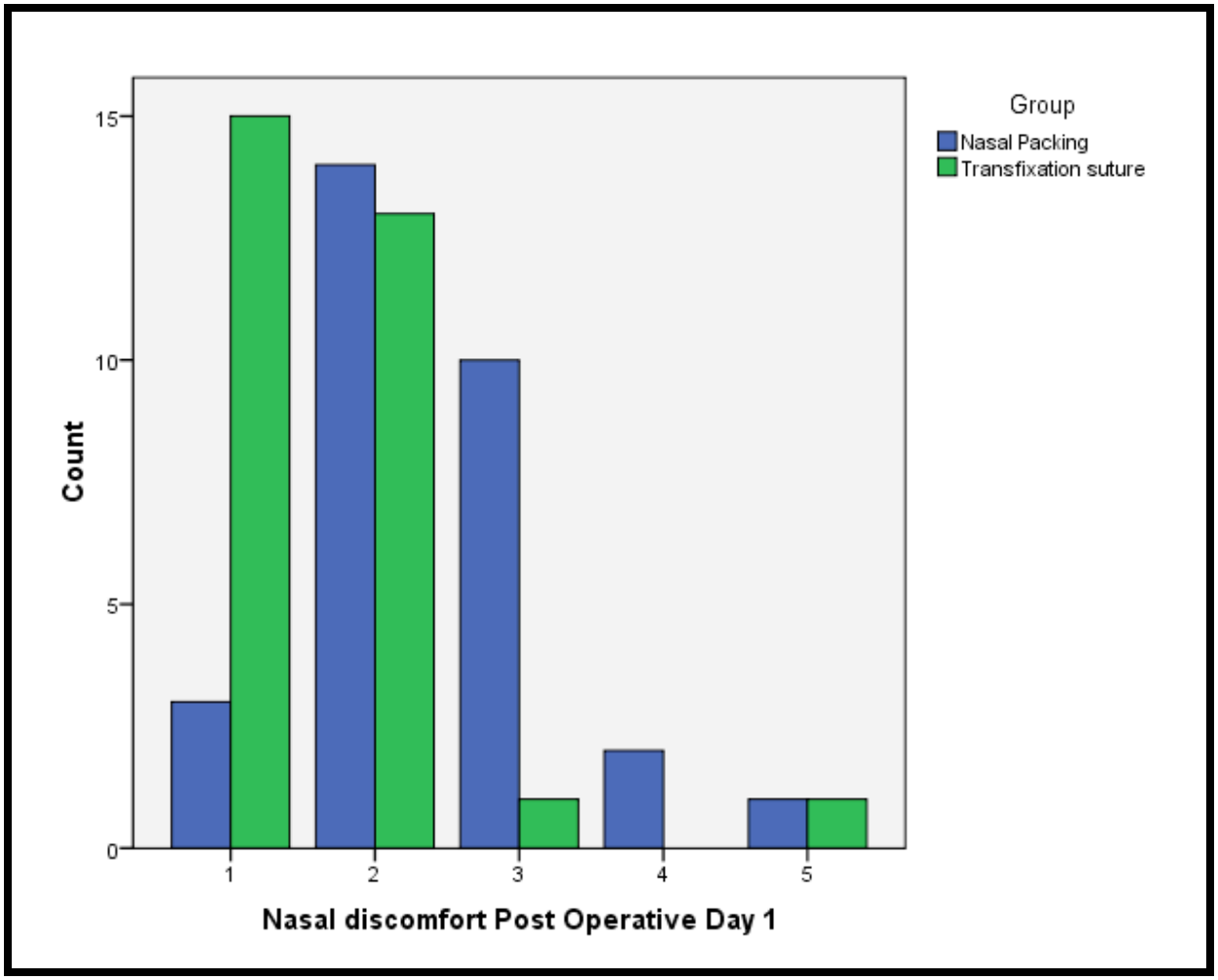
There comparing the mean visual analogue score with the presence of septal spur. There was no correlation. P value = 0.264, which was not statistically significant.



Graph 13: Comparison of Mean Visual Analogue score with presence of spur

The nasal discomfort scores calculated for post operative day 1 showed a mean discomfort score of 2.05, a median of 2 and a standard deviation of 0.964. Higher scores were observed in the packing group with 14 patients (46.7%) giving a score of 2 (mild discomfort) and 10 patients (33.3%) giving a score of 3(moderate dyscomfort) when compared with 15 patients (50%) giving a score of 1(minimal discomfort) and 13 patients (43.3%) giving a score of 2(mild discomfort) in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

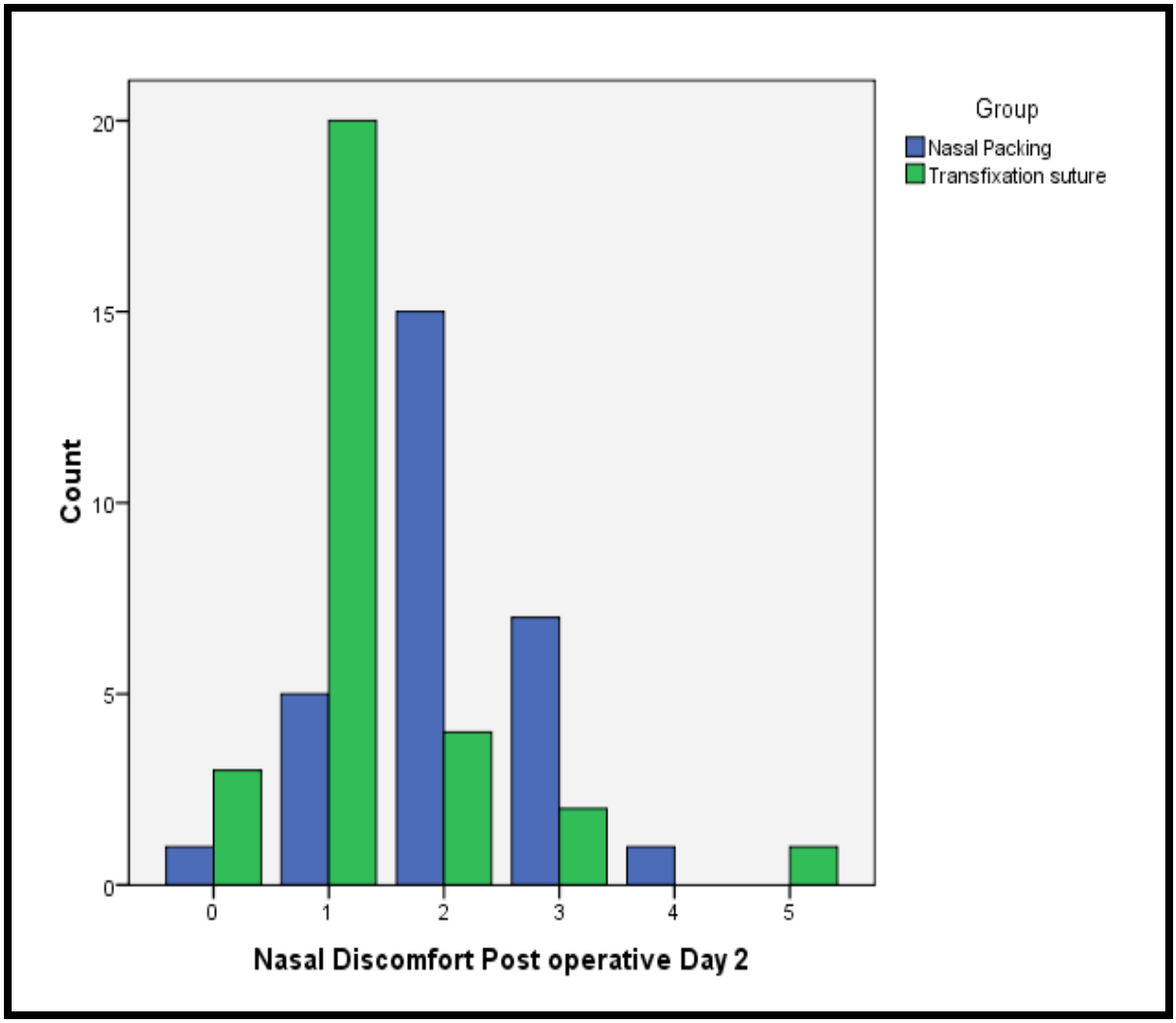
P value = 0.002



Graph 14: Nasal Discomfort Post op Day 1

The nasal discomfort scores calculated for post operative day 2 showed a mean discomfort score of 1.68, a median of 2 and a standard deviation of 0.990. Higher scores were observed in the packing group with 15 patients (51.7%) giving a score of 2 (mild discomfort) when compared with 20 patients (66.7%) giving a score of 1(minimal discomfort) in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

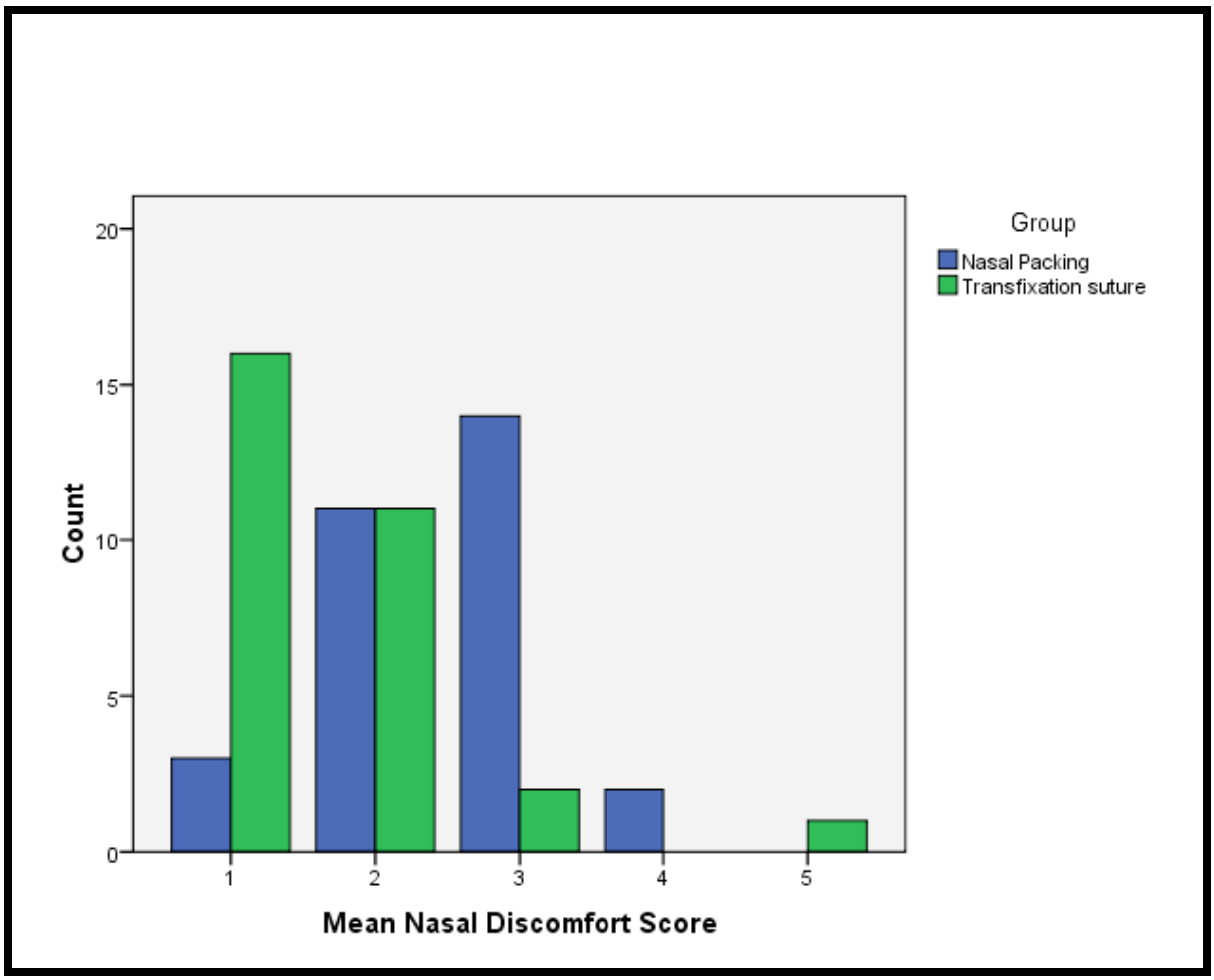
P value = 0.001



Graph 15: Nasal Discomfort Post op Day 2

The mean visual analogue score for nasal discomfort for the first two postoperative days in the nasal packing and suturing group was 2.50 and 1.63 respectively. The results were highly significant.

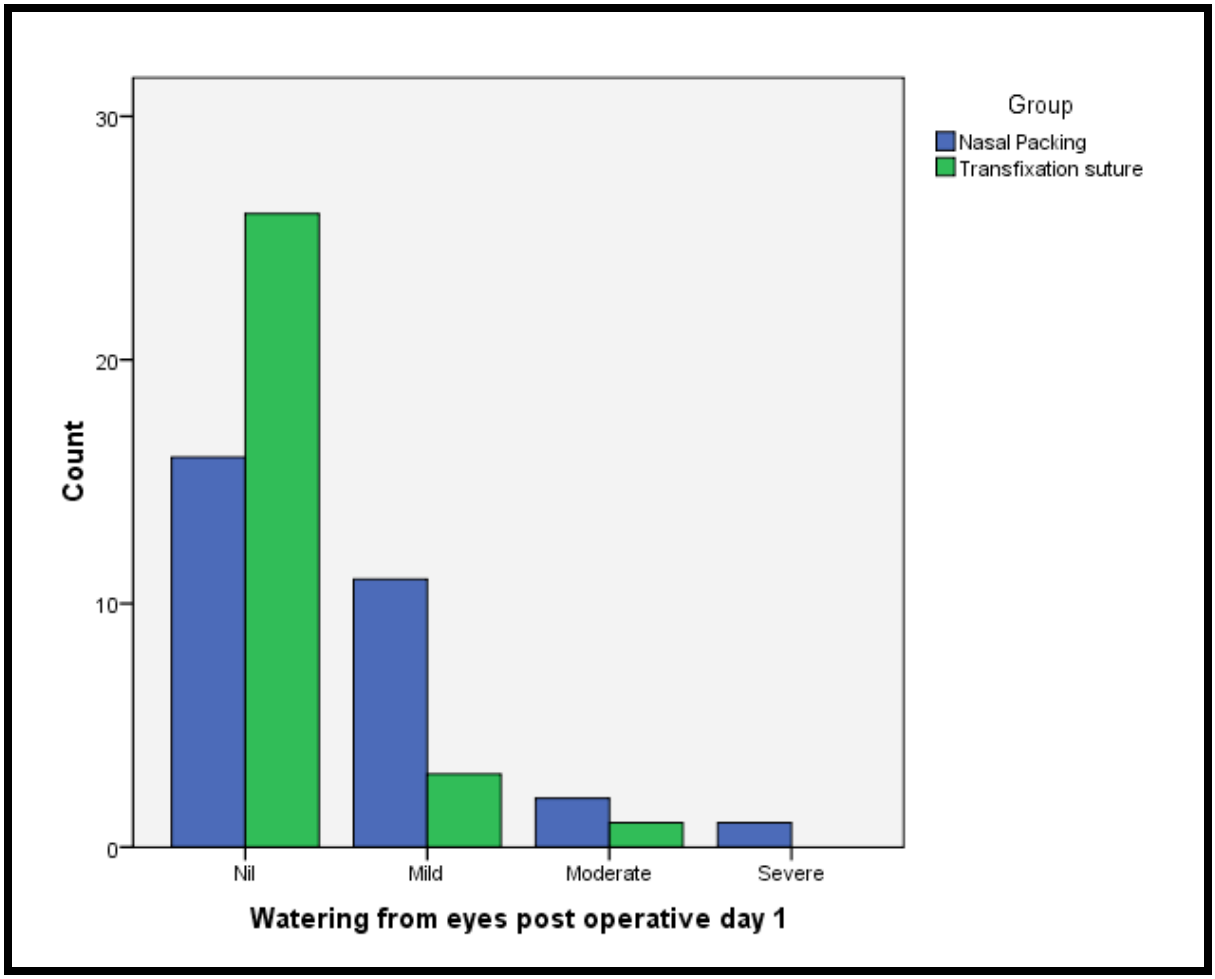
P value = 0.0001



Graph 16: Mean Nasal Discomfort Score

The scores for watering from the eyes calculated for post operative day 1 showed a mean score of 0.38 and a standard deviation of 0.666. Higher scores were observed in the packing group with 11 patients (36.7%) complaining of mild watering from the eyes when compared with 26 patients (86.7%) saying no watering from the eyes in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

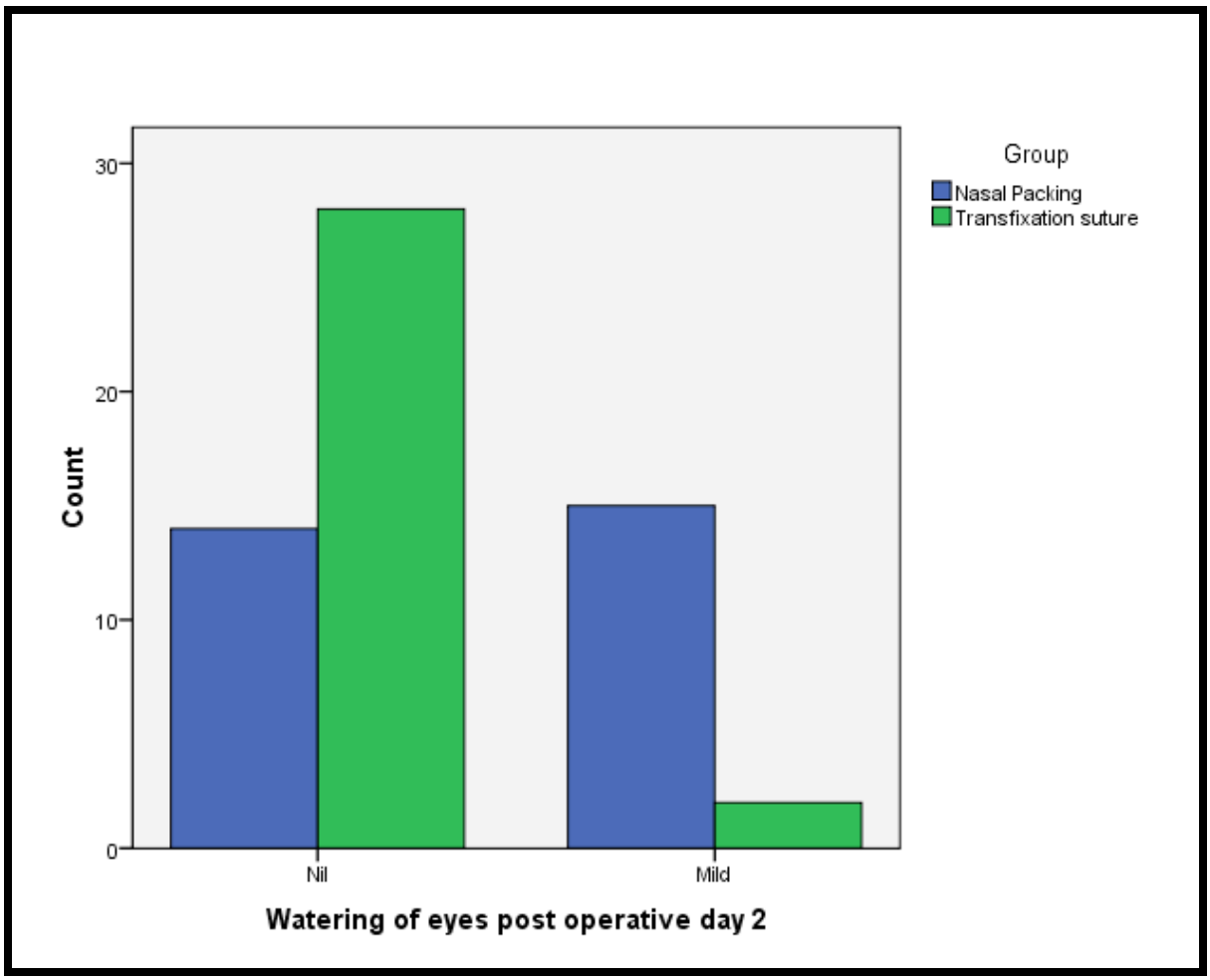
P value = 0.040



Graph 17: Watering of eyes Post op Day 1

The scores for watering from the eyes calculated for post operative day 2 showed a mean score of 0.29 and a standard deviation of 0.457. Higher scores were observed in the packing group with 15 patients (51.7%) complaining of mild watering from the eyes when compared with 28 patients (93.3%) saying no watering from the eyes in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

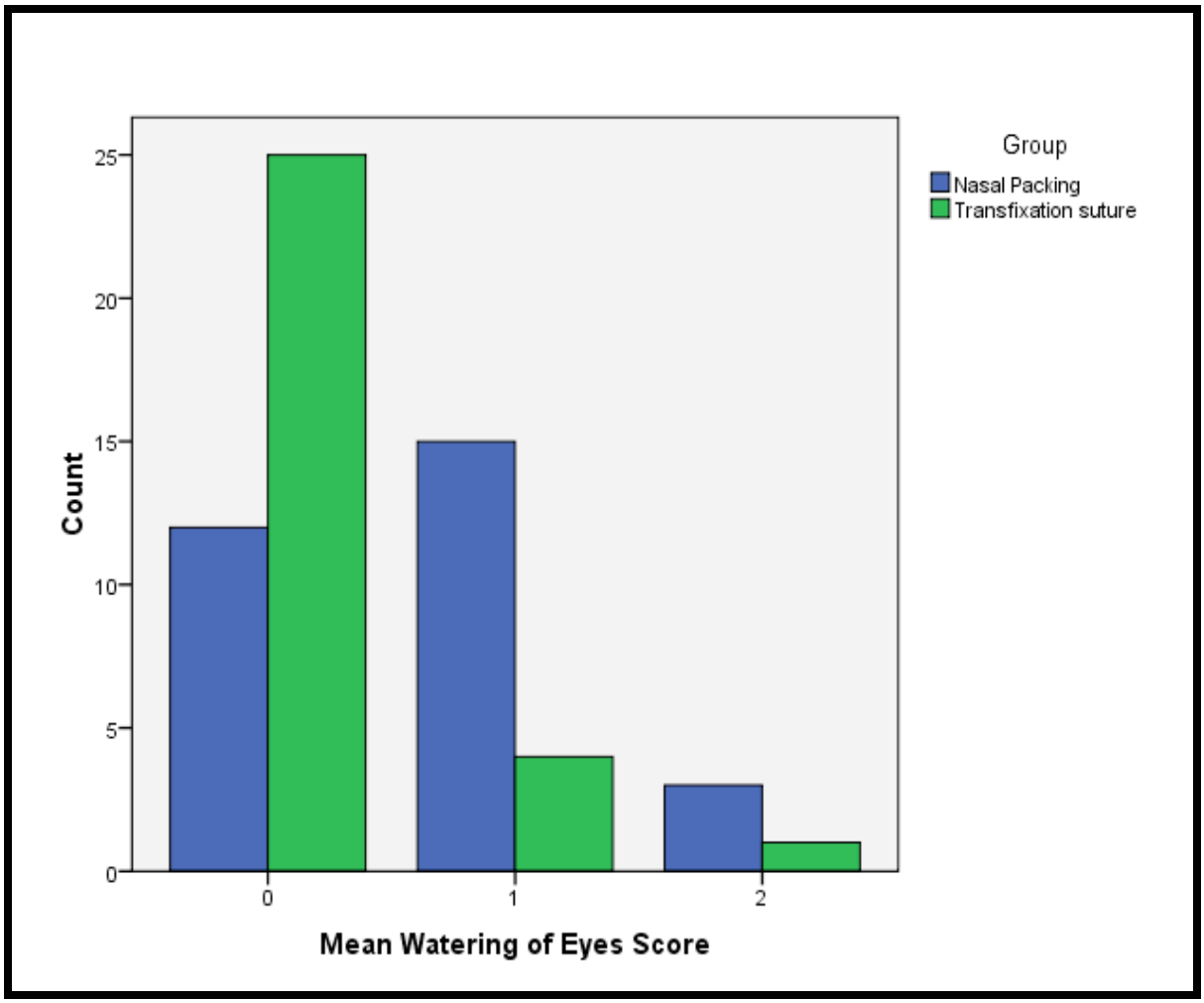
P value = 0.0001



Graph 18: Watering of eyes Post op Day 2

The mean watering of eyes score for the first two postoperative days in the nasal packing and suturing group was 0.70 and 0.20 respectively. The results were significant.

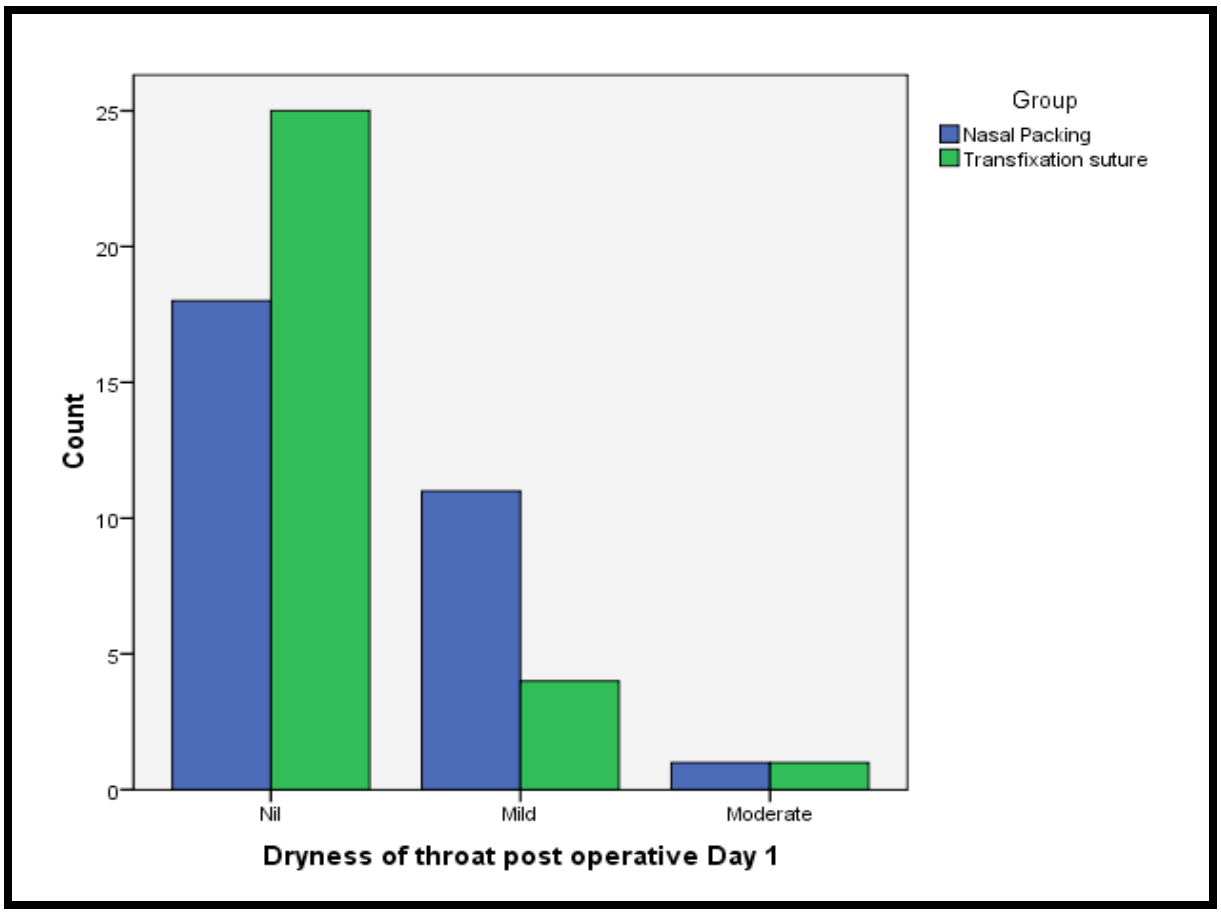
P value = 0.001



Graph 19: Mean Watering of Eyes Score

The scores for dryness of throat calculated for post operative day 1 showed a mean score of 0.32 and a standard deviation of 0.537. Higher scores were observed in the packing group with 11 patients (36.6%) complaining of mild dryness of throat when compared with 25 patients (83.3%) saying no dryness of throat in the transfixation suturing group. But the results were not statistically significant with a p value > 0.05.

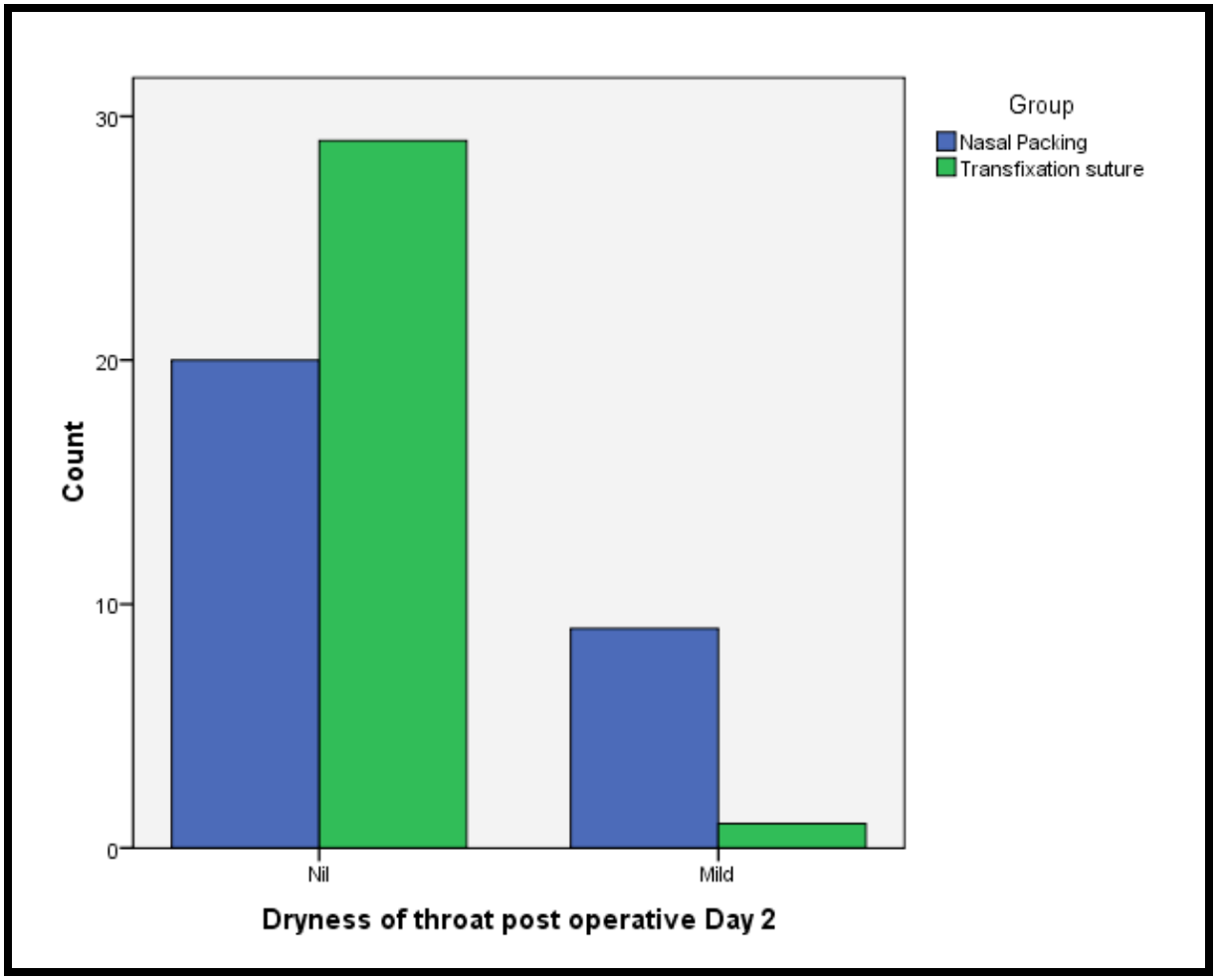
P value = 0.110



Graph 20: Dryness of Throat Post op Day 1

The scores for dryness of throat calculated for post operative day 2 showed a mean score of 0.17 and a standard deviation of 0.378. Higher scores were observed in the packing group with 9 patients (31%) complaining of mild dryness of throat when compared with 29 patients (96.7%) saying no dryness of throat in the transfixation suturing group. The results were statistically significant with a p value < 0.05.

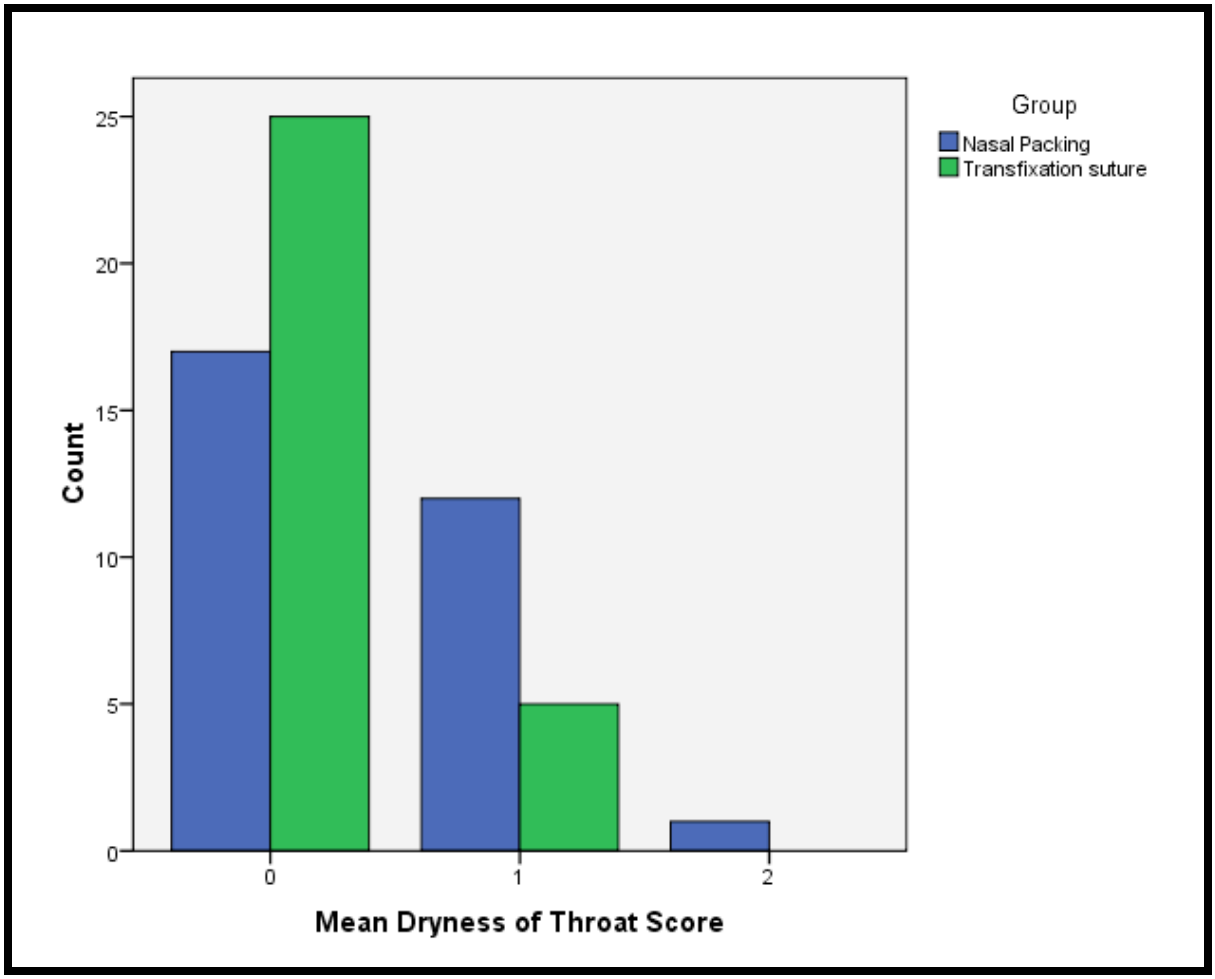
P value = 0.005



Graph 21: Dryness of Throat Post op Day 2

The mean dryness of throat score for the first two postoperative days in the nasal packing and suturing group was 0.47 and 0.17 respectively. The results were significant.

P value = 0.023



Graph 22: Mean Dryness of throat score

The only post operative complication to occur in the study was the development of epixtasis in 1 patient (3.3%). That patient belonged to the packing group while no patients in the transfixation suturing group developed and epixtasis. No patients in either groups developed septal hematoma or abscess post operatively.

DISCUSSION

Septoplasty is one of the most commonly performed operations in otorhinolaryngology. It has continually evolved from ancient times and nasal packing has been considered to be an integral step of surgery in different techniques.

In our study most of the patients were adults in the age group of 21-30yrs (36.7%). There was no significant variation in age between the 2 groups under study. In our study, males were more in number, with 36 patients (60%) being males and 24 females (40%).

In all the other studies that were compared also males were more in number, this is probably due to the number of males coming foreword seeking surgical treatment in response to symptoms.

Septal surgery performed during childhood carries with it the additional problem that it may interfere with the subsequent growth of the nose. Because of this risk, it was the usual practice to postpone all septal surgery until after the age of 16 years but, more recently, this view has been challenged by Cottle (1951), Jennes (1964), Huizing (1979), and others.[21]

We have restricted our age group to 14yrs as we felt that, any patient aged less than 14 yrs will be unable to answer our questionnaire satisfactorily. The mean age group of our study when compared with other studies was similar; this observation could be attributed to general treatment seeking behavior within this age group.

S.No	Study	Mean Age Group
1	Ardehali et al (2009)[4]	24.6 yrs
2	Awan et al (2009)[2]	27.63 yrs
3	Korkut et al (2010)[44]	35.6yrs
4	Our Study	26 yrs

Table 1: Comparison of Mean Age Group

Nasal obstruction was the most consistent symptom being present in all patients (100%) in both groups followed by headache seen in 28.3% of patients. Nasal discharge was a rarer symptom, being present in only 8.3% of patients. It was mostly bilateral watery nasal discharge associated with allergic symptoms. We also excluded patients with nasal obstruction secondary to allergic causes. Most other studies only mention nasal obstruction as the most common presenting symptom.

Only 1 patient had a previous history of nasal trauma and he was in the packing group with a VAS of 0.One patient had a previous history of nasal surgery (1.7%) and he was in the tranfixation suture group and had a mean VAS of 1. He had undergone nasal polypectomy with a snare 8 yrs back. None of the patients had any synechiae or any contributory findings, which could alter the patient's visual analogue scores.

90 % patients had an anterior septal deviation in relation to the cottles line and 10% had a posterior septal deviation. In both groups anterior deviation was more common and there was no significant difference between the two groups. 85% patients had a "C- Shaped" deviation of the nasal septum while 15% had an "S-Shaped" deviation of the nasal septum. There were no significant differences between the groups under study.

41.7% of patients had a septal spur on anterior rhinoscopic examination. There was no difference in its presence between the two groups. Presence of a grossly deviated septum impinging on the lateral was seen in only 10% of the patients. The nasal packing as well as the suturing group had 3 patients who had septal spur.

When comparing the mean visual analogue score with the presence of septal spur, we expected patients with septal spur to have higher mean visual analogue scores as they would require elaborate dissection and chance of tearing of flaps is higher among them, however there was no statistically significant correlation between presence of septal spur and mean visual analogue scores .

When the symptom of headache was compared with the presence of septal spur, it was found that 88.23% of patients with headache had a septal spur while 11.76% patients who had headache did not have any septal spur. Surprisingly 23.25% patients with septal spur had no headache while the rest 76.7% of patients had no spur or headache. There was found to be a positive correlation between headache and septal spur which was statistically significant.

In the early 1900s, Sluder (1927) proposed the concept of sphenopalatine ganglion neuralgia and vacuum headaches. Stammberger and Wolf (1988) postulated that mucosal contact could cause headache via substance P release from the nasal mucosa.[45]

Our study was comparable to the study by Harley DH, who found in his study that more than half the patients with sinonasal headache had contact points in the nasal cavity preoperatively. Therefore the presence of septal spur can be taken as a contributing factor for headache. While evaluating a patient with headache its presence should be ruled out with due diligence.

While comparing the mean visual analogue score with the presence of septal spur. There was no correlation. P value = 0.264, which was not statistically significant.

The visual analogue scores for pain calculated for post operative day 1 showed a mean visual analogue score of 5.05. The mean visual analogue score in the nasal packing group and transfixation group was 5.37 and 3.70 respectively. This result was a statistically significant with a p value < 0.05. Higher visual analogue scores were observed in the packing group with a score of 6 given by 8 patients (26.7%). In the transfixation suturing group, 10 patients (33.3%) gave a score of 4. In both groups the mean visual analogue scores dropped to 3.71 on the second post operative day. The ratio of males to females was evenly distributed within both groups, and did not bias the outcome.

Sl.No	Study	Mean Visual Analogue Scores
1	Ardehali et al (2009)[4]	The average VAS was 5 in the packing group and 2.1 in the suturing group
2	Awan et al (2009)[2]	The average VAS was 7.32 in the packing group and 1.57 in the non packing group
3	Korkut et al (2010)[44]	The average VAS was 7.3 in the packing group and 2.8 in the suturing group
4	Nunez et al (1991)[18]	The average VAS was 4.11 in the packing group and 2.92 in the suturing group
5	Gunaydin et al (2011)[45]	On a VAS scale of 1- 4, the average VAS in the packing group was 2.36 and 0.95 in the suturing group
6	Our Study	The average VAS was 5.37 in the packing group and 3.70 in the suturing group

Table 2: Comparison of Mean Visual Analogue Scores

The mean nasal discomfort score for the 2 days was 2.07.Higher scores were observed in the packing group with 14 patients(87.5%) giving a mean score of 3 when compared with 16 patients(84.2%) giving a mean discomfort score of 1 in the transfixation suturing group on the first two post operative days. The results were statistically significant with a p value < 0.05.

The pain and discomfort scores usually mirror each other as one symptom cannot be accurately distinguished from the other and that maybe the reason that other authors have analysed both these symptoms together in their studies.

The scores for watering from the eyes calculated for post operative day 1 and 2 showed a mean score of .38 and 0.29 respectively. In the nasal packing group 36.7% complained of mild watering from the eyes when compared with 86.7% saying no watering from the eyes in the transfixation suturing group on post operative day 1. These results were statistically significant with a p value < 0.05. There were also similar results on the second post operative day.

Sl.No	Study	Post Operative Epiphora
1	Awan et al (2009)[2]	All 44 patients in the packing group complained of epiphora while only 5 patients (11.4%) complained of the same in the non packing group
3	Korkut et al (2010)[44]	15 patients (55.6%) complained of increased lacrimation in the packing group when compared with 2 patients (5.4%) in the suturing group
4	Our Study	36.7% complained of increased lacrimation in the packing group when compared with 13.3% in the suturing group

Table 3: Comparison of Postoperative Epiphora

Nasal packing causes epiphora by blocking the naso-lacrimal duct; although this is a temporary problem, it was described as a nuisance by most of the patients in the packing group.

The scores for dryness of throat calculated for post operative day 1 and 2 showed a mean score of .32 and 0.17 respectively. Higher scores were observed in the packing group with 36.6% complaining of mild dryness of throat when compared with 16.7% in the transfixation suturing group. But the results were not statistically significant with a p value > 0.05 on day 1 but became significant on postoperative day 2.

Sl.No	Study	Post Operative Dryness Of Throat
1	Awan et al (2009)[2]	95% of the patients complained of some discomfort in the throat and difficulty in swallowing in the packing group when compared with 4.5% in the non packing group
3	Korkut et al (2010)[44]	27 patients (100%) complained of dryness of throat in the packing group when compared with 3 patients (8.1%) in the suturing group
4	Our Study	36.6% complained of dryness of throat in the packing group when compared with 16.7% in the suturing group

Table 4: Comparison of Postoperative Dryness of throat

The only post operative complication to occur in the study was the development of epixtasis in 1 patient (3.3%). That patient belonged to the packing group while no patients in the transfixation suturing group developed any complications.

We found that both techniques were effective in preventing the complications of septoplasty. Transseptal suturing was also found to significantly reduce the morbidity in the post operative period. By choosing transseptal suturing, we can avoid the pain and discomfort associated with pack insertion and removal.

Sl. No	Study	Presence Of Early Post Operative Complications
1	Ardehali et al (2009)[4]	Post operative septal hematoma was not detected in either group. 3 % had septal perforation in the packing group in comparison to 2% in the suturing group. (p = 0.56). 7% in the packing group had purulent nasal discharge when compared with none in the suturing group (p = 0.08).There was also no statistically significant differences in mucosal adhesions or residual deviation between the two groups.
2	Awan et al (2009)[2]	The 3 patients who developed septal hematoma and required incision and drainage were in the packing group (p > 0.05). Synechiae developed in 8 of the packing patients and in none of the non packing patients. (p>o.o5).No patients in either group exhibited any signs of local infection, although the mucosa appeared raw in 56.8% of patients in the packing group.
3	Korkut et al (2010)[44]	No post operative bleeding, submucoperichondrial hematoma or abscess formation occurred in either of the 2 groups.
4	Nunez et al (1991)[18]	Septal hematoma occurred in 3 patients in the packing group while there was none in the non packing group. Adhesion was present in 1 patient who was in the packing group compared with none in the suturing group.
5	Gunaydin et al (2011)[46]	2 patients in the non packing group developed septal hematoma when compared with none in the packing group.1 patient in the packing group developed a septal perforation and none in both groups developed any local infection.
6	Our Study	No patients in either groups developed septal hematoma or abscess post operatively. The only post operative complication to occur in the study was the development of epixtasis in 1 patient (3.3%) in the packing group.

Table 5: Comparison Presence of early post operative complications

CONCLUSION

1. Septal transfixation sutures and nasal packing are equally effective in preventing complications of septoplasty.

2. Transfixation suturing significantly reduces the pain, nasal discomfort, watering from the eyes and dryness of throat.

3. Transfixation suturing can be safely advocated in septoplasty patients, not only for preventing complications, but also for reducing early post operative morbidity.

SUMMARY

This study was done on all patients with symptomatic deviated nasal septum attending to ENT outpatient department at R L Jalappa Hospital, Kolar from December 2011 to December 2012.

Patients were selected based on the inclusion and exclusion criteria and were randomly divided into two groups by a 4 block randomization method. All patients underwent septoplasty. Per operatively patients in Group A were packed with soframycin impregnated ribbon gauze while in Group B patients the nasal septum was stabilized with 4 transfixation sutures.

- Maximum incidence was seen in the 2nd decade.
- 60% of the patients were males and 40% were females.
- Nasal obstruction was the most consistent symptom (100%) followed by headache (29%) and nasal discharge (8.3%).
- One patient had a history of previous nasal surgery and another had a past history of nasal trauma.
- 90% of patients had an anterior septal deviation and 85% had a C shaped deviation.
- 41.7% of patients had a septal spur and 10% had a lateral wall impingement.
- There was a positive correlation between the presence of septal spur and headache.
- The mean visual analogue score for pain in the packing and suturing group was 5.37 and 3.70 respectively and the difference was significant.

- Mean pain as well as discomfort scores were higher on post operative day 1.
- There was no significant difference in pain scores between the age groups or with the presence of septal spur.
- The mean nasal discomfort score was 2.07 and higher statistically significant scores were observed in the packing group than in the transfixation group.
- The mean watering of eyes score and dryness of throat score was higher in the nasal packing group when compared with the transfixation suturing group.
- Epixtasis was the only complication that was observed and it was seen in 1 patient in the packing group.

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ANNEXURE –I
PROFORMA

NASAL PACKING AND TRANSFIXATION SUTURES IN SEPTOPLASTY: A COMPARATIVE STUDY

I PERSONAL DETAIL

Name Age Sex | M | F |

Address DOA DOD

Telephone Hospital no: | | | | | | | Occupation

II PRESENTING COMPLAINT

1) Nasal Obstruction : Y/N | R | L | B | Duration 2)Nasal Discharge: | R | L | B |

Y/N, Duration 3)Headache Y/N Duration

III HISTORY OF PRESENT ILLNESS

Nasal Discharge
Onset: insidious/sudden Side: unilateral/bilateral Type: intermittent/continous
Quantity: copious/scanty
Quality: watery/thick & sticky/pus like Odor: odorless/ foulsmelling
Blood staining: Y/N
Aggravating factors:
Relieving factors:

Nasal Obstruction
Onset: insidious/sudden Side: unilateral/bilateral Intermittent/continous
Inspiration/Expiration
Aggravating factors: Y/N Relieving factors: Y/N

Headache
Onset: insidious/sudden Progressive/Non progressive Dull aching/throbbing/bursting
Variation with posture: Y/N Aggravating factors: Y/N Relieving factors: Y/N

IV PAST HISTORY
History of trauma to the nose : Y/N Previous Nasal surgery: Y/N If Yes
History of Diabetes mellitus, Hypertension, Tuberculosis, Bronchial asthma

V FAMILY HISTORY

VI PERSONAL HISTORY

Loss of appetite: Y/N Disturbed sleep: Y/N Bowel and bladder disturbances: Y/N
Habituated smoking: Y/N Alcohol: Y/N

EXAMINATION

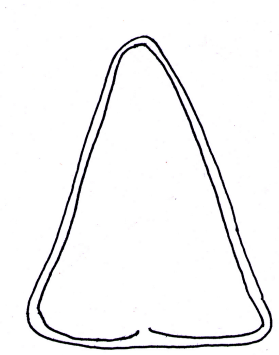
VII GENERAL PHYSICAL EXAMINATION

Temperature: Pulse: BP: RR: Pallor: Y/N Icterus: Y/N
Cyanosis Y/N
Clubbing: Y/N Lymphadenopathy: Y/N Oedema: Y/N
Built: Poor/medium/well built
Nutritional status: Poor/Satisfactory

VIII E.N.T Examination
NOSE AND PNS

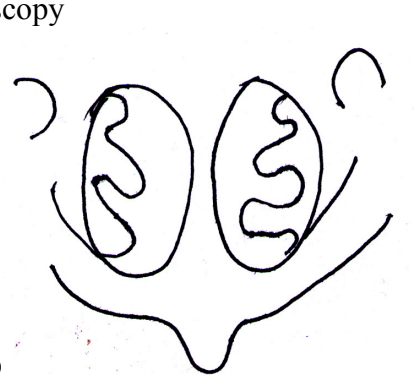
External Framework-Skin: Scars/swelling
Dorsum of Nose: Humped/deviated/saddle/supratip depression
Vestibule: Vestibulitis Y/N Caudal dislocation: Y/N If yes then R/L
Cold spatula test: Decreased R/L Cotton wisp test: Decreased R/L

Anterior Rhinoscopy



1,	Mucosa	Congested/Pale
2,	Septum	Deviation: R/L i) Site: Anterior/Posterior ii) Shape:`C'/ `S' iii) Spur: Y/N iv) Lateral wall impingement Y/N
3	Lateral Wall	Inferior Turbinate: Hypertrophied Y/N Middle Turbinate: Hypertrophied Y/N Concha bullosa: Y/N Middle Meatus: Mucopus Y/N
4	Discharge	Side: Right/left/bilateral Quantity: copious/scanty Quality: watery/mucoid/mucopurulent/purulent Odor: odorless/foulsmelling Blood staining: Y/N

Posterior Rhinoscopy



Adenoids/Polyp

Tenderness of PNS: Y/N If yes, Site- Frontal R/L Maxillary R/L Ethmoidal R/L

Sl No:	Ear	Rt	Lt
1,	Pinna: deformity scar	Y/N Y/N	Y/N Y/N
3,	Postauricular area: obliterated accentuated scar	Y/N Y/N Y/N	Y/N Y/N Y/N
4,	Preauricular area		
5,	External auditory canal: Discharge :	 Y/N	 Y/N
6,	Tympanic membrane:		
8,	TFT: Rinne's test Weber's test ABC decreased	+ve/-ve R/L/C Y/N	+ve/-ve R/L/C Y/N

VIII EXAMINATION OF THROAT

Oral cavity and Oropharynx

IDL

Neck

IX SYSTEMIC EXAMINATION

Cardio vascular system
Respiratory system
Abdomen
Central nervous system

X CLINICAL DIAGNOSIS

Symptomatic DNS
Sinusitis with DNS
Sluder's Neuralgia

R	L

XI INVESTIGATIONS

Hb: TC: DC: N: E: L: B: BT:
CT:
HIV: Y/N HbsAg: Y/N

A	B

Group

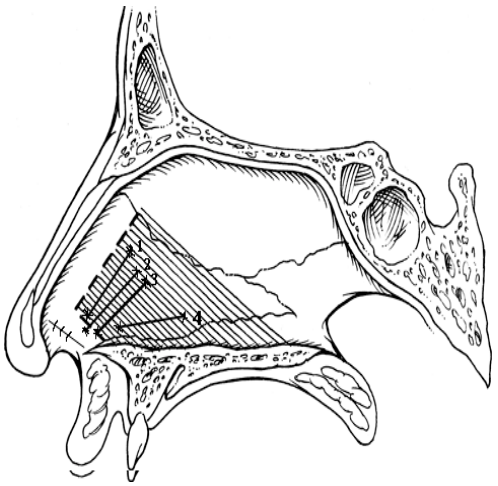
A – Septoplasty with nasal packing
B – Septoplasty with complete septaltransfixation suture

XII POST OPERATIVE

1	Visual Analogue scale (0-10) (0 = no pain and 10 = most pain experienced)	POD 1	POD 2
2	Nasal discomfort scale (1-5)1 (minimal discomfort) to 5 (severe discomfort).		
3	Watering from eye(0-3)(0=Nil, 1=Mild, 2=Moderate, 3=Severe)		
4	Dryness of throat (0-3) (0=Nil, 1=Mild, 2=Moderate, 3=Severe)		

XIII FOLLOW UP

1	Epixtasis	1 week Y/N	2nd week Y/N	4th week Y/N
2	Hematom	Y/N	Y/N	Y/N
3	Abscess	Y/N	Y/N	Y/N



ANNEXURE –II

INFORMED CONSENT

TITLE OF THE PROJECT: NASAL PACKING AND TRANSFIXATION SUTURES IN SEPTOPLASTY: A COMPARATIVE STUDY

I understand that I remain free to withdraw from the study at any time and this will not change my future care.

I have read the consent form / has been read to me and I understand the purpose of this study, the procedures that will be used, the risks and benefits associated with my involvement in the study and the confidential nature of the information that will be collected and disclosed during the study.

I have had the opportunity to ask questions regarding various aspects of this study and my question have been answered to my satisfaction.

I, the undersigned agree to participate in this study and authorize the collection and disclosure of my personal information as outlined in this consent form.

Subject's / Guardian's name and signature / thumb impression Date:

Name and signature of witness Date:

Name and signature of principle investigator Date:

Key To Master Chart

NO	:Nasal obstruction
ND	:Nasal discharge
HD	:Headache
SOD	:Site of deviation
TOD	:Type of deviation
POS	:Presence of Spur
LWI	:Lateral wall impingment
ITH	:Inferior turbinate hypertrophy
CD	:Caudal dislocation
PNS	:Previous nasal surgery
TON	:Trauma to nose
VASPOD1	:Visual analogue scale post op day 1
VASPOD2	:Visual analogue scale post op day 2
NDPOD1	:Nasal discomfort post op day 1
NDPOD2	:Nasal discomfort post op day 2
WEPOD1	:Watering from eyes post op day 1
WEPOD2	:Watering from eyes post op day 2
DTPOD1	:Dryness of throat post op day 1
DTPOD2	:Dryness of throat post op day 2
HT	:Hematoma
AB	:Septal Abscess
EX	:Epixtasis
Y	:Yes
N	: No