"COMPARISON OF ENDOSCOPIC SEPTOPLASTY WITH CONVENTIONAL SEPTOPLASTY IN DEVIATED NASAL SEPTUM"

By

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Dissertation submitted to

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in partial fulfilment
of the requirements for the degree of

MASTER OF SURGERY

in

OTORHINOLARYNGOLOGY

Under the guidance of

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ABSTRACT

Background :

Surgery on a deviated nasal septum has undergone several modification from radical submucous resection to conservative septoplasty. Endoscopic septoplasty is a fast developing concept and gaining popularity as it provides a direct – targeted approach to the septal anatomic deformity especially posterior deviations and spur.

Objective :

This study was carried out to compare conventional septoplasty versus endoscopic septoplasty with regard to procedure, outcome, complications and surgeon's experience..

Methods :

60 cases of symptomatic deviated nasal septum were selected and were randomly divided into two groups of 30 patients each using a simple random table. One group underwent endoscopic septoplasty and the other conventional septoplasty.

Results :

There was better symptomatic improvement and fewer complications in endoscopic septoplasty.

Interpretation and conclusion :

There was better symptomatic improvement in terms of nasal obstruction and headache in endoscopic septoplasty. Post-operative complications were more in the conventional septoplasty. Endoscopic septoplasty is useful in treating septal deviation and spur, allowing minimal resection of tissues.

Key words :

Deviated nasal septum; endoscopic septoplasty; conventional septoplasty.

LIST OF ABBREVIATIONS USED

A/R	:	Anterior rhinoscopy
E.S.	:	Endoscopic septoplasty
C.S.	:	Conventional septoplasty
C.S.T	:	Cold spatula test
DNS	:	Deviated nasal septum
Post-op	:	Post-operative
Pre-op	:	Pre-operative
SMR	:	Submucous resection of septum

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INTRODUCTION

Nasal obstruction is one of the most common complaint that a otorhinolaryngologist faces in his day to day practice. Deviated nasal septum (DNS) is one of the most common cause for the nasal obstruction. Deviated nasal septum not only causes breathing difficulties but also causes improper aeration of paranasal sinuses leading to infection of the same. It may also cause headache, drying of mucosa leading to crusting and epistaxis. It may cause blockage of eustachian tube leading to middle ear diseases, DNS might become symptomatic at any age.

Deviated nasal septum can be corrected by septoplasty. It is a conservative surgery in which only deviated part is removed leaving behind as much cartilage and bone as possible. Conventional septoplasty is performed under headlight vision and involves septal correction after elevating the mucoperichondrial and mucoperiosteal flaps.

Technical developments such as endoscopes, fibreoptics, and video cameras have stimulated the idea of endoscopic septoplasty which has become popular in recent years. Otolaryngologists have become adept at the use of endoscopes and endoscopic equipment.

Endoscopic septoplasty is a minimally invasive technique that helps us to correct septal deformities under direct endoscopic vision. Certain problems like poor visualization, relative inaccessibility, and poor illumination, difficulty in evaluation of the exact pathology, unnecessary manipulation, resection and overexposure of the

septal framework can be overcome by endoscopic technique. Endoscopic septoplasty aids limited resection and thus more conservation of septal cartilage and bone by precise excision.

This study compares the outcomes and complications of the septal correction by endoscopic septoplasty with the conventional septoplasty in patients with deviated nasal septum.

OBJECTIVE OF THE STUDY

1) To compare conventional septoplasty and endoscopic septoplasty with regard to procedure, outcome, complications and surgeon's experience.

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.[1]

The first 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.[2]

The first serious surgical attempts on septal deformities appear to have started about the middle of the Nineteenth century. Various surgeons in 19th century advised shaving the most convex portion of the cartilage along with its covering mucoperichondrium.[3]Ruprecht (1868) used a punch forceps to accomplish a through-and-through removal of the greatest convexity of the cartilaginous septum[3], and Bosworth (1887) used saw for excision of septal spurs.[2]

Freer and Killian in 1902 developed the foundation of modern septoplasty techniques with the submucous resection. The first description of submucous resection is given to Freer (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.[4]

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 1cm dorsal and caudal "L" strut of supporting septal cartilage.[2]

A series of modifications developed because surgeons were unhappy with the results of the classical submucous resection and felt that the normal rigidity of the septum should be preserved. The main problem concerning them was, anterior dislocation of the nasal septum. Over thirty submucous resection modifications have been described.

Most surgeons adopted the Killian technique, but it was found to develop delayed saddling due to scarring. Few surgeons replaced all or part of the excised cartilage, while others avoided producing a large defect in the cartilaginous septum by mobilizing and repositioning the septum in the central position, so that the bulk of the cartilage is retained and is still attached to its mucoperichondrium as part of a compound flap.

Metzenbaum (1929) using the latter concept, applied the operation only to caudal dislocations of septum. He, therefore, introduced the swinging door method in which the hinge was effectively produced by the incision at the level of the deviation. There was an existing free border inferiorly and one was produced posteriorly by separation of the cartilage from the vomer. There was not, however a free border

anteriorly where the septum was tethered to displaced upper lateral cartilages and the traction from this and from mucoperichondrium which was liberated only on one side above the incision, produced increased tension on the unfreed side during healing.[5]

Peer (1937) recommended extensive excision of the septum, leaving only a strut to support the dorsum of the nose. He claimed that the tip support could be maintained with a piece of the resected septum inserted into the columella.[6]

Galloway (1946) suggested that saddling was not due to excessive removal of septal cartilage but to subsequent scarring. He thought that the potential saddling, the retraction of the columella and the drooping of the tip could be avoided by replacing a segment of cartilage between the septal flaps and drawing it down into the columellar tunnel by guide sutures; once in place it could be held by two transfixion sutures.[7]

One of the problems of this procedure was that the columella became immobile so that the nasal tip had a peculiar appearance when the person smiled and another was unequal scar contraction between the two septal flaps which led to a recurrence of the deviation.

Fomon et al (1948) attempted to rectify this by replacing the cartilage in two segments, one in the columella and one between the septal flaps.[8]

With these problems, evolved septoplasty. As well as producing a rigid tip, free cartilage grafts carried the added complication of late resorption and subsequent saddling. Consequently the alternative solution of mobilization and repositioning of septal cartilage has been revived and further developed. This septoplasty concept, in particular, has been popularized by Cottle *et al* (1958).[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 the vomer again keeping below the chondrovomerine suture. These were the so-called 'inferior tunnels'. Finally uniting the anterior and inferior tunnels under direct vision using a sharp dissector or knife was done. This is the so-called 'maxilla-premaxilla' approach of Cottle.[9]

Septal surgery performed during childhood may interfere with the subsequent growth of the nose.

The incision for septoplasty is made at the lower border of the septal cartilage as was originally advocated by Freer (1902). A unilateral (hemitransfixation) incision is adequate and for the right-handed surgeon, this is usually most conveniently made on the left side. Bernstein (1973a) tabulated the advantages of this incision that the incision is placed in a relatively avascular plane, the mucosal edges are both thick and tough reducing the risk of tears, provides access to the whole of the septum, and it is easy to extend the incision through to the opposite side by a full transfixation incision if septoplasty is combined with rhinoplasty.[10]

Bernstein's (1973b) technique was of supporting a deficient septal cartilage with a bone graft from either the ethmoid or the vomer and showed that bone is much more satisfactory when used in this supporting role than cartilage, which frequently becomes absorbed.[11]

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. The surgery is ideal for cartilaginous deviations and also for anterior distortions of the septum.[2]

Nigel Edwards (1974) discussed that S.M.R. technique was not suitable for dealing with caudally-dislocated septal cartilage, the ventro-cephalic septal cartilage border, the ventro-cephalic septal cartilage strut. The other disadvantages of S.M.R. were loss of normal septal rigidity-the 'flapping septum' in areas of cartilage and bone resection, liability to septal perforation, technical difficulties of revision surgery. Septoplasty here was defined as a conservative and versatile system of corrective septal surgery. He defined the aims of corrective septal surgery. Also he discussed the success in septoplasty surgery due to certain basic principles and they are adequate septal exposure through partial or complete septal transfixion through intercartilaginous incisions, adequate subperichondrial/subperiosteal elevation of flaps on both sides, minimal sacrifice of septal skeletal tissue and lining, correction of deformed bone by precise trimming or controlled fracturing back into position, and by external or internal splinting to maintain restored and corrected relationships between structures.[12]

Murakami, Wong, Davidson (1982) recommended to incise cartilage full thickness during septoplasty. One mucoperichondrial surface must be elevated and the other left intact. The easiest method is to elevate the mucoperichondrium off the concave surface. Full thickness incisions will allow the cartilage to straighten. If the surgery must be performed on the convex surface then triangular cartilaginous

excisions must be made. This is technically more difficult and carries greatest risk of tearing mucoperichondrium on the intact concave surface.[13]

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.[7] 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.

Marshall, Jonston, Jones, (2004) described how different septal deformities can be corrected whilst minimizing morbidity. When the dorsal cartilage is straight and the columella is central, suggest limited submucous resection. In anteriorly dislocated septum, it can be dealt with by shaving the anterior edge of the quadrilateral cartilage. In anterior vertical deflection, a figure of '8' between the cartilages will stop the fragments over-riding one another. When there is an inherent bend in the cartilage as well as fracture, there will be loss of tip support. The three options include to excise the maximum convexity of the septum and disguise any dorsal deformity with a graft or to use a cartilage baton that may be sutured to the concave side of the septum or to remove the cartilage and harvest conchal cartilage and laminate the cartilage with several 4'0 prolene sutures.[14]

Fjermedal, Saunte, Pedersen (1988), analysed patients operated in the 5-year period with either septoplasty or submucous resection on an average 31 months after surgery. They observed that more patients were satisfied with the functional results after septoplasty, which also resulted in fewer and smaller perforations than SMR. They concluded that septoplasty ought to replace the latter as the routine procedure.

They also suggested need for objective parameter in pre- and post-operative evaluation.[15]

Stewart MG et al (2004) had done a study to assess disease-specific quality of life outcomes after nasal septoplasty in adults with nasal obstruction. In patients with septal deformity, nasal septoplasty results in significant improvement in disease-specific quality of life, high patient satisfaction, and decreased medication use.[16]

Messerklinger introduced endoscopic sinus surgery in the late 1970s. The use of endoscopes was popularized by Kennedy in the United States and Stammberger and Wigand in Europe in the beginning of the 1980s. The application of endoscopic techniques to the correction of septal deformities was initially described in 1991 by Lanza et al[17] and by Stammberger.[18] In 1993 Lanza et al described detailed endoscopic techniques to the treatment of more complex septal deformities.[19]

Gardiner, Oluwole, Tan, White (1996) wished to develop a model that could be used for training in endoscopic nasal and sinus surgery which would allow development of the basic techniques of instrument handling, and the sinus surgery. Endoscopic SMR/septoplasty was performed to allow development of endoscope instrumentation, skills and depth perception. The mucoperichondrium may be elevated and a standard septoplasty performed.[20]

Dipak Ranjan Nayak, Balakrishnan, Murthy (1998) used the nasal endoscope for the precise identification of pathological abnormalities of the nasal septum in relation to the lateral nasal wall including the osteo-meatal complex and in its ultraconservative management. They compared the efficacies of traditional septoplasty with endoscope aided septoplasty in terms of technique and outcome.

They observed that endoscopic approach was safe, effective, conservative. The endoscope can be utilized to precisely identify the type of the septal deformity preoperatively, permitting proper planning of conservative surgery. Also the scope aids in performing surgery with the minimal exposure, limited manipulation of the septal framework and least resection. The authors advocate combination of approaches-endoscopic for the inaccessible middle and posterior part and traditional for the accessible anterior most portion of the nasal septum.[21]

William C Giles, Charles W Gross, Adam C Abram, Michael Greene, Ted G Avner (1994) had done a study of endoscopic septoplasty on 38 patients who also underwent functional endoscopic sinus surgery during 1989-1992. They performed septoplasty on an isolated spur or limited deviation in the nasal septum causing airway obstruction, impingement on the middle meatus, or obstruction of the view and access to the surgical area of the sinus procedure. A mucosal Incision was made immediately caudal to the deviation. With a blunt end of knife, a pocket was raised on both sides of the septal deviation and the deviated bony or cartilaginous portion removed and the free ends of mucoperichondrium positioned in place.[22]

Cantrell H (1997) defined limited septoplasty as repair of a specific and confined septal deviation directly opposite the surgical area for Functional Enodscopic Sinus Surgery - namely, the middle turbinates and maxillary and ethmoid ostia. The primary purpose of the limited septoplasty was adequate visualization and room for intraoperative and postoperative instrumentation and cleansing. It does not deal with anterior (caudal) septal deviations, nor does alter nasal dorsal shape, and the deviated portion of nasal septum can be replaced after straightening. It is not done for nasal airway obstruction.[23]

Peter H.Hwang, Robert B.McLaughlin, Donald C.Lanza, David W.Kennedy (1999) presented their experience on endoscopic septoplasty in a series of 111 patients, for treating symptomatic nasal obstruction and also for improving surgical access to the middle meatus as an adjunct to endoscopic sinus surgery. 3 cases were performed as endoscopic septoplasty primarily. Incision used was Killian or hemitransfixion incision or in the immediate vicinity of the deformity in posterior isolated deformities. They observed that this procedure reduced morbidity and postoperative swelling in isolated septal deviations by limiting the dissection to the area of the deviation. This was particularly valuable in patients who have undergone prior septal cartilage resection. Also it allowed improved visualization in posterior septal deformities particularly. It is also helpful in revision cases and as an effective teaching tool.[24]

M. Gupta, G. Motwani (2005) concluded that endoscopic septoplasty showed better results and fewer complications as compared to conventional methods. They also observed that endoscopes gave better illumination, improved access and limited flap elevation causing less trauma to the septum, thus reducing post operative complications.[25]

Park et al (1998) concluded that they could visualize the nasal septum under magnification on a video monitor and operate with precision, as well as demonstrate the technique.[26]

S. P. Gulati (2009) compared endoscopic septoplasty with conventional septoplasty and found that post operative morbidity and complications were significantly less in endoscopic septoplasty group. He also felt that endoscopic

septoplasty has its own limitations like need for frequent cleaning of the tip of the endoscope and loss of binocular vision.[27]

Arunachalam PS, Kitcher E, Gray J, Wilson JA (2001) considered the indication for septoplasty to be nasal septal deformity or nasal spur with greater than a 50% airway obstruction.[28]

The Nasal Obstruction Symptom Evaluation Scale designed by Michael G Stewart et al (2004) is a valid, reliable, and responsive tool in studying outcome in adults with nasal obstruction.[29]

R Bothra and N N Mathur(2009) observed that the distortion of nasal anatomy by using nasal speculum was avoided in endoscopic septoplasty and endoscopic septoplasty was more convenient in doing revision septoplasty. However they also felt that in endoscopic septoplasty one hand is always engaged in holding the endoscope, which is a disadvantage.[30]

Chung BJ, Batra PS, Citardi MJ (2007) conducted a retrospective review of patients undergoing endoscopic septoplasty and concluded that endoscopic septoplasty represents a viable alternative to traditional headlight septoplasty with acceptable outcomes and complications. Endoscopic septoplasty allows for enhanced visualization of the septal deviation with more focused flap dissection and resection of the offending cartilage and bone. Furthermore, the technique facilitates teaching endeavours through use of video monitors.[31]

Getz AE and Hwang PH (2008) had reviewed and found that isolated lesions such as septal spurs and contact points may be better addressed with limited endoscopic techniques. Powered instrumentation has been utilized with reported

success. Operative time and outcomes of endoscopic septoplasty are at least commensurate with, and at times superior to, traditional techniques.[32]

Dory G Durr (2003) evaluated outcomes of endoscopic septoplasty using a telephone survey along with a validated disease-specific health status measure and a global rating questionnaire.[33]

Ranjan G Aiyer, Rahul Gupta, Jayman Raval (2009) performed endoscopic septoplasty in patients with symptomatic nasal septal deviation and also as a preliminary step of another endoscopic nasal surgery. They observed that packing was not required and can be done as a day care surgery, less expensive.[34]

EMBRYOLOGY AND

ANATOMY OF THE NASAL SEPTUM

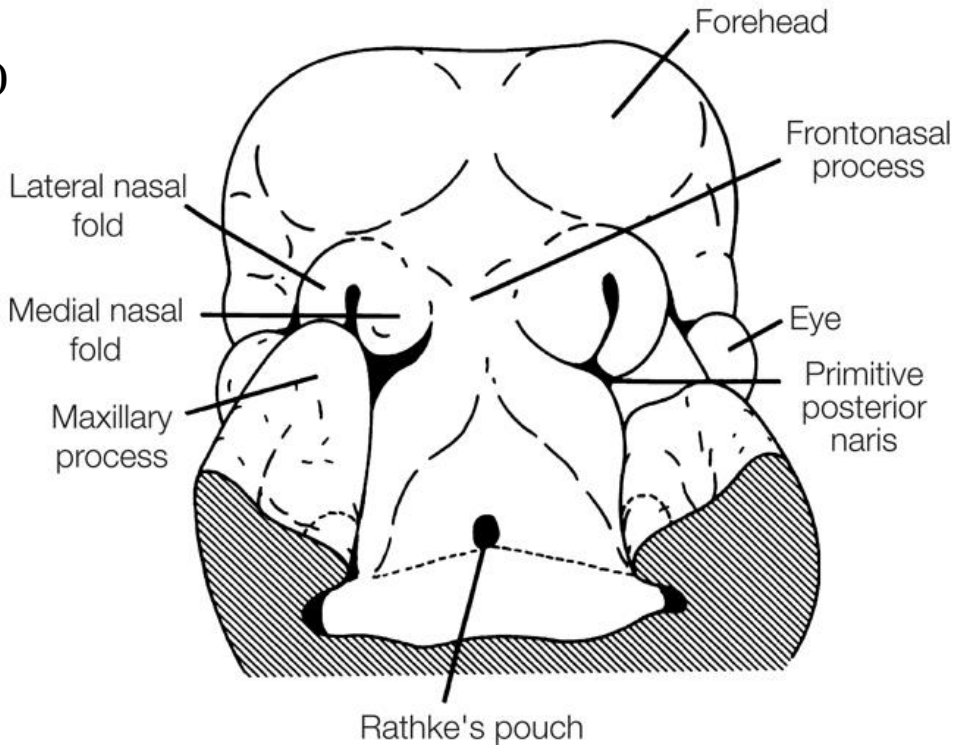
Embryology

A midline ridge develops from the posterior edge of the frontonasal process in the roof of the oral cavity and extends posteriorly to the opening of Rathke's pouch in 13.5mm embryo stage (Figure 1A). This becomes the nasal septum which is continuous anteriorly with the partition between the primitive nasal cavities.

As the nasal cavity enlarge, the palatal processes derived from the lateral maxillary mesoderm, grow medially towards each other and the septum. The fusion between the palatal processes and the septum from anterior to posterior, separating the nasal and oral cavities and most posteriorly the nasopharynx and oral cavity (Figure 1B).

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 centres 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.

(A)



(B)

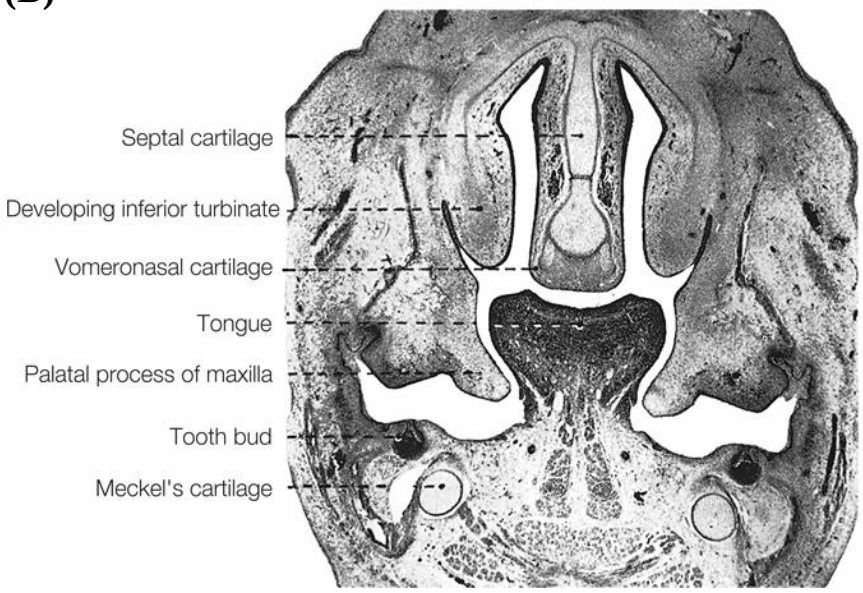


Figure 1 : Embryology of Nasal Septum

Anatomy of the nasal septum

The nasal septum is composed of a small anterior membranous portion, cartilage and several bones: the perpendicular plate of the ethmoid, the vomer and two bony crests of the maxilla and palatine (Figure 2).

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. The quadrilateral cartilage is 3-4mm thick in its centre 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.

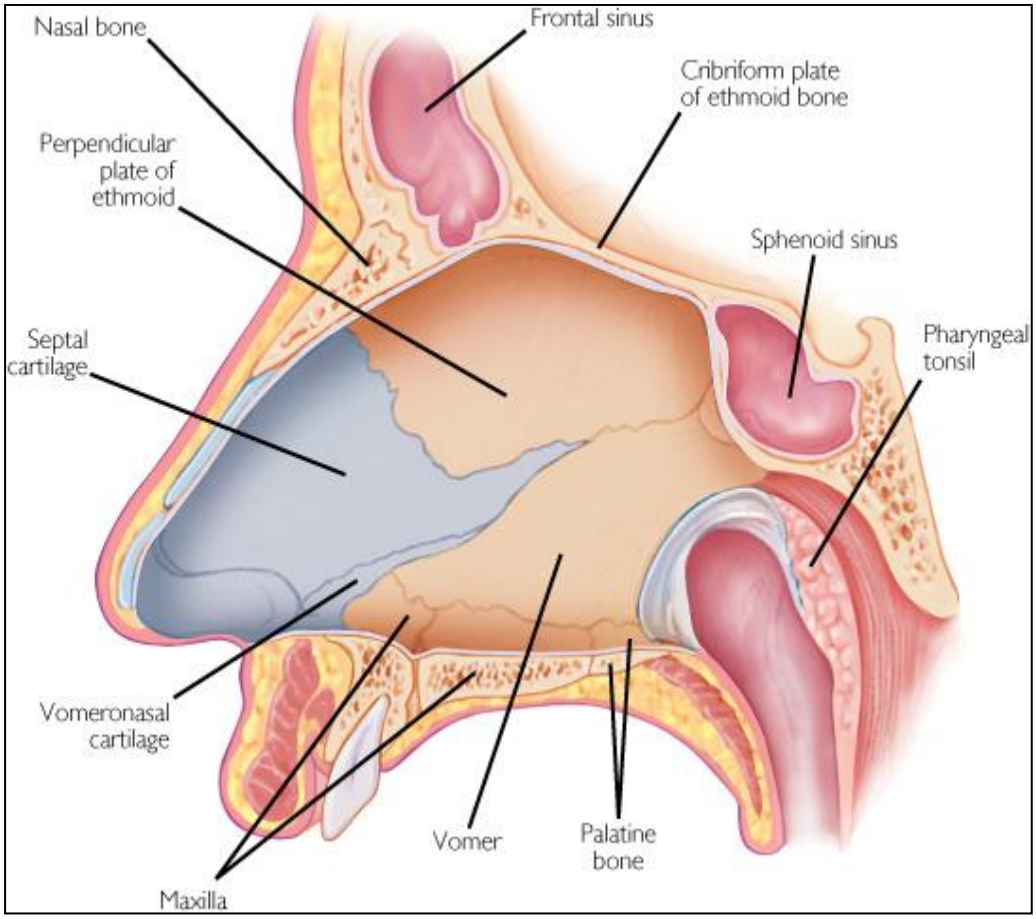


Figure 2 : Anatomy of the Nasal Septum

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.

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.

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.

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 nonciliated pseudostratified columnar cells, basal pluripotential stem cells and goblet cells (Figure 3). 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 1700mm^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 fibres join the axonal bundle.

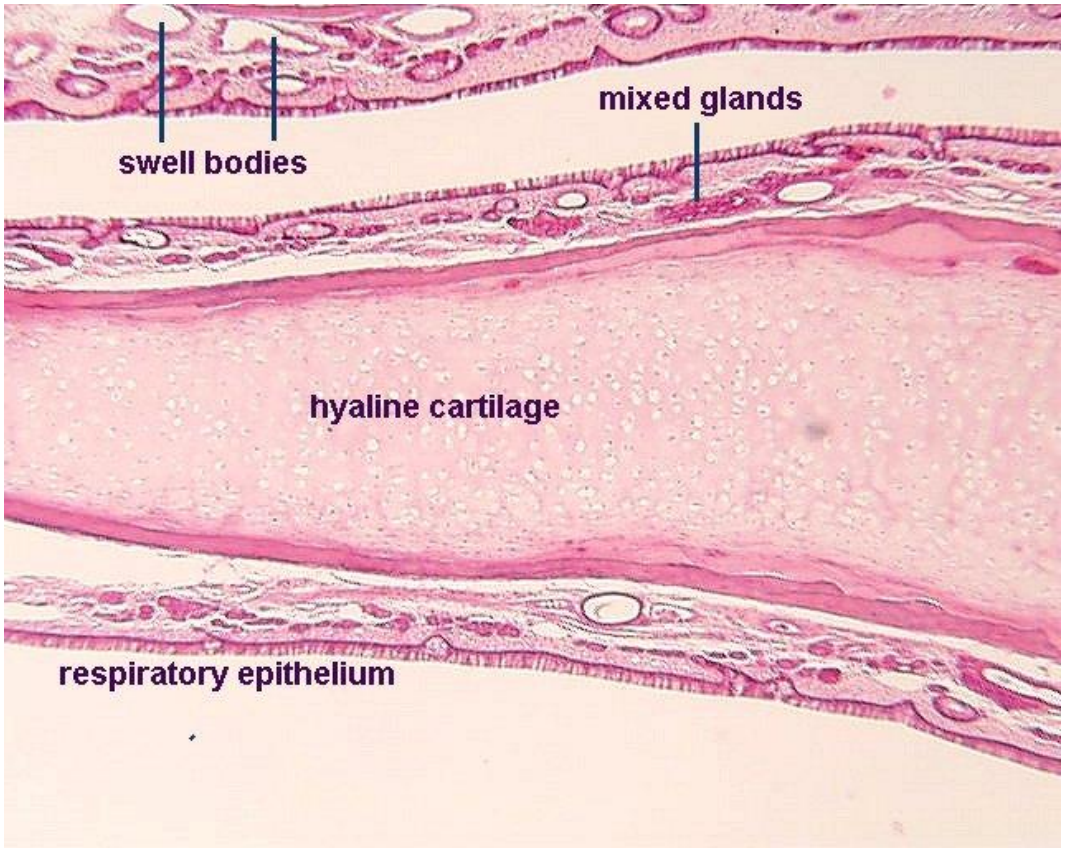


Figure 3 : Histology of Nasal Septum

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, which is composed of unusually long capillary loops and is situated in Little's area on the anterior septum - a common source of epistaxis (Figure 4).

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.

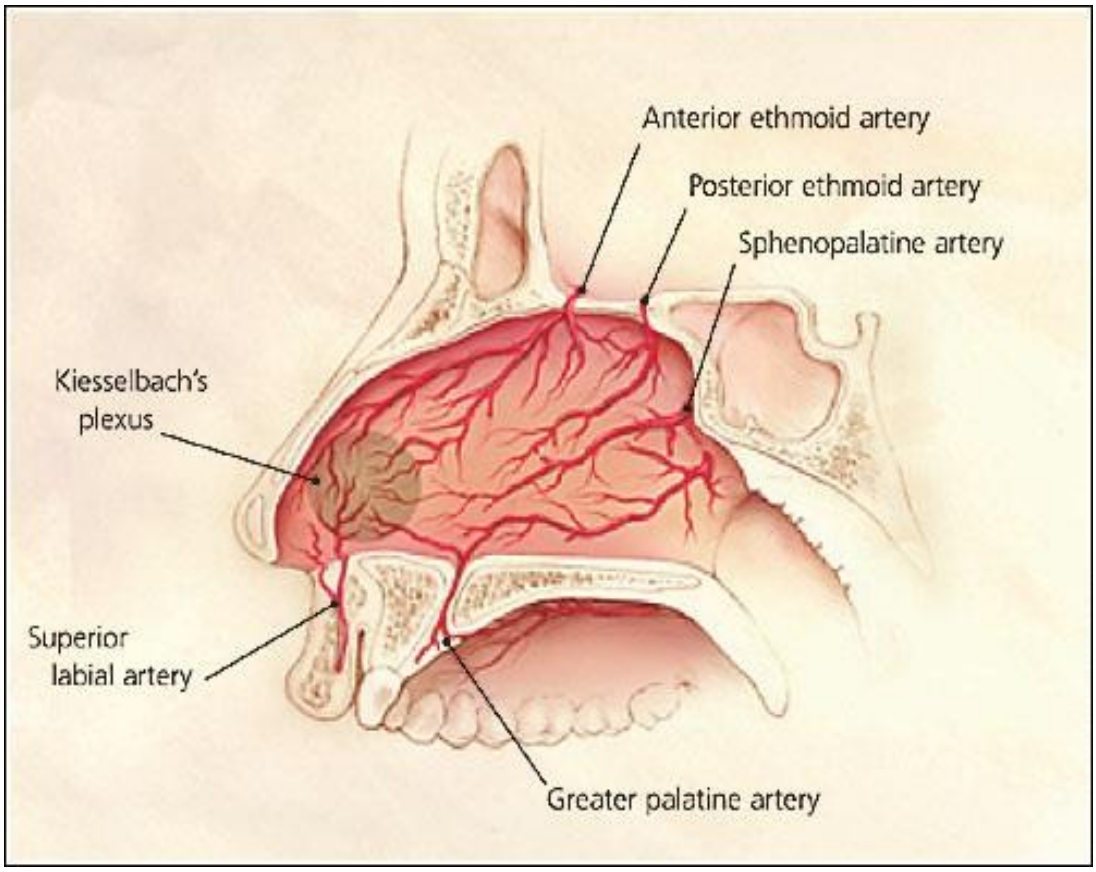
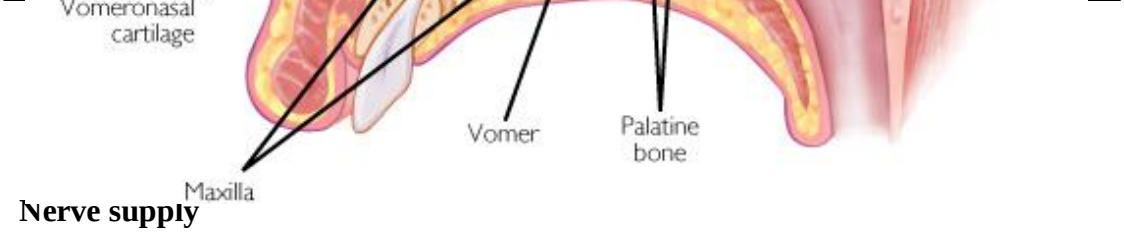


Figure 4 : Blood supply of septum



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.

The anterosuperior part of the septum is supplied by the anterior ethmoidal branch of the nasociliary nerve 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 (Figure 5).

The sensory nerves are accompanied by postganglionic sympathetic fibres to blood vessels and postganglionic parasympathetic secretomotor fibres 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.

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.

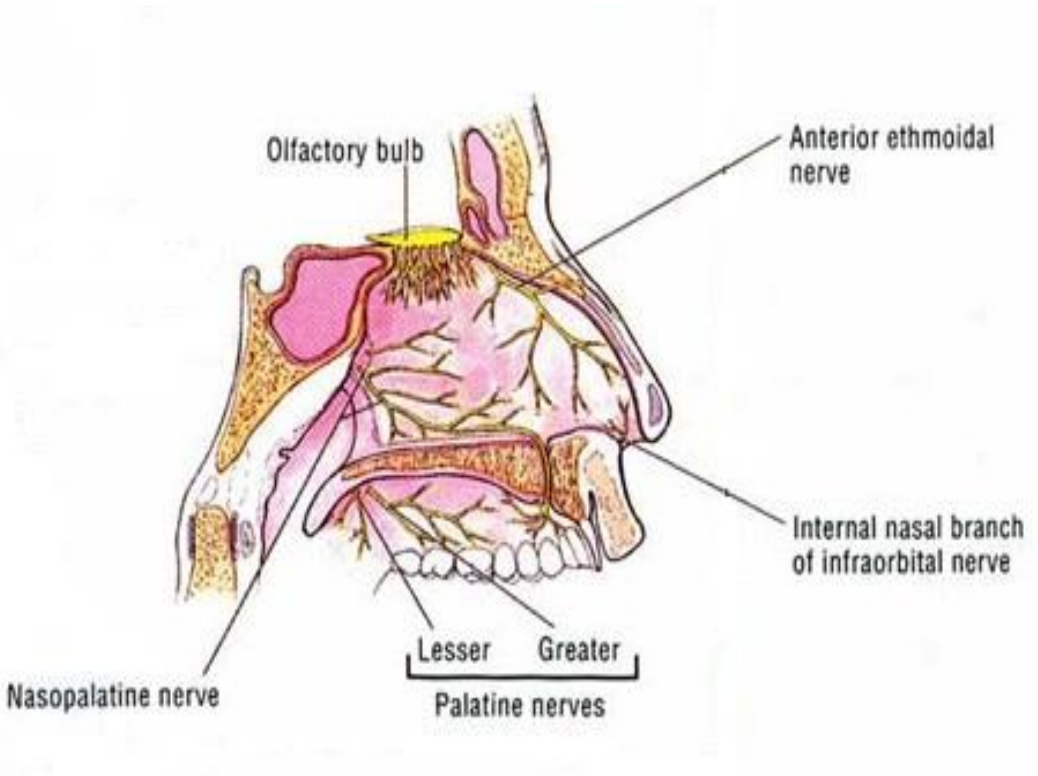


Figure 5 : Nerve supply of the septum

Physiology of the nose

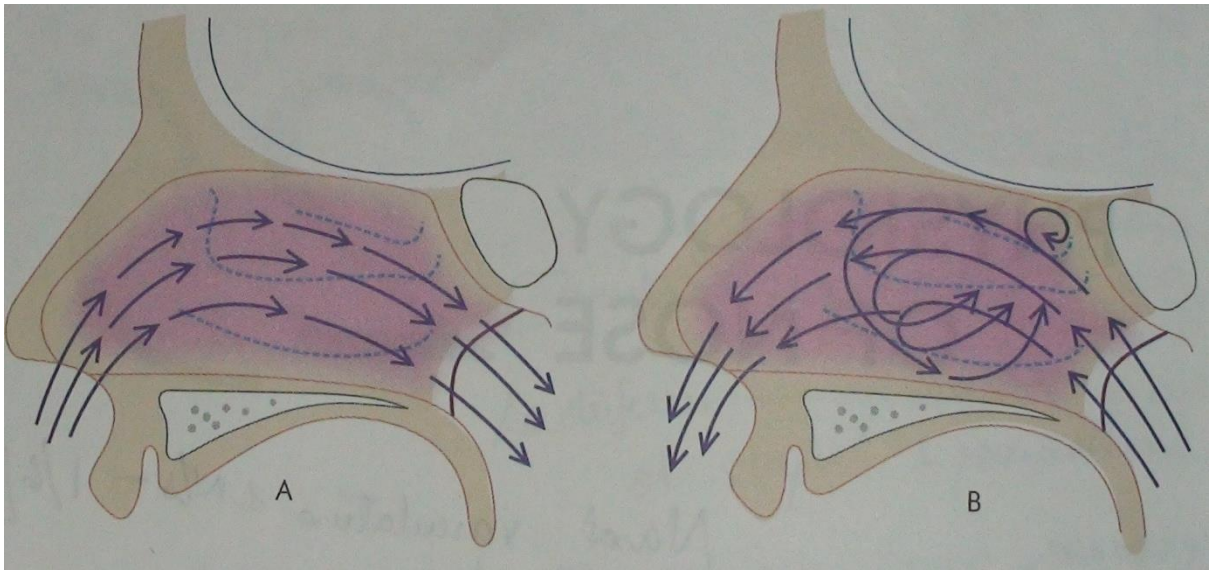
The nose is a paired structure. It is divided coronally into two chambers. Together they act as a functional unit.

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 it are very different. Cold receptors sense airflow. The flow is turbulent, but is considered laminar at rest (Figure 6).



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

Figure 6 : Physiology of Nose

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.

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.

Expiration lasts longer than inspiration and is more turbulent. Extrapulmonary airflow is turbulent because the direction changes, the calibre 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 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 breath preferentially through the nose at rest even though there is a significant resistance. During expiration, the positive pressure is transmitted to the alveoli.

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.

Rhinomanometry and acoustic rhinometry

The nasal airflow is usually measured as a volume flow and plotted against pressure. Quiet respiration is studied and a sample point of the flow at 150 Pascals pressure is the standard reference. Pulsed sound may be reflected (sonar) and the patterns of reflection give the cross-sectional area of the nose, which is the basis of acoustic rhinometry.

Etiology of deviated nasal septum

Septal deviation are extremely common, but are not usually severe enough to affect nasal function.

The causes of deviated nasal septum are

i. Developmental disturbances
ii. Trauma
iii. Impaired growth after trauma
iv. Systemic diseases

Types of deviated nasal septum

Deformity of the nasal septum can be classified into the following types (Figure 7) :

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.
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.

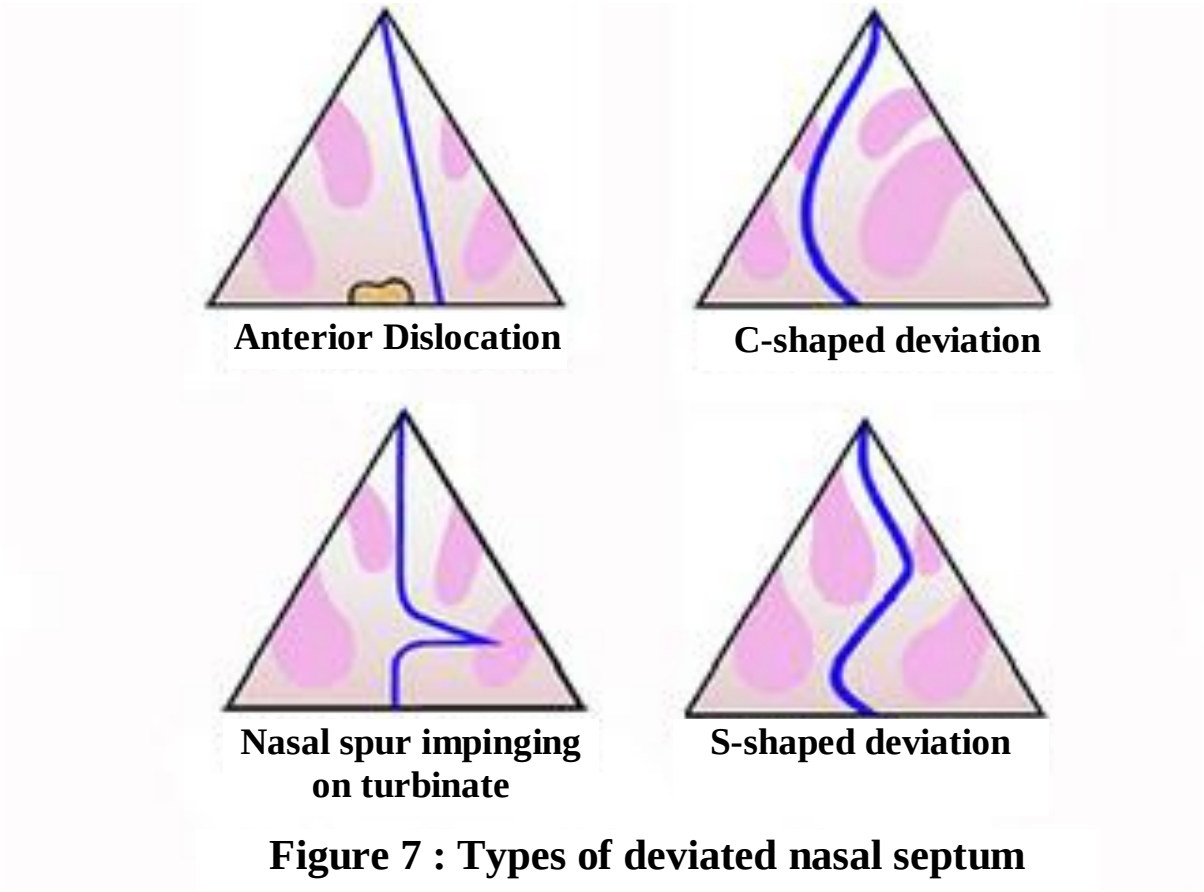


Figure 7 : Types of deviated nasal septum

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.

MATERIALS AND METHODS

Methods:

This study was done to compare septal correction by endoscopic septoplasty and conventional septoplasty in the department of ENT, R L Jalappa Hospital and Research Center, Kolar, between November 2009 and April 2011.

All patients attending outpatient department of Otorhinolaryngology with symptomatic deviated nasal septum willing to undergo surgical treatment were included in the study after taking written informed consent. Ethical committee clearance was obtained for the purpose of the study.

Patients were randomly divided into 2 groups of 30 each based on a simple random table. Group I underwent endoscopic septoplasty while Group II underwent conventional septoplasty.

Sample size: 60 patients were included in the study

Sampling method: Simple randomization

Type of the study (design): Prospective study

Inclusion criteria:

i. Patients with symptomatic deviated nasal septum.

Exclusion criteria:

i. Patients with allergic rhinitis

ii. Patients with external deformity of the nose

iii. Patients not fit for surgery

iv. Age below seventeen year

Method of collection of data:

Cases selected for the study were subjected to detailed history and clinical examination. They were assessed subjectively and objectively before the surgery. Cold spatula test was done followed by anterior rhinoscopy and details were noted.

Diagnostic nasal endoscopy was done in all patients to assess the nasal septal deviation and rule out any other pathology.

Deviation was classified as right, left or S shaped depending on the side of deviation. Depending on the involvement of cartilaginous or bony parts of septum, they were classified into anterior or posterior or both. Caudal dislocation, spurs, buckling of septum were identified along with lateral wall pathologies.

Cases were investigated in the following manner:

i) Routine haemoglobin, total count, differential count, bleeding time, clotting time.

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.

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 after explaining about the surgery, risks associated with it and post-operative complications.

iv. Premedication was given to the patients who underwent surgery under local anaesthesia, 45minutes prior to surgery. A combination of 25mg promethazine, pethidine (1- 1.5mg/kg) and 0.6mg atropine was given intramuscularly. Patients who underwent surgery under general anaesthesia were anaesthetised and handed over to the surgeon.

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

Instruments

- Routine septoplasty instruments
- Headlight
- 0^0 Karl Storz endoscope
- Monitor, Storz endoscopic camera

PROCEDURES

Endoscopic septoplasty

Patient is placed in supine position with head end of table raised. Under endoscopic visualization (0° with 4 mm diameter), the septum was infiltrated on both sides just anterior to the deviation with 2% lignocaine and adrenaline (1: 2,00,000) (Figure 10A).

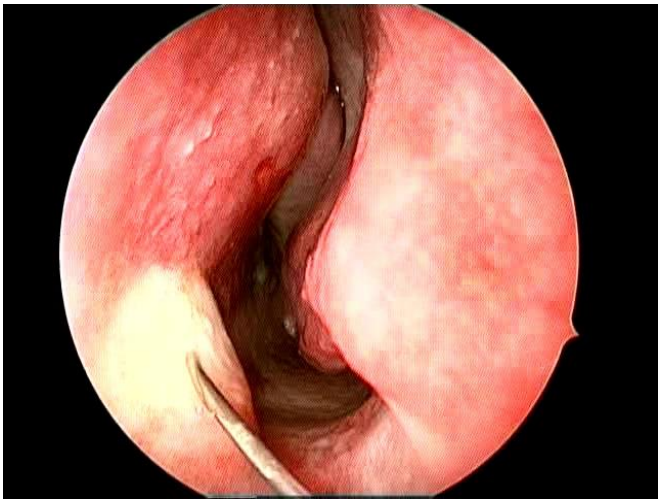
An incision caudal to the deviation on the convex side was made roughly parallel to hemitransfixion incision, except when there was a caudal dislocation, incision was made on the caudal end of the septum (hemitransfixion). In case of an isolated bony spur, incision was made parallel to the floor on spur itself.

Exposure: mucoperichondrial/mucoperiosteal flap was raised with Freer's elevator (Figure 10B). The cartilage was incised parallel but posterior to the flap incision and caudal to the deviation. If the deviation was bony, the incision was made at the bony cartilaginous junction. Mucoperichondrial elevator was inserted through the cartilaginous incision and mucoperichondrial/mucoperiosteal flap on the opposite side was raised. The deviation was excised (Figure 10C). The flaps were returned to their anatomic position.

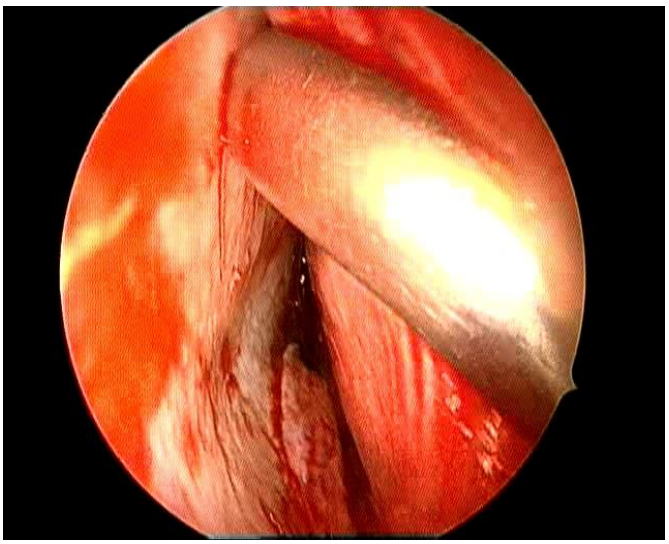
For septal spurs, an ipsilateral incision was given parallel to the floor of the nose. Flaps were elevated superiorly and inferiorly with an elevator to expose the underlying bony or cartilaginous spur. The spur was removed with Luc's forceps or osteotome was used. Then flaps were restored to their native position. Nasal cavity was packed with ribbon gauze antibiotic immersed packs.

Figure 8 : Instruments used in Endoscopic Septoplasty

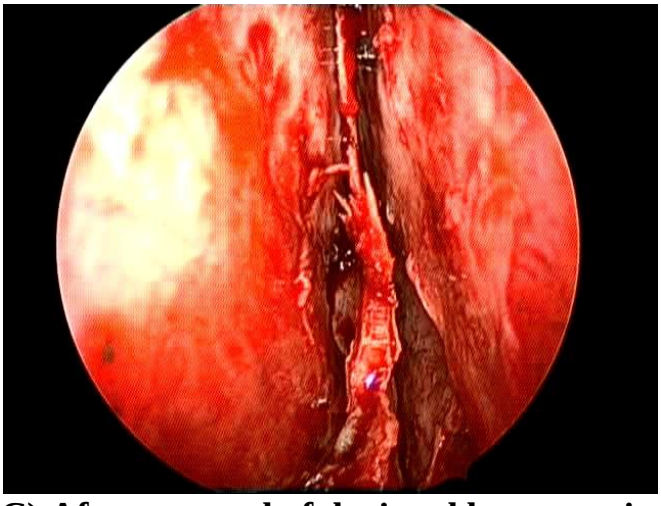
Figure 9 : Instruments used in conventional septoplasty



(A) Infiltration



(B) Flap elevation



(C) After removal of deviated bony portion

Figure 10 : Steps of Endoscopic Septoplasty

Conventional septoplasty

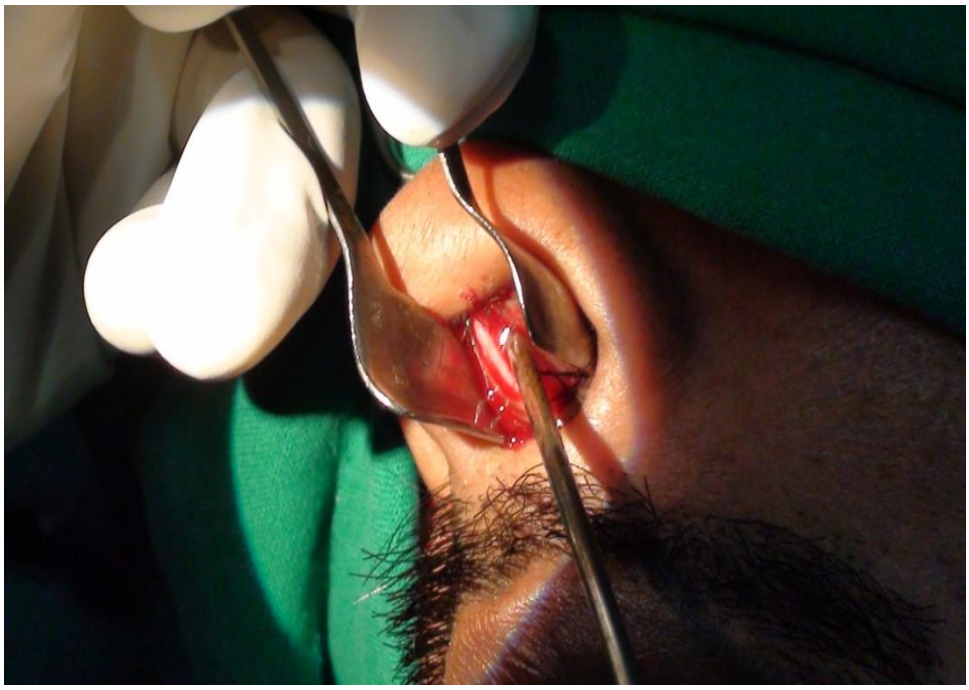
Patient is placed in supine position with head end of the table raised. Infiltration with 2% lignocaine with adrenaline (1:2,00,000) is given on both sides of nasal septum under direct visualization.

Hemitransfixion incision is placed along the caudal border of the septum (using 15number blade) preferably on the concave side (Figure 11A).

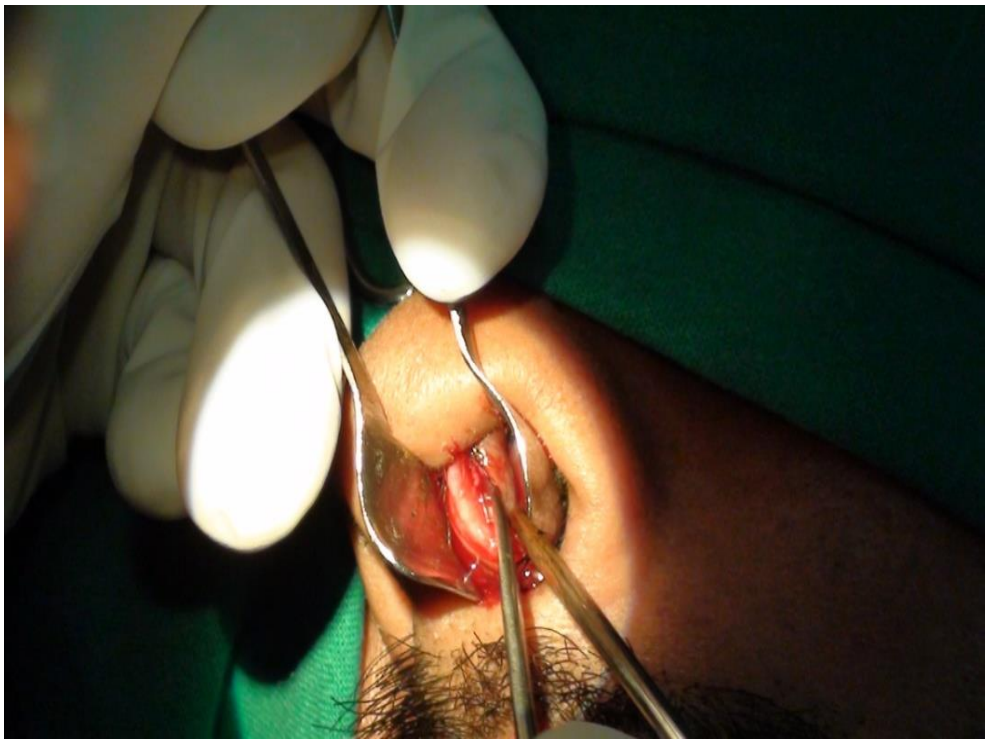
Exposure: cartilaginous and bony septum exposed by elevating mucoperichondrial and periosteal flaps using Freer's elevator (Figure 11B). The difficulties in flap elevation occur mainly at the junction of septal cartilage above with anterior nasal spine, premaxillary crest and vomer below, because the 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.

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. Cross hatch incisions are made on the concave side. The incision is closed using 3'0 chromic catgut suture. Bilateral nasal cavities packed with medicated ribbon gauze.



(A) After incision



(B) Flap elevation

Figure 11 : Steps of Conventional Septoplasty

Duration of surgery :

The duration of surgery was calculated from the time of infiltration of local anaesthetic to the completion of nasal packing.

Surgeon's remarks

Surgeon's remarks with respect to following aspects were taken:

i) Accessibility to all areas

ii) Illumination

iii) Adequacy of exposure

iv) Complications

v) As a teaching tool

Post-operative management:

Patients were given I.V antibiotics, analgesics and antihistamines. Pack removal was done after 24 hours. Follow up was done on 10^{th} post op day and at the end of 1^{st} month and 3^{rd} month. At each follow up visit, subjective assessment, objective assessment, and assessment of complications were done as follows:

1. **Subjective assessment:** nasal obstruction, nasal discharge, headache, bleeding per nose
2. **Objective assessment:** cold spatula test and endoscopic assessment of septal correction
3. **Assessment of complications:** synechiae, septal perforation, septal haematoma, dental pain, persistent nasal obstruction.

With the above findings, the outcomes of surgery were measured. Statistical analysis was done using Chi-square test.

OBSERVATION AND RESULTS

The results of 30 cases of endoscopic septoplasty and 30 cases of conventional septoplasty were assessed under the following heading.

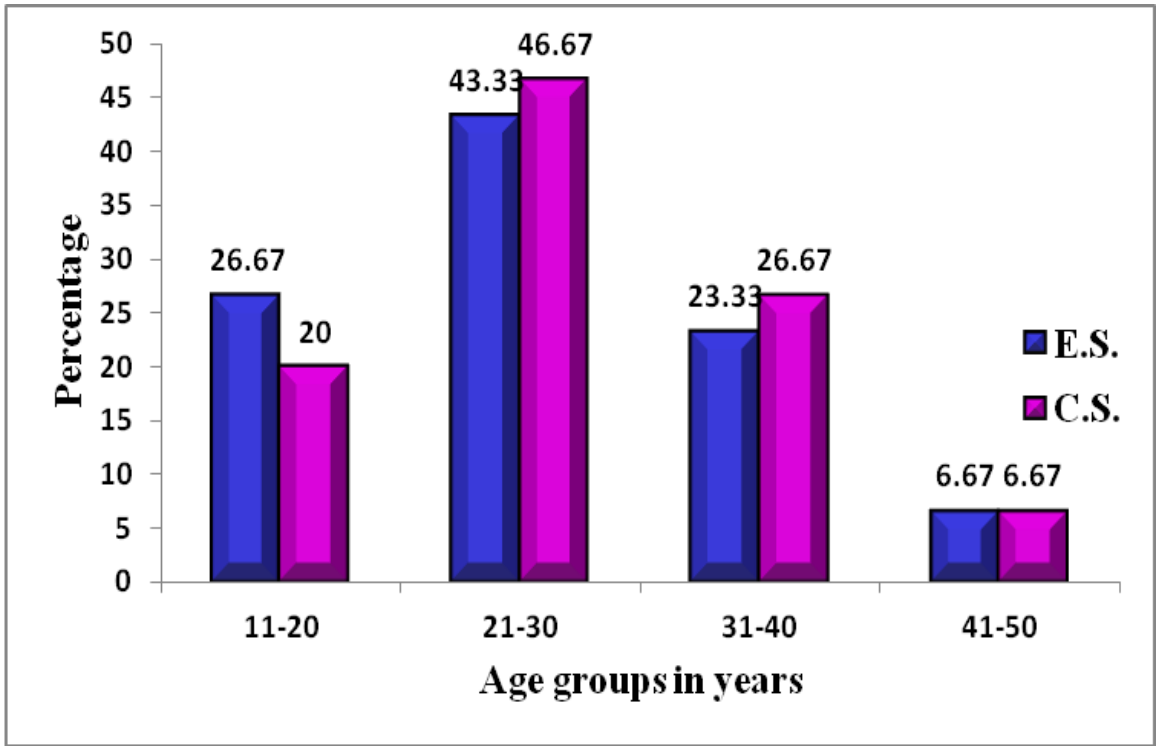
1. Patients statistics
2. Surgical results
3. Anatomical results
4. Functional results

Our study included 60 patients with symptomatic deviated nasal septum.

Table 1: Age distribution of the patients

Age Group	E.S. (n=30)		C.S. (n=30)		Total (n=60)	
	No	%	No	%	No	%
11-20	8	26.67	6	20.00	14	23.33
21-30	13	43.33	14	46.67	27	45.00
31-40	7	23.33	8	26.67	15	25.00
41-50	2	6.67	2	6.67	4	6.67

In our study of 60 cases, the age of the patients was varying between 18 and 50 years and in the group who underwent endoscopic septoplasty the average age was 28 years (range 18-45 years) and in the conventional septoplasty, the average age was 29.17 years (range 19-50 years) and overall average age was 28.58 years.



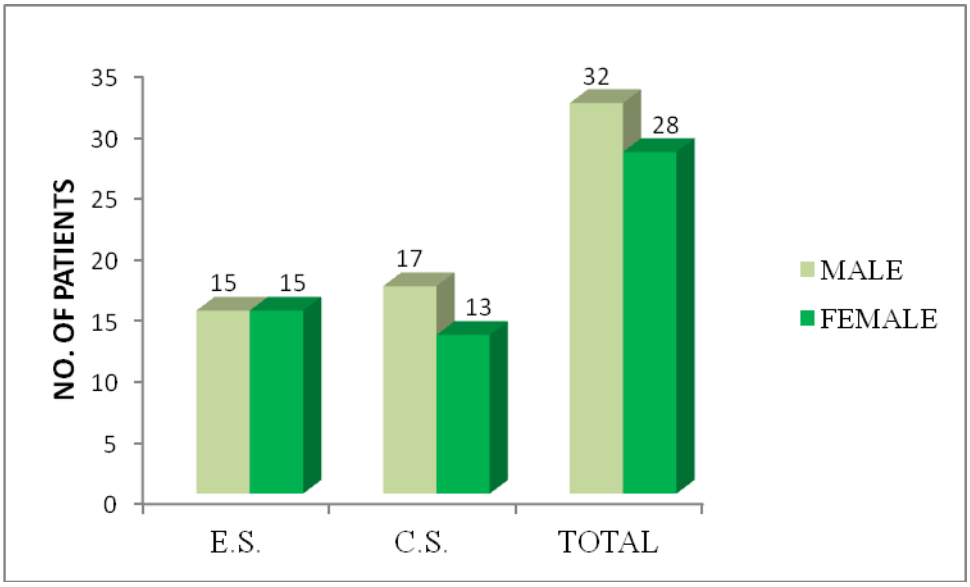
Graph 1 : Age distribution of the patients

Table 2: Sex distribution of the patients

Sex	E.S. (n=30)		C.S. (n=30)		Total (n=60)	
	No	%	No	%	No	%
Male	15	50.00	17	56.67	32	53.33
Female	15	50.00	13	43.33	28	46.67

In the present study, male to female ratio was 1.14:1, with 32 males (53.33%) and 28 females (46.67%).

There were 15 (50.00%) males and 15 (50.00%) females (in the endoscopic septoplasty group, and 17 (56.67%) males and 13 (43.33%) females in the conventional septoplasty group.

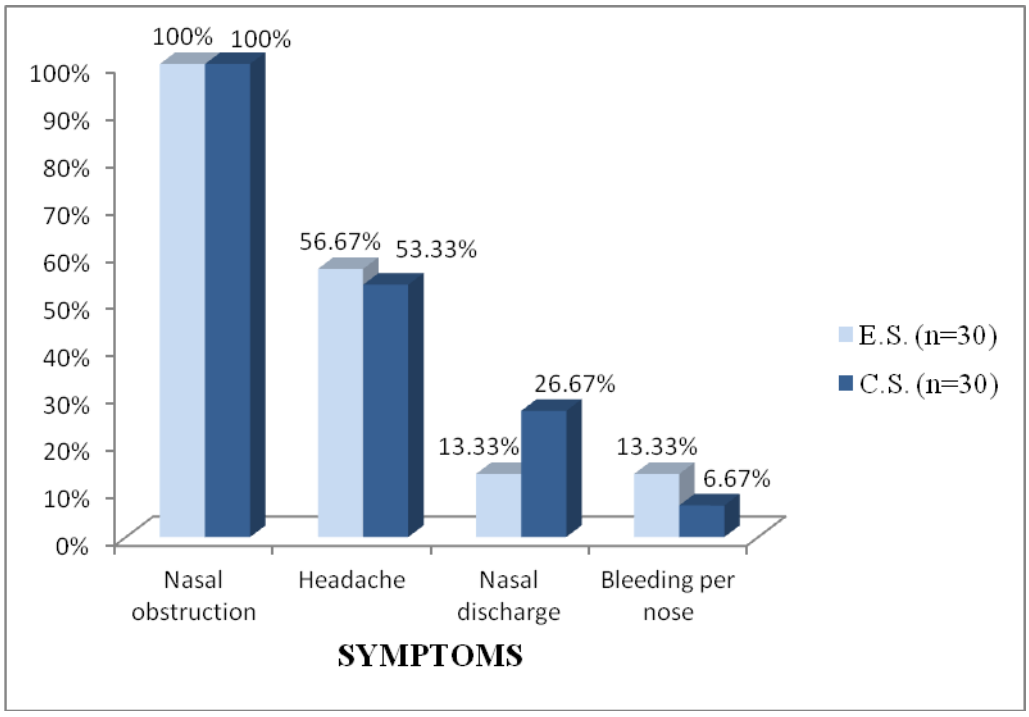


Graph 2: Sex distribution of the patients

Table 3: Symptomatology

Symptoms	E.S. (n=30)		C.S. (n=30)		Total (n=60)	
	No	%	No	%	No	%
Nasal obstruction	30	100.00	30	100.00	60	100.00
Headache	17	56.67	16	53.33	33	55.00
Nasal discharge	4	13.33	8	26.67	12	20.00
Bleeding per nose	4	13.33	2	6.67	6	10.00

All the 60 (100%) patients presented with nasal obstruction, 33 (55%) patients presented with headache, 12 (20%) presented with nasal discharge and 6 (10%) patients presented with bleeding per nose. In the endoscopic septoplasty group, there were 30 (100%) patients who presented with nasal obstruction, 17 (56.67%) with headache, 4 (13.33%) with nasal discharge and 4 (13.33%) with bleeding per nose. In the conventional septoplasty group, there were 30 (100%) patients who presented with nasal obstruction, 16 (53.33%) with headache, 8 (26.67%) with nasal discharge and 2 (6.67%) with bleeding per nose.

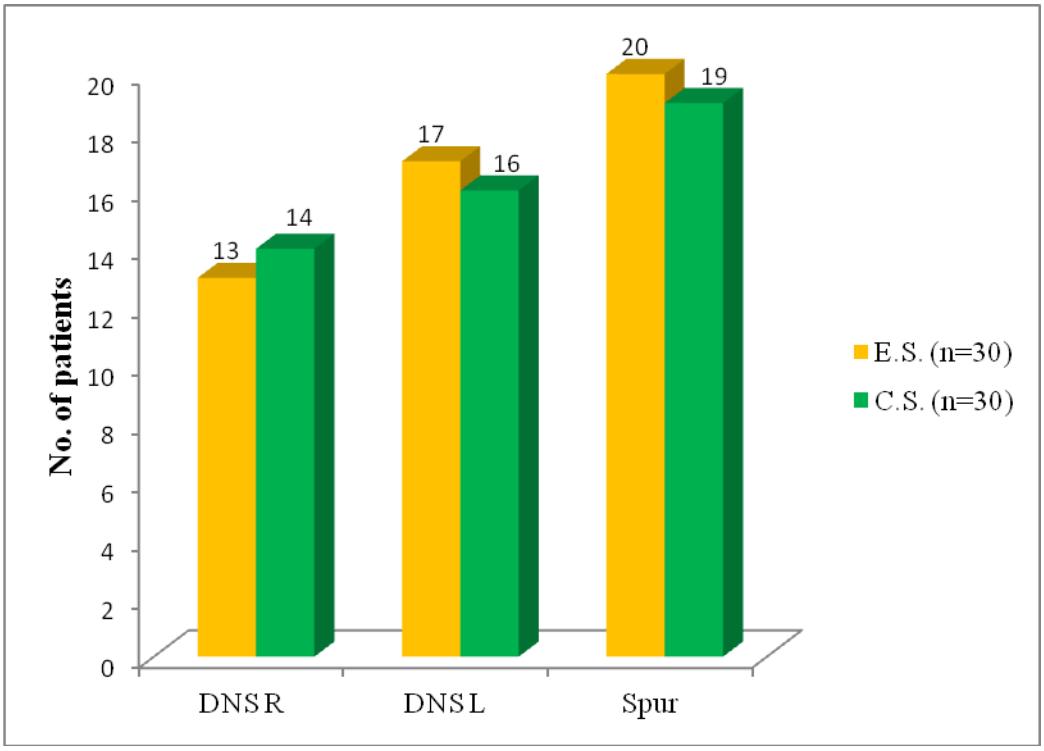


Graph 3: Symptomatology

Table 4: Anterior rhinoscopy and diagnostic nasal endoscopic findings

Findings	E.S. (n=30)		C.S. (n=30)		Total (n=60)	
	No	%	No	%	No	%
DNS R	13	43.33	14	46.67	27	45.00
DNS L	17	56.67	16	53.33	33	55.00
Spur	20	66.67	19	63.33	39	65.00

All patients were examined with nasal speculum and endoscopy. DNS was present in 27 (45.00%) cases on the right side, 33 (55.00%) cases on the left side. Of the patients who had DNS to right 13 (43.33%) cases underwent endoscopic septoplasty and 14 (46.67%) patients underwent conventional septoplasty. In those patients who had DNS to left 17 (56.67%) cases underwent endoscopic septoplasty and 16 (53.33%) cases underwent conventional septoplasty. Spur was present in 20 (66.67%) cases in endoscopic septoplasty and 19 (66.33%) cases in conventional septoplasty.

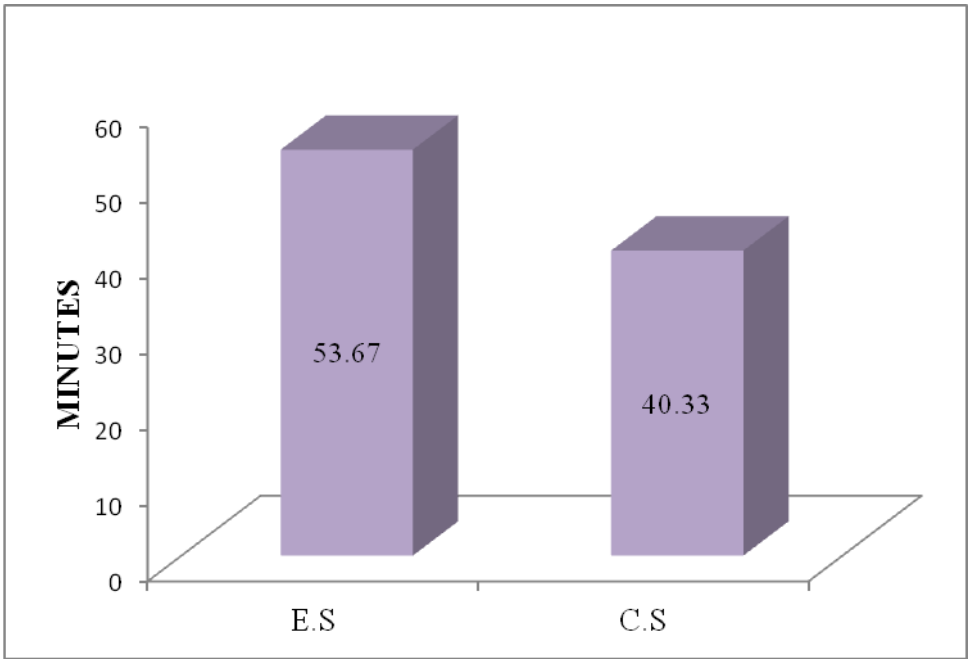


Graph 4: Anterior rhinoscopy and diagnostic nasal endoscopic findings

Table 5: Average duration of surgery

Duration in minutes	E.S.	C.S.
	53.67	40.33

The duration of surgery was calculated from the time of infiltration of local anaesthetic to completion of nasal packing. Endoscopic septoplasty on the average took 53.67 minutes (minimum 45min, maximum 65min). Conventional septoplasty lasted on average 40.33 min (minimum 30min, maximum 55min).

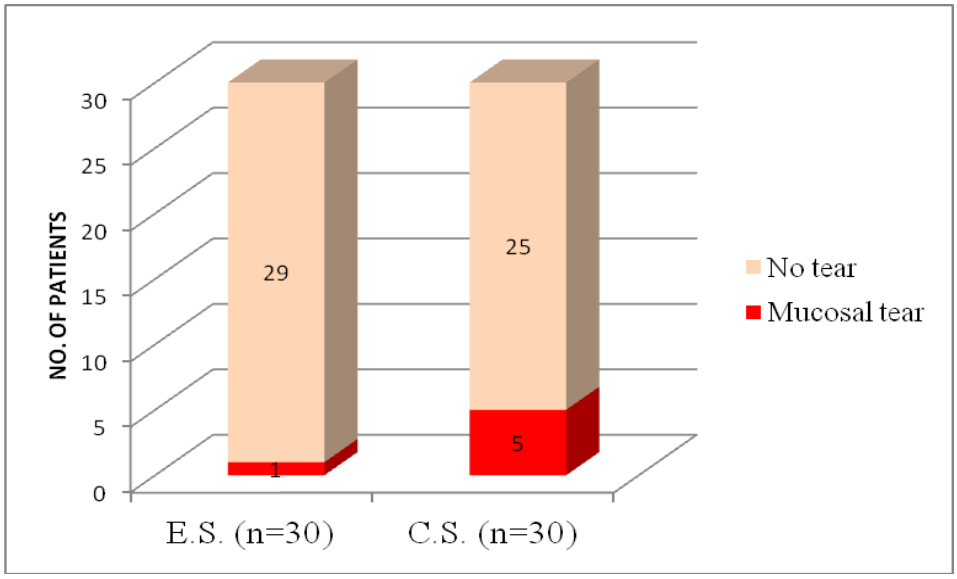


Graph 5: Average duration of surgery

Table 6: Intra-operative complications

Intra-operative complication	E.S. (n=30)		C.S. (n=30)		Total (n=60)	
	No.	%	No.	%	No.	%
Mucosal tear	1	3.33	5	16.67	6	10.00

Of the 60 patients, mucosal tear was seen in 6 cases (10.00%). Mucosal tear was seen in 1 case (3.33%) in endoscopic septoplasty and was seen in 5 cases (16.67%) in conventional septoplasty.



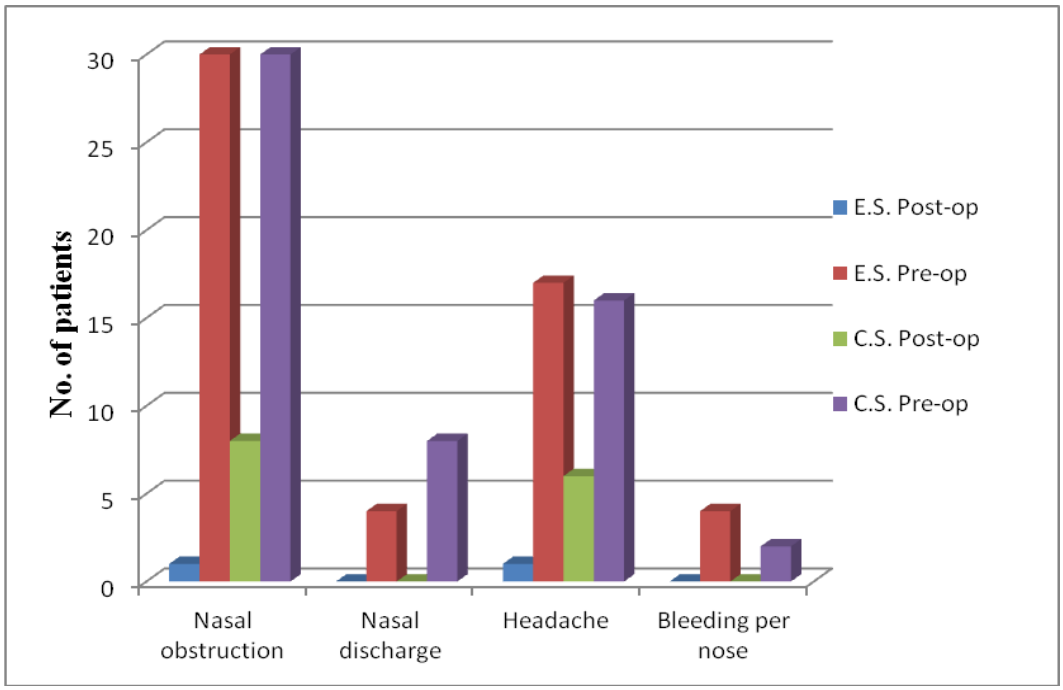
Graph 6: Intra-operative complications

Table 7: Post-operative symptomatology

Symptoms	E.S. (n=30)		C.S. (n=30)		Chi Square value	'p' value
	Post-op/ Pre-op	%	Post-op/ Pre-op	%		
Nasal obstruction	1/30	3.3	8/30	26.7	4.71	0.0300
Nasal discharge	0/4	0.0	0/8	0.0	-	-
Headache	1/17	5.9	6/16	37.5	3.22	0.039
Bleeding per Nose	0/4	0.0	0/2	0.0	-	-

Patients were reviewed weekly once for 1 month, and every month thereafter for 5 months. During each visit, patients were asked about benefits from their symptoms and were tabulated as follows.

Out of 60 patients with nasal obstruction, 29/30 patients (96.67%) and 22/30 (73.33%) were benefited in the endoscopic septoplasty and conventional septoplasty group respectively. Nasal discharge was relieved in, 4 (100%) endoscopic septoplasty and 8 (100%) conventional septoplasty group. Headache was complained by 1/17 (benefit 94.12%) in endoscopic septoplasty and 6/16 (benefit 62.50%) in conventional septoplasty group. Bleeding per nose was relieved in all the 4 (100%) patients in endoscopic septoplasty and 2 (100%) in conventional septoplasty group. The difference between the two groups was statistically significant.

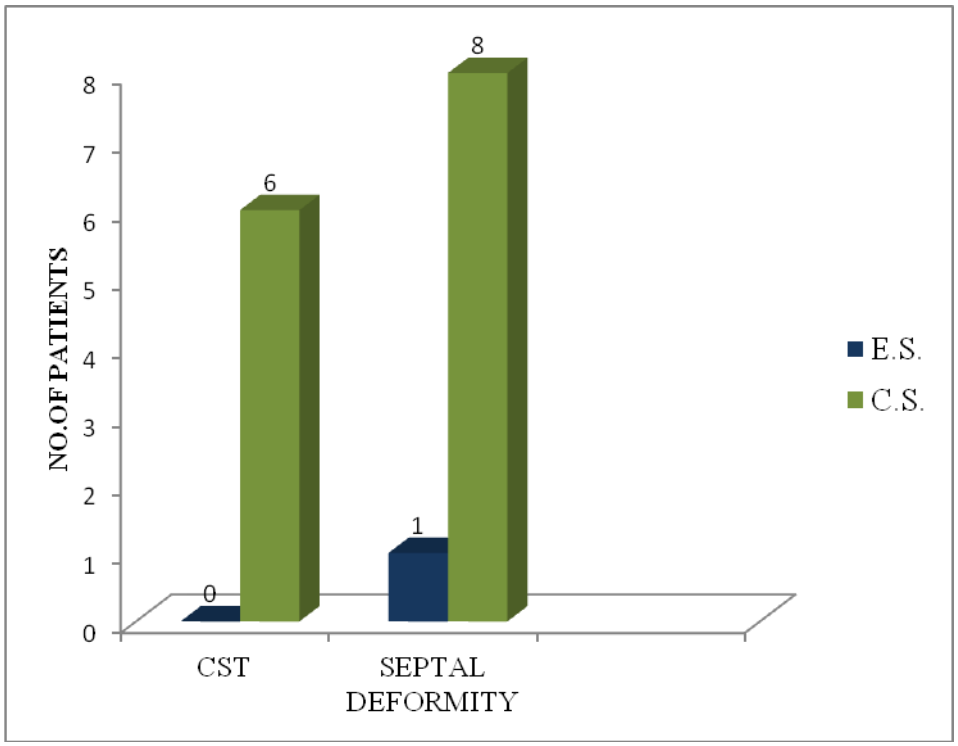


Graph 7: Post-operative symptomatology

Table 8: Post-operative findings

Post-op findings	E.S. (n=30)		C.S. (n=30)		Total		Chi Square value	'p' value
		%		%		%		
Abnormal Cold Spatula Test	0	0.0	6	20.0	6	11.7	10.0	0.0237
Persistent septal deformities	1	3.3	8	26.7	9	15.0	4.71	0.0256

All patients were examined during their post-operative visit by nasal speculum and endoscope. Cold spatula test showed good and equal misting in 54 patients, 30 in endoscopic septoplasty and 24 in conventional septoplasty group. Septal deformities was seen in 1/30 (Benefit 96.67%) in endoscopic septoplasty and 8/30 (Benefit 73.33%) in conventional septoplasty group. The observations made were better in endoscopic septoplasty compared to conventional septoplasty and was statistically significant.



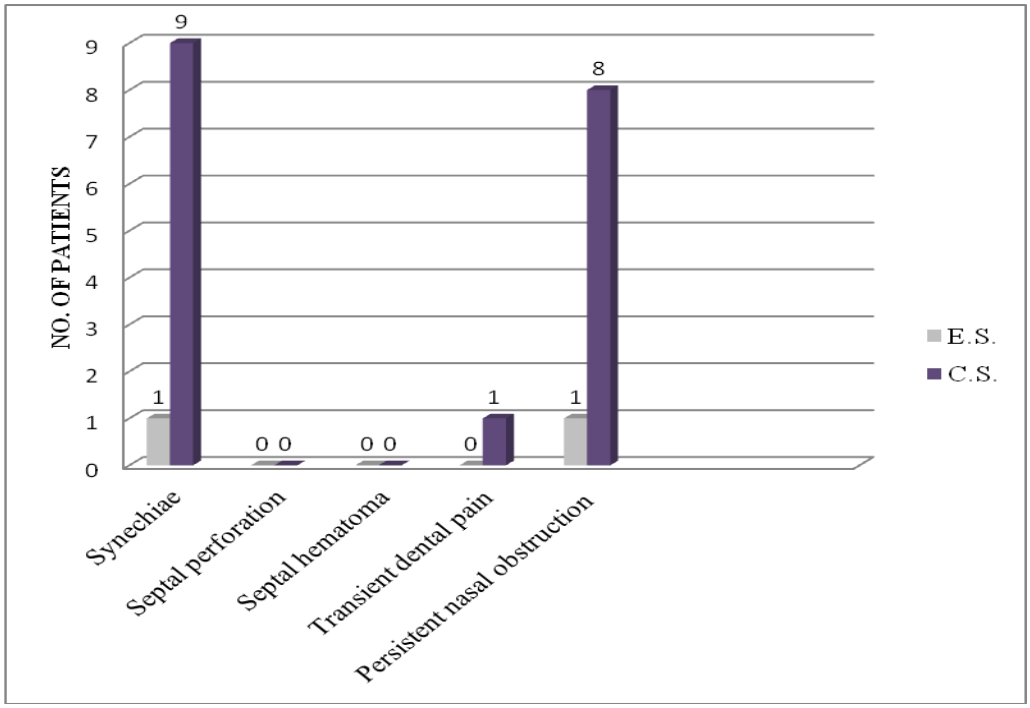
Graph 8: Post-operative findings

Table 9: Complications

Complications	E.S. (n=30)		C.S. (n=30)		Total (n=60)		Chi Square value	'p' value
	No	%	No	%	No	%		
Synechiae	1	3.3	9	30.0	10	33.3	7.55	0.005
Septal perforation	0	0.0	0	0.0	0	0.0	-	-
Septal hematoma	0	0.0	0	0.0	0	0.0	-	-
Dental pain	0	0.0	1	3.3	1	3.3	-	-
Persistent nasal obstruction	1	3.3	8	26.7	9	30.0	4.71	0.026

Post-operative complications in our study were tabulated as follows:

Synechiae was seen in 1 patient (3.33%) and persistent nasal obstruction was seen in 1 patient (3.33%) in endoscopic septoplasty. Synechiae was seen in 9 patients (30.00%), dental pain in 1 patient (3.33%), persistent nasal obstruction was seen in 8 patients (26.7%) in conventional septoplasty. Complications like septal haematoma, and septal perforation were not seen. The overall complications rates were less in endoscopic septoplasty. Both Synechiae formation and persistent nasal obstruction were less in endoscopic septoplasty group and was statistically significant.



Graph 9: Complications

DISCUSSION

The present study was conducted from November 2009 to April 2011 during which 60 cases with symptomatic deviated nasal septum were studied. They were divided into two groups, comprising 30 patients each in group I and group II. Group I patients underwent endoscopic septoplasty and Group II patients underwent conventional septoplasty.

Age distribution:

In present study most of the patients were adults in the age group of 18-50 years, with highest incidence in the 3rd decade. The average age was 28.58 years, which was comparable to various other studies.

In a study by Dipak Ranjan Nayak (2002) the mean age of the patients were 26.4 years.[35]

In a study by R. Bothra (2009), the age of the patients ranged between eight and 42 years, with the average age being 24.8 years.[30]

Sex distribution:

In the present study, male preponderance was noticed, with 32 patients (53.33%) being males and 28 (46.67%) females. This is comparable to the study conducted by Muhammad IA & Nabil-ur Rahman (2003) where 81% were males and 19% females.[36]

In another study by Janardhan Rao (2005), there were 69% males and 31% females.[37]

Symptomatology

In our study, in the endoscopic septoplasty group, there were 30 (100%) patients who presented with nasal obstruction, 4(13.33%) with nasal discharge, 17 (56.67%) with headache and 4 (13.33%) with bleeding per nose.

In the conventional septoplasty group, there were 30 (100%) patients who presented with nasal obstruction, 8 (26.67%) with nasal discharge, 16 (53.33%) with headache and 2 (6.67%) with bleeding per nose.

In the study conducted by Dipak Ranjan Nayak (1998), the presenting symptoms and their incidence was similar to this study, 25 (83%) patients presented with nasal obstruction, 15 (50%) with nasal discharge, 22 (73%) with headache in the endoscopic septoplasty group, 22 (73%) patients presented with nasal obstruction, 12(40%) with nasal discharge, 24(80%) with headache in the conventional septoplasty group.[21]

In another study done by R. Bothra nasal obstruction was the most common presenting symptom, found in 90% of patients.[30]

Anterior rhinoscopy and diagnostic nasal endoscopic findings

In this study, there were 27 (45.00%) patients with deviated nasal septum to the right, 33 (55.00%) patients with deviated nasal septum to the left and 39(65.00%) patients with spur.

In a study conducted by Dipak Ranjan Nayak (2002), they observed that C-shaped deviation was present in 56.25%, S-shaped deviation was present in 31.35%, spur in 36.6% and hypertrophied inferior turbinate in 75.2%, which was in little variance to our study.[35]

Average duration of surgery

In our study, endoscopic septoplasty on the average took 53.67 minutes and conventional septoplasty lasted on average 40.33 min.

In a study by Paradis J (2011) the mean post operative time for endoscopic septoplasty was less than conventional septoplasty.[38]

Intra-operative complication

Intraoperatively mucosal tear was seen in 5 cases (16.67%) in conventional septoplasty and mucosal tear was seen in 1 case (3.33%) in endoscopic septoplasty.

In a study by Ketcham and Han (2010), the improved picture in endoscopic septoplasty can help prevent and identify mucosal tears.[39]

Post-operative symptomatology

In this present study 60 patients had nasal obstruction, 29 out of 30 patients (96.67%) in the endoscopic septoplasty group and 22 out of 30 patients (73.33%) in the conventional septoplasty group were relieved of symptoms. None of the patients complained of nasal discharge in the post operative period (100 % symptom relief).94.12% patients had relief from headache in endoscopic septoplasty and 62.50% in conventional septoplasty group. Bleeding per nose was relieved in all the 4 (100%) patients in endoscopic septoplasty and 2 (100%) in conventional septoplasty group.

Sindhwani and Wright (2003) observed in their study that 54% patients with complaints of nasal obstruction and facial pain were cured and 38% showed improvement and 8% patients were not benefited.[40]

S.P.Gulati (2009) compared patient symptomatic relief and observed that 90.5% patients were relieved of nasal obstruction in the endoscopic septoplasty group and 80% in the conventional group. 75% were relieved of recurrent rhinorrhea in the endoscopic septoplasty group and 100% in the conventional group. Headache was relieved in endoscopic septoplasty group, whereas 87.5% were relieved in the conventional septoplasty group. The outcome of this study is comparable to our study.[27]

In a study by Harley et al (2003), patients with nasal obstruction and headache were selected and significant improvement was observed in endoscopic group as compared to conventional group.[41]

In a study by Dipak Ranjan Nayak (1998) endosocpe-aided septoplasty was found to be more effective in treating symptoms such as nasal obstruction (55 per cent in traditional vs 88 percent in endoscopic group) and headache (55 percent in traditional vs 82 percent) in the endoscopic group.[21]

The observation of relief in nasal obstruction was similar to that observed in our study.

Post-operative findings

Septal deformities was seen in 1/30 (benefit 96.67%) in endoscopic septoplasty and 8/30 (benefit 73.33%) in conventional septoplasty group.

Nayak et al (1998) found the post-operative incidence of persistent deviation and contact area to be significantly lower following endoscopic septoplasty compared

with conventional septoplasty (49% and 20% respectively in traditional versus 13% and 0% respectively in the endoscopic group).[21]

Similar benefits were seen in our study following endoscopic septoplasty compared to conventional septoplasty.

Complications

In our study, synechiae was seen in 1 patient (3.33%) and persistent nasal obstruction was seen in 1 patient (3.33%) in endoscopic septoplasty and; synechiae was seen in 9 patients (30.00%), dental pain in 1 patient (3.33%), persistent nasal obstruction was seen in 8 patients (26.7%) in conventional septoplasty. Septal haematoma and septal perforation was not seen.

Complications included transient dental pain/hypesthesia (4.3%), asymptomatic septal perforation (3.4%), synechiae formation (2.6%), epistaxis (0.9%), and septal haematoma (0.9%) in a study by Chung (2007) for endoscopic septoplasty.[31]

R. Bothra (2009) observed synechiae in 10 (25%) in endoscopic septoplasty patients and 2 (5%) in conventional septoplasty patients at one month postoperatively. Also in their study endoscopic assessment revealed that 15% of conventional septoplasty and 10% of endoscopic septoplasty patients had residual deviation. In our study endoscopy septoplasty group had less Synechiae when compared to conventional septoplasty group. [30]

Nayak et al (1998) observed that the complication rates were significantly more in the traditional group. Synechiae occurred in 17% of cases following the traditional septoplasty as compared to 3% following the endoscope-aided septoplasty, this is comparable to our study.[21]

In a study by Chung (2007), in patients undergoing endoscopic septoplasty, 4.3% of patients reported transient dental pain or hypesthesia, while less than 1% of patients suffered from epistaxis or septal haematoma following surgery.[31]

In a study by Giles et al (1994), 5 patients had small synechiae to the lateral nasal wall.[22]

In our study, the complications were less in the endoscopic septoplasty compared to conventional septoplasty group.

SUMMARY

This study was done on all patients with symptomatic deviated nasal septum attending to ENT outpatient department at R L Jalappa Hospital & Research Center, Kolar from November 2009 to April 2011.

All patients were examined and then were randomly divided into two groups for endoscopic septoplasty and conventional septoplasty.

1. Maximum incidence was seen in the 3rd decade with 53.33% males and 46.67% females.
2. The most common symptom was nasal obstruction (100%) followed by Headache (55%).
3. The most common type of deviated nasal septum was to the left
4. The relief from nasal obstruction was 96.67% in endoscopic septoplasty and 73.33% in conventional septoplasty.The relief from headache was 94.12 % in endoscopic septoplasty and 62.50% in conventional septoplasty. There was 100% relief with nasal discharge and epistaxis in both endoscopic septoplasty and conventional septoplasty.
5. Intra-operatively mucosal tear was seen in 5 cases (16.67 %) of conventional septoplasty and 1case (3.33%) in endoscopic septoplasty. Post-operative complications such as Synechiae was seen in 1 patient (3.33%) and persistent nasal obstruction was seen in 1 patient (3.33%) in endoscopic septoplasty. Synechiae was seen in 9 cases (30.00%), dental pain in 1 case (3.33%) and persistent nasal obstruction in 8 cases (26.7%) in conventional septoplasty. Septal haematoma and septal perforation was not seen in both the groups.
6. The mean duration of surgery was less in conventional septoplasty than endoscopic septoplasty.

Remarks of Surgeons

All surgeons felt endoscopic septoplasty to be a better modality than conventional septoplasty due to various advantages like:

1. Better illumination and improved accessibility to hidden areas.
2. limited incision and elevation of flaps with adequate exposure of deformity.
3. Minimal chances of tears and perforation.
4. Allows realignment by limited and precise resection of pathological areas and or by precise repair.
5. Contact areas are relieved effectively and thus contact headache is relieved.
6. Ability to visualize the structure deep in nasal cavity and detect hidden disease.
7. Helps in teaching the septal anatomy, pathology, surgery.
8. Good documentation tool.

CONCLUSION

The endoscopic septoplasty provides several advantages over the standard headlight technique. It facilitates accurate identification of the pathology due to illumination, improved accessibility to remote areas and magnification. It allows limited incision and elevation of flaps not compromising with adequate exposure of the pathological site. It allows better understanding of the lateral wall pathology associated with the septal deformity.

In this technique, disarticulation of vomerochondral junction and ethmochondral junction is not needed and precise shaving of septal cartilage and proper placement of wedge resection is all that is required in most of the surgeries.

At present, best functional and anatomical results are conquered with endoscopic septoplasty, when entire deformity of nasal septum is corrected without compromising resilience and stability of cartilaginous septum which is beyond the limits of conventional septoplasty.

However the conventional septoplasty has withstood the test of time and is a robust technique with an easy learning curve. It is better in areas like caudal end /dislocation. The ultimate choice of surgery is best left to the surgeon based on his experience with endoscopes and the type and severity of deformity.

BIBLIOGRAPHY

1. Fettman N, Sanford T, Sindwani R. Surgical management of the deviated septum: Techniques in septoplasty. Otolaryngologic Clin North Am 2009; 42: 241-52
2. Maran AGD. Septoplasty. J Laryngol Otol 1974; 88: 393-405
3. Huffman WC, Lierle DM. Progress in Septal Surgery. Plast Reconstr Surg 1957; 20: 185-198
4. Freer O. The correction of deflections of the nasal septum with a minimum of traumation. JAMA 1902; 38: 636
5. Metzenbaum M. Replacement of the lower end of the dislocated septal cartilage versus submucous resection of the dislocated end of the septal cartilage. Arch Otolaryngol 1929; 9: 282-96
6. Peer LA. An operation to repair lateral displacement of the lower border of the septal cartilage. Arch Otolaryngol 1937; 25: 475-77
7. Fomon S, Syracuse VR, Bolotow N, Pullen M. Plastic-repair of deflected nasal septum. Arch Otolaryngol 1946; 44: 141-56
8. Fomon S, Gilbert JG, Silver AG, and Syracuse VR. Plastic repair of the obstructing nasal septum. Arch Otolaryngol 1948; 47: 7-20
9. Cottle MH, Fischer GG, Gaynor IE, Loring RM. The maxilla-premaxilla, approach to extensive nasal septum surgery. Arch Otolaryngol 1958; 68: 301
10. Bernstein L. Early submucous resection of nasal septal cartilage. Arch Otolaryngol 1973a; 97: 273-8
11. Bernstein L. Submucous operations on the nasal septum. Otolaryngologic Clin North Am 1973b; 6: 675

12. Edwards N. Septoplasty-rational surgery of the nasal septum. J Laryngol Otol 1974; 89: 875-97
13. Murakami WT, Wong LW, Davidson TM. Application of the biomechanical behaviour of cartilage to nasal septoplastic surgeries. Laryngoscope 1982; 92: 300-9
14. Marshall AH, Johnston MN, Jones NS. Principles of septal correction. J Laryngol Otol 2004; 118: 129-34
15. Fjermedal O, Saunte C, Pedersen S. Septoplasty and/or submucous resection? J Laryngol Otol 1988; 102: 796-8
16. Stewart MG, Smith TL, Weaver EM, Witsell DL, Yeuh B, Hannley MT, et al. Outcomes after nasal septoplasty: results from the Nasal Obstruction Septoplasty Effectiveness (NOSE) study. Otolaryngol Head Neck Surg 2004; 130: 283-90
17. Lanza DC, Kennedy DW, Zinreich SJ. Nasal endoscopy and its surgical applications In: Lee KJ, editor. Essential otolaryngology: head and neck surgery. 5th ed. New York: Medical Examination; 1991 p. 373-87
18. Stammberger H. Functional endoscopic sinus surgery. The Messerklinger Technique. Decker BC. Philadelphia; 1991. p. 432-3
19. Lanza DC, Rosin DF, Kennedy DW. Endoscopic septal spur resection. Am J Rhinol 1993; 7: 213-6
20. Gardiner Q, Oluwole M, Tan L, White PS. An animal model for training in endoscopic nasal and sinus surgery. J Laryngol Otol 1996; 110: 425-8

21. Nayak DR, Balakrishnan R, Murthy KD. An endoscopic approach to the deviated nasal septum-a preliminary study. J Laryngol Otol 1998; 112: 934-9
22. Giles WC, Gross CW, Abraham AC, Greene WM, Avner TG. Endoscopic septoplasty. Laryngoscope 1994; 104: 1507-9
23. Cantrell H. Limited septoplasty for endoscopic sinus surgery. Otolaryngol Head Neck Surg 1997; 116: 274-7
24. Hwang PH, McLaughlin RB, Lanza DC, Kennedy DW. Endoscopic septoplasty: indications, technique and results. Otolaryngol Head Neck Surg 1999; 120: 678-82
25. Gupta M, Motwani G. Comparative study of endoscopic aided septoplasty and traditional septoplasty in posterior nasal septal deviations. Indian J Otolaryngol Head Neck Surg 2005; 57: 309-11
26. Park DH, Kim TM, Han DG, Ahn KY. Endoscopic assisted correction of the deviated nose. Aesthetic Plast Surg 1998; 22: 190–5
27. Gulati SP, Wadhera R, Ahuja N, Garg A, Ghai A. Comparative evaluation of endoscopic with conventional septoplasty. Indian J Otolaryngol Head Neck Surg 2009; 61: 27–9
28. Arunachalam PS, Kitcher E, Gray J, Wilson JA. Nasal septal surgery: evaluation of symptomatic and general health outcomes. Clin Otoloaryngol Allied Sci 2001; 26: 367-70
29. Stewart MG, Witsell DL, Smith TL, Weaver EM, Yueh B, Hannley MT. Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) scale. Otolaryngol Head Neck Surg 2004; 130: 157-63.

30. Bothra R, Mathur N. Comparative evaluation of conventional versus endoscopic septoplasty for limited septal deviation and spur. J Laryngol Otol 2009, 123: 737-41
31. Chung BJ, Batra PS, Citardi MJ, Lanza DC. Endoscopic septoplasty: revisitation of the technique, indications, and outcomes. Am J Rhinol 2007; 21: 307-11
32. Getz AE, Hwang PH. Endoscopic septoplasty Curr Opin Otolaryngol Head Neck Surg 2008; 16: 26-31
33. Durr DG. Endoscopic septoplasty: technique and outcomes. J Otolaryngol 2003; 32: 6–11
34. Aiyer RG, Gupta R, Raval J. Endoscopic septoplasty:a novel technique-A case series of 19 cases. Clinical Rhinology: An International Journal 2009; 2: 11-3
35. Nayak DR, Balakrishnan R, Murthy DK, Hazarika P. Endoscopic septoturbinoplasty: our update series. Indian J Otolaryngol Head Neck Surg 2002; 54: 20-4
36. Muhammad IA, Nabil-ur Rahman. Complications of the surgery for deviated nasal septum. J Coll Physicians Surg Pak. 2003; 13: 565-8
37. Rao JJ, Kumar ECV, Babu KR, Chowdary VS, Singh J, Rangamani SV. Classification of nasal septal deviations-relation to sinonasal pathology. Indian J Otolaryngol Head Neck Surg 2005; 57: 99-201
38. Paradis J. Open versus endoscopic septoplasty: a single blinded, randomized controlled trial. J Otolaryngol Head Neck Surg 2011; 1 : 28-33

39. Ketcham AS, Han JK. Complications and management of septoplasty. Otolaryngol Clin N Am 2010; 43: 897-904
40. Sindhwani R, Wright DE. Role of endoscopic septoplasty in the treatment of atypical facial pain. J Olaryngol 2003; 32: 77-9
41. Harley DH, Powitzky ES, Duncavage J. Clinical outcomes for the surgical treatment of sinonasal headache. Otolaryngol Head Neck Surg 2003;129:217-21

ANNEXURE - I

PROFORMA

NAME **:**

AGE **:** **Case No:**

SEX **:** **HO. NO. :**

ADDRESS **:** **D.O.A. :**

OCCUPATION **:** **D.O.D. :**

I. CHIEF COMPLAINTS **:**

II. HISTORY OF PRESENTING ILLNESS

1. Nasal obstruction:

- Unilateral / bilateral
- Duration
- Intermittent/constant
- Onset – sudden / insidious

2. Nasal discharge:

- Duration
- Discharge – watery/mucopurulent/purulent/bloody

3. Headache:

- Duration
- Onset –sudden / gradual
- Associated symptoms – nausea / vomiting
- Type –dull aching / throbbing / lancinating
- Diurnal variation

4. Bleeding per nose:

- Duration
- Onset –sudden / gradual
- Unilateral / bilateral

5. History of allergic symptoms:

6. Any other complaints:

III. PAST HISTORY

H/o similar complaints in the past

H/o trauma

H/o previous nose surgery

H/o systemic illness

IV. TREATMENT HISTORY :

V. FAMILY HISTORY :

VI. PERSONAL HISTORY :

Diet :

Appetite :

Sleep :

Bowel/Bladder :

Habits – smoking / tobacco chewing / alcohol

GENERAL PHYSICAL EXAMINATION :

Vital signs:	Pulse:	/min	BP:	mm of Hg
	Temp:		R.R:	cycles/min
	Pallor:	Icterus :		Oedema :
	Cyanosis:	Lymphadenopathy:		

ENT EXAMINATION :

I. EXAMINATION OF NOSE:

1. EXTERNAL APPEARANCE:

Glabella

Root

Dorsum

Tip

Alae

2. COLD SPATULA TEST:

Misting - equal/altered

3. TIP RAISING TEST:

Columella/vestibule/any caudal dislocation of septum

4. ANTERIOR RHINOSCOPY: **R** **L**

Nasal mucosa

Nasal cavity

Septum

Floor

Lateral wall

a) turbinates – normal/hypertrophied/atrophied

b) meatus - discharge

5. POSTERIOR RHINOSCOPY:

6. PARANASAL SINUS EXAMINATION:

Tenderness of frontal/ethmoidal/maxillary

II. EXAMINATION OF EARS :

1. Pinna
2. External auditory canal
3. Tympanic membrane

III. EXAMINATION OF THROAT:

1. Oral cavity:
2. Oropharynx:
3. I.D.L. Examination:

IV. NECK EXAMINATION:

V. SYSTEMIC EXAMINATION

RS :

CVS :

CNS :

PER ABDOMEN :

INVESTIGATIONS :

1. Blood

Hb%: TC: DC: P: L: E: M:

BT: CT:

2. Urine routine: Albumin: Sugar: Micro scopy:

3. Radiology: X-ray paranasal sinuses:

Chest X-ray:

4. ECG:
5. Diagnostic nasal endoscopy:

PROVISIONAL DIAGNOSIS:

FINAL DIAGNOSIS:

SURGERY UNDERWENT:

Conventional/endoscopic

Date :

G.A./L.A.

Surgeon's Remarks :

POST-OP FOLLOW UP: **1st** **2nd** **3rd**

Date :

1. Complaints:

a. Nasal obstruction:

b. Nasal discharge:

c. Headache:

d. Bleeding per nose:

e. Cold spatula test:

2. Endoscopic assessment :

3. Complications:

KEY TO MASTER CHART

DOS	:	Duration of surgery
NO	:	Nasal obstruction
ND	:	Nasal discharge
HD	:	Headache
BN	:	Bleeding per nose
DNS	:	Deviated nasal septum
HIT	:	Hypertrophied inferior turbinate
CST	:	Cold spatula test
PND	:	Persistent nasal deformity
IOC	:	Intra-operative complication
MT	:	Mucosal tear
SE	:	Synechiae
SP	:	Septal perforation
SH	:	Septal haematoma
DP	:	Dental pain
PNO	:	Persistent nasal obstruction
Y	:	Yes
N	:	No
+	:	Present
D	:	Decreased

ANNEXURE II : MASTER CHART

Endoscopic Septoplasty																											
Sl. No	**Name**	**Age**	**Sex**	**DOS (min)**	**Hosp. no**	**Symptoms**					**Signs**			**X ray**	**Procedure**	**Subjective**				**Objective**		**I0C**	**Complications**				
						NO	**DNO**	**ND**	**HD**	**BN**	**DNS**	**Spur**	**HIT**			**NO**	**ND**	**HD**	**BN**	**CST**	**PSD**	**MT**	**SE**	**SP**	**SH**	**DP**	**PNO**
1	Chandrashekar	29	M	55	552533	Y	2Y	-	Y	-	L	+	+	-	E.S.	N	-	N	-	-	-	-	-	-	-	-	-
2	Nagaraj	22	M	60	561062	Y	2Y	Y	Y	-	L	+	+	-	E.S.	N	N	N	-	-	-	-	-	-	-	-	-
3	Jai Jagadish	29	M	45	578868	Y	1Y	-	Y	-	L	+	-	+	E.S.	N	-	N	-	-	-	-	-	-	-	-	-
4	Gauramma	35	F	50	584504	Y	2Y	-	-	-	L	-	+	-	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
5	Sukanya	36	F	50	588648	Y	1Y 4M	-	Y	-	L	+	-	-	E.S.	N	-	N	-	-	-	-	-	-	-	-	-
6	Manjul	26	F	65	588482	Y	1Y	-	Y	Y	R	+	-	+	E.S.	N	-	N	N	-	-	-	-	-	-	-	-
7	Muniraju	36	M	50	591852	Y	1Y 6M	Y	Y	-	R	+	+	-	E.S.	N	N	N	-	-	-	-	-	-	-	-	-
8	Iqbal Pasha	40	M	55	59806	Y	1Y	-	-	-	R	+	+	+	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
9	Karthik Babu	19	M	45	607115	Y	1Y 3M	-	Y	-	R	-	-	-	E.S.	N	-	N	-	-	-	-	-	-	-	-	-
10	Arbaz Pasha	21	M	50	613819	Y	1Y	-	Y	-	R	+	+	+	E.S.	N	-	N	-	-	-	+	-	-	-	-	-
11	Naveen Kumar	25	M	55	652597	Y	1Y	-	-	-	L	-	-	-	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
12	Narayanappa	45	M	55	664778	Y	6M	-	Y	Y	R	+	+	+	E.S.	N	-	N	N	-	-	-	-	-	-	-	+
13	Ayesha	18	F	50	664527	Y	1Y	-	-	-	R	+	+	-	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
14	Navyashree	22	F	60	692006	Y	6M	Y	Y	-	L	+	+	+	E.S.	N	N	Y	-	-	+	-	-	-	-	-	-
15	Abdul Mallik	19	M	65	697632	Y	1Y 2M	-	-	-	R	+	-	-	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
16	Induja K	20	F	45	701255	Y	6M	-	Y	Y	L	-	+	-	E.S.	N	-	N	N	-	-	-	-	-	-	-	-
17	Manjunath	21	M	65	672650	Y	1Y	-	-	-	R	+	-	-	E.S.	N	-	-	-	-	-	-	+	-	-	-	-
18	Sujatha	26	F	60	651260	Y	3Y	-	-	-	R	-	+	-	E.S.	N	-	-	-	-	-	-	-	-	-	-	-
19	Abida	28	F	45	679227	Y	1Y	-	Y	-	L	+	+	-	E.S.	N	-	N	-	-	-	-	-	-	-	-	-
20	Nagaraj	35	M	50	702073	Y	1Y	-	-	-	L	-	+	+	E.S.	N	-	-	-	-	-	-	-	-	-	-	-

21	Santosh MM	19	M	55	704683	Y	4M	-	Y	-	L	-	-	-	E.S.	N	-	N	-	-	-	-	-	-	-	-
22	Umme Salma	24	F	50	687987	Y	2Y	Y	-	-	R	+	+	-	E.S.	N	N	-	-	-	-	-	-	-	-	-
23	Channa Nanjappa	38	M	60	716138	Y	10M	-	-	-	L	+	+	+	E.S.	Y	-	-	-	-	-	-	-	-	-	-
24	Bhargav Vishnu	20	M	60	657666	Y	1Y	-	Y	-	L	-	-	-	E.S.	N	-	N	-	-	-	-	-	-	-	-
25	Susheelamma	45	F	45	728169	Y	2Y	-	Y	-	L	-	-	+	E.S.	N	-	N	-	-	-	-	-	-	-	-
26	Amaravathi	32	F	50	719301	Y	1Y 6M	-	-	-	L	+	+	-	E.S.	N	-	-	-	-	-	-	-	-	-	-
27	Savithramma	30	F	55	728410	Y	6M	-	-	Y	L	+	-	-	E.S.	N	-	-	N	-	-	-	-	-	-	-
28	Ashwini	30	F	45	641974	Y	2Y	-	-	-	R	-	+	+	E.S.	N	-	-	-	-	-	-	-	-	-	-
29	Nagarathnamma	25	F	50	643230	Y	1Y	-	Y	-	R	+	-	-	E.S.	N	-	N	-	-	-	-	-	-	-	-
30	Komal	25	F	65	728311	Y	6M	-	Y	-	L	+	+	-	E.S.	N	-	N	-	-	-	-	-	-	-	-

Endoscopic Septoplasty																											
Sl. No	**Name**	**Age**	**Sex**	**DOS (min)**	**Hosp. no**	**Symptoms**					**Signs**			**X ray**	**Procedure**	**Subjective**				**Objective**		**I0C**	**Complications**				
						NO	**DNO**	**ND**	**HD**	**BN**	**DNS**	**Spur**	**HIT**			**NO**	**ND**	**HD**	**BN**	**CST**	**PSD**	**MT**	**SE**	**SP**	**SH**	**DP**	**PNO**
1	Narayanaswamy	35	M	45	572962	+	1Y	+	-	-	R	+	+	+	C.S.	N	N	-	-	-	-	-	-	-	-	-	-
2	Anand	19	M	40	516755	+	1Y	-	+	-	R	+	-	+	C.S.	N	-	N	-	-	-	-	-	-	-	-	-
3	Rani N	30	F	35	567788	+	6M	+	-	-	L	-	+	-	C.S.	N	N	-	-	-	-	-	-	-	-	-	_
4	Nirmala	25	F	50	585628	+	10M	-	+	-	R	+	-	+	C.S.	N	-	Y	-	-	-	-	-	-	-	-	-
5	Babu Jhan	24	M	55	585326	+	1Y	-	+	-	L	+	+	+	C.S.	Y	-	N	-	+	+	-	-	-	-	-	-
6	Sumithra	20	F	40	594664	+	1Y	+	-	-	R	+	-	+	C.S.	N	N	-	-	-	-	-	-	-	-	-	-
7	Iliaz Pasha	36	M	35	566854	+	1Y, 3M	-	+	-	L	-	+	-	C.S.	Y	-	N	-	+	+	+	+	-	-	-	+
8	Srinivasappa	39	M	30	597144	+	2Y	-	-	-	R	-	+	+	C.S.	N	-	-	-	-	-	-	-	-	-	-	-
9	Anitha G	20	F	35	569596	+	1Y	+	+	-	L	+	-	-	C.S.	Y	N	Y	-	+	+	-	+	-	-	-	+
10	Naveen Kumar	24	M	40	642819	+	8M	+	+	-	L	+	+	+	C.S.	N	N	N	-	-	-	-	-	-	-	+	-
11	Chinna Papamma	45	F	45	645024	+	1Y 1M	-	+	+	L	-	-	-	C.S.	Y	-	N	N	+	+	-	-	-	-	-	-
12	Haridas	50	M	30	627143	+	1Y	-	+	-	R	+	+	+	C.S.	N	-	Y	-	-	-	-	+	-	-	-	+
13	Papanna	40	M	35	609433	+	1Y	+	+	-	L	+	+	+	C.S.	Y	N	N	-	+	+	-	-	-	-	-	-
14	Gangadhar	35	M	35	653304	+	1Y 6M	-	+	-	L	-	+	+	C.S.	N	-	N	-	-	-	-	-	-	-	-	-
15	Bhavya	20	F	45	679732	+	1Y 6M	+	-	-	L	+	-	-	C.S.	N	N	-	-	-	-	-	-	-	-	-	-
16	Rehana	19	F	45	673430	+	4M	-	-	-	R	+	+	-	C.S.	N	-	-	-	-	-	+	+	-	-	-	+
17	Venkatram Reddy	29	M	50	660825	+	1Y	-	+	-	R	-	+	-	C.S.	Y	-	N	-	+	+	-	-	-	-	-	-
18	Monish	24	M	35	654214	+	6M	-	+	-	R	+	-	+	C.S.	N	-	N	-	-	-	-	-	-	-	-	-

19	Lakshmi	27	F	45	685315	+	9M	-	-	-	R	-	-	-	C.S.	N	-	-	-	-	-	-	-	-	-	-	-
20	Malar	40	F	55	711238	+	1Y 3M	-	+	-	R	+	-	_	C.S.	N	-	Y	-	-	-	-	-	-	-	-	-
21	Ananda K	29	M	35	712343	+	1Y	+	-	-	R	+	-	+	C.S.	N	N	-	-	-	-	+	+	-	-	-	+
22	Srinivas	36	M	45	646942	+	1Y	-	-	-	L	+	+	-	C.S.	Y	-	-	-	-	+	-	-	-	-	-	-
23	Sashikumar	28	M	30	716530	+	1Y 3M	-	+	+	R	-	-	-	C.S.	N	-	N	N	-	-	-	+	-	-	-	+
24	Anila	25	F	35	716944	+	6M	-	-	-	L	+	-	-	C.S.	N	-	-	-	-	-	-	-	-	-	-	-
25	Amar Ahmed	42	M	35	678758	+	2Y	-	+	-	R	+	+	+	C.S.	Y	-	Y	-	-	+	+	+	-	-	-	+
26	Moheena	21	F	30	733407	+	1Y	-	-	-	L	-	+	-	C.S.	N	-	-	-	-	-	-	-	-	-	-	-
27	Chandrakanth	20	M	40	661982	+	2Y	-	-	-	L	+	-	-	C.S.	N	-	-	-	-	-	-	+	-	-	-	+
28	Ashwath Lakshmi	29	F	45	661383	+	6M	-	+	-	R	-	+	-	C.S.	N	-	N	-	-	-	+	+	-	-	-	-
29	Devika	22	F	50	597421	+	1Y	-	-	-	L	-	-	-	C.S.	N	-	-	-	-	-	-	-	-	-	-	-
30	Karthik	22	M	40	611068	+	1Y	-	-	-	R	+	+	-	C.S.	N	-	-	-	-	-	-	-	-	-	-	-