

AESTHETIC RECONSTRUCTION OF THE NOSE

*Dissertation submitted in partial fulfillment of the
requirements for the degree of*

M.Ch.(Plastic and Reconstructive Surgery)

Branch III

AUGUST-2012.



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

CHENNAI.

TAMILNADU.

CERTIFICATE

This is to certify that the dissertation entitled '**AESTHETIC RECONSTRUCTION OF THE NOSE**' submitted by **DR.RAMANI.C.V.**, in partial fulfillment of the requirements for the award of the degree of M.Ch in Plastic Surgery by the Tamilnadu Dr.M.G.R. Medical University, Chennai is a bonafide record of the work done by him in the Department of Plastic Surgery, Madras Medical College, during the academic year 2009 - 2012.

Dr.V. KANAGASABAI, M.D.
DEAN
MADRAS MEDICAL COLLEGE &
GOVT. GENERAL HOSPITAL
CHENNAI- 600 003.

Dr.R.ANAND SUBRAMANIAM, M.Ch.
PROFESSOR AND HEAD
DEPARTMENT OF PLASTIC &
RECONSTRUCTIVE SURGERY. MMC,
CHENNAI.

DECLARATION

I solemnly declare that the dissertation titled "*AESTHETIC RECONSTRUCTION OF THE NOSE*", has been prepared by me in the Department of Plastic and Reconstructive Surgery, Rajiv Gandhi Government General Hospital & Madras Medical College, Chennai.

This is submitted to The Tamilnadu DR.M.G.R MEDICAL UNIVERSITY, Chennai, in partial fulfillment of the requirements for the Examination to be held in AUGUST-2012, for the award of MCh degree in Plastic and Reconstructive Surgery.

Date:

Chennai.

ACKNOWLEDGEMENT

I gratefully acknowledge and sincerely thank The Dean, Madras Medical College, Chennai, for granting me permission to utilize the facilities of the institution for my study.

I am extremely grateful to retired **Prof.K.V.Alalasundaram M.S,M.Ch.**, for his guidance and support.

I am extremely grateful to my teacher and guide **Prof .Anand Subramaniam.R M.S.,MCh, FICS** Professor and Head of the Department of Plastic and Reconstructive and Faciomaxillary Surgery, Madras Medical College, Chennai, who helped me in all stages of my study. I am thankful to him for his timely suggestions, unending patience, constant encouragement and scholarly guidance.

I also thank **Prof R. Gopinath M.S.,M.Ch.**, and **Prof Udhesh Ganapathy M.S,M.Ch.**, for their support.

I express my sincere gratitude to Dr.Ramadevi.V M.S,M.Ch., Dr.Saravanan.K, M.S, M.Ch., Dr.Sreedevi.S, M.S,M.Ch., Dr.Boopathy.K, M.S,M.Ch., Dr.T.M.

Balakrishnan, M.S,M.Ch.DNB , Dr.Selvakumar,C. M.S,M.Ch., for their sustained encouragement in my work and study.

Last but not the least , I thank all my patients , without their help and co-Operation this study would not have been possible.

CONTENTS

1. Introduction	01.
2. Aim of the Study	02.
3. Review of Literature	03-62.
4. Material and Methods	63-67.
5. Results	68.
6. Discussion	69-71.
7. Conclusion	72-73.
8. Bibliography	
<i>Appendix</i>	
<i>-Proforma</i>	
<i>-Master Chart</i>	

INTRODUCTION

Occupying the most prominent position on the face, the nose has been the source of well known sayings “plain as a nose in a man’s face”. The central location and projection not only emphasize its aesthetic importance but also contribute to its frequent injury.

The loss of each layer of the nose may be due to congenital, traumatic, infection or neoplasm and in the reconstruction each layer must be replaced.

Reconstruction of the nose is one of the oldest form of facial reconstructive surgery, its complexity continue to challenge facial reconstructive surgeons.

The nose to appear normal must have the proper dimensions, position and symmetry. Adequate osseocartilaginous support ,internal nasal lining and the soft tissue cover are the requirements for re-establishing a functional airway.

The external skin cover should be of similar colour and texture as the facial skin.

Thoughtful consideration of the patient, the wound and the available donor materials help to identify the most appropriate treatment.

AIM OF THE STUDY

To study the various techniques used in the reconstruction of defects of the nose and evaluate each technique.

REVIEW OF LITERATURE

HISTORY OF RECONSTRUCTION OF THE NOSE

The history of nose reconstruction begins with the history of plastic and reconstructive surgery.

Rhinoplasties have been performed in India since vedic times (circa 3000 BC) Sushruta Samhita (600 BC) ¹ reconstructed the nose with cheek flaps but did not provide lining. Vagbat realized the importance of lining and emphasized this in his writings. The first written account in English of the Indian midline forehead rhinoplasty appeared in the Madras gazette ,a Maratha surgeon belonging to Kumbhars reconstructed the nose with the forehead flap. In 1794 the account was later reproduced in London's Gentlemen's Magazine.

Tagliacozzi in the late sixteenth century perfected the technique of arm rhinoplasty known as the Italian method. In 1875, James Hardie used decorticated little finger for nasal support Composite grafts were described in Germany in 1877 by Koenig. In 1896, James Israel used bone graft from tibia as well as ulna for nasal support.

Many types of forehead flaps have been used successfully. Gilles developed the up and down flap in an effort to increase the length of the flap. The Scalping forehead flap (Converse 1942) represents an extension of the up and down flap. Washio described the retro auricular flap.

Cheek flaps were introduced by Dieffenbach and Sédillot. Dieffenbach was dissatisfied with the results of the cheek flaps he employed; in his later communication on nasal reconstruction Sédillot did not mention the cheek flap he introduced because they subsequently underwent contraction, as none of them was lined with epithelium.

In 1864 Boussion described the repair of an alar defect using a small flap turned in for lining and a large flap for cover, the latter one being a linear sliding flap pulling the nose toward the cheek.

Dufourmentel and De Cholnoky described a procedure that used one flap to provide both cover and lining. Following the principle of Nélaton, who took an unlined vertical sliding flap from the side of the nose, Dufourmentel and De Cholnoky extended the flap downward into the cheek so that its distal end is long enough to be turned into the nostril for lining. The flap successfully applied in 50 to 60 year old patients who had flabby skin at the nasolabial fold. Barron and Emmet' have provided another example of a folded flap that is cut as an island flap from the nasolabial sulcus on a subcutaneous pedicle. The lower half of the flap is turned inward to provide the lining. Pers described a nasolabial flap with only a 1 cm wide pedicle of subcutaneous tissue based at the margin of the pyriform aperture. This was turned and folded on itself to reconstruct the

cartilaginous parts of the nose on one side. Herbert modified this medially based nasolabial flap without interfering with the blood supply, by reducing the thickness of the subcutaneous flap to 0.5 cm to enhance the mobility of the flap.

Furthermore, he replaced the cheek rotation flap that was used by Pers to close the secondary defect with a subcutaneous pedicled nasolabial island flap as advocated by Barron.

Fujino reported a retro auricular free flap based on a branch of the posterior auricular vessel. Auchauer reported two cases of nasal reconstruction using the dorsalis pedis free flap. Ohmori reported a case of total nasal reconstruction with a dorsalis pedis flap that included part of the second metatarsal. Forearm free flap was developed by the Chinese surgeons Dr.K.F.Yang and used by Dr. R.Y.Xia. In 1976 Erol described experimental transfer of the temporalis fascia with a skin graft on top as a potential thin free flap.

Walter C. in 1975 suggested tumor excision and coverage of the raw surface with split grafts in order to inspect the area for several months for any recurrence and the delayed reconstruction with adjacent or distant flaps.

Mouly R, Papadopoulos O. in 1980³, suggested local flaps using the excess skin at the root of the nose (glabellar flap) or from the cheek (nasogenial flap)² give excellent results.

During World War I ,Capt H.D.Gillies⁴ of England defined principles that still guide the use of flaps and grafts for nasal reconstruction. His book, *Plastic Surgery of the Face*, condensed the field into a number of well-defined rules. These Principles of lasting importance to reconstructive surgeons, were published in the Classic 1957 volume *The Principles and Art of Plastic Surgery*.

Here are a few significant examples:

- Diagnose before you treat.
- Put the normal parts in their normal positions and retain them there.
- Make a plan and a pattern for your plan.
- Never throw anything away (unless you are sure you do not need it)
- Replace missing tissues in kind.
- Focus on the recipient site. Do not become pre-occupied with the donor Site.
- Never do anything today that you can honourably put off until tomorrow.
- Have a “lifeboat”.

ANATOMY AND PHYSIOLOGY

The nose is the first part of the upper respiratory tract, and is responsible for warming, humidifying, and to some extent, filtering the inspired air. It also houses the olfactory epithelium. It is subdivided into an external nose, which opens anteriorly onto the face- the nares, and an internal chamber, divided sagittally by a septum into right and left cavities which open posteriorly into the nasopharynx through the posterior nasal apertures or choanae.

The shape of the external nose varies considerably between individuals. The nose is shaped as a pyramid. It is an osteocartilaginous structure, covered with soft tissues that include skin, subcutaneous tissue, muscle and epithelium.

The nose can be divided into three components: the bony vault (frontal process of maxilla and nasal bones), the upper cartilaginous vault (upper lateral cartilages) and the lower cartilaginous vault (medial and lateral crura, alar lobules, alae, nostril vestibules and sills, columella, and membranous septum).

SKIN AND SOFT TISSUE

The skin and soft tissue covering the dorsum of the nose is usually thin especially at the osseo-cartilaginous junction, and loosely connected to the nasal aponeurosis and the muscle fibres that fan out within it. Over the tip the skin is often thicker in men and has numerous large sebaceous glands but this varies considerably. At the tip, the skin of the nose is tightly bound to the alar cartilages and nasal bones. The arteries and veins are situated in the soft tissues; the plane of dissection in nasal operations should be close to osseo-cartilaginous framework to avoid injury to the vessels and unnecessary bleeding.

ESSENTIAL EXTERNAL LANDMARKS OF NOSE:

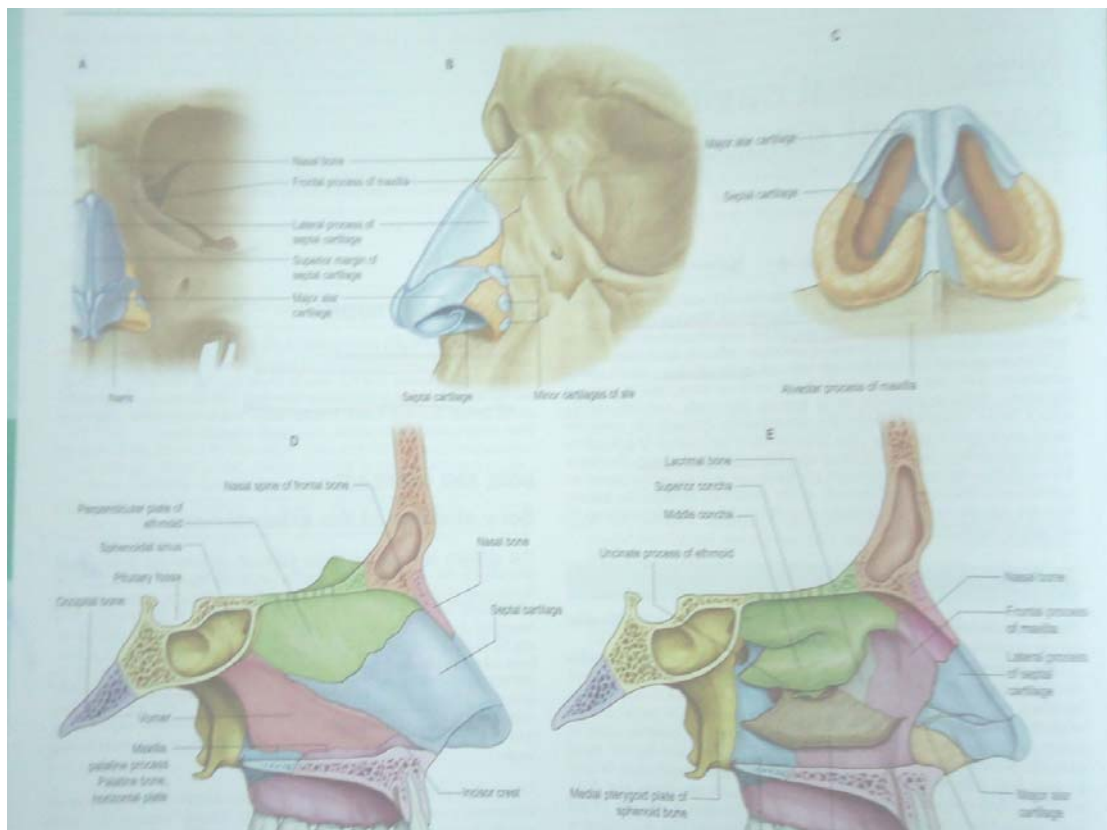
The dorsum or bridge of the nose is formed in part by the bony nose and in part by the cartilaginous nose. The naso frontal angle is the area where the nose joins the forehead, the radix or root of the nose.

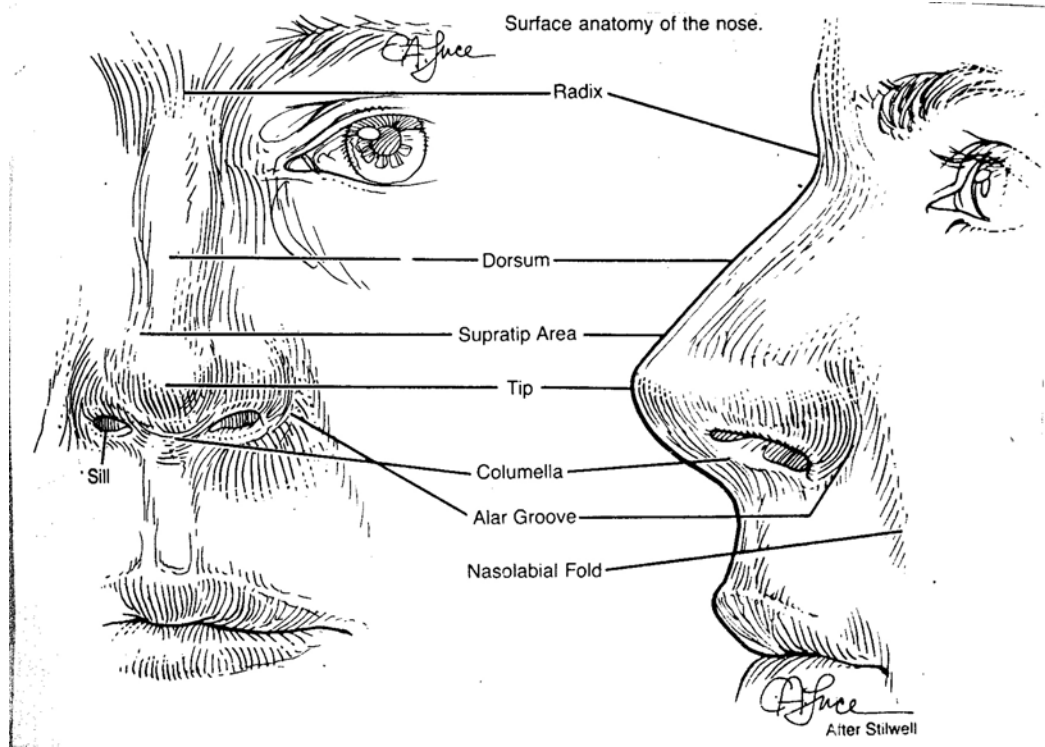
Above the tip of the nose is the supra tip area⁶. This area usually overlies the septal angle of the quadrangular cartilage of the septum. The septal angle is a convenient term for the angle formed by the caudal and dorsal borders of the septal cartilage.

The tip of the nose is formed by the junction of the two alae of the nose. The lobule is a descriptive term for the lower mobile part of the nose: tip, alae, columella and membranous septum.

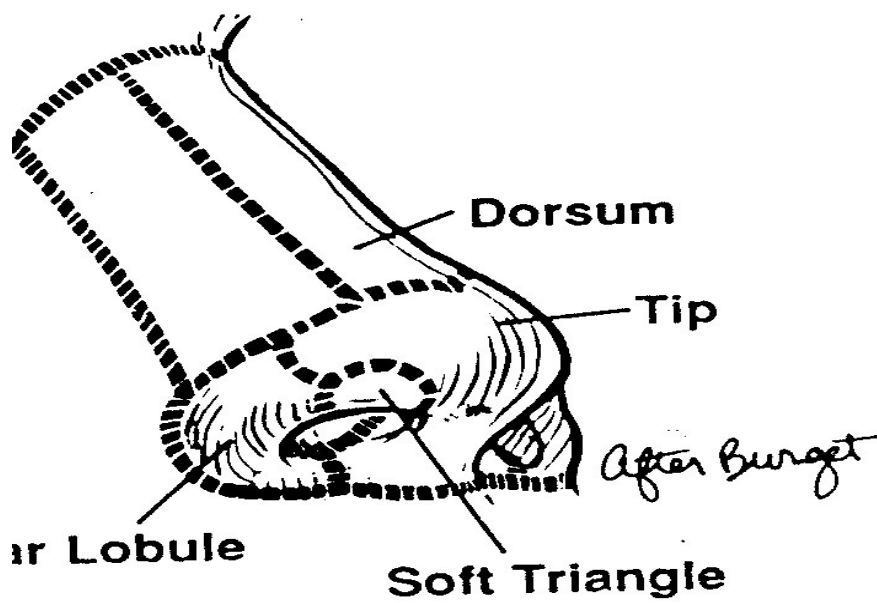
The base or caudal portion of the nasal pyramid is formed by nostrils and the columella. The nostrils are point of entry of air into the nose. The sills are the floors of the nostrils. The junction of the base of the columella with the upper lip defines the nasolabial angle. The tip-columellar angle is formed by the intersection of the surface plane of the columella with that of the lip.

Other essential landmarks of the external nose include the alar groove, which is at the junction of the ala with the cheek and which in its mid portion meets the naso-labial fold.





Esthetic subunits of the nose.

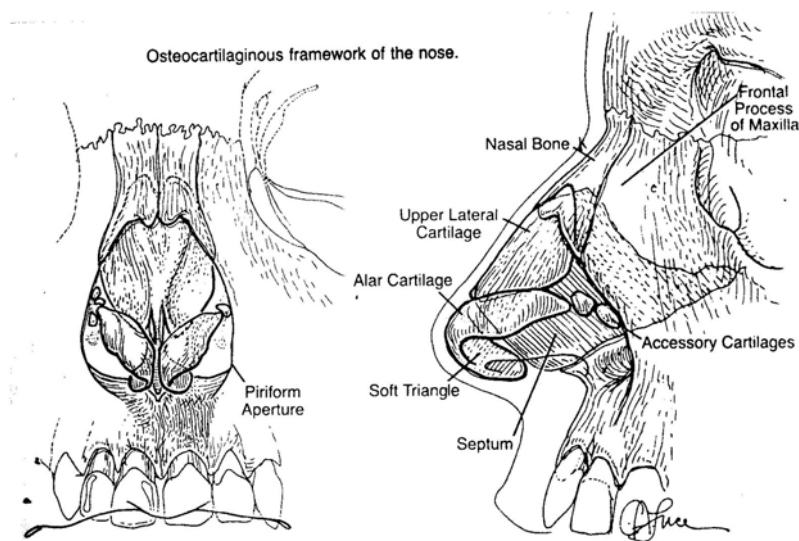


BONY STRUCTURES OF NOSE

The piriform aperture has sharp edges. It is bounded below and laterally by the maxilla and above by the nasal bones. The bony nasal septum articulates with the undersurface of the nasal bones and provide support to the dorsum of the nose.

The bony portion of the nose is formed by the paired nasal bones; these are joined in the midline and are supported superiorly by the nasal spine of the frontal bone. The osseous lateral walls of the nose are formed by the nasal bones and frontal process of the maxilla.

The nasal bones are quadrangular, thick and narrow above and thin and wide below. The frontal process of the maxilla is a plate of bone, thick below and thinner above, which projects upward and medially from the body of the maxilla⁷.



CARTILAGINOUS SKELETON OF THE EXTERNAL NOSE

The cartilaginous framework consists of the paired lateral and major cartilages and several minor alar nasal cartilages.

LATERAL(UPPER LATERAL) CARTILAGES.

It is triangular, and its anterior margin is thicker than the posterior margin. The upper part is continuous with the septal, but anteroinferiorly it may be separated from it by a narrow fissure. The superior margin of the upper lateral cartilage is attached to the nasal bone and frontal process of the maxilla and inferior margin is connected by fibrous tissue to the lateral crus of the alar cartilage. The lower margin diverges from the septum and constitutes the internal nasal valve.

ALAR CARTILAGE(LOWER LATERAL CARTILAGE)

The alar cartilage is thin flexible plate. It lies below the upper lateral cartilage and curves acutely around the anterior part of its naris. The medial part, the narrow medial crus (septal process), is loosely connected by fibrous tissue to its contralateral counterpart and to the anteroinferior part of the septal cartilage. The lateral crus lies lateral to the naris and runs superolaterally away from the margin of the nasal ala. The upper border of the lateral crus of the major alar

cartilage is attached by fibrous tissue to the lower border of the lateral nasal cartilage. Its lateral border is connected to the frontal process of the maxilla by tough fibrous membrane containing three or four minor alar cartilages. The junction between the lateral crura of the major alar and lateral cartilages is variable: the two edges may abut or overlap, in which case the lateral crus is then the more lateral at the junction. The lateral crus of the alar cartilage is shorter than the lateral margin of the naris and runs away from the margin of the ala nasi. The lateral part of the margin of the ala nasi fibroadipose tissue is covered by skin. In front, the angulations or domes between the medial and lateral crurae are separated by a notch palpable at the tip of the nose.

ACCESSORY CARTILAGES OF NOSE

The term sesamoid may be applied to the minuscule cartilages between the lateral and alar cartilages and also the small cartilages in the supero-lateral portion of the ala. The term accessory cartilages is suggested to designate the larger cartilages that join the lateral crus to the edge of the piriform aperture through the continuity of perichondrium of these structures.

NOSTRIL BORDER:

The border of the nostril is supported by the dense collagenous tissue arranged in resilient longitudinal bundles.

SOFT TRIANGLE:

The dome is separated from the margin of the nostril by a triangular shaped area known as the soft triangle, It consists of two juxtaposed layers of skin, the covering skin of the nose and the vestibular skin, separated by loose areolar tissue.

WEAK TRIANGLE:

The lateral crura of the alar cartilages diverge in the supratip area, leaving a triangular shaped area between them into which the septal angle is fitted.

COLUMELLA:

The columella extends from the tip of the nose to the lip, joining the lip at the upper portions of the philtrum and separating the external nares. The contour of the columella depends largely on the shape and degree of divergence of alar cartilages. The columella is penetrated by the paired depressor septi nasi muscles, which arise from the incisive fossae of the maxilla.

VESTIBULE:

The vestibule forms the caudal portion of the floor of the nose and extends under the dome of the alar cartilages.

NASAL SEPTUM AND SEPTAL CARTILAGES:

It is a midline structure composed of bony and cartilaginous constituents: the four bony components of the osseous septum (the perpendicular plate of the ethmoid, the vomer, the nasal crest of the palatine bone) and the septal cartilage.

The septal cartilage has a posterior extension into the ethmoid plate. The septal cartilage is a quadrangular lamina that forms the major portion of the framework of the caudal portion of the septum.

The caudal margin of the septal cartilage is separated from the columella (and medial crura) by the juxtaposition of two mucocutaneous flaps that forms the membranous septum.

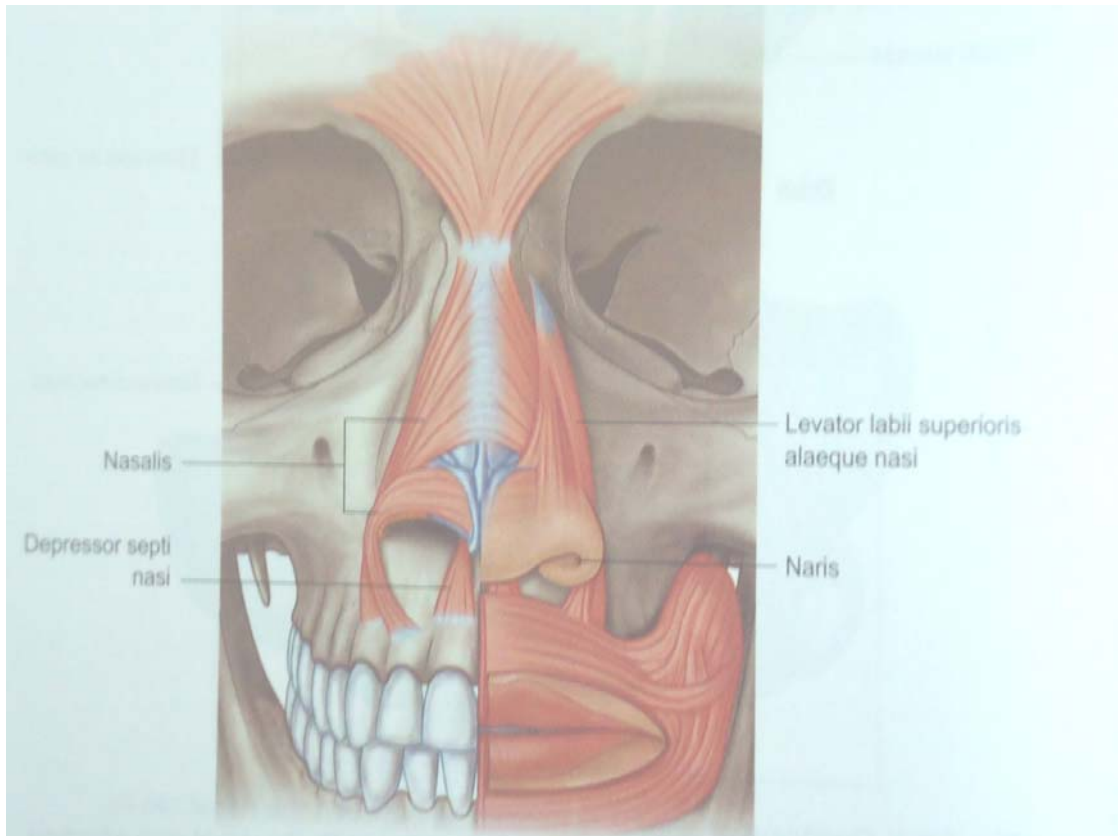
TURBINATES

There are three pairs of turbinates : the superior, middle and inferior. The superior is ethmoidal in origin and located beneath the cribriform plate. Partially covered by olfactory epithelium and more yellow in color; it has few mucous glands or cavernous sinuses. It is not involved in nasal respiration. The middle turbinate, ethmoidal in origin

overlies the maxillary ostium. While it secretes mucus, it has little effect on nasal respiration.

Because of its size and rich supply of cavernous sinuses, the inferior turbinate plays a major role in regulating the nasal airway.

MUSCLES OF THE NOSE:



Levator labii superioris alaeque nasi

Nasalis- transverse part and alar part

Depressor septi nasi

Procerus

Dilator naris

Compressor naris.

AESTHETICS OF NOSE

When one looks at the nose, one does not observe it in isolation. Intuitively it is related in the observers eye to the forehead, the brow or supra-orbital rims, the medial canthi, the eyes or orbits, the maxilla or “platform” of the nose, the lips and the chin. The stature or height of the patient must also be considered.

The topography of the face is characterized by a series of inter-connecting lines and curves often defined by the underlying craniofacial skeleton ⁷. As emphasized by Sheen, the nose should flow naturally into these lines and curves. There is a natural, un-interrupted curve from the brow to the lateral aspect of the nose. It is defined by the supra-orbital rim, the frontal process of the maxilla, and the medial canthi. These relationships should be preserved with rhinoplasty techniques.

The nose is narrow at its root, then becomes broader, showing a gentle convexity in the region of the hump to narrow again immediately above the tip of the nose. The dorsum of the nose should be adequate in width and height to prevent a hypertelorlic appearance between the eyes; the lower the dorsum, the wider apart the eyes appear. The tip of the nose should be differentiated from the remainder of the nose and be well

defined ,the base of the nose is in the shape of a rounded triangle, and the nares are tear shaped.

The projection of the supraorbital also varies in individuals ,and with recession of the rim ,a normal-sized nose appears large.The nose also relates to the maxilla and the underlying bony skeleton defines soft tissue contours.

The tip is the most subtle component of the nose and in many ways is responsible for its elegance and definition. The tip can also be the bane of the surgeon since it integrates the dorsum, the columella, domes, and nostrils.

Sheen (1978) described four essential landmarks of the refined tip.

1. Lateral projection of the left dome.
2. Lateral projection of the right dome.
3. Point of tip differentiation from the dorsum.
- 4.Columellar –lobular junction.

These points form two triangles with a common base, the intercrural distance. In ideal, three light reflexes should be apparent on the nasal tip- the two domes and the central arch that joins them. The columella should be 2-3mm lower than and parallel to the alar rims.

PHYSIOLOGY

The vestibules filter the air through their lining, which contains mucus secreting glands and vibrissae, entrapping foreign bodies and conditioning the temperature of air currents before the passage through the nasal valve. The air currents are further moistened by the secretions of the pseudostratified, ciliated, columnar epithelium of the nasal cavity. The most important function of the nose is to supply an adequate flow of properly conditioned air to the lungs. The nose has other functions: olfaction, filtration, and humidification of inspired air, the ability to clean itself and phonation. The nasal cycle is characterized by unilateral nasal obstruction at any given moment an alternating congestion and decongestion of the turbinates on each side.

ANATOMIC FACTORS INFLUENCING NASAL VENTILATION

NOSTRILS AND VESTIBULE:

The nasal tip and nostrils play a major role in nasal air flow and resistance. Excessively narrow nostrils impair air flow, as do dislocated and recessed tips.

The alar cartilages are subjected to movements by the nasal musculature and play an important role in nasal physiology.

INTERNAL VALVE

The internal valve or ostium internum is narrowed on deep inspiration. With the change in contour of the internal valve, airway resistance is increased and air flow patterns are modified. On expiration, airway pressure becomes positive and the area of the internal valve is widened.

With disruption of the internal valve and loss of the structural integrity of the lower cartilaginous vault, inspiratory effort is characterized by alar collapse or severe narrowing of the nostrils.

Septal deviations resulting from early childhood trauma show a developmental increase with growth and often cause deviation of the external nose. Septal fractures also occur as a result of injuries after nasal growth has been completed and are a common accompaniment of nasal bone fractures.

PRINCIPLES OF AESTHETIC RECONSTRUCTION

Flaps and grafts are only the beginning in nasal reconstruction. A single, large flap designed in two dimensions (length and width) will reconstruct a defect but will not restore the dimensions, proportion and contour of the nose, or face.

A two dimensional flap does not provide sufficient skin area to adequately form the nose and adjacent lip and cheek units. Furthermore, a single, large flap has just one center of contraction. Centripetal contraction will often obliterate the normal unit segmentation of the face⁸.

GENERAL GUIDELINES FOR RECONSTRUCTION OF THE NOSE

- *Use a model to design the nasal unit and its subunits.* Use the model in making measurements and patterns.
- *Make three-dimensional patterns for flaps.*
- *Place the new nose in its proper location on the face- raised, on a nasal platform.:* A new nose should sit on a nasal platform anterior to the maxilla and not extend beyond its normal unit borders^{9,10}.

- *Design flaps to cover entire nasal subunits or the whole nasal unit.* The convex subunits of the nose are tip,dorsum,alae,and columella.They have roughly geometric forms: the tip is hemisphere; the dorsum,a hemicylinder ;the ala ,a curved spindle; and the columella , a truncated cone.
- If more than 50% of a subunit is missing,the entire subunit should be replaced with a flap. A sheet of collagen exists beneath every flap. As collagen contracts , it pulls the flap centripetally into the convex shape of the subunit that it covers,a dome.,cylinder,spindle,or cone.Use the subunit principle for the convex subunits only, not for concave ones. It is not suitable for repair with skin graft which unlike flaps, do not bulge as they contract ^{11,12,13}.
- *Replace skin with donor skin of similar color, texture and thickness.*

ESTHETIC ZONES DIAGRAM.

SUBUNITS AND AESTHETIC ZONES



FIGURE 57-2. The nose possesses subunits of contour, zones of skin thickness and texture, and certain landmark highlights and shadows known collectively as tip definition.

A CHECKLIST BEFORE RECONSTRUCTION

Excise scarred tissues.

Return normal parts of the face and nose to their anatomically normal positions.

Make an airway lined with skin or mucosa.

Replace or overcorrect deep tissue volume loss.

Reconstruct the adjacent facial units.

Construct a platform, of skin fat to support the new nose .

Prepare lining flaps .

Design the forehead flap pattern from a model or from the contralateral normal side of the patient's nose.

If transverse forehead scars are present or the patient is a smoker, delay the forehead flap.

NASAL RECONSTRUCTION: THE OPERATIVE STAGES

OPERATIVE STAGE I

DETERMINING THE NASAL SITE.

The first step is to site the nose, that is ,to determine the proper location of the nasal unit on the face in relation to the eyes and upper lip. The pattern of the nasal sidewall is aligned with intercanthal line on the deformed side. The intended position of the alar groove and the lateral border of the nasal unit is then traced ^{14,15}.

ASSEMBLING THE LAYERS OF THE TISSUE

Nasal lining tissue options:

Lining an entire nose anterior to the maxilla requires a piece of skin approximately 8x9 cm.

Skin grafts as lining contract; therefore ,thin, soft flaps are a better choice. Inadequate lining is the most common cause of aesthetic and functional failure.

Gillies attributed the time-honoured turnover flaps for lining to Keegan¹⁶.

These small flaps of scarred skin or graft placed along the edge of a defect are turned over like the page of a book. They form a thin, stiff lining, and their length is limited by tenuous blood supply.

Nasolabial flaps were commonly used for nasal reconstructions. But is thick and not highly vascular.

A contralateral septal hinge flap was used first by de Quervain in 1902 and later by Kazanjian, Converse and Millard. It cannot reach the alar margin^{17,18}.

DONOR TISSUE FOR NASAL LINING

Defect

Alar margin defects <5mm	Fabricated composite graft of FTSG And cartilage strip.
>5mm	Bipedicled alar margin ribbon flap and c/l septal mucoperichondrial flap.
Large unilateral lining defect	Contralateral septal mucoperichondrial flap+ Skin backed by cartilage batten within Forehead flap.
Bilateral defects of the nasal tip	Septal pivot flap with bilateral wings Folded forehead flap (Menick's modification)
Subtotal and total lining defects	Two forehead flaps Multi-island microvascular free flaps.

CARTILAGE AND BONE GRAFT OPTIONS

The entire reconstructed nose must be braced by an internal lamina of cartilage and bone extending from the existing nasal bones above to the alar margins and columella below.

A nose so braced will maintain the dimensions and form given it on the operating table.

DONOR OPTION	CHARACTERISTICS
Septal Cartilage ¹⁸	Straight .strong and easily sharpened, short in supply.
Conchal cartilage	Its intrinsic curves lend it to alar batten .It is too Weak to support a scarred skin envelope.
Costal cartilage(6-9 th)	Plentiful,easy to carve and strong to five projection And length .Warping in <35 years age group ,so needs Balanced carving and soaking.
Costochondral graft (eighth rib)	In children used for septal and dorsum reconstruction.
Cranial bone grafts	Useful for restoring bony pyramid.
Iliac and costal bone	useful alternatives for bony pyramid and dorsum.

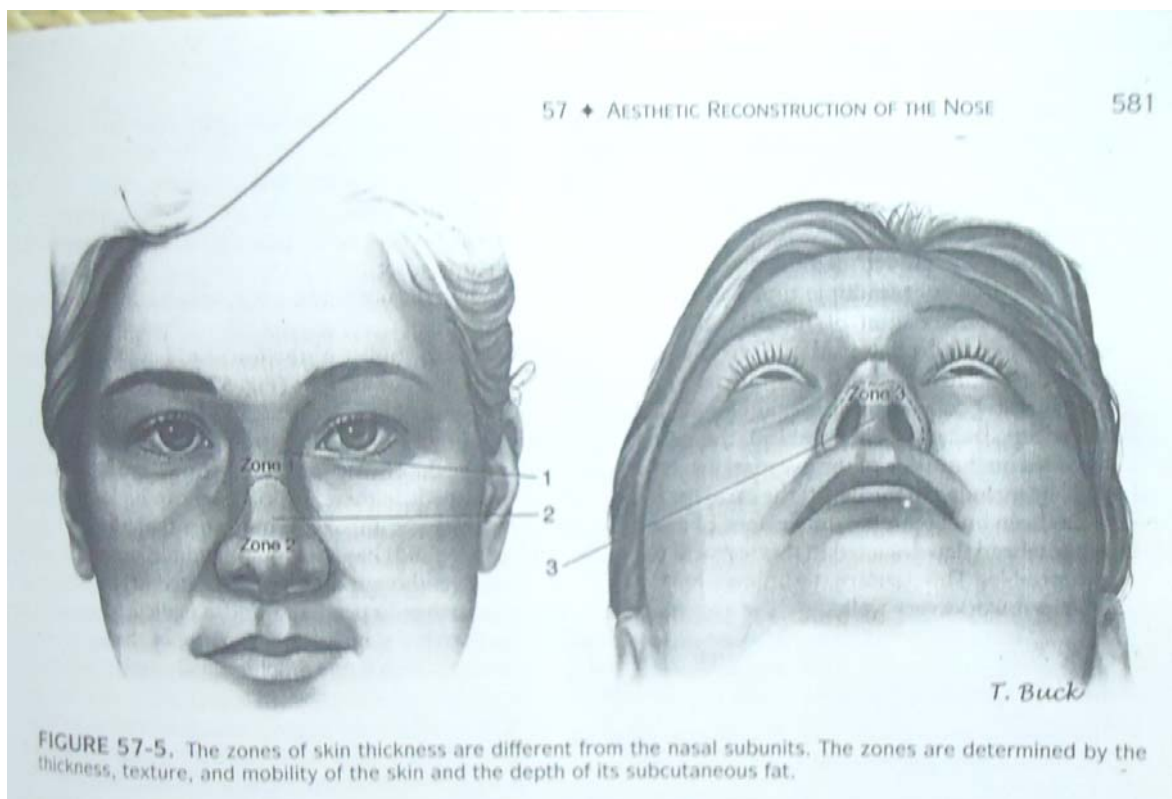
NASAL SKIN COVER OPTIONS

When the patient is young and the skin of the nose is normal, sebaceous and undamaged, the size and location of the defect dictate the choice of flap or graft. If the skin is damaged by irradiation or senile atrophy, almost any full thickness skin will blend with the thin, nonsebaceous skin. Donor skin is chosen for its color, texture, and thickness and for the quality of its subcutaneous fat. The size of the defect also limits donor choices. The nose has three zones of skin thickness, each with its own unique texture, subcutaneous fat, and sebaceous gland content.

Repair of nasal defects in zones 1 and 2 is a fairly straightforward aesthetic challenge. Composite grafts from the ear and preauricular full-thickness grafts blend well in these zones. Small local rotation and advancement flaps are successful in zone 1 because its skin is thin and soft¹⁹. In contrast, zone 2 poses a difficult aesthetic challenge. Most full-thickness skin grafts applied to zone 2 end up as shiny, pigmented, depressed areas in stark contrast to the thick, textured, pored skin of zone 2. Local flaps are difficult to move in zone 2 because the skin does not bend, twist or transpose easily. The skin tends to form large dog-ears or to strangulate from tension. The only skin donor sites that match zone 2 are remaining skin of zone 2

adjacent to the defect and forehead skin with its layer of dense subcutaneous fat. Aesthetic donor options for zone 2 are limited to local bilobed or V-Y advancement musculocutaneous flaps, or free full-thickness forehead skin graft, a paramedian forehead flap, or nasolabial flap²⁰. The last option is practical only for defects of the alar lobule and adjacent nasal sidewall.

ZONES OF SKIN DIAGRAM



AESTHETIC SKIN COVER OPTIONS

Small defect(<1.5 cm)	Aesthetic skin cover
Zone 1	Local flap, preauricular skin graft
Zone 2	Bilobed flap of Esser and Zitelli, Full-thickness forehead skin graft
Zone 3	Fabricated composite graft from ear Full-thickness skin graft,preauricular Or from root of helix.
Large defect (> 1.5.cm)	
Zone 1	Preauricular skin graft Forehead flap ^{21,22} .
Zone 2	Paramedian forehead flap Nasolabial flap, for alar lobule and adjacent Sidewall only.
Zone 3 (Loss of columella)	Nasolabial flap
Subtotal and total loss of	Paramedian forehead flap.
Nose	Scalp flap,delayed (black hair only) Microvascular free flap.

OPERATIVE STAGE 2

It is difficult to achieve a normal looking nose at the first operation. Dimensions may be inadvertently exaggerated or understated. A new approach was reported in 1989²³. The forehead flap was inset over the carefully constructed cartilage and bone framework with all of its layers together - skin, subcutaneous fat, and frontalis muscle. Only the distal 5-6mm of the flap was thinned. This masked the delicate contours of the framework and actually made the nose bulky; however, it allowed the performance of the intermediate flaying operation, a procedure carried out between the original reconstruction and division of the pedicle. Since that time, this three-stage approach has been a part of most nasal reconstructions. It allows secondary refinements, sculpting, detailing, and placement of supplementary cartilage grafts.

The intermediate flaying operation is done 3-4 weeks after initial nasal reconstruction. D. Ralph Millard developed the concept and in 1974 published a report, in which he performed the secondary refinement before dividing the pedicle. The nose is literally skinned or "flayed". The lateral scars of the forehead flap are excised as thin strips, leaving the distal end of the flap attached along the nostril margins or sometimes only in the region of the infratip lobule.

The flap is then elevated and thinned, but a 3-4- cm cushion of fat is left attached to the skin because this is the thickness of the normal subcutaneous fat in zone 2 .Although widespread thinning of the flap is risky at its initial elevation at this later intermediate stage, thinning is safe because blood flow has been greatly increased by the delay phenomenon and by the presence of a bipedicle blood supply. The flap is thinned with curved Joseph scissors²³. The flap bed is then sculpted with fine scissors until its surface has the normal contours of the nasal dorsum, sidewalls, supratip and alae.

When the subcutaneous bed has the right shape the thinned forehead flap is reattached with loosely tied quilting sutures of 5-0 polypropylene. The sutures discourage hematoma and cause the adherence by fibrin of the flap to its bed. For this purpose , the sutures are more reliable than a suction drain. This operation is performed with the patient under general anaesthesia to avoid the injection of epinephrine into the flap which blanches the flap, and it becomes difficult to judge the tension of the quilting sutures. Blanching of the skin by these sutures is warning of imminent necrosis,The quilting sutures remain in place only for 2 or 3 days, until the flap adheres to its bed. Polypropylene sutures are preferred they slide out easily without

causing pain. The nasal contour designed by these maneuvers is usually permanent.

The intermediate flaying operation is most useful for reconstruction of the central subunits of the nose- the tip and dorsum. Small defects less than 2.0 cm wide can be handled in two operative stages. The Menick technique is a new use of the intermediate flaying operation that permits development of a thin nasal lining from a folded forehead flap.

OPERATIVE STAGE 3

The stump of the pedicle should be replaced on the forehead only when inadequate eyebrow separation is imminent. In most cases, the stump should be discarded. Replaced on the forehead, the pedicle base usually requires secondary surgical improvement. If the forehead flap was designed with a 1- to 1.5cm base, the eyebrows will remain adequately separated.

The pedicle is divided, leaving enough skin above and below the point of division. The short stump of its base is thinned, with removal of old skin graft, frontalis muscle, and fat; it should be trimmed and fit into small inverted V-shaped defect made medial to the eyebrow. The distal portion of the pedicle is then elevated off the nasal defect for

1.5cm .With curved Joseph scissors , the pedicle is thinned of residual skin graft, scar, and some fat ,leaving an even 3-4mm cushion of fat on the flap.The nasal bed is contoured, and its edges are pared along subunit lines and wrinkle lines.

The nasal portion of the flap is anchored to its newly contoured bed with lightly tied quilting sutures .These sutures hold the flap to its bed, construct its surface contour, and prevent haematoma.

TIMING OF SURGICAL STAGES.

During the first 2 weeks after transfer, the attachment of the flap to the nose is weak. Any sudden , sharp movement by the surgeon might dislodge the flap.For this reason, it is advisable to wait at least 3 weeks between surgical stages,and 4-5 weeks for the frail or elderly. In general it is best to avoid returning to the same surgical field more than once every 3-4 months .The long biologic process of wound healing and scar maturation takes several months. Collagen contraction only begins 3 weeks after surgery. The surgeon should wait unit the surface scars soften, bleach ,and fade. Secondary refinement should not be attempted until 12- 16 weeks have passed. However, it is permissible to perform surgery in a separate surgical field after a shorer interval. For example, one could divide a forehead flap, wait 6 weeks, and then shape the columella and the alar margins.

CLINICAL CASE STUDIES

All cases of defects of the nose requiring reconstruction were included in the study. The study was prospective outcome analysis study.

The primary objective of the study was to analyze the various defects of the nose and to discuss the various aesthetic considerations in the reconstruction.

The proforma for the collection of data is presented. All the relevant details of the patient during preoperative, surgical, postoperative and follow up periods were collected and analyzed. Appropriate photographs were taken for documentation.

The patients were explained about the nature of the defect and the various options available. The proposed procedure was explained to the patient in detail including its merits and demerits and informed written consent was obtained from the patient. The proforma was submitted before the Institutional Ethical committee and approval obtained. The study did not incur any added expenditures for the patients or the department.

INCULSION CRITERIA

All patients with defects of the nose either congenital, traumatic, neoplastic and post burn / infective were included in the study.

EXCLUSION CRITERIA

Patients requiring surgery for deviated nose ,hump nose ,saddle nose or those requiring aesthetic rhinoplasty were excluded from the study.

PREOPERATIVE PREPARATION :

Patient preparation:

1. All patients were subjected to routine investigations for anesthetic fitness.
2. Preoperative Hemoglobin levels and Blood Grouping & Rh typing were routinely done.
3. Informed consent was obtained after explaining the nature of the surgery and the need for secondary surgeries when needed- skin flap/ FTSG for skin cover, cartilage graft for support and local flaps for lining.

OPERATIVE PROCEDURE FOR CLINICAL STUDIES:

SPECIAL CONSIDERATIONS WHILE RECONSTRUCTING THE NOSE

1. Make an accurate estimate of tissue requirements, that is, the length and breadth of the flap required and the design of the flap necessary. This should also take into consideration the carrier segment so as to ensure easy transfer of tissue without risk of jeopardizing the vascular supply of the flap due to twisting, angulation, or increased tension.
2. Choose an appropriate donor site, keeping in mind the requirements of reconstruction and availability of tissues.
3. Carefully evaluate the need to provide additional support, especially when using tissues other than that on forehead.
4. Pinched nostril, following scar contracture with obstructed nasal airway, must be restored to normal by preliminarily releasing the contracted scar, restoring the alar and columellar remnants to their original position, and skin grafting the resulting skin/lining defect.
5. Avoid the necessity of multistaged thinning procedures after reconstruction of bulky nose by judiciously thinning the flaps at the time of first and second insets, and trying to give the proper shape and form to the nasal tip, ala, and columella at primary operation.

6. Form the alar rim by infolding of the flap to give a good smooth rolled alar margin.

OPERATIVE PROCEDURE FOR CLINICAL CASES;

1. Defects of the nasal skin layer

a) A case of Basal Cell Carcinoma on the dorsum of the nose

Excision and Full thickness graft cover for the defect

40 year female with lesion in the root of the nose ,

Patient underwent excision of the lesion under general anaesthesia and then the defect was covered with full thickness graft harvested from the postauricular region.

PRE- OPERATIVE PICTURES



30 year female patient with basal cell carcinoma involving the dorsum and Left sidewall of the nose.

POST OPERATIVE PICTURES



Patient underwent excision of the lesion with full thickness skin graft cover from the Left post-auricular region.

CASE 2

PREOPERATIVE PICTURES



21 year old male with post traumatic scar over the tip of the nose and the right sidewall.

POST OPERATIVE PICTURES



Patient underwent excision of the unsightly scar over the tip of the nose and the dorsum and the defect on the tip was covered with full-thickness skin graft harvested from the post-auricular region, the defect on the dorsum was closed primarily .

CASE 3-PREOPERATIVE PICTURES



60 year female patient with swelling -neurofibroma in the right nose involving the sidewall.

INTRAOPERATIVE PICTURES



The defect following excision of the lesion. Raising a paramedian forehead flap for the defect, with cheek advancement.



POSTOPERATIVE PICTURES



Following flap division and inset .

Patient seen after three weeks following excision of the lesion and flap cover.

The forehead is the most suitable donor site for the reconstruction of the nose and has the following advantages:

1. It results in excellent color and texture match.
2. It has a profuse blood supply.
3. Because the forehead flap can be transferred without delay, the period of hospitalization is shorter.
4. The use of the forehead flap obviates immobilization in uncomfortable positions.
5. The skin of the forehead is stiff, precluding the need for support²⁵.

AXIAL PARAMEDIAN FOREHEAD FLAP:

A vertical, axial paramedian forehead flap is the donor tissue of choice for nasal reconstruction. However, in some situations it is not ideal. It is thicker than the normal skin of the nasal dorsum. And when it is used to resurface the subunit it produces a greater aquiline hump than the original nose possessed^{26,27}.

The vertical branches of the angular and supratrochlear vessels cross the superior orbital rim in the region of the wrinkle line that lies perpendicular to the corrugator muscle. They cross the rim deep to the frontalis and corrugator muscles and rapidly enter the

subcutaneous layer as they ascend the forehead. In the upper half of the forehead, many fine branches of the arteries lie in the subcutaneous fat close to the dermis. The entire frontalis muscle and some of the subcutaneous fat may be removed from the distal end of a paramedian forehead flap without injuring its axial arteries^{28,29}.

- The flap is designed vertically and axially. This makes it vascularly robust, so that it may be radically thinned and depilated.
- The base of the flap is made no wider than 1.5cm for easy mobility without strangulation.
- The base of the flap is positioned to include a branch of the angular-supratrochlear arteries, located with Doppler.
- Additional length is attained by extending the flap's proximal end across the orbital rim or its distal end into the hair-bearing scalp^{31,32}.
- The flap is not designed to fit the nasal defect, for the nasal defect, distorted by edema, scar contraction, and local injections does not represent what is missing from the nose.

- An exact three dimensional pattern of nasal surface subunits taken from the contralateral normal side of the nose or from an ideal model is used as a template for the flap's design.
- No marginal excess of skin is included when the flap is incised to minimize centripetal flap contraction, which obliterates surface contour.
- Distal portions of the flap are thinned to the thickness for nasal tip skin and are depilated where necessary^{33,34}.

OPERATIVE TECHNIQUE

The base of the pedicle is traced 1.2 to 1.5cm wide., and no wider, to allow axial rotation without strangulation. The proximal 2/3 rd of the pedicle may be quite narrow and then expand suddenly to incorporate the pattern. When the flap is incised, the cuts are made on the inside of the blue so that not even a half millimeter of excess skin is included. In the distal 2 cm , the flap is elevated superficial to the frontalis muscle. Proximally , the frontalis muscle is elevated off the periosteum with the pedicle to protect the axial vessels. If extra length is needed, corrugator muscle fibers are divided using magnifying loupes so that vascular branches are preserved while restricting bands of muscle are released. If the flap still proves short,

then the pedicle is extended across the orbital rim., including a bit of the eyebrow if necessary. Again, it is helpful to mobilize the pedicle by dividing corrugator muscle fibers while preserving vascular branches.

After the flap is elevated, its borders and distal 2 cm are thinned using curved Joseph's scissors. Hair follicles remaining in the distal part of the flap are clipped off with fine scissors under 2.5x magnification.

During the thinning, axial branches of the supratrochlear-angular arteries visible in the subcutaneous tissue than others, and the flap may be thinned accordingly. The thinned flap is transported to the nasal defect. Right-sided flaps rotate clockwise, left-sided flaps rotate counter-clockwise. Key sutures fix the flap in position.

CASE 4 –PREOPERATIVE PICTURES



65 year female - Basal cell carcinoma of the nose –involving the dorsum and the right side wall of the nose.

POSTOPERATIVE PICTURES



Wide local excision followed by Paramedian forehead flap cover- from the left side.

CASE 5 PREOPERATIVE PICTURES



60 year female –Post-traumatic loss of distal $1/3^{\text{rd}}$ nose- a fullthickness defect involving the tip ,columella and the medial $1/3^{\text{rd}}$ of both ala.



Loss of tip, medial 1/3rd alae, and columella

INTRAOPERATIVE PICTURES



Markings for an oblique forehead flap.

Lining – Scar based hinge flap

Skin Cover- Oblique paramedian forehead flap.

SKIN COVER WITH OBLIQUE FOREHEAD FLAP



INTRAOPERATIVE PICTURES

THREE WAYS TO LENGTHEN A FOREHEAD FLAP

- *Extend the base of the flap over the orbital rim:* It may be necessary to extend the parallel incisions through the eyebrow and to elevate this part of the eyebrow with the pedicle. This technique gains 1.0-1.5cm of flap length.
- *Extend the design of the distal end of the flap into the hair-bearing scalp;* The flap should be elevated and the hair bulbs removed surgically. This method is useful only for flaps that have a robust blood supply and is not suitable for flaps of

cigarette smokers^{35,36}. The flap is turned over, and with 3.5X loupes for magnification, the frontalis muscle and subcutaneous fat is removed from the hair-bearing end of the flap to visualize the hair bulbs. Each hair bulb is then clipped with fine scissors.

- *Release the frontalis muscle layer*; If the flap has been elevated and transposed and still falls short of the defect, a lifeboat remains. The flap is flipped, and with scissors, a transverse line across the frontalis muscle is clipped until the yellow subcutaneous fat is visible. This procedure is repeated at 1-cm intervals along the flap, cutting only the frontalis muscle, not the underlying fat. This technique does not devascularize the flap because few branches of the supratrochlear vessels travel in the muscle layer. The trochlear vessels travel in the muscle layer. The flap will lengthen and an extra 1.5cm of length can be gained.

INSET OF FOREHEAD FLAP WITH SSG FOR DONOR SITE



The donor defect was closed with skin graft .

POST OPERATIVE DAY 5



POSTOPERATIVE DAY 14





FLAP DIVISION AND INSET



CASE 6 PREOPERATIVE PICTURES



40 year male - **post human bite nasal defect**



INTRAOPERATIVE PICTURES-FLAP
ELEVATION FROM NASOLABIAL AREA



FLAP INSET INTO THE DEFECT



POST OPERATIVE DAY 5



TENTH POSTOPERATIVE DAY



NASOLABIAL FLAP

The nasolabial flap was originally advocated by Dieffenbach for the partial reconstruction of nasal alar defects. Many others have modified the application of this flap and claimed good results.

Climo has suggested the use of the same flap for both the skin and its lining.

It is suggested the use of the nasolabial flap for the reconstruction of a skin defect with its lining, along with simultaneous insertion of cartilage, which completes the reconstruction³⁷.

Surgical Technique

In the majority of the patients, local anesthesia and sedation are used. The lesion is first marked for excision and a nasolabial flap twice as long as the lesions is outlined in the nasolabial fold. The nasal excision is then completed using a No. 11 blade, leaving a full-thickness defect in the ala. Nasal bleeding is controlled by applying a nasal pack and pressure. The nasolabial flap is raised from its bed as previously outlined. The flap is then wrapped in saline gauze, and the lateral aspect of cheek is boldly undermined so that the donor site can be easily closed without distortion of the angle of the mouth.

MATERIALS AND METHODS

20 patients who required reconstruction of the nasal defects , presented to the Department Of Plastic ,Reconstructive and Faciomaxillary Surgery, Madras Medical College ,Rajiv Gandhi Government General Hospital ,Chennai were included in the study and period ranging from October 2009- March 2012. The follow up of these patients ranged from 2 months to 24 months .

Out of the 20 patients ,14 patients were female and the remaining 6 were male patients .Age ranging from 20-75 yrs.

Of the 20 cases ,post excision defect for malignancy accounted for 10 cases,defect following excision of benign lesion -6 cases and post-traumatic defects accounted for 4 cases.

Full-thickness defects of the nose accounted for 6 cases,and skin cover only defects accounted for the rest of the cases.

The site of the defect was found to be on the dorsum of the nose alone in 2 cases, dorsum and sidewall in 10 cases, tip,ala and columella in 4 cases and ala and dorsum in 4 cases.

The post excisional defects following excision of the benign or malignant tumor were reconstructed primarily and were followed up

regularly for recurrence. The post-traumatic defects were reconstructed secondarily.

All the patients with basal cell carcinoma underwent excision with a 5mm margin and the reconstruction was carried out.

The type of reconstruction used in our study was predominantly forehead flap. Of the 20 cases, 6 cases were reconstructed with Paramedian forehead flap, 4 cases the defect reconstructed with Oblique forehead flap., Nasolabial flap was used to reconstruct the defect in 4 cases. Four patients had the skin defects resurfaced with full-thickness skin grafts.

Additional flaps was used in one case for a defect on the nasal sidewall, and was covered with paramedian forehead flap and cheek skin advancement flap.

One patient with defect on the tip of the nose following a human bite underwent initial treatment with wound debridement and antirabies vaccine and later underwent reconstruction with a nasolabial flap.

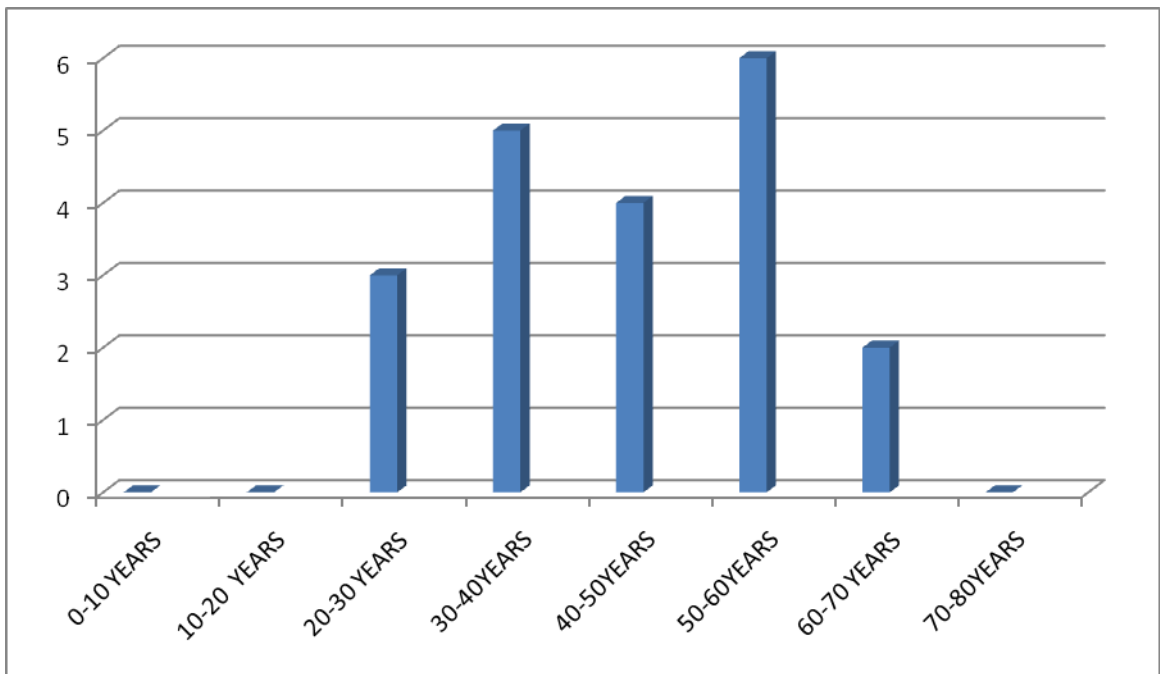
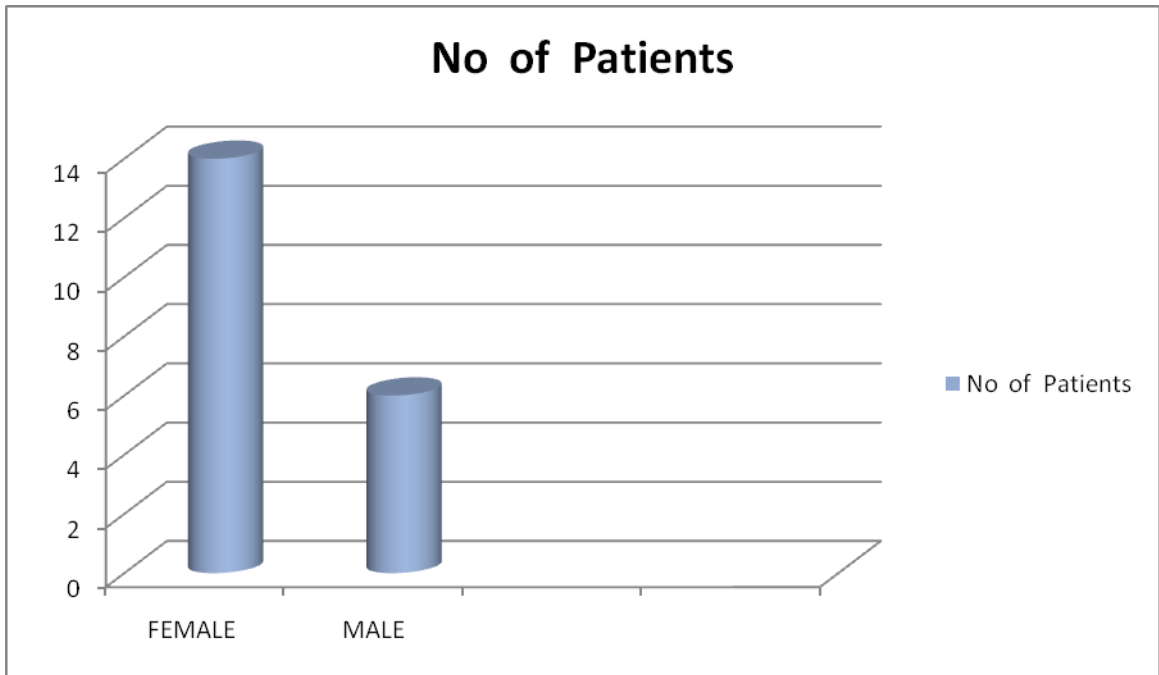
Most of the patients underwent a three stage procedure of excision and flap inset, flap division and later flap thinning done after

a period of 3 months. Four patients with skin defects covered with full thickness skin graft had a single stage procedure. The graft was harvested from the postauricular area.

The donor site in most cases – 19 were closed primarily ,one patient with a subtotal nose defect who underwent oblique paramedian forehead flap ,the donor site was skin grafted.

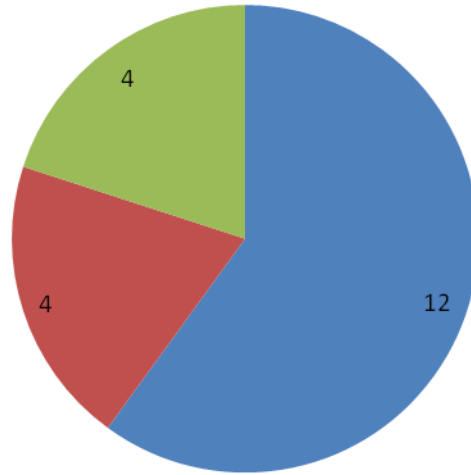
None of the forehead flaps had any complications.,though one patient who had fullthickness graft for a defect on the dorsum and tip had partial loss of the graft which settled .

The maximum size of the defect in our study was 48x 36 mm,and the minimum size of the defect was 5x3 mm.None of the patients in our study required the need for reconstruction of support as the forehead and the nasolabial flao were found bulky enough to give the contour.



AGE WISE DISTRIBUTION

TYPE OF RECONSTRUCTION-SKIN COVER



■ FOREHEAD FLAP ■ NASOLABIAL FLAP ■ FULL THICKNESS GRAFT ■

RESULTS

The results of the study were evaluated for aesthetic outcome following reconstruction with the local flaps .The flaps were evaluated for color match, contour and the need for secondary thinning of the flap.

The defects reconstructed with forehead had excellent color match,but the junction of the flap and recipient site needed contouring in the form of thinning at a secondary stage.

The nasolabial flap had excellent contour for the defect in the tip and ala of the nose ,but needed thinning to reduce the bulkiness of the flap used for the lining.

During the follow-up period of 24 months the reconstructed nose retained the shape and tip projection. The pedicled flaps had no complications.One patient who had a subtotal nasal reconstruction with oblique paramedian forehead flap had the donor site skin grafted which reduced in size as there was graft contraction.

All the cases operated for malignancy were followed for the biopsy report for the margins and regularly monitored for any recurrence.No case had any recurrence in the operated site.

DISCUSSION

The nose is second only to the eye in receiving critical scrutiny, in its reconstruction, only one must artistically restore the finest anatomical details for the patient to regain a normal body image.

Nasal reconstruction represents one of man's earliest surgical attempts to imitate nature's form.

Planning and staging and an aesthetic reconstruction of nose requires the need to understand the quantity, quality of tissue with respect to the layers missing in the defect, the cartilage support structures required to rebuild the defect ; the exact size and form of the lost skin subunits .Other aesthetic considerations such as skin texture,color,contour are also crucial is achieving an optimal result.

The operative stages for the aesthetic reconstruction of the nose involve

- To determine the proper location of the nasal unit on the face in relation to the eyes and upper lip.
- To determine the options for nasal lining- full thickness skin graft, alar margin flap, septal mucoperichondrial flap, folded forehead flap.
- To determine cartilage and bone graft options- septal cartilage , conchal cartilage, costal cartilage, iliac crest and costal bone grafts.
- To determine the nasal skin cover options- full thickness skin graft, local flap ,forehead flap,scalp flap and microvascular free flap.The different stages for the reconstruction of nose require adequate time gap between the procedures for the flap to anchor to its bed ,and for biologic process of wound healing and scar maturation.

The subunit principle of reconstruction is applied to reconstruct the large superficial defects of the nose ,the nasal subunits are surface regions separated by linear ridges and valleys that reflect lines of light and cast linear shadows .

Careful attention must be paid to the thickness of the nasal skin, since it varies from thick and densely adherent to the underlying cartilaginous structures in the lower half of the nose, to thin and loosely attached to the bony framework of the upper half of the nose. Along the

upper portion of the nose the limiting factor in the soft tissue closure is the prominence of the nasal skeleton.

In the lower portion of the nose the immobility of the skin severely limits the reconstructive options. When performing aesthetic reconstruction of the nose, the facial reconstructive surgeon must take into account the concept of nasal subunits. When a large portion of a given subunit has been lost replacing the entire subunit rather than simply patching the defect often produces a superior aesthetic result. This approach places the border of scars of flaps and grafts within the normal depressions and elevations of the nose, where they are least visible to the eyes.

CONCLUSION

Aesthetic reconstruction of the nose is required in cases of nasal defects following trauma, tumour extirpation, congenital etc.

The art of reconstruction of the nose is one of the oldest techniques in the field of plastic surgery with its initial roots in India, and the techniques continue to be modified to match the pre injury status of the patient.

Small and medium sized defects of the nose requiring only the skin cover are best reconstructed by full-thickness grafts.

Larger defects of the nose are reconstructed based on the component of the nose lost, and may require replacement of the lost tissues with lining, support and skin cover. The subunit principle is followed in the reconstruction in the large convex subunit areas of the nose to allow for a more natural appearance.

Reconstruction of the nasal cover is of aesthetic importance with regard to the colour and the texture of the skin.

With careful attention to the reconstruction of all components of a nasal defect, a forehead flap can restore virtually any large nasal defect with excellent functional and cosmetic results. The skills that help optimize the process of nasal reconstruction are important to acquire. With careful planning and surgical finesse, forehead flaps can often result in nearly imperceptible restoration of the nose.

In our series of cases requiring reconstruction of the nose, the forehead flap was found to be the best option aesthetically for the reconstruction with regards to the skin color, contour and texture match.

BIBLIOGRAPHY

1. Bhishagratna KKL,ed:Sushruta Samhita,Calcutta,Bose,1907-1916.
2. Antia NH, Daver BM. Reconstructive surgery for nasal defect. Clin
plastsurg 1981;8 535 - 63
3. Aygenc E, Beriat K, Kaymakci M, Ozbek C, Ozdem C. Kulak Burun
Bogaz Ihtis Derg. 2002 Jul-Aug;9(4):282-5.
4. Barlow RJ, Swanson NA. The nasofacial interpolated flap in
reconstruction of the nasal ala., J Am Acad Dermatol. 1997 Jun;36(6
Pt 1):965-9.
5. Barton FE Jr. Principles of nasal reconstruction. J Dermatol Surg
Oncol. 1982 Jul;8 (7):568-74.
6. Barton, F. E., Jr. Aesthetic aspects of nasal reconstruction. Clin.
Plast. Surg. 15: 155, 1988.
7. Barton, F. E., Jr. Aesthetic aspects of partial nasal re construction.
Gun. Plait. Surg. 8: 177, 1981.
8. Barton, F.E., and Byrd H.S. Acquired deformities of the nose in
plastic surgery volume 3, Philadelphia saunders 1990, pages
1925 to 2008.

9. Boyd CM, Baker SR, Fader DJ, Wang TS, Johnson TM. Arch Dermatol. 2000 Nov;136(11):1365-70.
10. Brodland DG. Dermatol Surg. 2005 Aug;31(8 Pt 2):1046-52.
11. Burger, G. C., and Menick, F.J. The subunit principle in nasal reconstruction. Plast. Reconstr. Surg. 76: 239, 1985.
12. Burget GC and memck FJ: The subunit principle in nasal reconstruction. Plast reconstruct surg 76 (2): 239, 1985.
13. Burget, G. C. Nasal reconstruction: Seeking a fourth dimension. Plast. Reconstr. Surg. 78: 145, 1986.
14. Burget, G. C., and Menick, F.J. Aesthetic Reconstruction of the Nose. St. Louis, Mo.: Mosby, 1994.
15. Burget, G. C., and Menick, F.J. Nasal support and lining: The marriage of beauty and blood supply. Plast. Reconsir. Surg. 84: 189, 1989.
16. Keegan DF: Rhinoplastic Operations with a Description of Recent Improvement in the Indian Method .London,Bailliere,Tindall.and Cox,1900.

17. Millard DR Jr: Reconstructive rhinoplasty for the lower half of a nose. *Plastic Reconstructive Surgery* 1974; 53:133-139,722-28.
18. Converse JM : Composite graft from the septum in nasal reconstruction. *Trans Lat Am Congr Plast Surg* 1956; 8:281.
19. Burget GC : Surgical restoration of the nose .In Marsh JL ,ed: *Current Therapy in Plastic and Reconstructive Surgery*.St.Louis,BC Decker,1989: 400-412.
20. Jackson IT : Local flaps in Head and Neck Reocnstruction.St.louis,Mosby,1985.
21. Millard JR Jr: *Principilization of Plastic Surgery*. Boston, Little, Brown,1986.
22. Menick FJ : A 10year experience in nasal reconstruction with the three- stage forehead flap.*Plastic & Reconstructive Surgery* 2002: 109: 1849-1855.
23. Burget G, Menick F;Nasal reconstruction : seeking a fourth dimension. *Plastic& Reconstructive Surgery* 1986; 78:145-157.
23. Uchinuma, E., Matsui, K., Shimakura Y, Murashita, k., and Shioya, Evaluation of the median forehead flap and the nasolabial flap in nasal reconstruction. *Aesthetic Plast Surg*, 21: 86, 1997.

24. Vander Meulen JC, Gilbert M, Roddi R. Early excision of nasal hemangiomas: the L-approach : *Plast Reconstr Surg.* 1994 Sep;94(3):465-73; discussion, 474-5.
25. Rohrich, R. J., Barton, F. E., Jr., and Hollier, L. Nasal reconstruction. In S.J. Aston, R. W. Beasley, and C. H. Thorne (Eds.), *Grabb and Smith's Plastic Surgery*, 5th Ed. Philadelphia, Pa.: Lippincott-Raven, 1997.
26. Mouly R, Papadopoulos O. *Rev Stomatol Chir Maxillofac.* 1980;81(2):91-101.
27. Orticochea, M.: A new method for total reconstruction of the nose: The ears as donor area. *Br. J. Plast. Surg.*, 14:225, 1971.
28. Pribaz JJ, Chester CH, Barrall DT. : *Plast Reconstr Surg.* 1992 Aug;90(2):275-80.
29. Quatela VC, Leake DS, Sabini P. *Facial Plast Surg Clin North Am.* 2004 Feb;12(1):133-56.
30. Redman RD, Olshansky K. Anatomical alar reconstruction with staged nasolabial flap: *Ann Plast Surg.* 1988 Mar;20(3):285-91.
31. Mc Gregor - *Fundamentals of Plastic Surgery* 1995.

32. Mc Gregor Jc, Mclean RR. Reconstruction of a large nasal defect using a bibbed forehead flap. *Ann Plast Surg* 1982; 9; 419 —24.
33. Mc Carthy, Plastic surgery Vol-3: The face part 2 WB. Saunders company 1990.
34. Millard, D. R. Aesthetic reconstructive rhinoplasty. *Gun. Plast. Surg.* 8: 169, 1981.
35. Millard, D.R. Jr, Reconstructive Rhinoplasty for the lower two thirds of the nose. *Plast reconstructive surg* 57: 722, 1976.
36. Manson, P. N, Hoopes, J.E., Chambers, R. G., and Jaques, D.A., Algorithm for nasal reconstruction. *Am. J. Surg.* 138 : 528, 1979.
37. Marchac, D., and Toth, B. The axial frontonasal flap revisited. *Plast. Reconstr. Surg.* 76: 686, 1985.
38. Meyer,R. Aesthetic aspects in reconstructive surgery of nose.*Aesthetic Plastic Surgery*,12: 195,1988.