RECONSTRUCTION OF NASAL DEFECTS

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

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CERTIFICATE

This is to certify that, this dissertation titled ***RECONSTRUCTION OF NASAL DEFECTS***, submitted by Dr.P. NELLAIAPPAR appearing for M.Ch., (Plastic Surgery) Degree Examination in August 2006, is a bonafide record of work done by him under my guidance and supervision.

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CONTENTS

INTRODUCTION

The nose is the most prominent feature of the human face. Its central location and projection not only emphasize its overall aesthetic importance but also contribute to its frequent injury.

Loss of nasal tissue may be caused by congenital malformations, infection, trauma or neoplasm. A mutilated nose is a severe affliction that impedes normal social contact and creates great self – identity problems.

Although the reconstruction of the nose is oldest form of facial reconstructive surgery, its complexity continues to intrigue and challenge facial reconstructive surgeons. The unique shape and configuration of the nose are often difficult to recreate.

The central location of the nose in relation to the eyes, lips and forehead make the choice of reconstructive techniques paramountly important to avoid deformity and dysfunction of these associated structures. Adequate osteocutaneous support, internal nasal lining and soft tissue coverage are the minimum requirements in reestablishing a functional nasal airway.

The external skin covering, which should be thin and of similar color aspect and texture as the facial skin.

AIM OF STUDY

To study the various methods of nasal reconstruction done in our department and to critically evaluate each technique.

REVIEW OF THE LITERATURE

HISTORY OF NASAL RECONSTRUCTION

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) 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.

The fronto temporal flap was described by Schmid in 1952. In 1971 Orticochea proposed a retro auricular flap by previous transposition of the dissected temporal artery to the post auriclar area.

Cheek flaps were introduced by Dieffen bach 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.

On the other hand, flaps used in such a manner can be successful if they are lined with a split skin graft during a first stage and then swung into the defect and sutured a week later, as recommended by May. San venero-Rosselli described a procedure in which the often cicatricial skin in the region of the defect border can be used for inner lining of the defect. The skin must be cut and dissected carefully and rotated downward into the vestibule. Once the inner lining has been formed by suturing the folded skin, a transposition flap from the region of the frontal process of the maxilla is used to cover the external defect. A similar procedure, attributed to Ombrédanne and Kazanjian,' uses a skin flap taken from the nasolabial fold and swung with the raw surface outward into the defect to become the inner lining. The external raw surface is covered with a full- thickness skin graft.

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.

Alar reconstruction was performed by von Hacker with a larger turned in cheek flap covered with a long slim flap cut from the opposite side of the nose." The lower border of the flap used for lining was rolled up and outward, creating a soft alar rim just before it joined the covering nasal flap. Likewise Preindelberger used a square cheek flap based on the border of the defect and turned its skin surface toward the vestibulum, with the lower border being turned outward on it self.

Dufourmentel and De Cholnocky 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 Cholnocky 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 auncular 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 1980, suggested local flaps using the excess skin at the root of the nose (glabellar flap) or from the cheek (nasogenial flap) give excellent results.

Barton FE Jr. in 1982, Histographic excision of the lesion with immediate plastic surgical reconstruction offers the best prospects for tumor control with the least residual deformity.

Redman RD, Olshansky K. (1988) proposed an initial excision with flap inset and a second procedure for debulking and contouring the alar groove to complete reconstruction of the aesthetic unit.

Ducours JL, Richard D, (1989) described Kite flap The "Kite" flap is a triangular protruding flap attached underneath the skin.

Pribaz JJ, Chester CH, (1993) the extended V-Y flap is a modification of the V-Y advancement flap, which is very useful in closing defects following excision of facial lesions.

van der Meulen JC, (1994) in nasal hemangioma, early surgery in the involution phase has proved to be beneficial.

Boyd CM, Baker SR, (2000) concluded the fore head flap The forehead flap represents one of the best methods for repair of extensive nasal defects.

Aygenc E, Beriat K, (2002) revealed supratrochlear artery-based paramedian forehead flap gives Acceptable functional and successful oncologic results in the nasal reconstruction.

Rod J. Rohrich M.D., (2003) after having reviewed 1334 cases for 15 years, have concluded

- Maximal conservation of native tissue is advised.
- Reconstruction of the defect, not the sub- unit, is advised.
- Complementary ablative procedures, such as primary dermabrasion, enhance the final result and decrease the number of reversionary procedures.
- Primary defatting is safe in nonsmokers and decreases the number of revisionary procedures.
- The use of axial pattern flaps is preferred.
- Good contour is the aesthetic endpoint.

ANATOMY AND PHYSIOLOGY

ANATOMY

The nose is shape 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)

The nasal pyramid has two openings at its base, the external nares. These inlets for the nasal airway admit air into the nasal vestibules, delimited posteriorly by the internal flares, frequently referred to as the nasal valves. They control the airflow into the nasopharyngo-tracheal airway.

COVERING SOFT TISSUES OF NOSE

At the tip, the skin of the nose is tightly bound to the alar cartilages, in contrast, the skin and musculature are loosely attached and mobile over the lateral cartilages and nasal bones. The skin is rich in sebaceous glands over the caudal portion of the nose. The arteries and veins of the nose are situated in the soft tissues.

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 area. 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 artery of air into the nose. The sills are the floors of the nostrils. The junction of the base of the coluinella 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.

BONY STRUCTURE OF NOSE

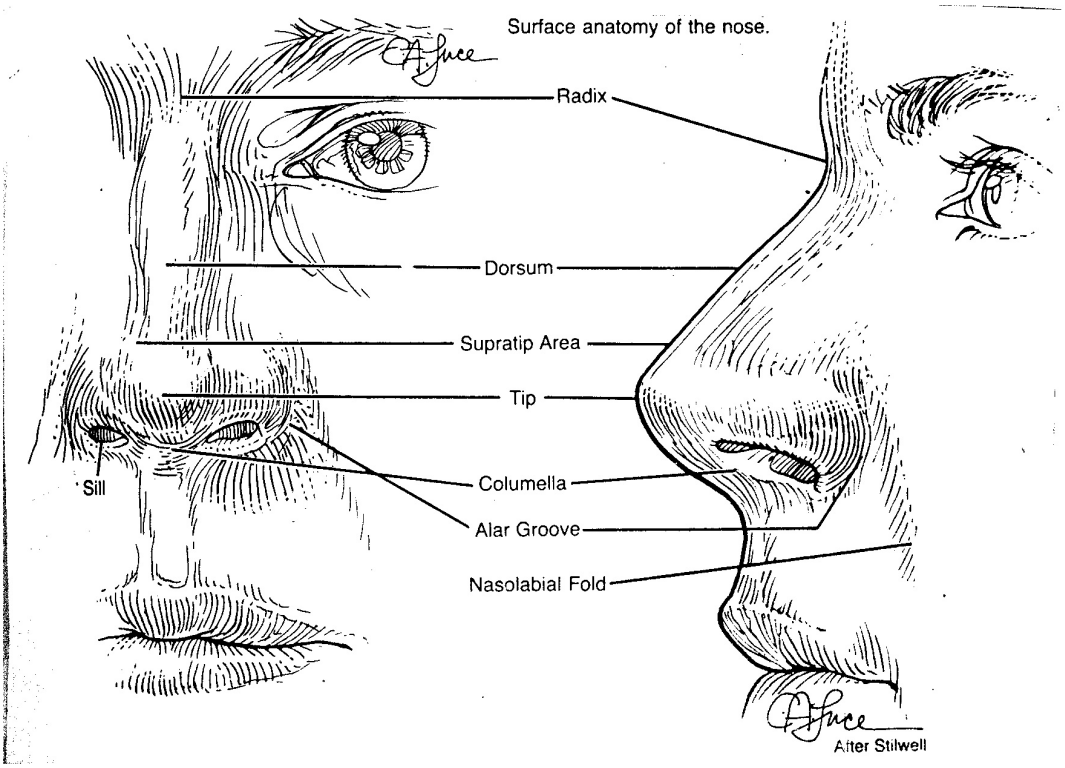
The bony portion of the nose is formed by the paired nasal bones; these are joined in the midline and are supported superiorly by the nasal spine of the frontal bone. The osseous lateral walls of the nose are formed by the nasal bones and frontal process of the maxilla.

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 maxilla, forming the edge of the piriform aperture.

CARTILAGINOUS STRUCTURES OF NOSE

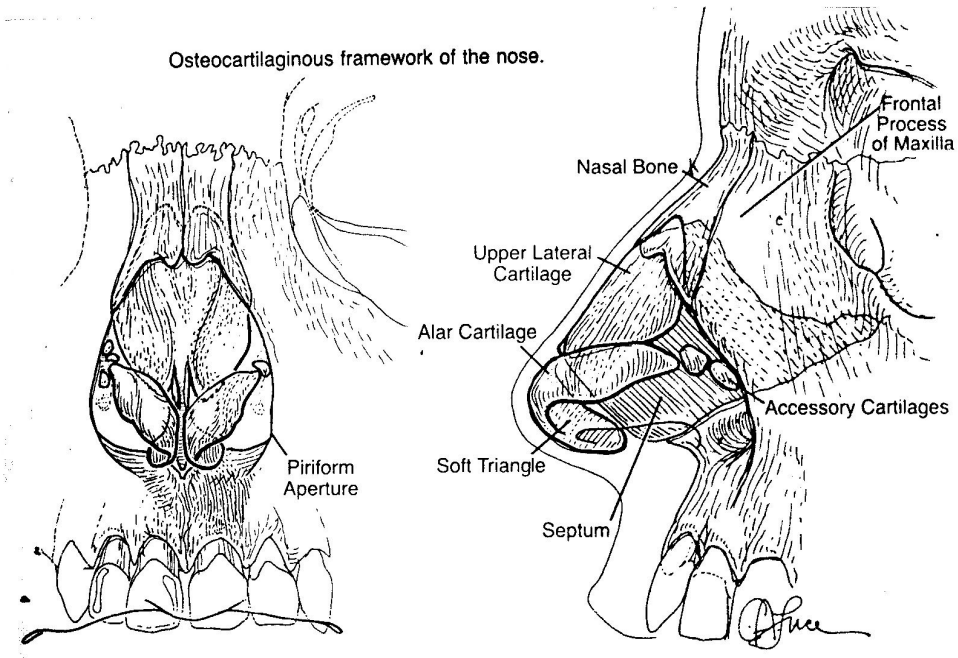
LATERAL (UPPER LATERAL) CARTILAGES

The lateral cartilages are paired structures, roughly triangular in shape attached to the nasal bones and frontal processes of the maxilla above and to the septal cartilage in the midline. The lower third of the lateral cartilages diverges from the septum, becomes mobile and constitutes the internal valves of the nose.

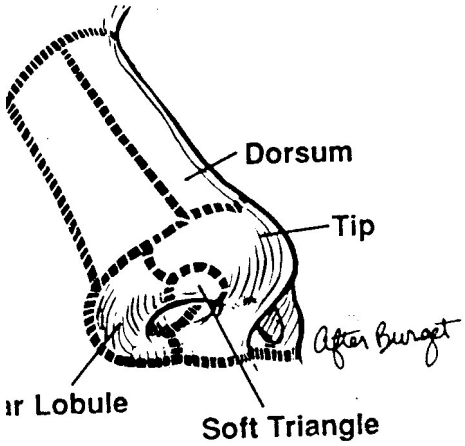


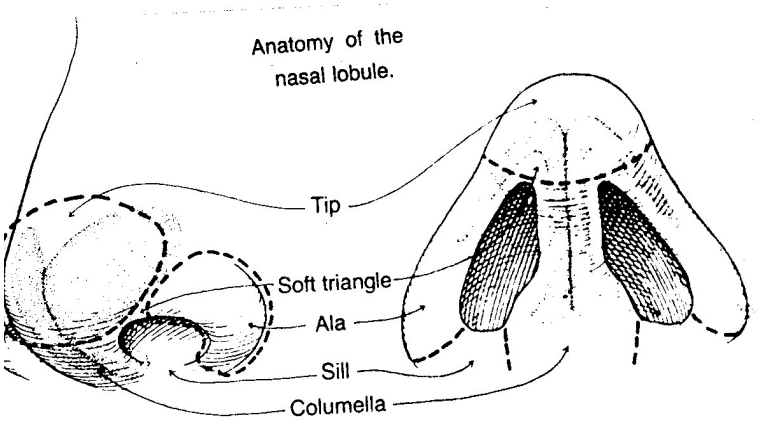
Surface anatomy of the nose.

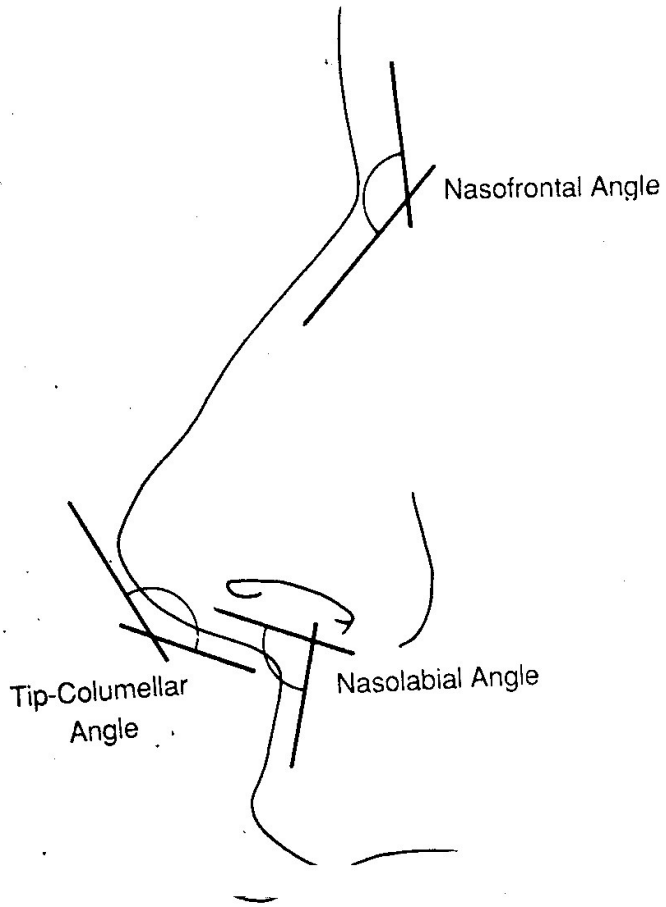
Osteocartilaginous framework of the nose.



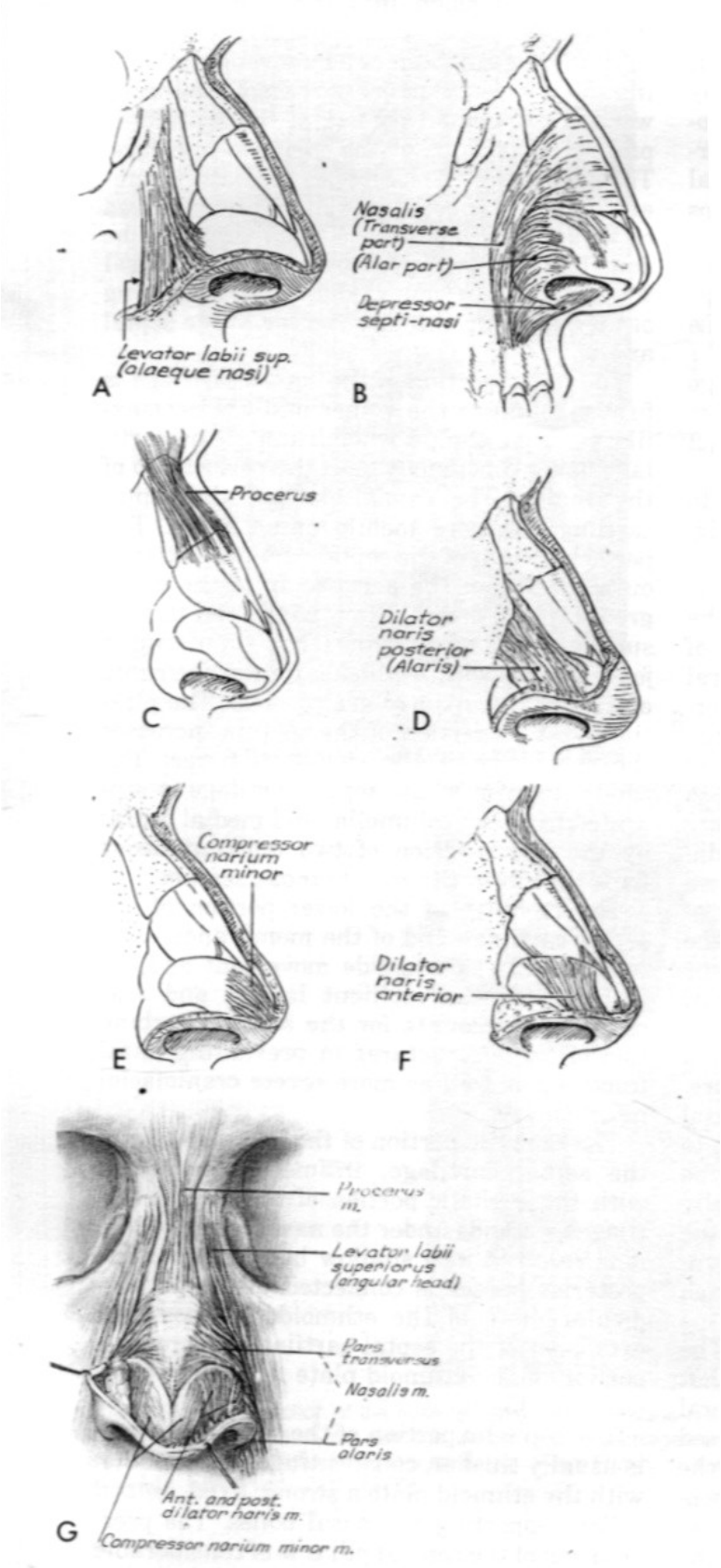
Esthetic subunits of the nose.




Anatomy of the
nasal lobule.
Tip
Soft triangle
Ala
Sill
Columella



The surface angles of the nose.



THE MUSCLES OF THE NOSE

ALAR (LOWER LATERAL) CARTILAGES:

These are paired structures that form the cartilaginous framework of the tip of the nose. Each cartilage consists of two portions, a medial crus and a lateral crus, which are joined at the most prominent point of the tip of the nose, the dome of the alar cartilage. The medial crura curve downward to form the skeletal framework of the columella.

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 collaginous tissue arranged in resilient longitudinal bundles.

SOFT TRIANGLE:

The dome is separated from the margin of the nostril by a triangular shaped area known a the

soft triangle, It consists of two juxtaposed layers of skin, the covering skin of the nose and the vestibular akin, 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 repiration.

The middle turbinate, ethmoidal in origin overlies the maxillary ostium. While the secretes mucus, it has little effect on nasal respiration.

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

ESTHETICS

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. For example, the small, high sculpted nose on a taller person is as incongruous as a large nose on a person of small stature.

The topography of the face is characterized by a series of inter-connecting lines and curves often defined by the underlying craniofacial skeleton. 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.

On a frontal view the nasal configuration also shows a series of curves. 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 hyperteloric 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 anterior projection of the supra-orbital rim is also variable among individuals. With recession of this structure, a normal-sized nose appears large.

In a similar fashion Nose relates to the maxilla or the perinasal region. The underlying bony skeleton defines soft tissue contours. A small nose is often a component of nasomaxillary hypoplasia,

and surgical correction entails advancement of the entire nasomaxillary component. A normal sized nose appears large if the maxilla is hypo plastic. A corrective rhinoplasty would yield only a flattened appearance to the face whereas augmentation of the hypo plastic maxilla would restore facial relationships.

Vertical maxillary excess or the long face syndrome is associated with incisor show at rest, gingival exposure on smiling, and an obtuse nasolabial angle. Piimaiy surgical attention should be directed towards correcting the underlying skeletal pathology, before considering rhinoplasty surgery. Maxillary advancement surgery also affects nasal, especially tip position.

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. Collumellar-Lobular junction.

These points form two triangles with the common base, the intercrural distance. In the ideal, three light reflexes should be apparent on the nasal tip- the two domes and the central arch that joins them. On the oblique view, the intercrural distance must be sufficient to project the far dome beyond the near one. Deviations of the tip are associated with distortions of these relationships. The columella should be 2 to 3mm lower than and parallel to the alar rims.

PHYSIOLOGY

The vestibules filter the air through their lining, which contains mucus secreting glands and vibnssae, 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 pseudo-stratified, 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.

CLASSIFICATION OF NASAL DEFECTS

(ANTIA& DAVER)

MAJOR DEFECTS

1. FULLTHICKNESS LOSSES
2. DEFECTS OF LINING
3. DEFECTS OF COVER (DORSUM, ALA, TIP, COLUMELLA)
4. DEFECTS OF SUPPORT (BONY, CARTILAGINOUS)

MINOR DEFECT:

ALA, COLUMELLA

STENOSIS OF NOSTRIL

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 a 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.

EXCISION AND PRIMARY CLOSURE (IN STAGES)

5 yrs old boy presenting with involuting haemongioma of the tip of nose

Lateral view after I stage of excision

View after II stage excision

RHINOPHYMA

EXCISION AND COVER WITH SSG

60 yrs old man presented with rhinophyma of the tip of the nose

Per operative photo after paring of the thickened skin of the tip of the nose

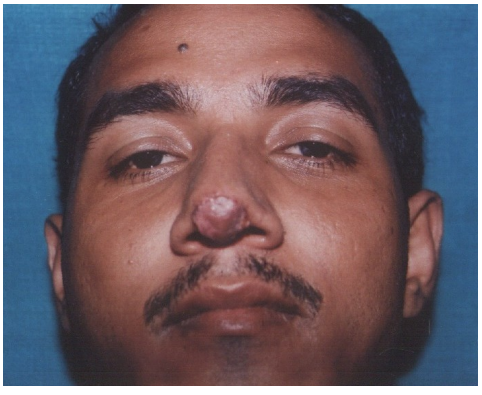
Split thickness skin graft cover applied over the defect

Post Operative Picture

EXCISION AND COVER BY FTSG


25 yrs old man presenting with congenital hairy naevus of tip of nose


Per operative view of excision and FTSG Cover

Postoperative View

BCC - WIDE LOCAL EXCISION
AND GLABELLAR V-Y ADVANCEMENT FLAP COVER

Bcc at The Radix of The Nose

Post operative view after suture removal

7. Avoid using lined flaps because skin grafts on the raw undersurface of the flap will contract, making them rigid and unsuitable for reconstruction.
8. Aim at minimal mutilation of the donor site, especially if it is an exposed area.

TECHNIQUE OF RECONSTRUCTION

Regardless of the source of skin, the flap required for reconstruction should conform to a standard design to achieve satisfactory results (Fig,1)

Design of Flap.

The design of the flap can be discussed in three parts: distal, middle, and proximal.

The distal part is meant for reconstruction of columella, alar lining, and part of the tip. The length (A) and width (B) of this segment is determined by the length and width, respectively, of the columella to be reconstructed. Its proximal portion is used to provide alar lining by folding inward. This segment of the flap is rougly triangular, with the apex pointing distally.

The middle segment is roughly rectangular and goes to form the nasal tip (dorsum) in the middle and both alae on sides. Its dimensions depend on the width of the skin required to reconstitute the main nasal defect. Its distal part contributes partly to the alar lining.

The proximal third of the flap is meant to cover the nasal bridge and act as a carrier for transfer of the distal two-thirds of the flap for purposes of reconstruction. It is the base of the flap and carries the vascular supply.

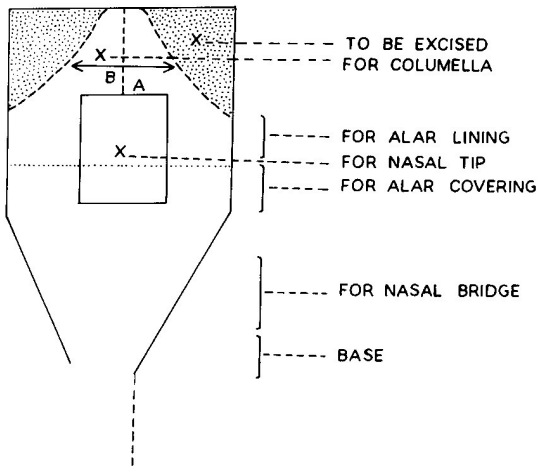


Figure 1. Design of the flap required for partial reconstruction of the nose.

Preparation of the Recipient Site.

The dorsum is incised 0.5 cm from the free mar gin of the defect. Laterally the incision cuts through the alar remnant paring it, and medially it extends to the midline and then curves around it to extend downward and backward along the margin of the free septal border up to the end of the columellar defect, where it ends in an arc.

The incision is deepened through skin and subcutaneous tissue, and the skin flap is raised superficial to the cartilaginous framework and turned downward as far as the free edge of the defect. Blunt dissection is carried around the free edge and extended upward in the sub mucosal plane on the inner side of cartilagi nous framework. This mobilizes the mucosal lining in continuity with the turnback flap of overlying skin and further contributes to the alar lining (Fig. 2). Contrary to expectations, the requirement for lining, even in large subtotal losses, is small and can easily be provided by this maneuver. There is no ne cessity to sacrifice additional skin on the dor sum for providing the lining nor are cheek flaps necessary. If the septum is absent, a turndown flap from the middorsum of the nose provides a bed for suture to the new columellar edge, or a U-shaped flap from

the columellar base is raised up with the base posteriorly for inset of the columella.

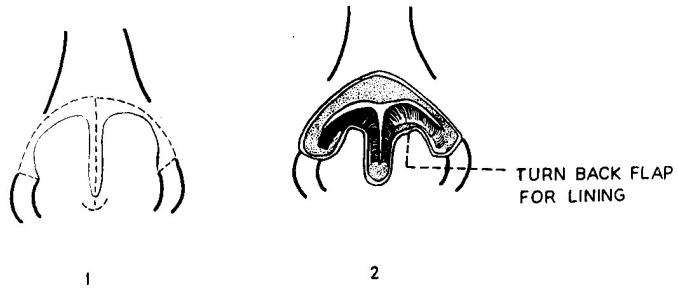


Figure 2. Incisions and raising of the turn-back flaps used for lining the recipient site of the nose before inset.

RESTORATION OF SKIN DEFECTS

The loss of lateral nasal skin usually involves at least a small amount of subcutane ous tissue. Deep abrasions may spare the subcutaneous tissue, but these usually occur on the nasal dorsum. Defects caused by the loss of skin and a small amount of subcutaneous tissue can be reconstructed by free skin grafts or local flaps.

Split-Thickness Skin Grafts.

Split-thickness skin grafts have limited usefulness in nasal repair. In most instances, split skin is used to provide temporary cover or closure. If this is the case, the donor site should be selected with this eventuality in mind. If, however, it is anticipated that the split skin graft might provide permanent cover, the upper chest and upper back are preferred as donor sites.

Full-Thickness Skin Grafts.

The well circumscribed but relatively superficial defect of the nose is often best treated with a full- thickness skin graft. The upper third of the nose and the medial canthal regions can be nicely resurfaced with a skin graft from the upper eyelid or the postauricular region. These donor sites (in most patients), however, do not give a good color or texture match for the skin of the lower two-thirds of the nose, and in these cases supraclavicular skin graft is preferred.

Local Flaps.

Flaps from the nose itself are usually based laterally and are applicable only for resurfacing relatively small defects. The skin of the nose has little range for rotation and/or advancement without producing a secondary deformity and/or requiring a donor site skin graft.

FOREHEAD RHINOPLASTY

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 support.

THE SCALPING FLAP: A GALEACUTANEOUS FLAP

One of the major problems facing surgeons has been that of obtaining a forehead flap of adequate length. The length of the flap is important in subtotal nasal reconstruction in order to avoid

tension, which may endanger survival of the flap. Adequate length also provides for a columella of adequate vertical dimension so that the tip of the reconstructed nose has sufficient projection.

Oblique or horizontal forehead flaps were designed solely to provide additional length. At Sidcup, Gillies began to extend the flap into the scalp and to curve it downward into the forehead. Gillies then developed what he called the “up-and-down” flap in an effort to increase the length of the flap; the flap ascended into the scalp and descended into the forehead skin, the latter portion of the flap serving to reconstruct the nose.

Variations of the up-and-down flap were also designed. While the ascending portion of the flap was an axial pattern flap, the descending portion was random.

The scalping forehead flap designed in 1942 represents an extension of the up-and- down flap and includes the forehead skin, the scalp and galea, and the major portion of the vasculature of the forehead and anterior portion of the scalp.

The frontalis muscle is a thin, quadrilateral muscle intimately adherent to the superficial fascia. Its vertically oriented fibers are pale. The medial margins, joined above the root of the nose, gradually diverge from each other, leaving a muscular gap in the central portion of the forehead.

The paired frontalis muscle, the galea, and their overlying integument are vascularized by a rich anastomotic network from the supraorbital, supratrochlear, and superficial temporal arteries. All of these vessels, with the exception of the superficial temporal vessels on the ipsilateral side, ensure a rich blood supply to the flap.

BCC DORSUM OF NOSE & Right Ala
WLE WITH MIDLINE FOREHEAD FLAP. LINING BY SSG

BCC dorsum of the nose extending into the right ala

Wide local excision done with 5 mm clearance
Lining by split skin graft was given

Vertical fore head flap elevated

Post Operative Picture

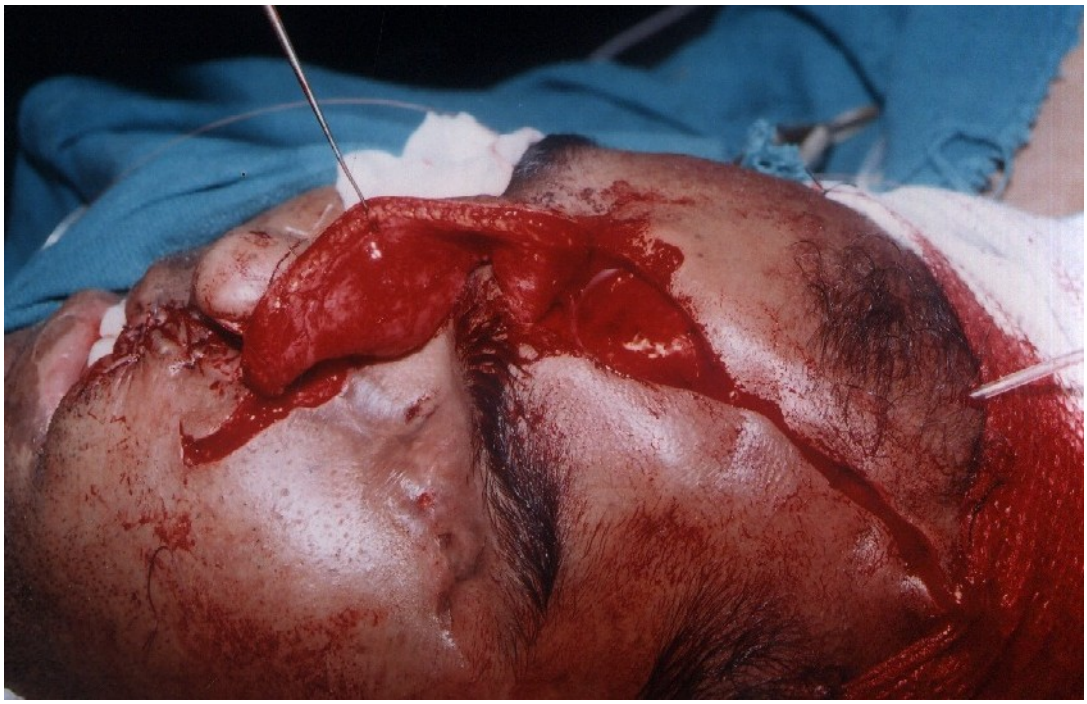
COMPLEX NASAL RCONSTRUCTION
WITH OBLIQUE FOREHEAD FLAP AND
TISSUE EXPANDER USED FOR CHEEK ADVANCEMENT

30 yrs old male presented with wide scar in the left side of the face & lost his left eye in an industrial accident

Tissue Expander removed after 10 weeks and the scar excised. Cheek advancement done

Tissue expander was inserted in the left side of face

Defect of the left side of the nose comprising ala and dorsum of the nose with left side of upper lip



Oblique forehead flap elevated

Left side of dorsum of nose and left ala reconstructed. Flap doing well seen with a pedicle

Post Operative View

CONGENITAL NASAL CLEFT WITH LEFT NOSTRIL STENOSIS. COVER WITH PARAMEDIAN VERTICAL FOREHEAD FLAP

12 yrs old female operated for frontal meningosele at her 2 yrs of age. She was reconstructed for the fronto nasal defect with a vertical midline fore head flap at that time. Now she is presenting left nostril stenosis with left alar defect with a fore head scar

Lining of the defect was reconstructed by the scar based turnover flap

Fore head flap elevated along with excision of the previous vertical fore head scar

Vertical fore head flap insert given

Fore head flap surviving well

Flap division done. Nostril stenosis corrected.
Only one fore head scar seen.

RECONSTRUCTION OF TIP BOTH ALA AND COLUMELLA WITH SCALPING FOREHEAD FLAP

38 yrs old male presented with loss of distal half of the nose following an Road Traffic Accident

Scalping fore head flap planned.
Lining was given by scar based turnover flap

Fore head skin elevated superficial to the frontalis muscle

Flap transferred to the nasal defect

Reconstruction of nasal tip columella and alar rims with the distal portion of the scalping fore head flap

A suture is inserted in distal portion of the flap and placed through a more pxoimal portion of the under surface

Post operatively flap surviving well

Post operative picture after division

The venous drainage is remarkably efficient. The supraorbital veins that run superficial to the frontalis muscle communicate with the frontal branch of the superficial temporal vein and receive the frontal vein. The frontal vein also communicates with the frontal branches of the superficial temporal vein. It drains into the supraorbital vein at the medial angle of the orbit to form the angular vein. The superficial temporal vein drains the upper portion of the flap.

Planning the Operation.

First a diagnosis of the true defect must be made. As a result of the loss of tissue, the surrounding tissues have contracted, thus masking the true defect. The condition of the remaining nasal skin must be assessed. It can be used for lining, when not suitable another flap such as a median forehead (island) flap with a subcutaneous pedicle may be necessary. A composite graft may be needed to reconstruct an ala.

Raising the Skin from the Frontalis Muscle.

The prepared pattern is placed over the lateral portion of the forehead. An outline in ink should extend 2 mm beyond the borders of the pattern to allow for slight shrinkage of the detached flap. The incision extends through the skin and subcutaneous tissue, sparing the frontalis muscle.

A plane of dissection must be found between the light-colored fibers of the frontalis muscle and the donor forehead skin. Injection of a local anesthetic solution with adrenalin should be avoided as it blanches the muscle and makes its identification more difficult. If the operation is performed under local anesthesia, block anesthesia of the supraorbital nerve is preferred. This is the most delicate part of the operation because the preservation of the blood supply of the skin with its thin layer of subcutaneous tissue depends upon the sharp dissection of an even plane from the muscle. The frontalis

muscle and the associated expressive movements of the forehead are preserved, thus providing a more acceptable donor site.

When the area of junction of the frontalis muscle and the galea is reached, the galea is incised and the remainder of the flap is raised along a plane between the galea and the pericranium.

Coronal Incision.

The incision extends in a cephalic direction from the lateral border of the skin flap that has been dissected from the frontalis muscle. The scalp incision is continued posteriorly to the level of a line extending across the scalp from the tip of one auricle to the apex of the contralateral helix.

The Second Stage: The Return of the Flap.

The flap should usually be returned to the calvarium between 14 and 18 days, unless the nasal recipient sites are poorly vascularized, as with postradiation changes.

Further delay renders the task of approximating the margins of the flap to the edge of the coronal incision a difficult one. Multiple incisions through the galea may be required to distend the flap; undermining the scalp posterior to the coronal incision may also be necessary. The galea is not sutured in a separate layer; a single layer full-thickness running suture-type of closure incorporating galea and scalp is adequate.

At the time of final inset of the flap to the upper portion of the bony nose, it is essential that the pedicle of the flap is divided at a level that will leave sufficient flap tissue to resurface the more cephalic portion of the nasal defect.

Midline Forehead Flap.

The flap is 2 to 2.5 cm wide and is based on two supra trochlear and dorsonasal arteries at the root of the nose, extending vertically upward to the hairline. The flap is elevated in the sub galeal plane. It leaves a midline forehead scar.

Angular Midline Flap.

This flap, a variant of midline flap, extends upward vertically along the lower two-thirds of the forehead and then deviates to one or the other side, depending on the ala that requires reconstruction. The angle between the vertical and oblique part is 145° to 160°.

The flap extends up to the hairline. It leaves a vertical scar in the lower part and an oblique scar along the hairline in the upper part. This gives additional vertical length to the flap.

These two flaps are useful in reconstructing small defects of the nose. The flaps are rotated through 180° to reach the nose. The donor defect is approximated after wide undermining.

Extended midline forehead flap.

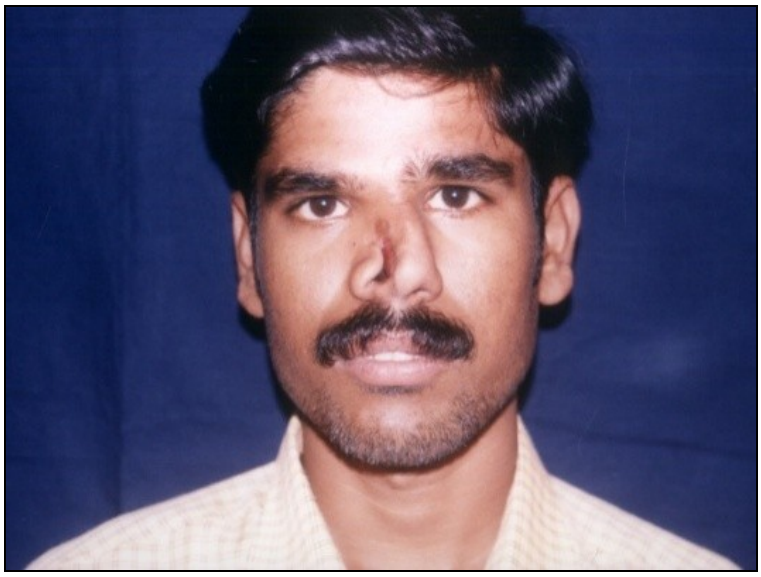
This flap is raised in the midline of the forehead or slightly obliquely to get more length. Its base is narrow, being 1.5 to 2 cm wide and situated at the root of the nose between the two eyebrows.

The flap widens as it proceeds upward and extends up to the hairline. The width at the upper end can be 3.5 to 4 cm or more, depending on the requirements of reconstruction.

The incision is deepened to the subgaleal plane. It is extended downward along the medial border of the eyebrow on one side, cutting across the supratrochlear artery. On the other side the extended incision is given through the skin alone and then blunt dissection is carried out in the subdermal plane, safeguarding the supratrochlear artery which is the lifeline of the flap.

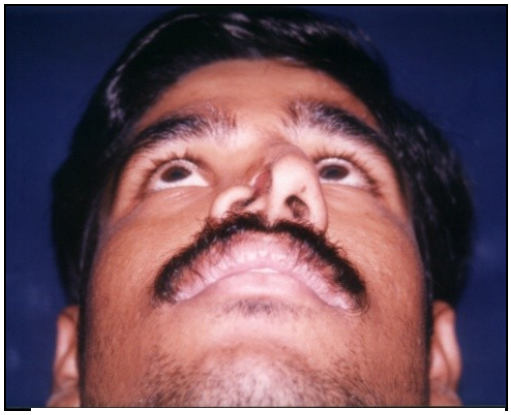
The flap is dissected as far down as the root of the nose. The narrow base, the extension of the incision downward, and dissecting the flap as far as the root of the nose all help in rotating the flap through 180° and bringing down the base of the flap. This indirectly increases the effective vertical length of the flap to enable it to reach the base of the columella. This is further facilitated by direct approximation of the forehead wound, which further shifts the base of the flap downward. Excision of the rigid and inelastic galea on the undersurface of the flap permits stretching it considerably to afford additional length.

CONGENITAL NASAL CLEFT
COVER WITH PARAMEDIAN FOREHEAD FLAP
LINING BY TURNOVER FLAP



Front view of the defect

Profile view of the defect

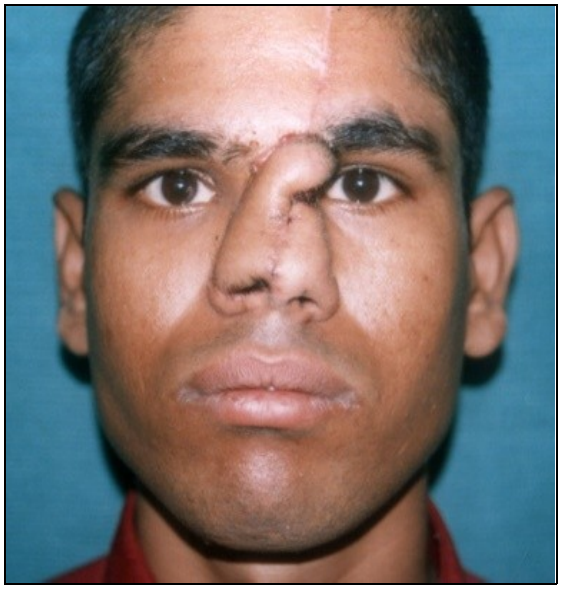


Worms eye view of the defect

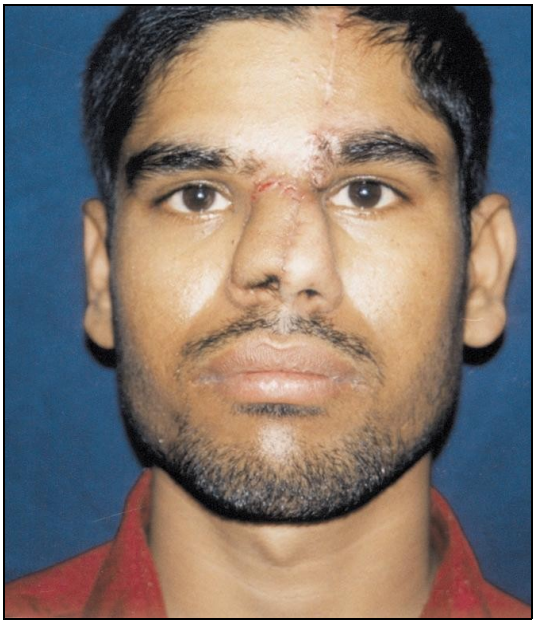
Flap markings are made

Local lining flap

Midline vertical fore head flap elevated



Post operatively flap surviving well



Post operative picture after flap division and final insert

GUNSHOT INJURY
SCALING FORE HEAD FLAP FOR COVER
LINING BY TURNOVERFLAP

30 yrs old male received bullet injuries at root of nose.
Both eyes lost vision. Wound was present in the root of nose

Markings for both local lining flap and for the scalping flap for cover

Fore head skin elevated superficial to the frontalis muscle

Post operatively flap surviving well

Post operative Picture after flap division and final insert

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 reconstruction.

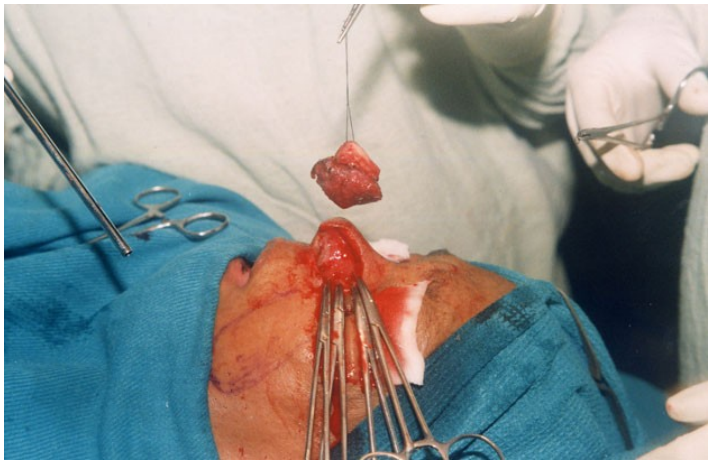
Surgical Technique

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. If the primary lesion is found to be malignant, the knife blade is discarded at this point.

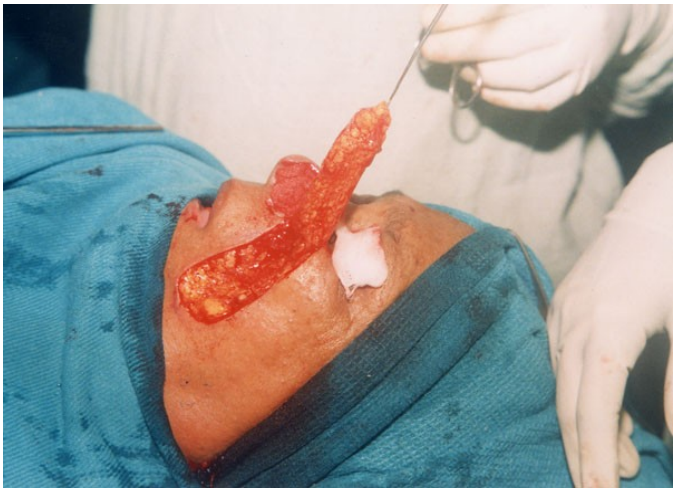
The nasolabial flap is raised from its bed as previously outlined. The flap is then wrapped in saline gauze, and the lateral aspect of cheek is boldly under mined so that the donor site can be easily closed without distortion of the angle of the mouth.

NASO LABIAL FLAP

BCC of the left ala



Per operative view of excision with 5mm clearance



Left nasolabial flap elevated

Nasolabial flap insert given. Stent given at the left nostril

Post Operative View

HUMAN BITE - RIGHT ALA DEFECT
RECONSTRUCTION WITH DELAYED NASOLABIAL FLAP

Human bite defect of the right ala

Profile view of the defect

Nasolabial flap elevated for the delay

Defect with delayed nasolabial flap

Defect of the ala reconstructed with nasolabial flap
The donor site was primarily closed

Post Operative Picture

The distal portion of the nasolabial flap is then thinned by excising fat and subcutaneous tissues since this will form the lining of the newly reconstructed ala. This portion is then folded on itself and joined to the margin of the mucosa in the alar defect with interrupted sutures of 5-0 Dexon or 5-0 vicryl.

The outer flap is then sutured over the folded flap, matching the opposite side in shape and form. The cartilage is then introduced as a last stage and is placed much closer to the margin of the rim for adequate support. The nasal packing is removed and replaced by small pieces of petrolatum-impregnated gauze packing. The area is dressed lightly with sterile gauze. Adequate hemostasis is maintained through out the procedure. The donor site is closed directly.

RECONSTRUCTION OF DEFECTS OF SUPPORT

It vary from a minor depression of the dorsal line to gross depression of the whole nose. It may be congenital or the result of trauma, septal infection, excessive resection of the septum, leprosy, or syphilis.

Support may be provided by cartilage, bone, or an inert implant. Cartilage has a tendency to

curl after a period of time, some times years, and is not generally used. Until recently an autogenous bone graft was the material of choice for support because it retains its shape, is resistant to infection, and can be sculpted with ease. There is, however, a small but definite risk of absorption of the graft, though this is generally partial and does not detract from the final result.

The shape of the support depends on the type of deformity. In the minor saddle deformity without depression of the tip of the nose, a small, boat-shaped graft or implant is used. In the usual case with marked depression of the bony and cartilaginous structures, an L-shaped graft or implant is used to recreate the dorsal line and restore the normal projection of the nose.

L-shaped Bone Graft

The inner table of the iliac crest is the donor site of choice. The L-shaped graft may be carved in one piece, but constructing it in two separate pieces will make it easier to shape and introduce and requires a smaller piece of donor bone

The graft, which should be filed smooth of spicules, is introduced through a columella splitting incision. The incision is deepened to expose the full length of the inferior margin of the septum from the spine of the maxilla to the dome of the alar cartilages. The apex of the alar cartilages must not be separated, as this widens the tip producing a bifid effect, which increases the risk of ulceration of the skin over the angle of the graft.

A subcutaneous cavity, sufficiently wide to comfortably receive the graft, is made along the dorsum of the nose, and the outer surface of the nasal bones is roughened with a rasp to hasten union with the graft. The longer limb of the graft is then introduced into the cavity to restore the dorsal line of

the nose.

The shorter limb of the graft, the columellar strut, should be a thin flat sliver and is placed within the columella. The strut rests on the spine of the maxilla and acts as a prop to the longer limb of the graft.

The columellar incision is closed in two layers. The nose is immobilized with a plaster of Paris splint that is worn continuously for three weeks and at night for another three weeks.

Cantilever Bone Graft.

Support following a postnasal inlay may be achieved by an indwelling prosthesis or a cantilever bone graft. Despite the excellent cosmetic result of the former, the patient will often request its replacement by a bone graft, which will afford a greater sense of security and prevent the formation of a troublesome oronasal fistula.

The subcutaneous border of the ulna near the olecranon is the most suitable donor site for the cantilever bone graft. Its outer surface is composed of dense cortical bone, which provides strength, and its undersurface of soft cancellous bone, which can be shaped easily and permits early union with the nasal bones. The graft can be obtained under brachial plexus block anesthesia, and the patient can remain ambulatory throughout the period of treatment.

Technique

The nasal bones are exposed through a curved incision over the root of the nose and the periosteum is stripped off the outer surface. A tunnel is then made along the dorsum of the nose

between the skin and the grafted lining by careful dissection through the same curved incision. A finger in the cavity and the thumb on the dorsum greatly helps in this delicate dissection

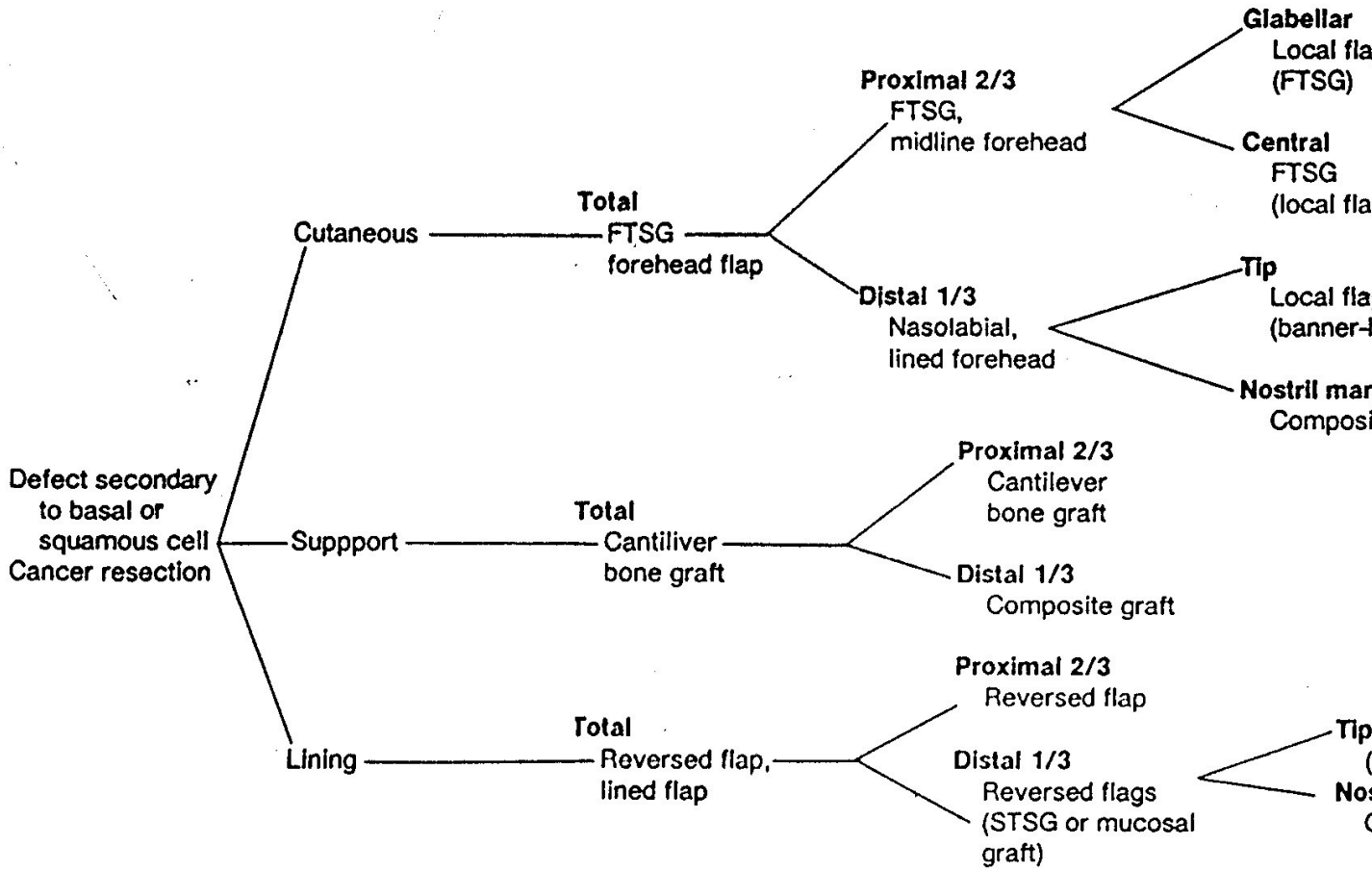
The proximal 5 cm of the subcutaneous border of the ulna is exposed through a curved incision, and the desired length of graft is removed with the help of an osteotome or saw. The required thickness of the proximal end of the graft is directly proportional to the extent of absorption of the nasal bones. The graft is trimmed to the required shape and the undersurface of the proximal end bevelled to produce the desired angle of projection of the nose.

The graft is introduced retrograde into its prepared bed and wired securely to the nasal bones. If the absorption of the nasal bones is severe, it may not be possible to drill holes through them because of the proximity of the eyes. In such a case the graft is wedged into the frontal bones, or fixed to the nasal bones with K-wires, or both. The skin incision is closed in two layers.

Silicone Nasal Implant

A silicone nasal implant is the support of choice in patients who have adequate skin cover and mucosal lining. It is introduced through a columellar-splitting incision, being careful to avoid separation of the alar cartilages at the tip. The dissection should stop short of the root of nose to prevent a “Grecian” deformity. Perforation of the mucosa must be scrupulously avoided. The columellar strut is shortened until there is no pres sure at the tip and a V-shaped notch cut into it so that it can sit astride the nasal spine. As with all support, the surgeon should resist the temptation of overcorrection and err on the side of slight undercorrection to avoid the danger of extrusion through pressure necrosis. A nasal splint is worn for a week, during which time antibiotic cover is also provided. Once the implant is well settled after a few months, there is little danger of extrusion even following trauma.

ALGORITHM OF NASAL RECONSTRUCTION IN POST EXCISIONAL DEFECT



MATERIALS AND METHODS

All the 26 cases who required nasal reconstruction in the Department of Plastic, Reconstructive & Facio-maxillary Surgery, Madras Medical College & Government General Hospital, Chennai between July 2003 and December 2005 were selected for the study with a follow up ranging from 3

months to 30 months. Patients underwent surgery of the nose for cleft lip nose or cosmetic rhinoplasty were excluded from this study.

Out of the 26 patients, 20 were men and 6 were women, with ages ranging from 5 years to 77 years. Road traffic accidents accounted for 5 cases; post human bite defects accounts for 3 cases; one case each was due to industrial accident and Gun shot injury. Post excision defects for malignant lesions were 5 in number and post benign tumour excision defects were 8 in number. 3 patients were with congenital defects.

Full thickness defect was in 13 patients. Defect of cover was seen in 12 patients. One patient had cover and support defect. Defect of dorsum of the nose was there for 4 patients. Defect of the ala alone were there for 6 patients. Defect of ala and dorsum were presented for 6 patients. Both the ala with tip present were found defective for 4 patients. Dorsum with ala, tip and columella was present for 3 patient. Defect of tip alone present for 3 patients.

All the post traumatic and post infective cases underwent secondary reconstruction. All the post excision defects were reconstructed primarily. One industrial accident patient underwent repair after tissue expander insertion for the cheek scarred skin.

All the patients with basal cell carcinoma underwent excision with a margin of 5mm all around and the appropriate method of reconstruction planned and executed.

Reconstruction with pedicled vertical forehead flap was performed in 5 patients. 1 patient was reconstructed with oblique forehead flap. Galbellar V-Y Advancement flap was done for 3 patients. Two cases underwent reconstruction with scalping forehead flap. Seven cases underwent reconstruction with nasolabial flap. One patient underwent delayed nasolabial flap.

Four defects were resurfaced with full thickness skin graft and the graft take was 100% in all

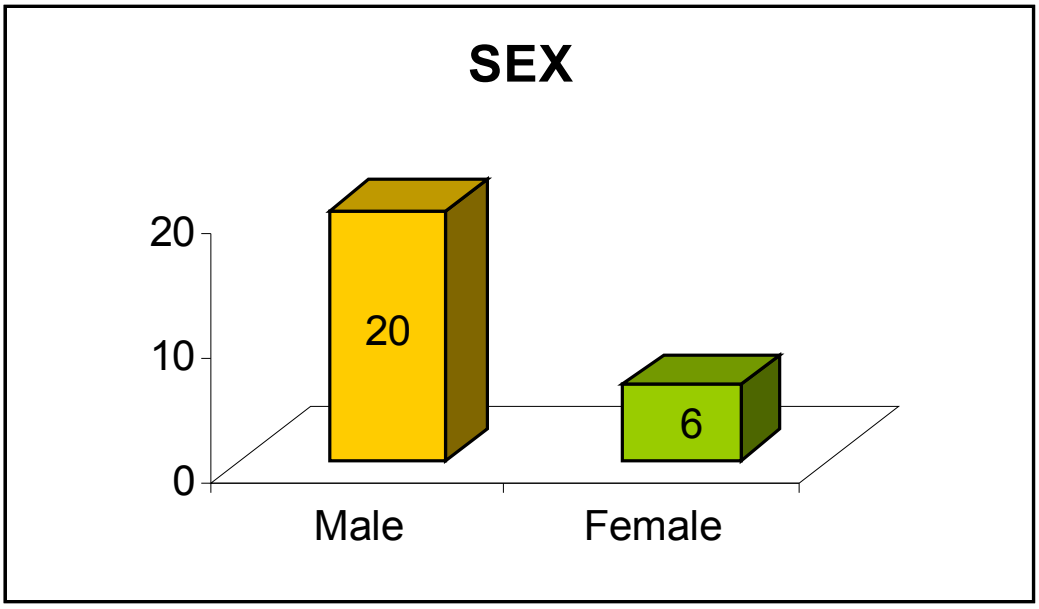
cases. One patient underwent only SSG because of poor general condition later prosthesis was applied to him. 2 patients underwent primary closure.

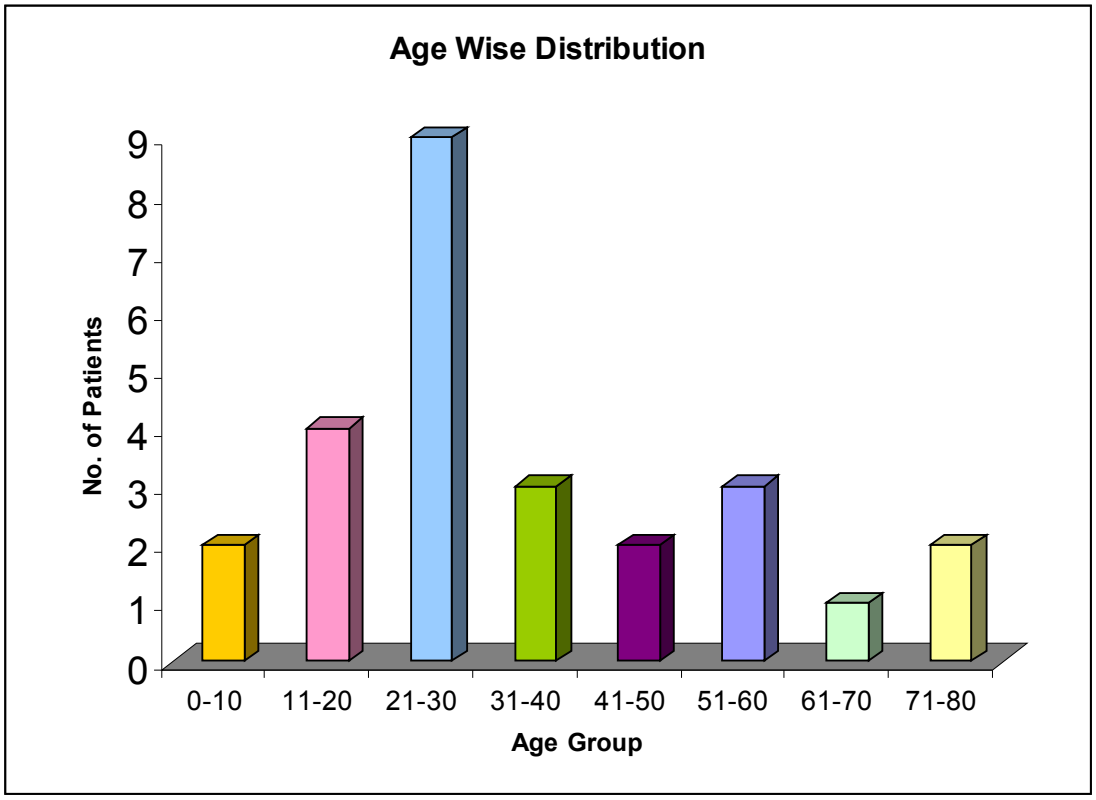
Two patients had associated eye injury. Two patients had associated upper lip injury. Two patients had preoperative nostril stenosis which was cleared postoperatively. One patient has undergone tissue expander insertion before nasal reconstruction. One patient was re-operated, eight years after the first surgery.

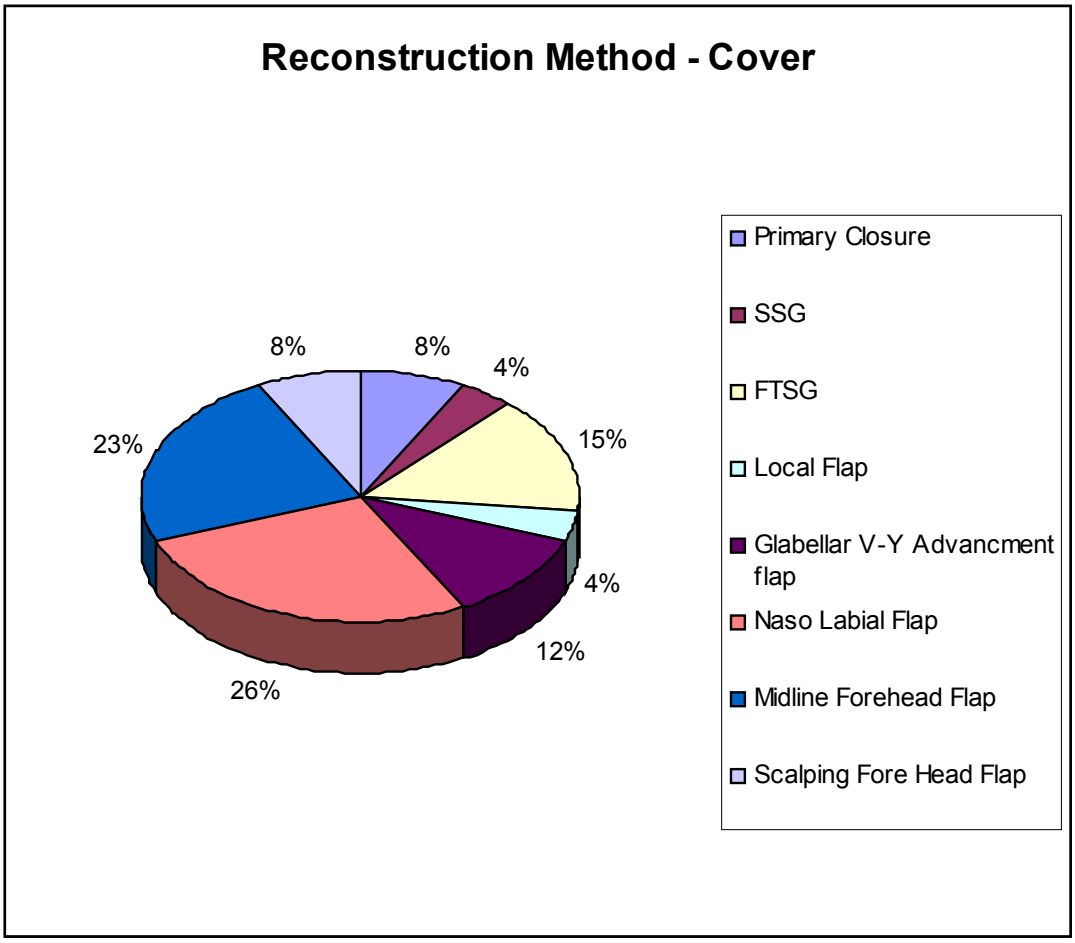
Ten patients required only one operative stage. Ten patients had 2 stages of surgery. Three patients had 3 stages of surgery. Two patents had 4 stages of surgery. One patient had 5 stages of surgery.

All the pedicled flaps survived completely. In our study none of the patients underwent reconstruction for support because forehead flap, naso labial flap and scalping flap were all found bulky enough to give the contour. Midline forehead flap based on the supra-trochlear vessels was used in the majority of patients with dorsal and tip nasal defects which is comparable to other studies. Patients with subtotal defects were reconstructed with scalping forehead flap. The maximum size of the defect was 43 x 39 mm and the minimum was 6x4 mm.

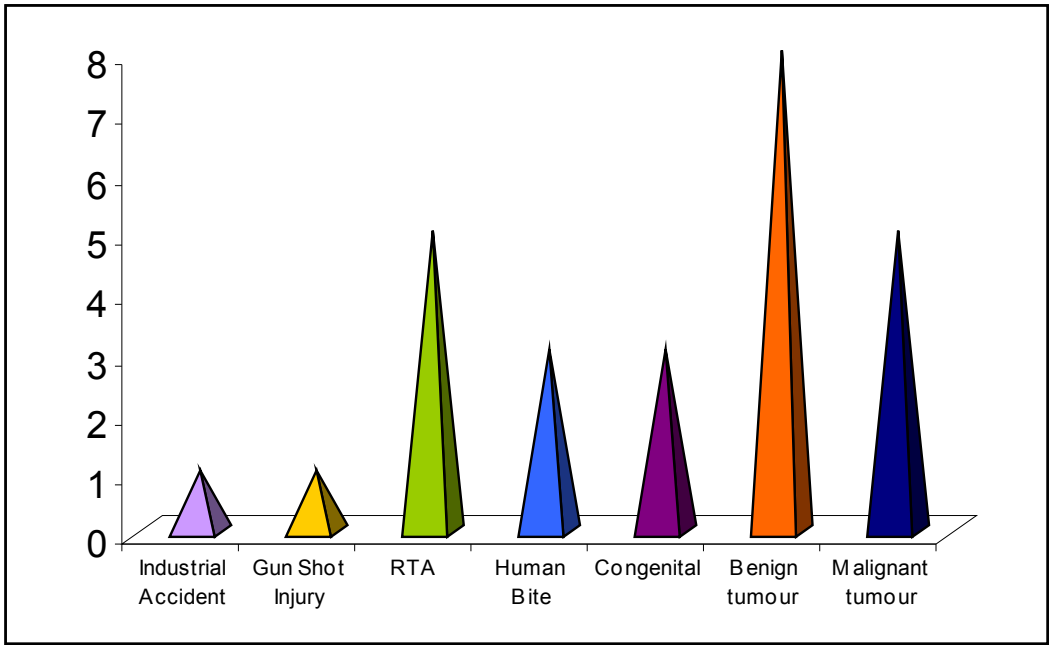
None of our patients had any significant complications.

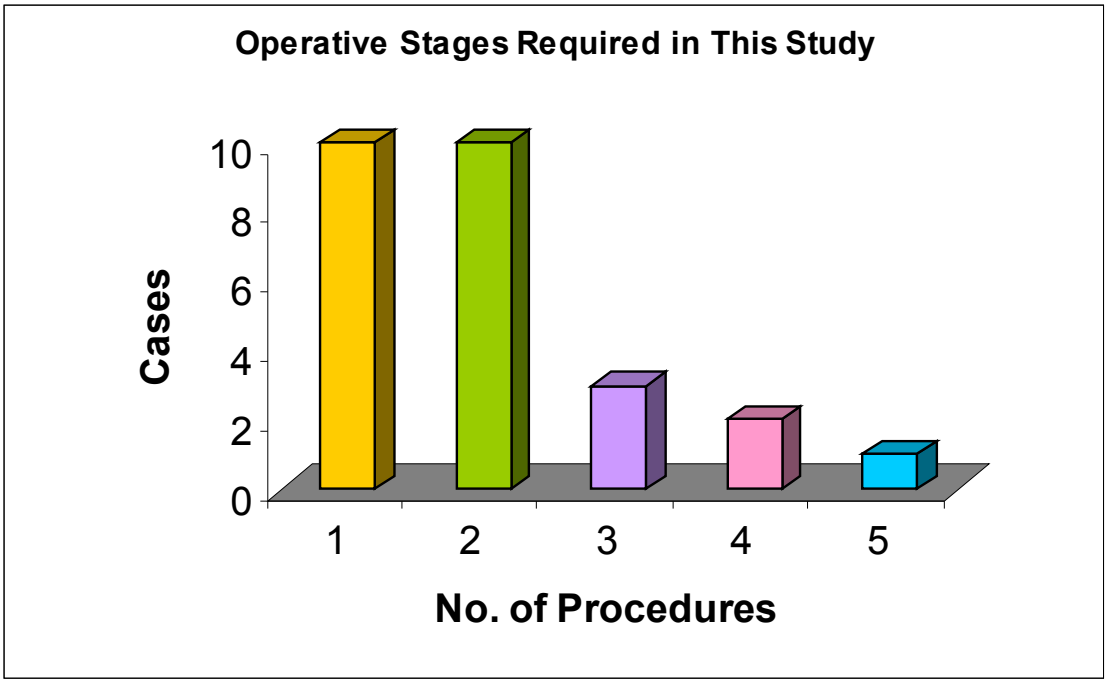

SEX
20
10
0
20
6
Male
Female

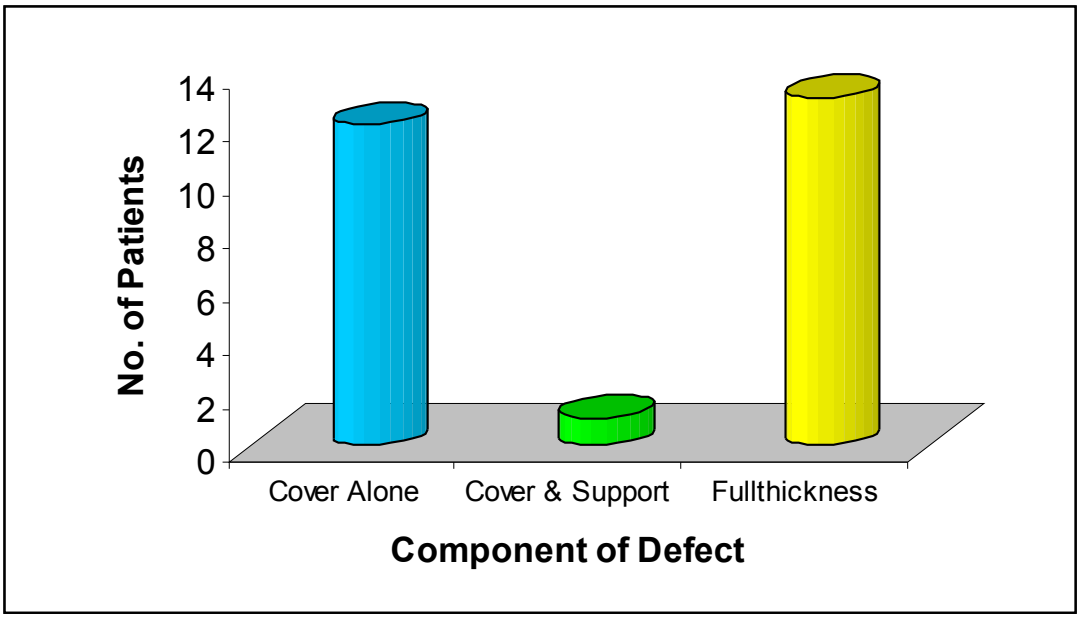

Age Wise Distribution
No. of Patients
9
8
7
6
5
4
3
2
1
0
0-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
Age Group


Reconstruction Method - Cover
8%
8%
4%
15%
4%
12%
26%
23%
Primary Closure
SSG
FTSG
Local Flap
Glabellar V-Y Advancment flap
Naso Labial Flap
Midline Forehead Flap
Scalping Fore Head Flap

ETIOLOGY


8
7
6
5
4
3
2
1
0
Industrial Accident
Gun Shot Injury
RTA
Human Bite
Congenital
Benign tumour
Malignant tumour


Operative Stages Required in This Study
Cases
10
8
6
4
2
0
1
2
3
4
5
No. of Procedures


No. of Patients
14
12
10
8
6
4
2
0
Cover Alone
Cover & Support
Fullthickness
Component of Defect

RESULTS

The results were evaluated as follows: Regarding the colour, small to moderate nasal defects were reconstructed quite well with the midline forehead flap. The forehead flap had the same colour and a superb texture match with the facial skin. Scalping forehead flap provided a good amount of tissue, but the donor site had to be grafted.

In our study, at 30 months follow- up, the contour of the reconstructive nose were found to be satisfactory and retained the good shape of the nose and projection of the tip. There was no need for reconstruction of the support. All the pedicled flaps survived completely. The two nasolabial flaps needed thinning as a second stage surgery.

There is no recurrence of the tumour even after 2 years of followup in the patients who underwent tumor excision and cover.

DISCUSSION

Nasal reconstruction is always challenging for plastic surgeons. Its midfacial localisation and the relationship between convexities and concavities of nasal subunits make impossible to hide any sort of deformity without a proper reconstruction.

Nasal tissue defects can be caused by tumor removal, trauma or by any other insult to the nasal pyramid, developing an irreversible sequela. Due to the special characteristics of the nasal pyramid surface, the removal of the lesion or the debridement must be performed according to nasal subunits as introduced by Burget. Afterwards, the reconstructive technique or a combination of them must be selected according to the size and the localisation of the defect created, and tissue availability to fulfil the procedure. An anatomical reconstruction must be completed as far as possible, trying to restore the nasal lining, the osteocartilaginous framework and the skin cover.

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.

The basic requirement for nasal reconstruction is three fold: the reconstruction of the outer skin, skeletal framework and nasal lining. The goal of nasal reconstruction is the reconstruction of nasal function and aesthetic contour. When faced with a given nasal wound it is not necessary, nor is it wise to initiate treatment with a single reconstructive option in mind.

However, the surgical axiom of performing the simplest and the least complicated procedures that will produce the desired result should be maintained. Prior to an operation the full understanding of the exact extent and location of the nasal defect as well as the cartilage and skeletal frame work is to be ascertained. The following four factors have a large impact on the outcome of the nasal reconstruction:

1. Good contrast between the nose and its surroundings.
2. An inconspicuous border scar.
3. A good colour and a texture match with the surroundings skin and
4. Symmetry. A good aesthetic outcome of reconstruction requires adequate contrasts with the surrounding facial features and an inconspicuous border scar. In general a forehead flap is used to reconstruct the nasal dorsum, and nasal tip. A naso labial flap is used for alar reconstruction. Scalping forehead flap was found useful in subtotal losses when the low frontal hairline precludes use of a mid line forehead flap.

CONCLUSION

Nasal defects commonly seen by plastic surgeons result from trauma, burn injury, or tumor resection. While nasal reconstruction is one of the oldest plastic surgery endeavors, techniques continue to evolve and be modified. Grafts and local flaps are used in smaller defects. Larger and complex defects are best reconstructed following the aesthetic unit principle. These defects also require replacement of all lost tissues to provide nasal lining, skeletal support, and skin coverage. Careful analysis of the defect and reliance on these general guidelines will allow for less obvious nasal reconstruction and a more natural appearance and function.

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

Axial pattern flap is preferable. Midline forehead flap is the workhorse in the reconstruction of small to moderate nasal cover defects, and scalping forehead flap is ideal for subtotal nasal defects.

Split skin graft can be used as a lining for forehead flap. Nasal support not needed as a skin flap was itself tough and resulted in good contour. We don't consider aesthetic subunits or constraint for nasal reconstruction. Staged procedure is ideal to attain maximum benefits.

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.

BIBLIOGRAPHY

1. Antia NH, Daver BM. Reconstructive surgery for nasal defect. Clin plastsurg 1981:8 535 - 63
2. Aygenc E, Beriat K, Kaymakci M, Ozbek C, Ozdem C. Kulak Burun Bogaz Ihtis Derg. 2002 Jul-Aug;9(4):282-5.
3. 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.
4. Barton FE Jr. Principles of nasal reconstruction. J Dermatol Surg Oncol. 1982 Jul;8 (7):568-74.
5. Barton, F. E., Jr. Aesthetic aspects of nasal reconstruction. Clin. Plast. Surg. 15: 155, 1988.
6. Barton, F. E., Jr. Aesthetic aspects of partial nasal re construction. Gun. Plait. Surg. 8: 177, 1981.
7. Barton, F.E., and Byrd H.S. Acquired deformities of the nose in plastic surgery volume 3, Philadelphia saunders 1990, pages 1925 to 2008.
8. Boyd CM, Baker SR, Fader DJ, Wang TS, Johnson TM. Arch Dermatol. 2000 Nov;136(11):1365-70.
9. Brodland DG. Dermatol Surg. 2005 Aug;31(8 Pt 2):1046-52.
10. Burger, G. C., and Menick, F.J. The subunit principle in nasal reconstruction. Plast. Reconstr. Surg. 76: 239, 1985.
11. Burget GC and memck FJ: The subunit principle in nasal reconstruction. Plast reconstruct surg 76 (2): 239, 1985.
12. Burget, G. C. Nasal reconstruction: Seeking a fourth dimension. Plast. Reconstr. Surg. 78: 145, 1986.
13. Burget, G. C., and Menick, F.J. Aesthetic Reconstruction of the Nose. St. Louis, Mo.: Mosby, 1994.
14. Burget, G. C., and Menick, F.J. Nasal support and lining: The marriage of beauty and blood supply. Plast. Reconsir. Surg. 84: 189, 1989.

15. Denk MJ, Ajkay N, Yuan X, Rosenblum RS, Freda N, Magee WP Jr. Ann Plast Surg. 2002 May;48(5):489-94; discussion 494-5.
16. Ducours JL, Richard D, Aftimos J, Wangermez A, Poizac P. : Rev Stomatol Chir Maxillofac. 1989;90(5):345-8.
17. Evans, C. R., Williams, J.Z., and Ainslie, N. B. Cutaneous nasal malignancies: Is primary reconstruction safe? Head Neck 19: 182, 1997.
18. Gonzalez-Ulloa, M. Regional aesthetic units of the face. Plast. Reconstr. Surg. 79: 489, 1987.
19. Grabb and Smith's Text book of Plastic surgery, fifth edition, Lippincott- Raven, 1997.
20. Gurunluoglu R, Shafighi M, Gardetto A, Piza-Katzer H. Aesthetic Plast Surg. 2003 Jul-Aug;27(4):286-92.
21. Herbert, D. C.: A subcutaneous pedicle cheek flap for reconstruction of alar defects. Br. J. Plast. Surg., 31:79, 1978.
22. Ira D Papal, Nathan E. Nichias: Reconstruction of nose in facial plastic and reconstructive surgery. Mosby Year book 1992 Pages 407 to 417.
23. Manson, P. N, Hoopes, J.E., Chambers, R. G., and Jaques, D.A., Algorithm for nasal reconstruction. Am. J. Surg. 138 : 528, 1979.
24. Marchac, D., and Toth, B. The axial frontonasal flap revisited. Plast. Reconstr. Surg. 76: 686, 1985.
25. Mc Gregor - Fundamentals of Plastic Surgery 1995.
26. Mc Gregor Jc, Mclean RR. Reconstruction of a large nasal defect using a bibbed forehead flap. Ann Plast Surg 1982; 9; 419 —24.
27. Mc Carthy, Plastic surgery Vol-3: The face part 2 WB. Saunders company 1990.
28. Millard, D. R. Aesthetic reconstructive rhinoplastv. Gun. Plast. Surg. 8: 169, 1981.
29. Millard, D.R. Jr, Reconstructive Rhinoplasty for the lower two thirds of the nose. Plast reconsir surg 57: 722, 1976.

30. Mohs, F. E. Chemosurgery for the microscopically con trolled excision of skin cancer. J. Surg. Oncol. 3:257.1971.
31. Mouly R, Papadopoulos O. Rev Stomatol Chir Maxillofac. 1980;81(2):91-101.
32. Orticochea, M.: A new method for total reconstruction of the nose: The ears as donor area. Br. J. Plait. Surg., 14:225, 1971.
33. Pribaz JJ, Chester CH, Barrall DT. : Plast Reconstr Surg. 1992 Aug;90(2):275-80.
34. Quatela VC, Leake DS, Sabini P. Facial Plast Surg Clin North Am. 2004 Feb;12(1):133-56.
35. Redman RD, Olshansky K. Anatomical alar reconstruction with staged nasolabial flap: Ann Plast Surg. 1988 Mar;20(3):285-91.
36. Rieger, R. A. A local flap for repair of the nasal tip. Plast. Reconstr. Surg. 40: 147, 1967.
37. Rohrich, R. J., Barton, F. E., Jr., and Hollier, L. Nasal reconstruction. In S.J. Aston, R. W. Beaslev, and C. H. Thorne (Eds.), Grabb and Smith's Plastic Suigerv,Sth Ed. Philadelphia, Pa.: Lippincott-Raven, 1997.
38. Rohrich, R. J., Muzaffar, A. R., Adams, W. P.. Jr., and Hollier, L. H. The aesthetic unit dorsal nasal flap: Rationale for avoiding a glabellar incision. Plast. Re constr. Surg. 104: 1289, 1999.
39. Rohrich, R.J., Griffin,J. R., and Adams, W. P.,Jr. Rhinophyma: Review and update. Plast. Reconst, Surg. 110: 860, 2002.
40. Sheen JH., Clin Plast Surg. 1981 Apr;8(2):193-200.
41. Shumrick, K. A., Campbell, A., and Becker, F. Nasal reconstruction in the elderly patient: The case for not letting age determine method. Arch. Facial Plast. Surg. 1: 297, 1999.
42. Shumrick, K.A. Campbel, A., and Becker, F. Nasal reconstruction in the elderly patient: The case for not letting age determine method. Arch. Facial Plast. Surg 1: 297, 1999.
43. Stucker FJ, Stockley WW, Biyarly RC: Modifications of facial flaps, Otolaryngol Clin N Am 16 (2): 457, 1983.
44. Teichgraeber, J. F., and Goepfert, H. Rhinectomy: Timing and reconstruction. OtolaryngoL

Head Neck Surg. 102: 362, 1990.

45. Tessier R. Anatomical classification of facial, craniofacial and lactofacial clefts / maxillofar. Surg. 4 : 69. 1976.
46. 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.
47. 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.
48. Vander Meulen., J.C., Mazzola, R., Vermey – Keers, C., Strickers M. and Raphael B. A morphogenetic classification of craniofacial malformation. Plat. Reconstr Surg. 71 : 560, 1983.
49. Walter C. Nasal reconstruction Laryngoscope. 1975 Jul;85(7):1227-40.

PROFORMA

NASAL DEFECTS RECONSTRUCTION

Name : Age: Sex: D.O.A :

Address : I.P.No. : D.O.S :

P.S. No.: D.O.D :

Complaints :

Cause : CONGENITAL

TRAUMATIC

Nature of Trauma

Time of Occurrence

Treatment History

Associated Injury

POST SURGICAL

Nature of Surgery

Time of Surgery

INFECTIVE

Duration of Infection

Nature of Infection

NEOPLASTIC

Duration of Tumour

Nature of Growth

Secondary Changes

Functional History :

Smell Intact ?

Nasal obstruction ?

Any other associated problem

Personal History :

Previous Medical History

- Diabetic
- Hypertension
- Tuberculosis
- Leprosy
- Previous History of any surgery

General Examinations :

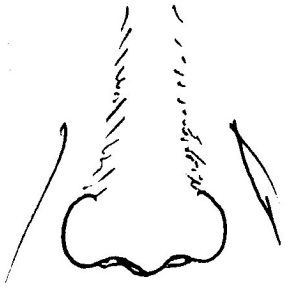
- Build
- Anaemic
- Icterus
- Lymphadenopathy

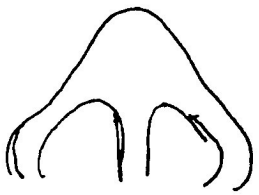
Systemic Examination :

Pulse	CVS
BP	RS
RR	

Local Examination :

1. Defect in the _____
2. Size and extent of the defect
3. component lost
    a. skin
    b. Cartilage
    c. Mucosa
    d. Bony frame work
4. Condition of the surrounding area
5. Incase of Neoplastic
    a. Size
    b. Site
    c. Extent of the ulcer / swelling
    d. Nodal status
6. Defects after surgical clearance
    a. Site
    b. Size
    c. Extent
    d. Components involved
7. Investigations
    a. Blood Haemoglobin
    b. Blood Sugar
    c. Blood Urea
    d. Serum Creatinine
    e. Urine Sugar
    f. X- Ray Chest
    g. E.C.G.
    h. Blood Grouping





Provisional Diagnosis :

Treatment Planning : i)

ii)

Reconstruction Methods Utilized :

1. Skin flap alone
   - Adjacent normal skin
   - Forehead
   - Nasolabial fold
   - Scalp
   - Distant Flap
2. Frame work reconstruction
   - Bone
   - Cartilage
3. Lining flap
   - SSG
   - Skin flap
   - Prefabricated flap

Results :

Stage of Repair :

Complications :

Follow Up :

MASTER CHART

S. NO.	PS. NO.	AGE	SEX	ETIOLOGY	SITE OF DEFECT	SIZE OF DEFECT mm	COMPONENT OF DEFECT	RECONSTRU METHO
1.	4807/03	43	F	Human bite	Left Ala	10 x 8	Full thickness	Naso labial flap
2.	5020/03	30	M	Gun shot injury	Upper half of nose	40 x 30	Full thickness	Scalping forehea
3.	5462/03	74	M	Keratoacanthoma	Dorsum	15 x13	Cover	FT SG
4.	5941/03	19	F	Naevus	Tip	8 x 10	Cover	FT SG
5.	6042/03	60	M	Rhinophyma	Dorsum, Tip & Both Ala	30 x 20	Cover	SSG
6.	6066/03	35	M	BCC	Left Ala	17 x 18	Cover	Naso labial flap
7.	6145/03	52	M	BCC	Radix	8 x 7	Cover	Glabellar V-Y Adv flap
8.	6217/03	23	F	Human Bite	Right Ala	18 x 12	Full thickness	Naso labial flap
9.	6236/03	5	M	Venous Vascular Malforamtion	Tip, Rt. Lt. Ala	18 x 17	Cover	Excision and Prim Closure
10.	6397/03	30	M	Human Bite	Left Ala	28 x 18	Full thickness	Naso labial flap
11.	6675/03	25	M	Recurrent Neurofibroma	Tip, Rt. Ala	3 x 4	Cover	Primary closure
12.	92/04	24	M	RTA	Radix	8 x 7	Cover & Support	Glabellar V-Y Adv flap
13.	460/04	12	F	Congenital	Lt. Ala & Dorsum, Tip	16 x 8	Full thickness	Forehead flap
14.	259/04	55	F	BCC	Rt. Ala & Dorsum	18 x 14	Full thickness	Naso labial flap
15.	763/04	38	M	RTA	Radix	6 x 4	Cover	Glabellar V-Y Adv flap
16.	896/04	9	M	Naevus	Tip	4 x 3	Cover	FT SG
17.	1410/04	16	M	Congenital	Rt. Ala	13 x 9	Full thickness	Forehead flap
18.	1806/04	22	M	Congenital	Rt. Ala & Dorsum	18 x 8	Full thickness	Forehead flap
19.	1839/04	77	M	Basal Cell Epithelioma	Right Ala	10 x 13	Full thickness	Naso labial flap
20.	2340/04	45	M	RTA	Tip & Both Alae	17 x 13	Full thickness	Forehead flap
21.	2371/04	19	F	RTA	Dorsum	24 x 16	Full thickness	Forehead flap
22.	2456/04	38	M	RTA	Rt. Ala, Dorsum Tip & Columella	43 x 39	Full thickness	Scalping forehea
23.	2287/04	24	M	Naevus	Tip	9 x 5	Cover	FT SG
24.	210/05	30	M	Industrial Accident	Lt Ala & Dorsum	24 x 18	Full thickness	Forehead flap
25.	1669/05	25	M	Naevus	Dorsum	8 x 4	Cover	Local flap
26.	3984/05	68	M	BCC	Rt.Ala & Dorsum	16 x 14	Cover	Naso labial flap