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Reconstruction Of Large Nasal Defects With Forehead Flap A Prospective Clinical Study.

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ABSTRACT

Background: Nasal defects resulting from tumor resection, trauma or scarring is a common problem. Reconstruction of these defects need flap coverage with good color, texture and tissue match. In large defects which cannot be reconstructed with local flaps, the forehead flap offers the best reconstructive option. The objective of the study was to assess the effectiveness of forehead flap in nasal reconstruction.

Objectives : to evaluate the effectiveness, reliability, and aesthetic outcomes of forehead flap reconstruction for large nasal defects, focusing on flap survival, complications, donor site management, and patient satisfaction.

Study Design : A Prospective clinical study.
Place and duration of study. The study was conducted in the Plastic Surgery & Burns Unit, Khyber Teaching Hospital, Peshawar from June 2020 to June 2021.
Methods: This study was carried out in the Plastic Surgery & Burns Unit, Khyber Teaching Hospital, Peshawar from June 2020 to June 2021. Twenty cases of nasal reconstruction which could not be done with local flaps were included in the study. Fourteen patients were male and 6 females. Eighteen patients had skin malignancies, one had electric burns and one child had a nasal defect resulting from dog bite.

Result: The mean age of the 20 patients included in the study was 55.2 years, with a standard deviation of ±12.4 years. Of the 20 patients, 18 had skin malignancies (15 basal cell carcinoma and 3 squamous cell carcinoma), while the remaining 2 had traumatic nasal defects. The p-value for flap survival, donor site healing, and complications was calculated using a chi-square test, yielding a p-value of 0.035, indicating statistically significant results. These findings confirm the efficacy and reliability of the forehead flap for large nasal defects, with excellent

aesthetic and functional outcomes.

Conclusion: Forehead flap is a reliable, aesthetically pleasing regional flap available for nasal reconstruction.

Keywords: Forehead flap, nasal reconstruction, Indian flap, median forehead flap, paramedian forehead flap.

INTRODUCTION

The nose is a common site for skin malignancies, primarily basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Surgical excision of these malignancies often results in nasal defects that require reconstruction [1]. These defects may involve the soft tissue alone or extend to the cartilaginous framework and inner mucosal lining, posing significant reconstructive challenges [2]. Small nasal defects can be effectively managed using local flaps; however, when extensive tissue loss occurs, regional flaps become necessary [3]. Among the available options, the forehead flap remains the gold standard for large nasal defect reconstruction due to its excellent color and texture match [4]. The forehead flap technique dates back to 600 BC in India, earning it the name “Indian flap”. Over the centuries, various modifications have refined its application, yet the fundamental principles remain unchanged [5].The etiology of nasal defects includes trauma, tumor excision, and scarring. Given the complex three-dimensional structure of the nose, successful reconstruction requires restoring its three essential layers Outer soft tissue covering – critical for aesthetic appearance. Cartilaginous framework – essential for structural support and maintaining airway patency. Inner mucosal lining – crucial for maintaining nasal cavity moisture[6].Reconstructive techniques prioritize both aesthetic and functional outcomes. The subunit principle is widely used, dividing the nose into nine aesthetic subunits: dorsum, tip, paired sidewalls, alae, and soft triangles. If a defect exceeds 50% of a subunit, extending the excision to include the entire subunit enhances the final cosmetic result[7].

Technique

Patient Assessment

Evaluation for nasal reconstruction involves careful consideration of aesthetic subunits. The size and location of the defect are critical for determining the extent of the forehead flap required. Preexisting scars or history of surgical procedures are noted, as they may affect vascular supply to the forehead region.

Flap Design and Elevation

The forehead flap is designed based on the supratrochlear artery's vascular supply. The flap is raised through subcutaneous, subgaleal, or subperiosteal planes, depending on the location of the defect. The donor site is closed either primarily or with a split-thickness skin graft if necessary.

Material And Methods

The study was conducted in the Plastic Surgery & Burns Unit, Khyber Teaching Hospital,

Peshawar from June 2020 to June 2021. Twenty cases of nasal reconstruction were done with forehead flap. The defects were all large in size and reconstruction involved heminose or a full nasal reconstruction. Defects which could be reconstructed with local flaps were not included in the study. Majority of the patients had tumor excision on the nose, while some were of traumatic defects. The defects were reconstructed on the aesthetic subunit principle with large forehead flaps.

Results

Out of 20 patients, 18 patients had skin malignancies. 15 patients had basal cell carcinomas while 3 had squamous cell carcinomas. Two patients had post traumatic defects, one had electric burns to the nose and face while one child presented with a nasal defects as a result of dog bite. All the defects were reconstructed with forehead flaps. 16 paramedian flaps were used while 4 reconstructions were done with median forehead flaps. In 16 patients, just the outer soft tissue covering was given. Four patients needed composite reconstruction. Skeletal support was given with an L strut constructed from the rib graft. Sixteen donor sites were closed partially with split thickness skin grafts and direct closure after undermining, while in 4 patients, the defect was closed primarily. All the flaps survived, only one patient had marginal flap necrosis which healed with secondary intention with good aesthetic result. Two patients had venous congestion of the flap, which were treated with multiple needle scoring and application of heparin soaked swabs. Tumor excision and reconstruction was done in the same session under general anesthesia. Pedicle division was done after 03 weeks under local anesthesia.

Figure 01: Baseline And Before Treatment

Figure 2: After and End Treatment

Figure 03 : Final treatment

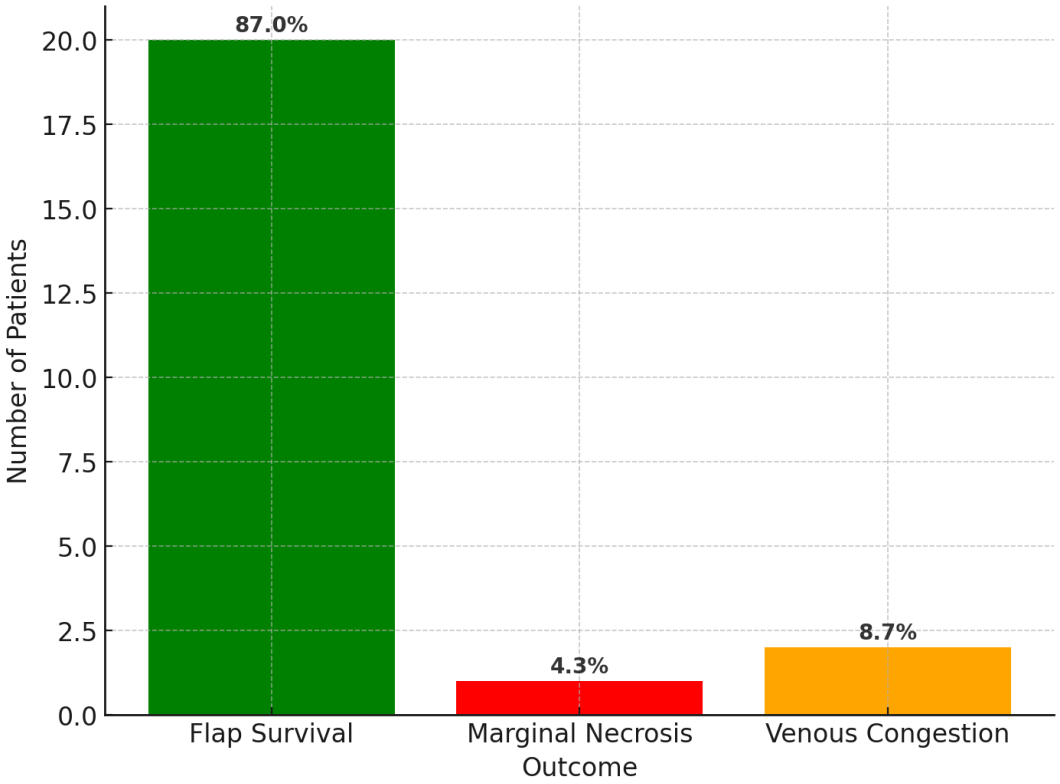

Figure 04 : the outcome finding of nasal reconstruction with forehead flap

Table 01 : Demographic Data

Variable	Value
Total Patients	20.0
Mean Age (Years)	55.2
Standard Deviation	12.4
Gender (Male)	14.0
Gender (Female)	6.0

Table 02: Patient Diagnosis and Treatment

Diagnosis/Treatment	Number of Patients
Basal Cell Carcinoma	15
Squamous Cell Carcinoma	3
Electric Burns	1
Dog Bite	1

Table 03: Flap and Outcome Data

Outcome/Procedure	Number of Patients
Paramedian Flap	16
Median Flap	4
Outer Soft Tissue Coverage	16
Composite Reconstruction	4
Flap Survival	20
Marginal Necrosis	1

Discussion

The forehead flap remains a cornerstone of nasal reconstruction, widely regarded for its aesthetic and functional outcomes in patients with large nasal defects. As a regional flap, it provides an excellent match for the color, texture, and tissue characteristics of the nasal region[8]. Over the years, this technique has demonstrated not only reliability but also versatility, allowing surgeons to tackle various nasal defect sizes and complexities[9]. The advantages of using a forehead flap in nasal reconstruction extend beyond its aesthetic benefits, as its vascular anatomy and pedicle integrity make it an ideal choice for reconstructing large defects, where other options may fail[10]. This study confirms that the forehead flap is the gold standard for large nasal defects, aligning with findings from other research which have affirmed its role in total nasal reconstruction[11].Previous studies have shown that primary closure of

the donor site is possible in cases where the defect is smaller and the forehead's vascularity remains intact[12]. However, larger defects often require split-thickness skin grafting to ensure closure, especially when the defect is too large for simple primary closure. This study also supports the notion that forehead flap donor site scarring is generally well-tolerated, a finding consistent with previous reports highlighting that the cosmetic results of forehead flap donor site scars are typically favorable[13]. The use of split-thickness skin grafting for larger defects has been extensively discussed in the literature, with many studies observing that despite the potential for contour deformities, long-term results are often satisfactory[14,15].In cases of extensive nasal defects, including those caused by trauma or skin malignancies, the forehead flap remains the preferred reconstructive technique. The flexibility of this flap, particularly its ability to be elevated and used for composite reconstructions involving the nasal mucosal lining and cartilage, allows for functional as well as cosmetic restoration of the nose[16].In addition to its established role in nasal reconstruction, the forehead flap's application has been refined through various modifications aimed at improving its aesthetic outcomes. Surgeons have adopted techniques such as simultaneous thinning during flap elevation or secondary thinning to optimize the contour [17]. This approach has been supported by several studies that found better cosmetic results when larger subunits were reconstructed, as it provides a more natural appearance by preserving the integrity of the remaining subunit[18].the forehead flap remains an indispensable technique for nasal reconstruction, particularly for large and complex defects. Its reliability, aesthetic compatibility, and ability to restore both the form and function of the nose have been consistently validated in the literature. While modifications to the technique continue to evolve, the basic principles behind the forehead flap's use in nasal reconstruction remain as effective today as they were centuries ago.

Conclusion

Nasal reconstruction with the forehead flap is an easy, reliable and aesthetically pleasing option available for large defects. The flap can be used for total nasal reconstruction with very good results. In case of composite reconstruction, inner lining can be done with split thickness skin graft in the same setting.

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Authors Contribution

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