A Practical Method for Designing Paramedian Forehead Flap: A Preliminary Report

Paramedian Alın Flebi Tasarımı İçin Pratik Bir Metod: Öncalışma

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ABSTRACT Objective: The paramedian forehead flap (PFF) is an interpolated flap which provides excellent aesthetic and functional results in the reconstruction of extensive nasal defects. The key elements for a PFF is the blood supply (supratrochlear artery and vein) and wideness of the pedicle. Herein, we offer a practical and reliable method for the design of PFF and discuss the effectiveness of this surgical method. **Material and Methods:** The harvestment of PFF was started by the identification of the potential area of the supratrochlear artery and vein. The medial canthal vertical line (MCVL) and transverse axis of the superior orbital rim (SOR) were marked as "primary lines", which were used as reference. Thereafter, the lateral borders of the potential area were metered 7 mm medial and lateral to MSVL and marked as the "secondary lines". The pedicle of the PFF was formed by using "secondary lines" and SOR. Finally, PFF was harvested and anchored to the defect area. **Results:** Six cases who had large nasal defects due to skin cancer were included into the study. All the PFFs were designed and successfully harvested according to this surgical method. None of the cases had flap failure or major complications. **Conclusion:** The surgical method for the design of PFF is easy, reliable and anatomically based, and it facilitates a relatively narrow pedicle without jeopardizing the blood supply.

Key Words: Forehead; surgical flaps; skin; nose neoplasms

ÖZET Amaç: Paramedian alın flebi (PAF) interpolat bir flep olup geniş nazal defektlerin rekonstrüksiyonunda mükemmel estetik ve fonksiyonel sonuçlar sağlamaktadır. PAF için en önemli nokta flebin beslenmesi (supratroklear arter ve ven) ve pedikülün genişliğidir. Bu çalışmada, PAF tasarımı için pratik ve güvenilir bir metod sunarak, bu metodun etkinliği tartışılacaktır. **Gereç ve Yöntemler:** PAF cerrahisi, supratroklear arter ve venin potansiyel alanının tanınması ile başlandı. Medial kantal dik hattı (MKDH) ve süperior orbital rimin (SOR) transvers aksı "primer hatlar" olarak işaretlenerek referans olarak kullanıldı. Bundan sonra, potansiyel alanın lateral sınırları MKDH'ın 7 mm medial ve laterali olarak belirlenerek "sekonder hat" şeklinde işaretlendi. PAF'ın pedikülü, "sekonder hat" ve SOR kullanılarak oluşturuldu. Son olarak, PAF oluşturularak defekt alanına sütüre edildi. **Bulgular:** Çalışmaya, deri kanseri nedeniyle geniş nazal defekti olan altı olgu dahil edildi. Tüm PAF' lar bu cerrahi metod kullanılarak dizayn edildi ve başarıyla oluşturuldu. Hiçbir olguda flep kaybı veya major komplikasyon gelişmedi. **Sonuç:** PAF dizaynı için kullanılan bu cerrahi metod basit, güvenilir ve anatomiye dayalıdır, ayrıca flep beslenmesini bozmadan görece dar bir pedikül oluşturulmasını sağlamaktadır.

Anahtar Kelimeler: Alın; cerrahi flepler; cilt; burun tümörleri

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Skin cancers are the most common type of cancer especially in the Caucasian population. The incidence and prevalence rates are increasing worldwide. Skin cancers are mainly classified as melanoma and non-melanoma skin cancers (NMSC). NMSC, which is the most common type,

encompasses two major entities: basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). The estimated incidence of NMSC is approximately 1000000 in United States of America.[1] The most frequent location of the NMSC is the head and neck region. The standard treatment modality of NMSC is surgical excision, which unfortunately leads to small to large facial defects. To date, many different surgical techniques (primary closure, grafts, flaps, etc.) have been defined for the aesthetic reconstruction of facial defects. The decision of the appropriate surgical technique for the reconstruction is made regarding the location, size and shape of the defect area.

The forehead flap is the ultimate surgical technique for the reconstruction of the extensive midfacial defects. Forehead flaps are traditionally classified as median and paramedian, however many variations have been introduced in the literature. Paramedian forehead flap (PFF) has aesthetic and functional advantages due to its location, axial design, narrower pedicle and effective length.[2] In addition, the PFF has an abundant blood supply providing revascularization of cartilage and bone grafts covered by the flap. The key factors for a successful PFF are its blood supply, which is mainly based on the supratrochlear artery (STrA), and the width of the supratrochlear vascular pedicle (SVP).

In this article, we described a new, simple and reliable method for designing a PFF which principally depends on anatomical landmarks; and discuss the effectiveness of this method.

MATERIAL AND METHODS

We preferred to perform PFF for the reconstruction of large nasal defects which appeared after excision of skin cancer; and the surgical technique described below was used for designing PFF.

SURGICAL TECHNIQUE

Preoperatively, the vertical axis of the medial canthus and transverse axis of the superior orbital rim (SOR), are marked as the "primary lines" on the forehead (Figure 1). We begin with determining the potential area for the STrA by using the primary lines as the reference. The lateral borders of the potential area are measured 7 mm medial and lateral to the medial canthal vertical line (MCVL), and marked as the "secondary lines". The medial and lateral borders of the pedicle were designated according to the "secondary lines"; and the lower border was designated by measuring 1 cm above the SOR.

If a defect involves greater than 50% of one of the cosmetic subunits the remainder of the subunit of the nose is excised for an aesthetically better result (Figure 2A-B). The inner lining and cartilaginous vault should be reconstructed in case of a full-thickness defects of the nasal dorsum (Figure 3A-B).

We started nasal reconstruction with injection of the entire forehead, using approximately 10 cc of local anesthetic containing lidocaine 1% and adrenaline (1:100.000). Subsequently, the defect area was measured, and same area was marked as the "donor area" on the forehead. The flap was incised through the periosteum to the frontal bone and it was elevated 1 cm above the SOR by referring the secondary and donor area lines (Figure 4A). The donor area on the forehead was undermined bilaterally and closed in layers after the maximal mobility was achieved. Eventually, the flap was transposed and anchored to the defect area by 5/0 prolene sutures (Figure 4B).

The flap was detached 2-3 weeks after the first operation, and some defatting of the distal part of the flap was performed. The postoperative clinical evaluation was made by regular photographic documentation (Figure 5A-B).

RESULTS

Six cases (three women, three men), who had large skin cancers (five basal cell carcinoma, one squamous cell carcinoma) on their nose, were operated in the Department of Otorhinolaryngology, Celal Bayar University between December 2007-April 2009. The mean age of the patients was 65.4 + 6.2 years. The size of the nasal defects were between 2.5-4.5 cm. The defects were localized on the nasal dorsum (four cases), lateral wall (one case), and both lateral wall and alar area (one case). All the nasal defects were successfully reconstructed with

PFF using aforementioned surgical technique. There were no flap failure or major complications postoperatively. In only one case with peripheral venous disease, early postoperative cyanosis and engorgement of the flap were seen and they resolved in a couple of days without any complications. All the PFFs were detached three weeks after the primary surgery. The follow-up of every case was made by photographic documentation, and the mean follow-up period was 35 weeks (28-60 weeks).

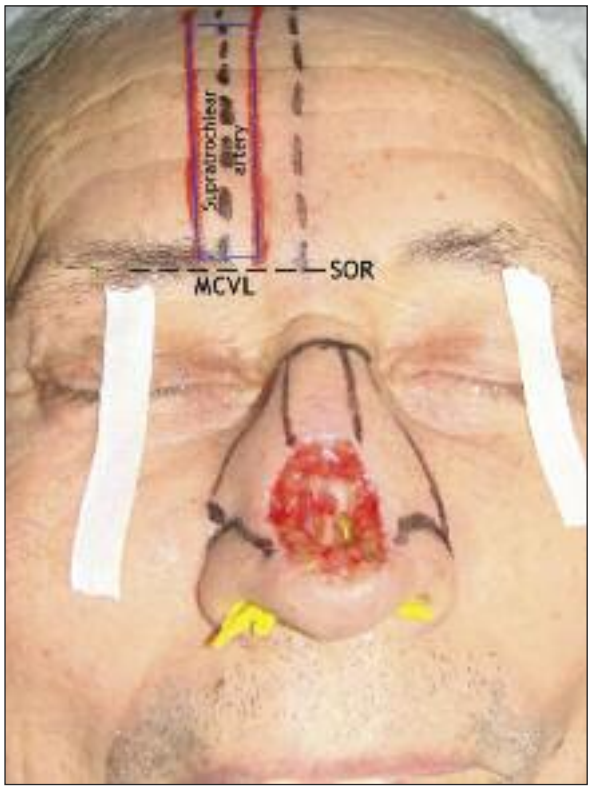

FIGURE 1: Medial canthal vertical line and superior orbital rim were marked as "primary lines", and "secondary lines" were drawn according to the "primary lines". In addition, all the cosmetic subunits of the nose were marked preoperatively.

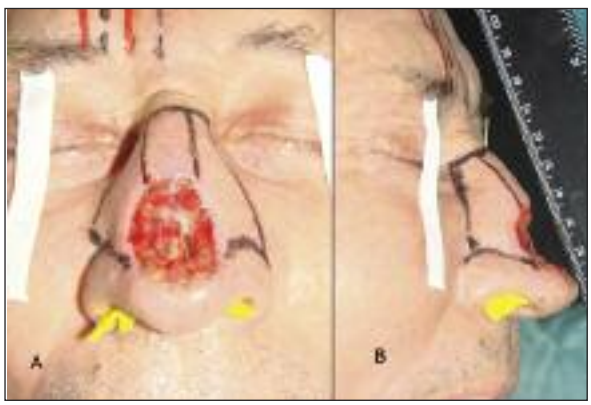

FIGURE 2: A case with a 3x2.5 cm full-thickness defect of nasal dorsum after the resection of infiltrating basal cell carcinoma (A, B).

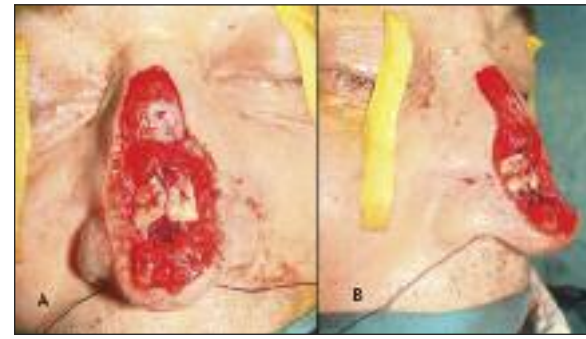

FIGURE 3: The remainder of the cosmetic subunit was excised, the inner lining and cartilaginous vault were reconstructed by using nasal mucoperichondrium and auricular cartilage (A, B).

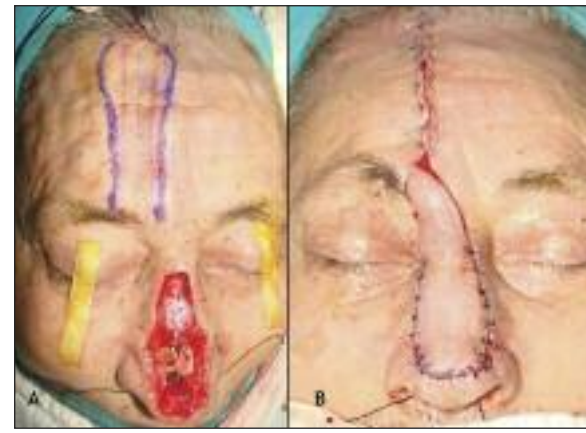

FIGURE 4: The paramedian forehead flap was marked on the donor area, and the flap was elevated referring these lines (A). Finally, donor area was undermined and closed in a layered fashion, and the flap was sutured to the cutaneous defect area (B).

FIGURE 5: Fifteen months after surgery (A, B).

DISCUSSION

The PFF has evolved from its origin in India through a series of refinements that have made it the ultimate tool in the reconstruction of extensive facial defects. It is especially preferred for large nasal defects (>2 cm) because of its perfect color and texture that match with dorsal nasal skin, and suitability to cover extensive defect areas.[3] PFF should be designed with a narrow pedicle allowing a wider arch of rotation with less kinking in the SVP. The pedicle should be as narrow as possible (1-1.5 cm) without jeopardizing the blood supply. Therefore, the identification of the emerging point and the course of the STrA is invaluable for a successful PFF.

The STrA can be detected using Doppler imaging. Yeatts et al. reported successful identification of STrA and superfical temporal arteries using transcutaneous ultrasonic Doppler flow detector.[4] However, this technique needs equipment, experience and extra-time. In addition, surgeon may fail to identify the STrA in some cases.[5] Due to these limitations, we prefer to depend on the knowledge of the forehead anatomy, and suggest a practical method which is based on anatomical landmarks.

One of the most important and reliable landmarks for the detection of the STrA is medial canthus. Kleintjes reported that the STrA never deviated 5 mm lateral or medial from the MCVL in the inferior third of the forehead.[6] Similiarly, Uğur et al. mentioned that they localized SVP on the MCVL, and at most 3 mm away from it.[5] Furthermore, Reece et al. suggested that the zone of safety for the SVP was 7 mm above the SOR.[7] Depending on these data, we raised off the pedicle by using the secondary lines which were located 7 mm medial and lateral to the MCVL, and did not elevate the pedicle lower than 1 cm above the SOR. By application of this method, we successfully harvested PFFs for the nasal reconstruction of our cases without any flap failure.

CONCLUSION

The PFF is one of the best surgical techniques for the reconstruction of large nasal defects. The successful harvestment of PFF needs careful assessment and design of the vascular pedicle. This surgical method, which mainly depends on anatomical landmarks, is easy to perform, cost-effective, reliable and confidently allows a narrower pedicle (approximately 1.5 cm wide) which optimises the flap perfusion.

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