

Reconstruction of the Nose using the Paramedian Forehead Flap – an interesting history

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ABSTRACT

The forehead flap has been used to reconstruct nasal defects for many centuries. It can be used to correct nasal deformities, repair defects following removal of skin cancers and also to treat traumatic injuries of the nose. The flap can be traced back to the times of Sushruta, known by many as the Father of Indian Medicine. Many years ago, removal of the nose was punishment for a host of different crimes, including infidelity. Thus, a repair that addressed both functional and aesthetic needs of the individual was required. This article will explore the technique, history and adaptability of the paramedian forehead flap which is a procedure performed in Oral and Maxillofacial Surgery (OMFS) departments across the United Kingdom.

INTRODUCTION

Nasal reconstruction is a complex procedure and ideally takes into account the various anatomical layers when undergoing the design stage. The forehead flap is a surgical method for nasal reconstruction that allows the transfer of skin via a pedicle to restore anatomical defects of the nose.¹ Consideration is given to maintaining an axial pattern as the flap is extended through a 180 degree angle. Dissection and undermining of the periosteal layers allows for good forehead reconstruction.¹ The objectives of nasal reconstruction are a good aesthetic result as well as patent airways to allow for a functional outcome for the patient.

To restore the aesthetic durability and patency of nasal airways, conchal cartilage is often used as structural support.² Cartilage is taken from behind the ear and used to reconstruct the shape of the nostril.

This article will explore the method of paramedian forehead flap use following the removal of cutaneous non-melanoma malignancies of the nose.

HISTORY AND PREVALENCE

The paramedian forehead flap was first described in India in 700 BC. Nasal amputation was punishment for a number of crimes and repair of the resulting nasal defect was attempted by doctors at this time.³

The early Indian methods of reconstruction did not spread further afield for many centuries due to limited foreign travel and communication of the day. It is thought that the technique spread to Arabia after the Islamic conquest of India in the 10th century.⁴ It did not appear in European literature until the 9th century, likely due to the Islamic occupation of Sicily at that time.⁵

J.C. Carpue is credited with performing the first paramedian reconstruction in the United Kingdom (UK) and began to popularise the procedure in the western world. Having read about the technique in 1794 and practiced on cadavers for over 20 years,⁶ he later completed two operations and published his work in 1814. Many modifications and adaptations ensued but it wasn't until the 20th century,

in particular the First World War, that facial reconstructive surgery gained mainstream recognition.³ Harold Gillies is noted to have completed several such nasal reconstructions and commented on how well the forehead tissue matched the surrounding nasal tissue.³

In the 1930s, reference was made to the likely primary blood supply to the flap i.e. the supratrochlear and supraorbital arteries. Anatomical location of these structures was considered in determining the design of the forehead flap. Adaptation over time led to redesign of the forehead flap with the use of a unilateral supratrochlear artery in paramedian position whereby the central glabella skin was excluded. This design was first documented by Millard.⁷ Over time, this was further adapted to use an increasingly narrowed pedicle, allowing for greater movement, length and adaptability of the flap.

Today, the paramedian repair is a relatively common procedure used for repair following removal of cancerous skin lesions on the alar of the nose (see figure 1). Cohort retrospective studies have found the most common post-operative complication to be infection at 2.9% with less than 1% requiring ITU admission.⁸ Bleeding was cited as a complication in 1.4% of cases and DVT at less than 0.5%.⁸ It would seem most complications were mild with just 4% returning to A&E within thirty days of surgery.

INDICATIONS AND CONTRAINDICATIONS

The careful selection of patients is an important factor when deciding upon a paramedian forehead flap technique for nasal reconstruction. Patients must be made aware of immediate aesthetics following completion of the first stage of the procedure, with pedicle left in place until second stage release and inset of the pedicle 3-5 weeks later. Age is not considered an immediate contraindication to flap reconstruction,¹ however a patient's co-morbidities must be taken into account when listing for the procedure. It may be necessary to alter a patient's anticoagulation regime prior to surgery.



Figure 1: Skin cancer on nasal alar region, indicating paramedian forehead flap reconstruction.

Contraindications include patients with previous trauma to the orbit³ or where blood supply to the flap may be compromised increasing the likelihood of flap failure. A further relative contraindication includes a history of radiation to the donor site.³

SURGICAL PROCEDURE

Nasal reconstruction is most commonly carried out under general anaesthetic. Local anaesthetic is used during the procedure to assist with local vasoconstriction. A sterile field, as with any surgical procedure, is maintained in order to reduce the likelihood of post-operative infection.

Accurate flap design is crucial to ensure best postoperative cosmesis and function. Symmetry is important, and use of the contra-lateral side of the nose as a template may be helpful. The flap rotated into position must have the ability to reach the defect of the nose without any tension in the pedicle. A template of the defect is used to measure the size and shape required from the forehead donor area.

The next consideration is pedicle design which centres over the supratrochlear artery, using anatomical landmarks such as the medial brow border; or more accurately though the use of a Doppler (see figure 2).

Cartilage is taken from behind the ear to replicate the anatomy and patency of the alar nasal rim (see figure 3).



Figure 2: Patient dressed, draped and anatomical locations marked prior to surgical incision.

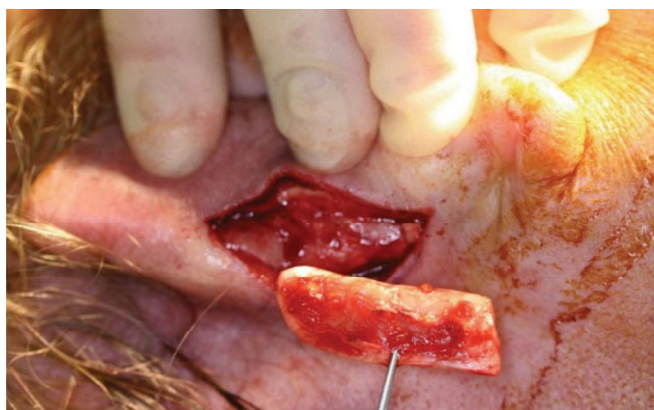


Figure 3: Cartilage obtained from the posterior aspect of the ear. The postauricular area is closed primarily.

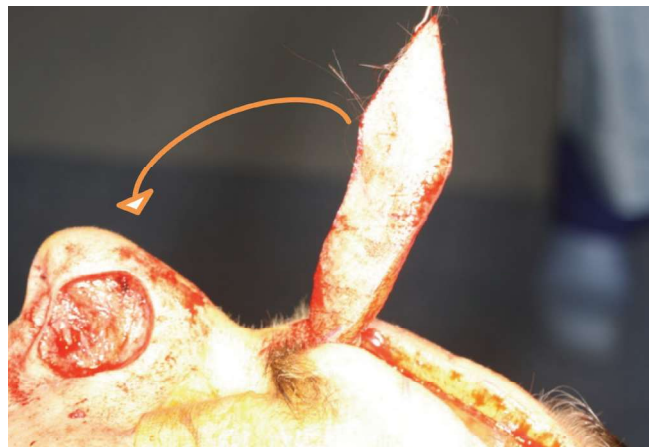


Figure 4: Raised paramedian forehead flap, rotated into place over the nasal defect. Arrow shows the rotational movement involved.

The paramedian forehead flap is raised from the superior to inferior aspect and raised within the subgaleal plane (see figure 4). The donor defect is then closed following appropriate undermining of the skin.

Following the surgical procedure, overnight observation is required to assess flap viability; this includes monitoring of the capillary refill time. Second stage release of the pedicle, trimming and inseting of the repair takes place approximately one month following initial surgery.

DISCUSSION AND CONCLUSION

The repair of nasal defects is one of the oldest forms of facial reconstructive surgery, and the earliest descriptions are from ancient India. Nasal reconstruction was originally described using a cheek flap. The first European records appeared 800 years later and are attributed to the Greek physician, Celsus.⁹ It took another 1700 years before the idea of folding a forehead pedicle flap on itself was first published in Paris by Piere Auguste Labat.³

More recent designs favour the paramedian forehead flap due to its abundant tissue availability and excellent blood supply. Burget and Menick⁷ studied the blood supply extensively and came to the conclusion that the paramedian flap was the optimal design.¹¹ Their work has significantly expanded the use of mucoperichondrial lining flaps and cartilage grafts for more extensive nasal repairs.

Due to the two-stage nature of the procedure and unusual interim appearance after the first stage (see figure 5), patient counselling is a critical factor, and must always be done in a comprehensive manner prior to surgery, to ensure informed consent is achieved. Photographs, videos and animations may be shown to patients so they have a complete understanding.

Moreover, patients should be given comprehensive information regarding wound care for the donor site/pedicle and the goals of their surgery.

This article has highlighted how the paramedian forehead flap has developed from its original historical concept and design over the centuries. With the improving sterile theatre environment and ever-advancing techniques the treatment outcomes have over the years been more elegantly approached, improved and well received by patients (figure 6).

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Figure 5: Prior to undergoing the first stage of surgery, patients must be made aware of the post-operative appearance.



Figure 6: Treatment following second repair stage. Red arrow on forehead denotes linear scar resulting after flap is raised from the forehead. Blue arrow to left side of nose showing the location of previous skin lesion removed.

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Paul Smith is fundraising for Bay Hospitals Charity



Lancaster Ironman competes in world championships for Bay Hospitals Charity

A Lancaster athlete competing in the Ironman World Championships in Hawaii recently raising funds for Bay Hospitals Charity

As well as taking on the epic challenge of a 2.4-mile swim, 112-mile bike and 26.2-mile run, Paul Smith used the event as opportunity to raise funds for UHMBT

He said: "I am very excited to be racing in the World Championships which will be even more challenging due to the conditions of the heat, humidity and strong winds associated with the volcanic island of Hawaii. I would very much like it if you could sponsor me for the event and help inspire me for when the going gets tough and raise money for our local hospital

You can donate to Paul's fund-raising total here: <https://www.justgiving.com/fundraising/paul-smith444>