

Resection of the Procerus and Periosteum in Management of the Nasal Frontal Angle in Rhinoplasty

Anil R. Shah* and Samieh Rizk

University of Chicago, USA.

*Correspondence:

Anil R Shah, MD University of Chicago, Aesthetic Skin, 200 W Superior 2nd Floor Chicago IL 60654, USA.

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ABSTRACT

Background: The procerus plays a significant role in the nasal length and the ideal nasofrontal angle.

Objectives: The objective was to understand the anatomy of the procerus muscle by using existing anatomic terms and updating its role. In addition, techniques for manipulation of the procerus muscle and periosteum of the dorsum are discussed.

Materials and Methods: Retrospective review of the surgeons (ARS and SR) results Results: The procerus muscle can be altered to affect the nasal frontal angle.

Conclusion: Procerus resection may be a helpful tool in management of the nasal frontal angle.

Keywords

Surgeons, Rhinoplasty, Nasofrontal, Procerus muscle.

Introduction

Surgeons are familiar with the importance of the nasofrontal and nasal facial angles in preoperative planning for rhinoplasty. The majority of manipulation of this area alteration of bone morphology. However, there is limited data on the role the procerus muscle plays in rhinoplasty. The present study was undertaken to define the procerus muscle better in order to improve operative planning for primary and revision rhinoplasty. A description of the operative technique is provided.

Clinical Data

In this study a database of over 34,000 patients (ARS and SR) was examined for cases where the procerus muscle was resected. This retrospective review was examined over a 24 year span. Patients were excluded where less than six month follow ups were not available. Patients were classified as either primary or revision cases. Patients' preoperative photographs and postoperative

photographs were examined to determine the nasofrontal angle both before and after rhinoplasty.

Operative Planning and Anatomy

As in all procedures in rhinoplasty, careful preoperative evaluation of the patient is extremely important to identify the exact problems present to tackle. Detailed analysis of the nose is an important first step in rhinoplasty.

The nasion refers to the point at the deepest part of the nasofrontal line and is between 4 to 6 mm deep relative to the glabella [1]. It is critical to determine the ideal position of the nasion. It is roughly located between the supratarsal fold and the eyelashes in a straight gaze. Its location on the lateral view has an enormous effect on the perception of the nasal length [2,3].

The two lateral lengths of the nose are the length from the nasion to the alar margins bilaterally. The lateral length is affected by the appearance of the lateral ala whether they are retracted or hooded.

Byrd and Hobar in 1993 described a way to estimate the nasal length and radix projection.[4] Their reference point of the radix projection was the cornea. The radix should project 9 to 14 mm from the corneal plane surface. Aiach G in 2002 described the ideal position of the nasion to be in a specific point at the deepest part of the nasofrontal groove.[5] The ideal radix projection as described by Aiach et al is calculated by measuring the distance between the corneal plane and the radix plane and then using the nasal length (NL) in the formula $R_{nasi} = 0.28 \times NL$ with R being the distance from the medial canthus [5] . The usual goal attained in performing surgery on the radix is to modify the location and projection of the nasion.

Operative Technique

This technique can be performed with either a closed or open approach. Marking of the curvature of the brow down to the level of the desired nasofrontal angle. It is also important to mark the dorsal profiles laterally and connect the desired nasofrontal angle to the tip on both sides [6]. It is recommended against injecting local anesthesia as it may cause swelling that alters intraoperative estimates of the soft tissue overlying the bone.

Once the dorsum has been exposed, the underlying skin is then undermined superficially deep to the dermis. The authors prefer to first expose the cartilaginous and bony dorsum through a subperichondrial/periosteal plane. A distinct incision is into the soft tissues of the dorsum exposing the subcutaneous tissues and

muscles in this area. The soft tissue and the procerus muscles can then be either removed separately or together. Frequently, the authors observe filler placed from previous nonsurgical rhinoplasty procedures which may contribute to the shallow radix.

If the intention is to remove both the soft tissue and the muscle together, then placing the curved scissors turned against bone and removing the soft tissue and the procerus lateral to the marked lines to the level of the bone [6]. Undermining that is required to expose the soft tissues can result in hematoma accumulation [6]. The authors also recommend removing residual periosteum of the radix as it may contribute to postprocedure swelling and lead to tenting of the radix area due to its stiff nature. The periosteum can be removed only at the radix of the nose and can extend to the inferior aspect of the frontal bone.

Results

259 cases were shown to have had procerus resection with sufficient followup to analyze changes in the nose. Of these cases, 146 were revision and 113 were primary rhinoplasty patients. Analysis revealed that patient satisfaction appeared high as no revisions were required in the radix area after procerus resection. No patients reported adverse events including thinning of skin, soft tissue asymmetry, change in facial expression or long term sequelae or vascular compromise. Prolonged swelling was noticed in several patients.

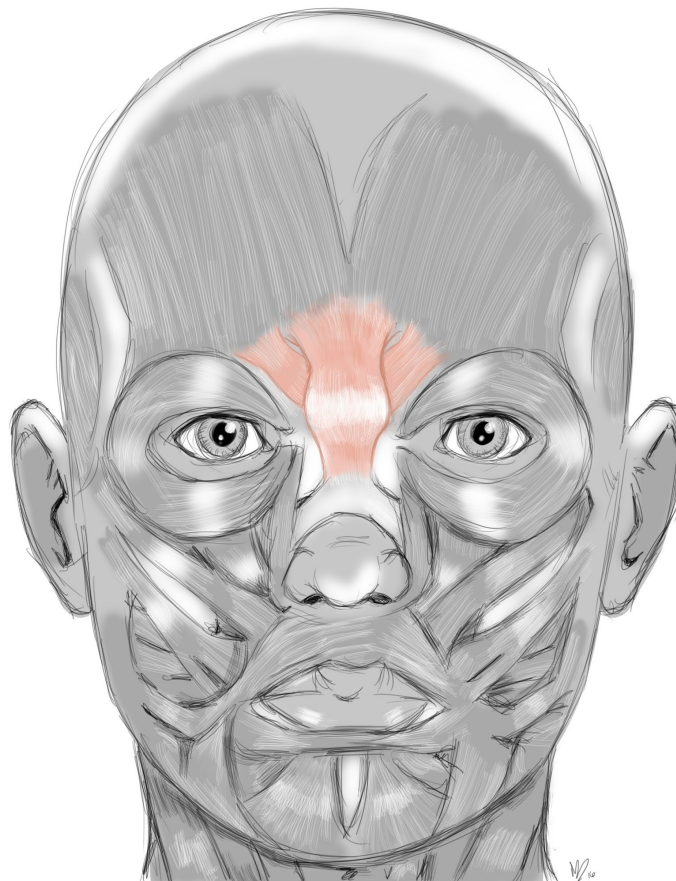


Figure 1: The Procerus Muscle.

Discussion

It is important to assess the nasofrontal junction because of the impact it has on the aesthetic look of the nose. The nasofrontal junction can be an angle, a concave line or it may not be clear-cut making the profile of the forehead into the nose as a straight line. The deeper the angle, the shorter the nose [6]. Any alteration of the nasofrontal angle will profoundly affect the appearance of the patient. In high radix patients, the nose will be continuous with the forehead giving the appearance of a straight line which can appear overly masculine and allow the nose and forehead to be aesthetically seen as one unit.

Correcting the high radix can be done in several ways depending again on the patient's aesthetic anatomy in that area. Modifying the nasofrontal angle can have several advantages and effects including achieving results that cannot be made possible with tip positioning alone. It also eliminates certain hazardous tip changes alone and makes rhinoplasty more predictable in select cases.

An aesthetically desirable nasofrontal angle is within the range of 130 and 134 degrees in males and females respectively. The apex of this angle is the radix [2,3] should lie between the supratarsal fold and the upper lid lashes. It is also important to note that the perceived nasal length and tip projection can be altered by the position of the nasofrontal angle as seen in figure 2.



Patient 1 year after resection of procerus and periosteum (surgeon Anil R Shah MD).

The procerus muscle plays a role in creating a more acute nasofrontal angle. The removal of the procerus muscle has been limited in scientific literature. The procerus muscle can bulge after rhinoplasty. This occurs after lateral osteotomies create a narrower platform for the procerus muscle to lie on. The muscle can then bulge along either the lateral sidewall or the dorsal surface. In revision rhinoplasty, some surgeons will mistake the acute nasofrontal angle as excess bone. With further removal of the bone, the angle often looks similar or wider from the front view with little change in the acute nasofrontal angle. Some authors have further defined this problem by showing that

The surgeon should also be familiar with the anatomy of the nasion. The usual layers are the skin, adipose tissue and then followed by the longitudinal muscle layer of the procerus that fuses with the procerus muscle of the other side covering the upper dorsum. On exam, the surgeon should be able to assess the amount of soft tissue by palpating or by pinching the soft tissue between the forefinger and index finger that can reveal tightness or looseness.

Aiach et al in 1982 demonstrated that the thickness of the soft tissue of the nasion to be between 3.5 and 9.5 mm averaging 7 mm in females and 7.5 mm in males on profile cephalograms [5]. The soft tissue retraction is dependent on the skin's laxity and thickness. This retraction can best be described as the difference between the thickness of the soft tissues and the volume and bony prominence of the radix. It can also be referred to the lateral redraping of the soft tissue and by the two fixed points at the inner canthi. Both thickness and elasticity affect the skin redraping.

The periosteum of the overlying radix also should be considered. The periosteum of the nose lies in continuity with the frontal bone and attaches to the rhinion. Simple resection of the procerus can lead to a tenting effect of the periosteum which may not result in a loss of radix height. Resection of the periosteum can help alleviate the tension allow for better soft tissue draping of the radix allowing for a deeper radix to be created.

The bony anatomy of the radix consists of the nasal bone and the nasal process of the frontal bone. It is difficult to reduce this area surgically. In most cases, there is an associated prominent nasal hump that is reduced intraoperatively too.

The response of the soft tissue to the bony radix removal is described by Guyuron B in 1988 to be about 25 percent. This means that in order to achieve a 2 mm increase in depth, 8 mm should be removed. For this reason and if the radix fullness was due to the procerus muscle, excision of this muscle would be of great value [1,8].

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