

Decreasing Nasal Tip Projection in Rhinoplasty

Michael R. Lee, M.D.
Palmyra Geissler, M.D.
Spencer Cochran, M.D.
Jack P. Gunter, M.D.
Rod J. Rohrich, M.D.

Dallas, Texas

Background: Decreasing nasal tip projection is occasionally required in rhinoplasty and requires a working knowledge of nasal support and function. Equally important is an understanding of the evolution to a more conservative and incremental approach when decreasing nasal tip projection. Such a conservative approach reserves the most aggressive and precarious maneuvers to be used only when absolutely required.

Methods: The authors review the history and evolution of techniques regarding decrease in nasal tip projection. Anatomy of the nasal tip with focus on tip support structures is reviewed. Distinguishing between pseudo-overprojection and true overprojection of the nasal tip is discussed. Methods of diagnosing nasal tip projection are reviewed and a suggested surgical approach is presented.

Results: Reduction of nasal tip projection requires a thorough knowledge of relevant anatomy and tissue interplay. Although a variety of techniques and algorithms exist in addition to those recommended in this article, the goal should be an incremental approach with constant reassessment. Tip truncation is rarely if ever indicated and is often associated with eventual contour deformity.

Conclusion: The described approach in this article has been proven reliable for the vast majority of patients undergoing rhinoplasty with the overprojected nose. (*Plast. Reconstr. Surg.* 134: 41e, 2014.)

Patients undergoing rhinoplasty occasionally require a decrease in nasal tip projection. Accomplishing such an objective requires a comprehensive working knowledge of nasal anatomy and function. Maneuvers executed to simply gain exposure during open or closed rhinoplasty can influence final position of the nasal tip. Failure to recognize and account for any alterations in tip support structures may lead to an unpleasant result. Equally relevant is an awareness of the evolving surgical philosophy as it pertains to rhinoplasty. Antiquated techniques relied on aggressive weakening or resection of the nasal substructure. Subsequently, patients developed problematic results both aesthetically and functionally. Although more aggressive techniques are occasionally required, a graduated approach should be used when decreasing tip projection. Such a conservative approach reserves the most aggressive and precarious maneuvers to be used only when they are unavoidable.

HISTORY AND EVOLUTION OF TECHNIQUE

Over the past century, many authors have described techniques and modifications to decrease nasal tip projection. Joseph¹ is credited with the original description in which he performed a transverse resection of the cartilaginous dome. Noting limitations to Joseph's technique, Safian^{2,3} modified the method to include a variable-sized triangular resection of the dome through a similar endonasal approach. Truncation of the dome, as seen with Goldman's technique,⁴ was prone to result in sharp edges and contour deformities of the nasal tip. As a result, many authors further altered their techniques to circumvent such untoward corollary. Modification by Smith⁵ stressed the preservation of underlying vestibular skin. Brennan⁶ overlapped the medial ends of the lateral crura after splitting the dome but did not perform suture fixation. It is now accepted that failure to overlap the abutting cartilage ends results in a less stable

From the Department of Plastic Surgery, University of Texas Southwestern Medical Center.

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construct secondary to fibrous union. Kridel and Konior⁷ described the use of dome truncation in open rhinoplasty for precise reduction of the tip in which they used suture fixation to stabilize the alar complex. Constantinides et al.⁸ and Wise et al.⁹ recently published details regarding their preferences and experiences with resection of the intermediate crus.

Unpredictability with the original dome truncation techniques welcomed new ideas and techniques to decrease nasal projection.¹⁰ Lipsett¹¹ pioneered the concept of medial crura shortening to evade disruption of natural domal architecture. Modifications to Lipsett's technique, similar to the advances of dome truncation, focused on vestibular skin preservation, suture fixation, and support preservation.^{12,13} Peck argued that the cross-striations proposed by Lipsett violated normal alar cartilage integrity.¹⁴ Soliemanzadeh and Kridel¹⁵ have since provided their algorithm for use of medial crura overlay in reduction of nasal projection.

Fredricks¹⁶ suggested a more aggressive approach to decrease the nasal tip. He described his radical tripartite technique as excising full-thickness tissue from the bilateral alar base and central one-third of the columella. Contrary to the text description, the illustrations and patient photographs included in the publication seem to suggest a more basal columella excision was performed. Although Peck¹⁰ commended the relative preservation of the alar cartilages, he disagreed that such a radical resection was necessary. The patient case included in the article is disconcerting for severe nostril distortion and alar deformity. Other authors have described advanced techniques related to coinciding resection of the proximal lateral and medial crura. Close et al.¹⁷ described using photographs to calculate the amount of cartilage requiring resection. They stressed that the equivalent reduction disallowed tip rotation and obviated compensatory alar base reduction. Rees¹⁸ suggested transection of the medial and lateral crura proximal to the domes with the cut ends left to overlap. Foda¹⁹ insightfully described his method of alar setback in which the location of medial crura resection is influenced by the existing columella-tip relationship. He also urged cartilage overlap with suture fixation for maximal support. Kridel and Konior²⁰ also noted the usefulness of lateral crural overlay in decreasing nasal tip projection.

Attempts to maximize cartilage preservation and nasal infrastructure led to the popularity of suture techniques. Rafaty²¹ described dividing

the soft-tissue attachments of the medial crura to caudal septum followed by suture fixation of the medial crura to the posterior caudal septum. Hamra²² used suture to reposition the lateral crura farther posterior. Suture techniques to decrease tip projection have also been described by Tebbets,²³ Neu,²⁴ and Foda and Kridel.²⁵

A shift in the paradigm of surgical techniques has centered on tissue preservation and maintenance of infrastructure integrity. Initial methods focused primarily on aggressive removal of cartilage, frequently compromising both the aesthetic and functional result. Rhinoplasty advances in general concentrate on preservation of the existing cartilage and tissues.²⁶ Understanding the relevant anatomy and tip support structures is crucial for approaching tip deprojection.

ANATOMY OF THE NASAL TIP

Nasal tip projection is the combined result of bony, cartilaginous, and soft-tissue structures. Together, these structures function as a unit to hold the nose in a semifixed position. Aberrancy, either developmental or traumatic, can alter tip projection, compromising nasal and facial harmony. A practical understanding of tip support structures is essential when treating the overprojected nose. The release of soft-tissue attachments or weakening/resection of insulting cartilage/bone will result in decreased tip projection.

Although the nasal bones provide support for the upper nose, it is the nasal spine, septum, and alar cartilages that are responsible for tip projection. The alar cartilages themselves are primarily responsible for tip projection, as they not only protrude from the underlying bony framework but also abut the upper lateral cartilages and nasal septum. Janeke and Wright²⁷ produced the original work on nasal tip support structures. Since that time, multiple authors have expounded on the major and minor tip support structures.^{15,28-30}

Major Tip Support Structures

Major tip support structures consist of the following: fibrous connection of lateral crura to the upper lateral cartilage; abutment and attachment of the lateral crural complex to the pyriform aperture; fibrous attachment of the medial crura footplate to the caudal septum and maxillary spine; and suspensory interdomal tip ligament (Fig. 1).

Minor Tip Support Structures

Minor tip support structures consist of the following: fibrous attachments of alar cartilage to

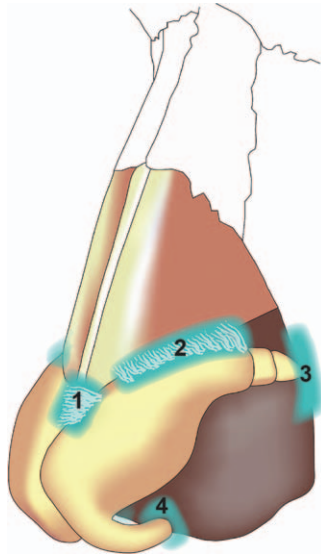


Fig. 1. Illustration of major tip support structures. 1, Suspensory interdomal tip ligament; 2, fibrous connection between upper lateral cartilage and lateral crura; 3, connection of lateral crura complex to pyriform aperture; 4, connection of medial crura to caudal septum and spine.

cartilaginous dorsum; alar cartilage attachment to skin; and membranous septum.

Alar Cartilages

Alar cartilages are composed of a medial crus, a middle or intermediate crus, and a lateral crus. Variety in size, strength, and shape of each alar cartilage influences tip definition, rotation, and projection. The lateral crura form soft-tissue connections with the upper lateral cartilages and pyriform aperture, both providing substantial support for the nasal tip. Soft-tissue connections between the alar domes themselves and with the septum provide ancillary support. The medial crus functions as a unit with the contralateral medial crus and adjacent soft tissue of the columella. The medial crura provide significant projection to the nasal tip from its relationship with the nasal septum and maxillary spine.

Nasal Septum and Maxillary Spine

The nasal septum influences tip projection by means of attachments to the alar cartilages and maxillary spine. Excessive cartilaginous septum can both give the illusion of an overprojected nose and actually induce nasal overprojection. Eloquent articles by Tardy et al.,³¹ Johnson and Godin,³² and Guyuron³³ detail the relationship of the nasal septum and medial crura as they relate to tip projection. Overdevelopment of the nasal spine is an infrequent cause of nasal overprojection but

a cause nevertheless. On rare occasion, the spine may need to be carefully reduced and the septum seated farther posterior.

Soft Tissue

Soft-tissue attachments orchestrate tissue alignment crucial for tip support and integrity. Anatomical detail of the lateral crura complex is well delineated,³⁴ whereas that of the medial crural attachments is not. Despite the crucial role performed by soft-tissue attachments of the medial crura, nasal septum, and anterior maxillary spine, a paucity of literature exist for purposes of histologic assessment.^{35,36}

Tripod Concept

The tripod concept proposed by Anderson³⁷ has proven a useful means of understanding the relationship between tip rotation and projection. With the facial frontal plane serving as the tripod base, the lateral crura serve as lateral legs and the abutting medial crura produce the third tripod leg (Fig. 2). The tripod leg of the medial crura is also influenced by the caudal septum. Shortening of the medial crura or simply violating the soft-tissue support structures produces a decrease in nasal projection and rotation. Shortening of the lateral legs of the tripod by resection of the lateral crura yields decreased projection and increased rotation. Equivalent resection of all three legs of the tripod will provide decreased tip projection, with preservation of existing rotation. Although the tripod concept provides a foundation for understanding tissue interplay, it is apparent that subtleties in tip dynamics preclude total reliability.^{9,37,38} This underscores the importance of an incremental implementation of maneuvers, with periodic reassessment of nasal projection and rotation (Fig. 3).

FACIAL ANALYSIS AND DIAGNOSIS

Evaluation of nasal projection should follow a comprehensive assessment of the overall face and

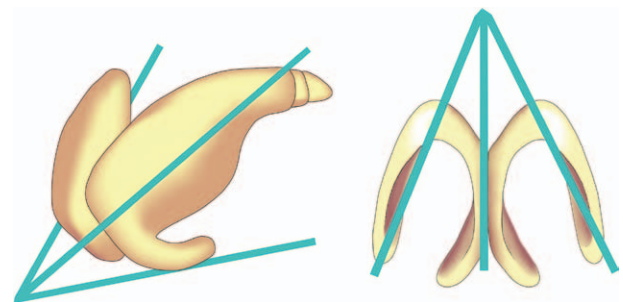


Fig. 2. Tripod concept of nasal tip projection.

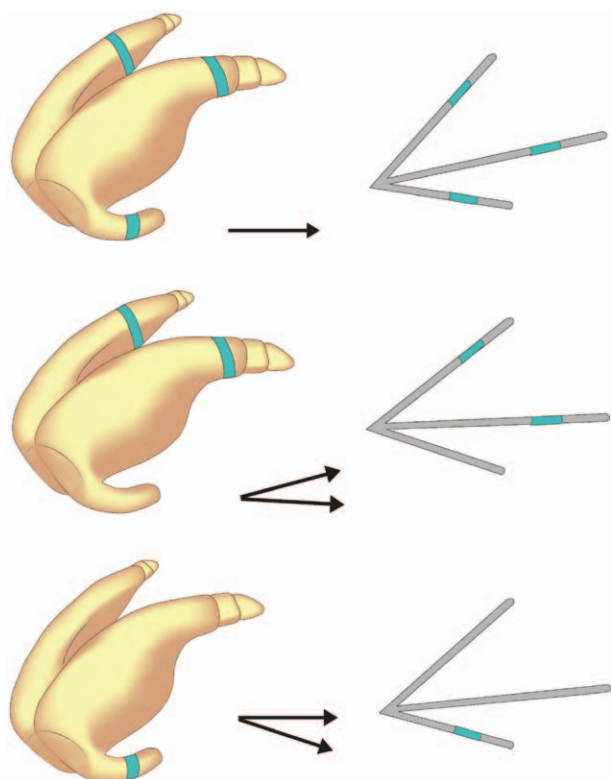


Fig. 3. Illustrations of lateral and medial crura resection on tip projection and rotation.

nose. Deviation from normal ideals of facial proportions or subunits may erroneously produce the illusion of nasal overprojection.^{15,39} Decreasing nasal projection in these patients may lead to worsening of facial and nasal harmony, underscoring the importance of appropriate analysis and diagnosis.

Pseudo-Overprojection

Multiple methods of facial assessment exist in the literature. It is crucial that a comprehensive approach is performed. In patients presenting for rhinoplasty, surgeons should specifically look at factors known to influence the appearance of projection. Such factors can be divided into nasal and nonnasal factors.

Nasal Factors

Nasal factors include the following: deep nasofrontal angle, low radix, and deficient dorsum/saddle nose deformity (Fig. 4).

Nonnasal Factors

Nonnasal factors include the following: sloping forehead, anterior maxilla (typically associated with type II occlusion), mandibular retrusion/deficient chin, and short upper lip (Fig. 5).

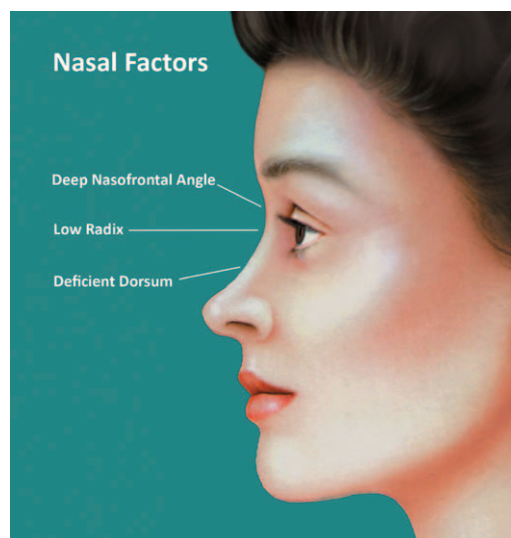


Fig. 4. Nasal factors that give the illusion of an overprojected nose.

Nasal factors may be addressed at the time of rhinoplasty if the patient desires. Patients with poor chin projection may be candidates for genioplasty or implantation. Aberrancy of normal occlusion with midface or mandibular malposition warrants consideration for orthognathic referral.

True Overprojection

Multiple methods have been described to diagnose true nasal tip overprojection. These methods consist mostly of lines created from different anatomical landmarks using mathematical ratios or measurements to best determine nasal balance. Landmarks most commonly used are the nasion, tip-defining points, and alar-facial groove.

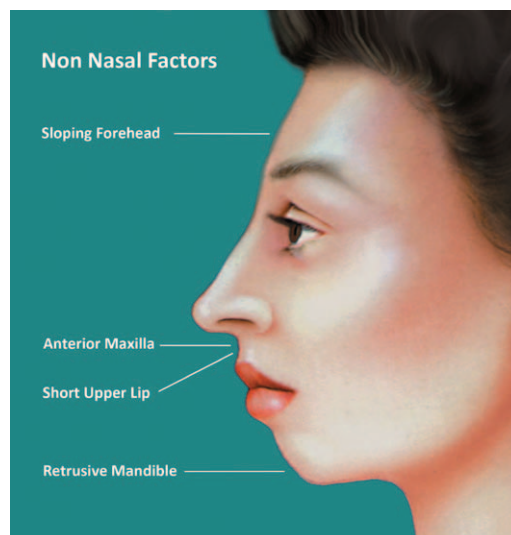


Fig. 5. Nonnasal factors that give the illusion of an overprojected nose.

Methods of Diagnosing Tip Projection

- Simons suggests, on profile view, that the distance from the subnasale to the tip-defining point should equal the upper lip length.⁴⁰
- Baum suggests an ideal 2:1 (vertical-to-horizontal) ratio of nasal length. Vertical length is determined by a line extending from the nasion to subnasale. The horizontal length is measured from a line perpendicular to the original extending to the tip-defining point.⁴¹
- Powell and Humphreys proposed a method that is a modification of Baum's method, stating the ideal ratio of nasal height to projection as 2.8:1, thus creating an aesthetic triangle with an ideal nasofacial angle of 36 degrees.⁴²
- Goode measures the nasal dorsal length from nasion to the tip-defining point and projection from alar crease to the tip-defining point. The projection should be between 0.55 and 0.6 of the nasal dorsal length. The nasofacial angle should be between 36 and 40 degrees.⁴³
- Crumley and Lanser proposed a method whereby the nose is viewed as a right-angle triangle. Vertical height is determined by a line drawn from the nasion to the upper vermillion. A line is then drawn perpendicular to the original extending to the tip-defining point. This second line should measure 0.2833 of the original. The ratio of nasal projection to height to length is 3:4:5, with the ideal nasofacial angle being 36 degrees.⁴⁴
- Byrd and Hobar suggest that the proportioned nasal length is two-thirds (0.67) the midfacial height and equal to chin vertical. Ideal tip projection is then two-thirds (0.67) the surgically planned or ideal nasal length.⁴⁵

Although these descriptions are among the most commonly used, other methods have been described. An additional ideal occasionally used includes the nasal projection anterior to the upper lip being 50 to 60 percent of the total nasal projection (from alar-facial groove to tip). Such a variety of methods highlight that all in some manner possess limitation. Using a combination of the aforementioned methods is often recommended when diagnosing tip overprojection (Fig. 6).

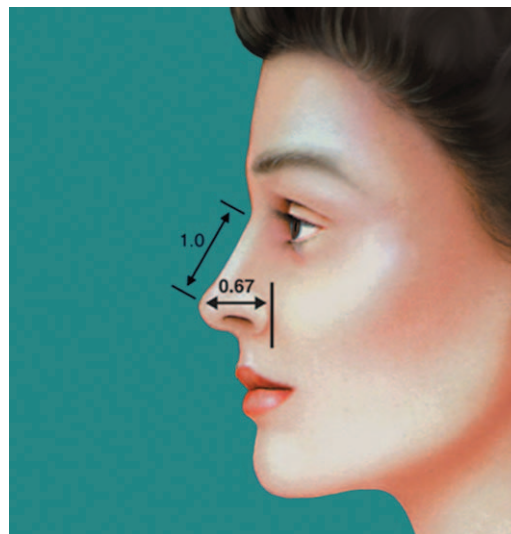


Fig. 6. Depiction of Byrd and Hobar's method for evaluating nasal projection.

INCREMENTAL APPROACH TO DECREASING TIP PROJECTION

As with most aspects of rhinoplasty, there exist varied approaches to achieve the ideal result.^{46–48} Reducing nasal tip projection does not deviate from this concept. Some surgeons prefer to treat projection and then alter the dorsum, whereas others execute the inverse of that order. There are clearly different approaches that yield similar acceptable results. Crucial to achieving the surgical endpoint is to use an incremental approach, maximizing predictability and avoiding unnecessary maneuvers. The method in this article fulfills this goal, allowing for a reliable approach to decreasing tip projection. Key aspects of the presented algorithm are listed in Table 1. It should be mentioned that the soft-tissue envelope serves as the main limitation in what can be accomplished pertaining to tip projection. This point should be stressed before surgery in patients with thick skin, as only a certain amount of reduction is possible.

Suggested Surgical Approach

The nasal envelope is opened by means of transcolumellar and bilateral infracartilaginous incisions. Following broad exposure, the nasal infrastructure is evaluated to determine the likely

Table 1. Key Aspects of Decreasing Nasal Tip Projection

Determine the cause(s) of overprojection
Incrementally address each factor
Set desired tip projection
Reestablish support for each leg of the tripod



Fig. 7. Case example of a 28-year-old woman undergoing primary rhinoplasty. Postoperative results are at 1 year. The nasal tip projection was decreased with the following maneuvers: (1) open rhinoplasty approach disrupting the interdomal ligament and medial crura attachments to the septum and spine; and (2) cephalic trim disrupting attachments between the upper and lower lateral cartilages. Note that with the decrease in projection, the patient develops a wider nasal base. Occasionally, alar base resection may be required when the nose is deprojected. The patient also received component dorsal hump reduction, cartilaginous augmentation of the radix, spreader grafts, floating columellar strut, and tip sutures.

cause(s) of overprojection. Each cause should be addressed incrementally, with alterations to projection assessed after each move. As tip rotation is often altered with techniques to decrease projection, the tripod concept guides which maneuvers are acceptable to execute.

Next, fibrous attachments are released. Separating the soft-tissue attachments of the medial crura to the septum and maxillary spine violates the central arm of projection, subsequently decreasing projection.⁴⁹ Ligamentous attachments between the upper and lower cartilages may also



Fig. 8. Case example of an 18-year-old female patient undergoing primary rhinoplasty. Postoperative results are at 1 year. The nasal tip projection was decreased with an open rhinoplasty approach disrupting the aforementioned support structures. Her bulbous tip was treated with cephalic trim and tip suture techniques. Osteotomies were used to correct her deviated bony vault. The patient also received alar contour grafts and a floating columella strut to improve nasal harmony. Conservative measures allowed for tip deprojection, whereas tip sutures provided the needed increase in tip rotation.

be breached in isolation or in conjunction with excision of the lateral crura cephalic margin. The nasal septum is now assessed. Excessive dorsal or caudal septum is now resected to achieve the desired tip projection. Noticeably, this is accomplished before any graft harvest of the septum, as sufficient substructure of the dorsal-caudal strut

must be preserved. Examination of tip projection is assessed once again following treatment of the nasal septum. With each assessment, the skin envelope should be redraped and viewed from the profile position.

If a greater decrease in projection is required, the medial and lateral crura are addressed. Again,

the importance of understanding the interplay between rotation and projection is crucial for achieving the desired result.^{50,51} The medial crura are treated first to set the desired amount of projection. Medial crura cartilage can be divided and removed or overlapped depending on surgeon preference. A columella strut is routinely applied to fortify the adjusted crura. The location of medial crura resection is typically stair-stepped from the transcolumellar incision. Furthermore, adjustments in location of the medial crura shortening may be made if there is aberrancy from the ideal columella-to-lobule ratio of 2:1 as suggested by Foda.¹⁹ Next, attention is focused on the lateral crura. In much the same manner, the lateral crura may be resected to decrease projection or cut and overlapped. If the lateral crura are not overlapped, support must be added to prevent alar collapse and subsequent external valve obstruction. Reestablishing lateral support of the nasal tip is crucial and cannot be overstated. The most reliable manner of fortifying the lateral crura is placement of a lateral crura strut graft. Conservative technique such as lateral crura repositioning should be completed before resection techniques if they are to be used. Following repositioning, the tip projection is reassessed to determine whether cartilage resection is needed to further reduce projection (Figs. 7 and 8).

Technical Considerations

Following reduction of the nasal tip, the nose should be once again assessed from each view, with particular attention to the profile and basal views. The nose may require resection of the alar base to account for the now present soft-tissue excess. If not addressed, alar excess or flaring can compromise an otherwise good result. Reduction of the alar base, although not altering the absolute tip position, will influence the overall balance of the nose with regard to projection proportions.⁵²

Reducing the soft tissue of the nasal envelope may also be considered in patients with thick skin. Preservation of the subdermal plexus should be achieved to ensure adequate blood supply. As previously mentioned, external valve compromise can occur if the lateral crus is not appropriately fortified. Use of lateral crura strut grafts ensures the utmost of the alar support and avoids many associated problems such as retraction, notching, and airway obstruction when properly executed. Finally, surgeons should be aware of dorsal-tip disproportion. The ideal nasal length-to-tip projection approximates a 3:2 ratio. Failure to correct a low radix or overaggressive lowering of the

dorsum may deliver the illusion of overprojection even when ideal.

CONCLUSIONS

Reduction of nasal tip projection requires a thorough knowledge of relevant anatomy and tissue interplay. Although a variety of techniques and algorithms exist in addition to those recommended in this article, the goal should be an incremental approach with constant reassessment. Tip truncation is rarely if ever indicated and is often associated with eventual contour deformity. If implemented, the cut edges should be overlapped or covered with placement of a cap graft. The described approach in this article has been proven reliable for the vast majority of patients undergoing rhinoplasty with the overprojected nose.

Michael R. Lee, M.D.

The Wall Center for Plastic Surgery
8600 Fern Avenue
Shreveport, La. 71105
michaellee.prs@gmail.com

PATIENT CONSENT

The patients provided written consent for the use of their images.

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