

## Nasal Tip Sutures Part II: The Interplays

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The achievement of consistently superior results in rhinoplasty is rendered difficult in part by a number of complex interplays between the anatomical structures of the nose and the techniques used for their alteration, such as tip sutures. The effects of sutures depend largely on the magnitude of suture tightening, the intrinsic forces on the cartilages, cartilage thickness, and the degree of soft-tissue undermining. The tip complex is perhaps the most intricate of the nasal structures, exhibiting subtle but evident responses to manipulations of the lower lateral cartilages. The three-dimensional effects of nine suture techniques that are frequently used in nasal tip surgical procedures are discussed and illustrated. (1) The medial crura suture approximates the medial crura and strengthens the support of the tip. The suture also has effects that are less conspicuous immediately. There is slight narrowing of the columella, caudal protrusion of the lobule, and minimal caudal rotation of the lateral crura. (2) The middle crura suture approximates the most anterior portion of the medial crura. There is greater strengthening of the tip and some approximation of the domes with this suture. (3) The interdomal suture approximates the domes and can equalize asymmetric domes. However, the entire tip may shift to the short side if there is a significant difference in the heights of the domes because of short lateral and medial crura. (4) Transdomal sutures narrow the domal arch while pulling the lateral crura medially. The net results are increased tip projection, alar rim concavity, and the potential need for an alar rim graft. In addition, depending on suture position, cephalic or caudal rotation of the lateral crura may be observed. (5) The lateral crura suture increases the concavity of the lateral crura, reduces the interdomal distance, and may retract the alar rims. Perhaps the most significant inadvertent results of this suture are caudal rotation of the tip and elongation of the nose. This is important because patients who undergo rhinoplasty would often benefit from cephalic, rather than caudal, rotation of the tip. (6) The medial crura-septal suture not only increases tip projection but also rotates the tip cephalically and retracts the columella. (7) The tip rotation suture shifts the tip cephalad while retracting the columella. (8) The medial crura footplate suture approximates the footplates, narrows the columella base, and improves undesirable nostril shape. (9) The lateral crura convexity control suture alters the degree of convexity of the lateral crura. The nuances of these sutures and their multiplanar effects on the nasal tip are discussed. (*Plast. Reconstr. Surg.* 112: 1130, 2003.)

A thorough understanding of changes in the three-dimensional disposition of the nasal tip cartilages with each suture placed in the cartilages during tip surgical procedures is beneficial for both experienced and novice surgeons. The lower lateral cartilages are the chief providers of structural support to the tip of the nose. Therefore, any excess, deficiency, or alteration of these cartilages directly affects the shape of the overlying nasal skin sleeve and thus the nasal tip. Nasal surgical procedures frequently involve manipulation of the lower lateral cartilages, and the sutures placed to alter these cartilages are critical components of current tip surgical procedures. It is crucial to understand that these sutures result in changes beyond the main goals for which they are placed. These unexpected effects can be important for the overall aesthetic results.

In this report, the most frequently used tip suture techniques are discussed. Special emphasis is placed on the effect of each suture on the three-dimensional configuration of the nasal tip. The interactions discussed here represent general guidelines; the final suture effects are influenced by factors such as forces intrinsic to the cartilages, the degree of suture tightening, and limitations posed by the soft-tissue attachments. Many of these effects may not be immediately evident if needle fixation techniques are used. The changes occur gradually after needle removal, making observation of the changes difficult. The sutures considered are the medial crura suture, the middle crura suture, the interdomal suture, the transdomal suture, the lateral crura suture, the medial crura-septal suture, the tip rotation suture, the footplate suture, and the

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lateral crura convexity control suture. The effects of each suture on the nasal appearance are discussed.

#### THE SUTURES

##### *The Medial Crura Suture*

This suture is placed as a loop suture between the two medial crura. It can be placed such that it affects the cephalic half, the caudal half, or the entire width of the medial crura,

and the knot is positioned in the space between the two medial crura. The suture is placed in the middle one-third of the medial crura length and functions to bring together the medial crura, narrowing the columella while strengthening it and thus providing additional tip support. Narrowing of the columella occurs even if the cephalic borders of the medial crura are in contact, because of further narrowing of the angle between the medial crura. When a greater width of the medial

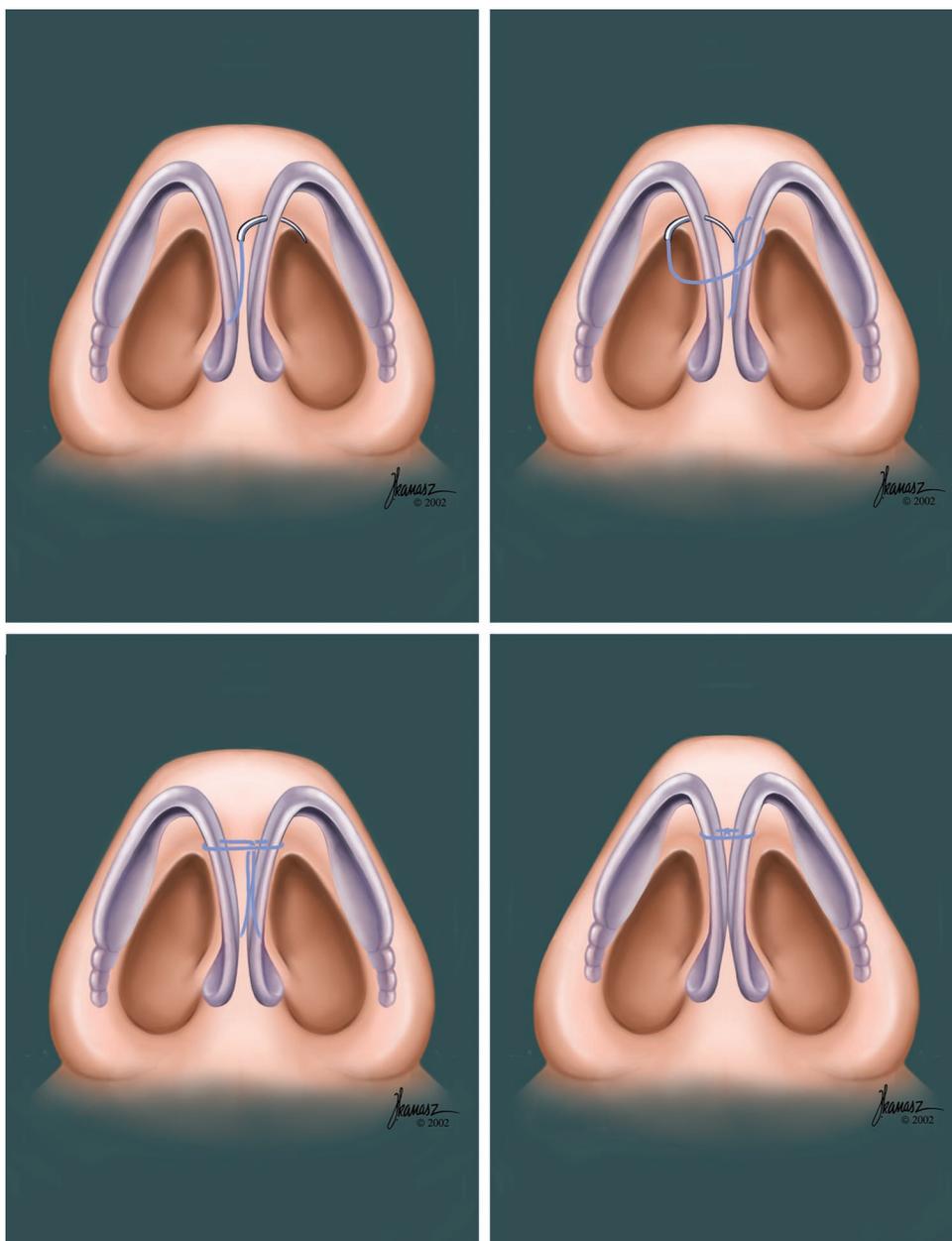


FIG. 1. The medial crura suture. (Above, left) The position of the domes in a widened nasal tip is depicted. (Above, right, and below, left and right) Placement of the medial crura suture results in narrowing of the tip and increased lobule size.

crura is included in the suture, the angle between the medial crura is smaller and the columella appears narrower. The lobule volume is augmented if the soft tissue between the domes is not removed before placement of the medial crura suture. Additional lobule length, which is a consequence of geometric alteration of an obliquely oriented medial genu to a more cephalocaudally oriented position, is also observed. This suture may minimally reduce the interdomal distance (Fig. 1). However, depending on suture position, additional changes may occur. Placement of the medial

crura suture along the caudal half of the medial crura causes caudal rotation of the lower lateral cartilages. For a patient with hanging alar rims and insufficient columellar show, such caudal rotation of the lateral crura would be detrimental. A moderate increase in columella protrusion is also noted.

#### *The Middle Crura Suture*

The middle crura suture is placed through each medial genu, in the uppermost portion of the medial crura. The knot is positioned me-

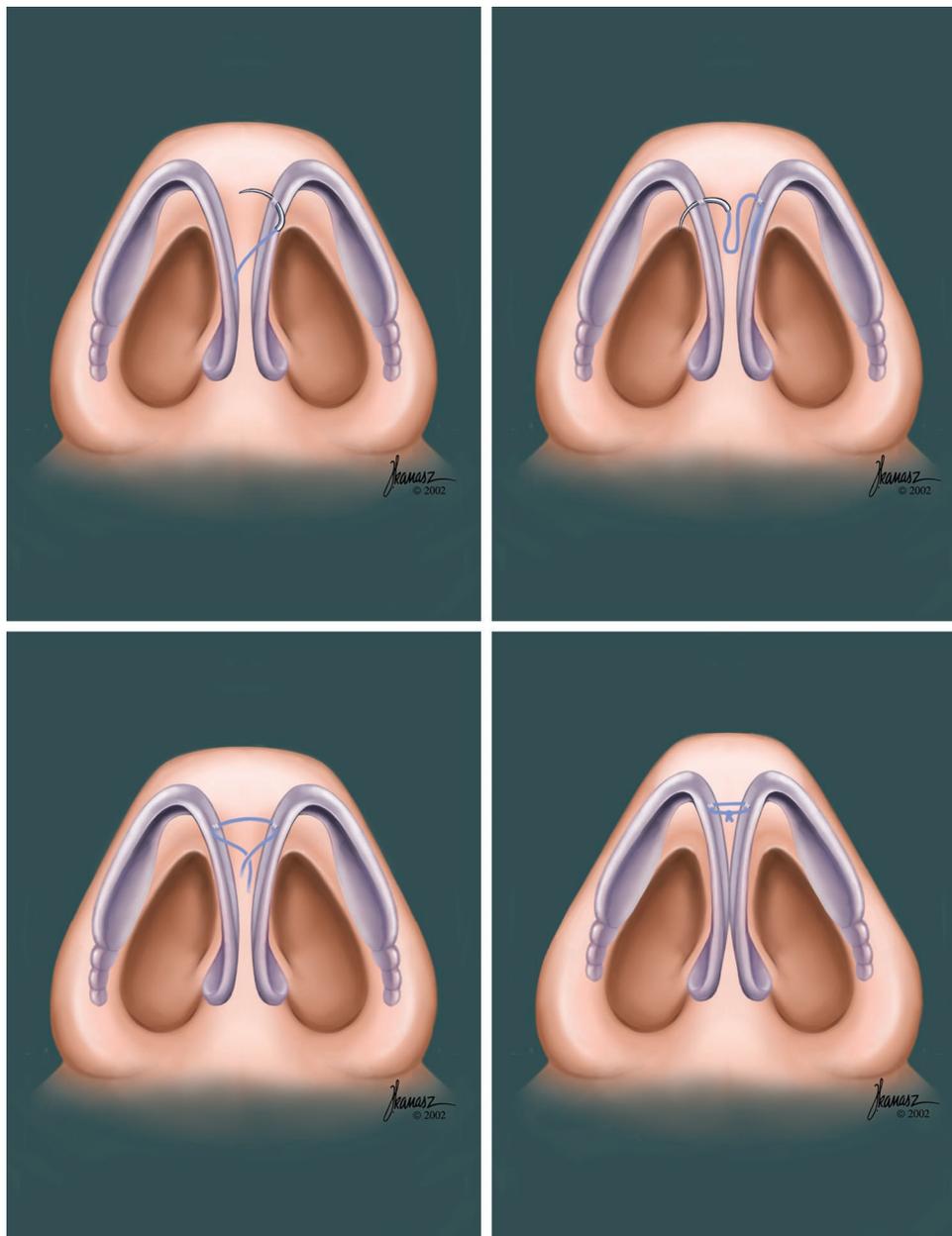


FIG. 2. The middle crura suture.

dially. In contrast to the medial crura suture, this suture results in more pronounced reduction of the interdomal distance, increased lobule size, and lobule protrusion (Fig. 2). The nasal tip support is improved with strengthening of the upper columella.

#### *The Interdomal Suture*

The interdomal suture is a figure-eight or simple loop suture placed from the most anterior portion of one dome to the contralateral dome. The changes in the cartilages produced by this suture are somewhat similar to the effects of the transdomal suture. As the suture is tied, the

domes are approximated, narrowing the tip and increasing the length and potential volume of the lobules. However, the interdomal suture approximates the domes to a greater degree, compared with the transdomal suture (Fig. 3). Depending on the position of the suture, outcomes can vary. When the suture is placed along the cephalic margin of the domes, the lateral crura minimally shift cephalically. A suture placed in the center of the domes reduces the interdomal distance without rotation of the lateral crura. A suture placed along the caudal margin of the dome rotates the lateral crura caudally. The more laterally the suture is placed on the dome,

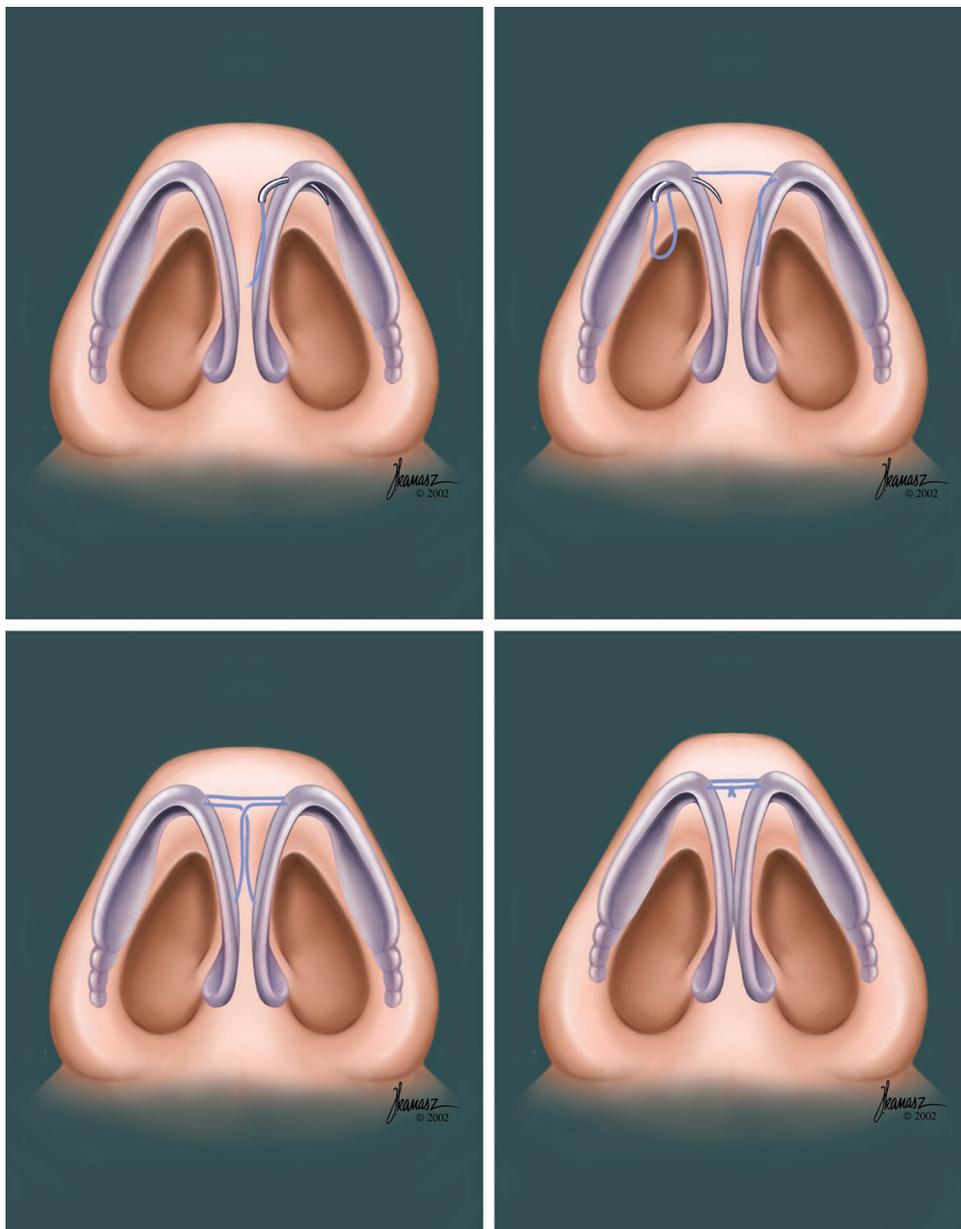


FIG. 3. The interdomal suture, approximating the domes.

the more it reduces the convexity of the lateral crura and narrows the domal arches. This suture is indicated when the domal arches are optimally shaped but are set apart.

#### *The Transdomal Suture*

The transdomal suture is a horizontal mattress suture that spans the domal arch anterior to the vestibular lining. With its placement, the medial and lateral crura of the same lower lateral cartilage are brought into closer proximity. The consequences are tip narrowing, increased lobular size, increased tip projection, and reduced interdomal distance, if the medial crura are sufficiently stabilized (Fig. 4). Whenever a suture that involves both crura of the lower lateral cartilages is placed, careful attention to its location is required. Because the medial and lateral crura are in different cephalocaudal planes, the position of the transdomal suture can further affect the position of the lateral crus of the lower lateral cartilage. Caudal rotation of the lateral crus is observed when the suture is placed toward the caudal half of the dome (Fig. 5). Cephalic rotation of the lateral crus occurs when the suture is placed in a more cranial position on the dome. A depression in the cephalic portion of the medial genu may occur if this portion of the lower lateral cartilage is attenuated, necessitating a columellar graft. The transdomal suture is indicated when the patient possesses wide domal arches. It should be noted that lateral crura concavity that occurs with the transdomal suture often mandates the use of an alar rim graft to strengthen the external valve and avoid alar rim retraction. In addition, placement of the suture anterior to the vestibular lining is essential, to avoid suture exposure.

#### *The Lateral Crura Suture*

The lateral crura suture described by Tebbetts is a horizontal mattress suture placed cephalad to the domes.<sup>1</sup> It is generally positioned in the middle two-thirds of one lateral crus, spanning the caudal nasal dorsum to reach the contralateral lateral crus, where it is passed through the cartilage as a horizontal mattress suture. The knot is tied in a central position over the dorsum while being controlled with a pair of smooth forceps, to avoid excessive tension (Fig. 6). Depending on the tension of the suture, the convexity of the lower lateral cartilages is decreased or eliminated completely. As the suture is tied, the lateral crura move more medially, forcing the domes to move more caudally and retracting the alar rims. Depending on the intrinsic forces, this suture may also result in concavity of the alar rims, necessitating an alar rim graft. The resulting anatomical changes are elongation of the nose and narrowing of the interdomal distance (Figs. 7 and 8). When the suture is positioned closer to the anterior portion of the domes, the effect on the interdomal distance is greater.

#### *The Medial Crura-Septal Suture*

This suture is placed to increase or reduce nasal tip projection. Once the footplates of the medial crura are exposed, the suture is passed through each medial crus or footplate and anchored to the septum (Fig. 9). Depending on the position of this suture on the medial crura and caudal septum, an increase or decrease in tip projection or simple columella retraction can be expected. If the suture is passed through the

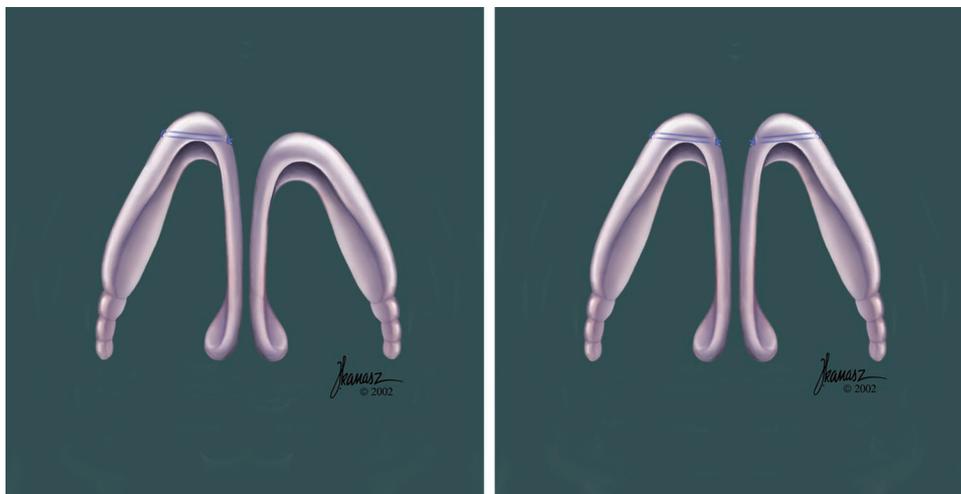


FIG. 4. The transdomal suture, narrowing the domal arch.

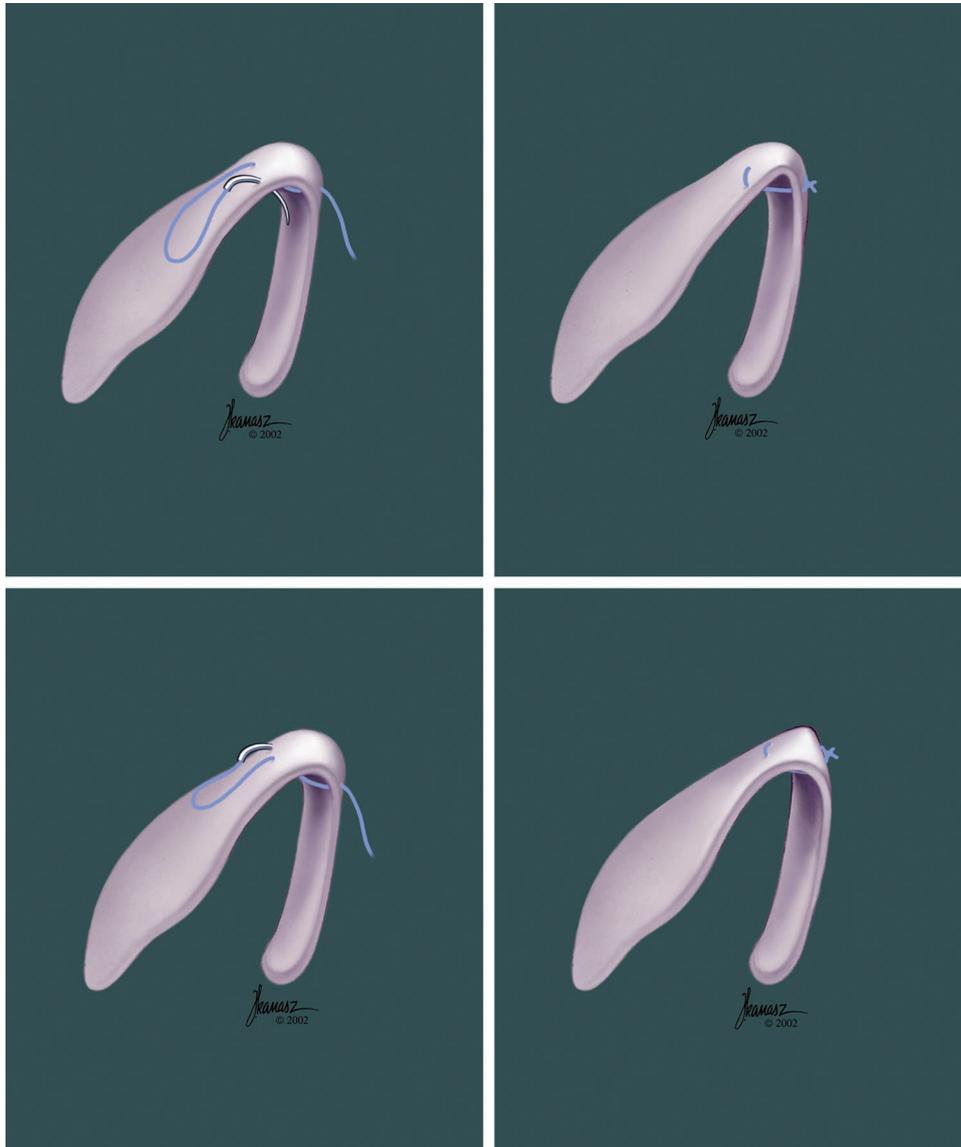


FIG. 5. Positional effects of the transdomal suture. (*Above, left and right*) Caudal rotation of the lateral crus of the lower lateral cartilage in response to a more caudal position of the transdomal suture. (*Below, left and right*) Cephalic rotation of the lateral crus of the lower lateral cartilage in response to a more cephalic position of the transdomal suture.

footplates or the posterior portion of the medial crura and antero-caudal septum, then increased tip projection is accompanied by cephalic rotation of the lower lateral cartilages and widening of the interdomal distance, unless the interdomal connection has been stabilized with a suture (Fig. 10). To minimize widening of the interdomal distance, a second suture is placed in the middle segment of the medial crura (Figs. 11 and 12). It is

also possible to decrease nasal tip projection with the medial crura-septal suture. The suture is passed through the medial crura anteriorly and then anchored to the caudal septum close to the nasal spine. This not only reduces tip projection but also reduces the nasolabial angle and the interdomal distance. The greatest benefit of this suture is observed among patients with anteriorly displaced medial crura and footplates and an

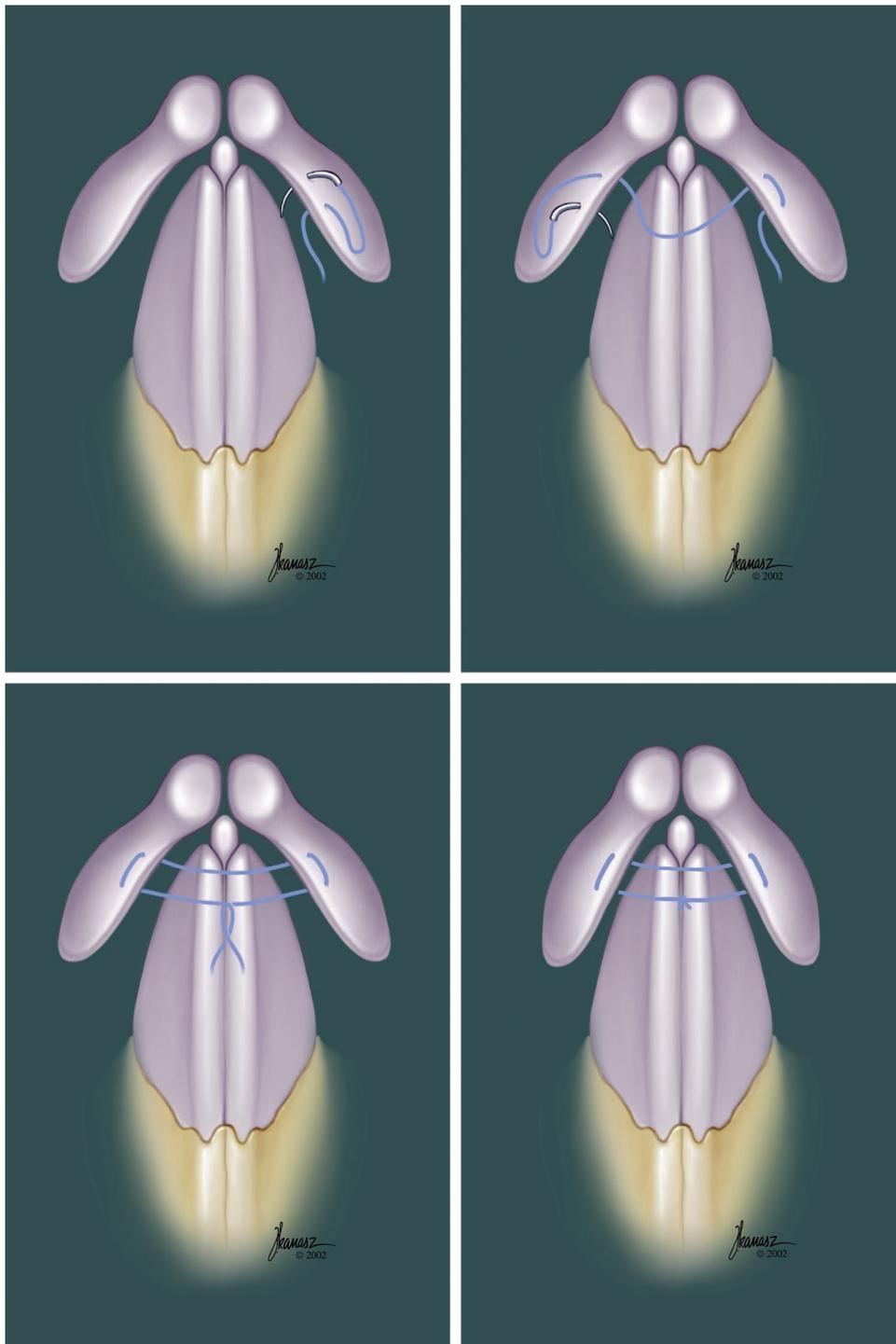


FIG. 6. The lateral crura suture. (*Above, left*) A horizontal mattress suture is placed in the lateral crus, on the cephalic aspect of the medial two-thirds. (*Above, right*) The suture then spans the upper lateral cartilages, and a similar suture is placed in the contralateral lower lateral cartilage lateral crus. (*Below, left*) The medial position of the knot ensures symmetry. (*Below, right*) Tightening of the knot results in decreased convexity of the lateral crura, caudal repositioning of the domes, and decreased interdomal distance. As a result, the nose is elongated.



FIG. 7. The lateral crura suture, preoperative and 5-year postoperative photographs. Narrowing of the interdomal distance, slight elongation of the nose, and increased concavity of the alar rims should be noted.

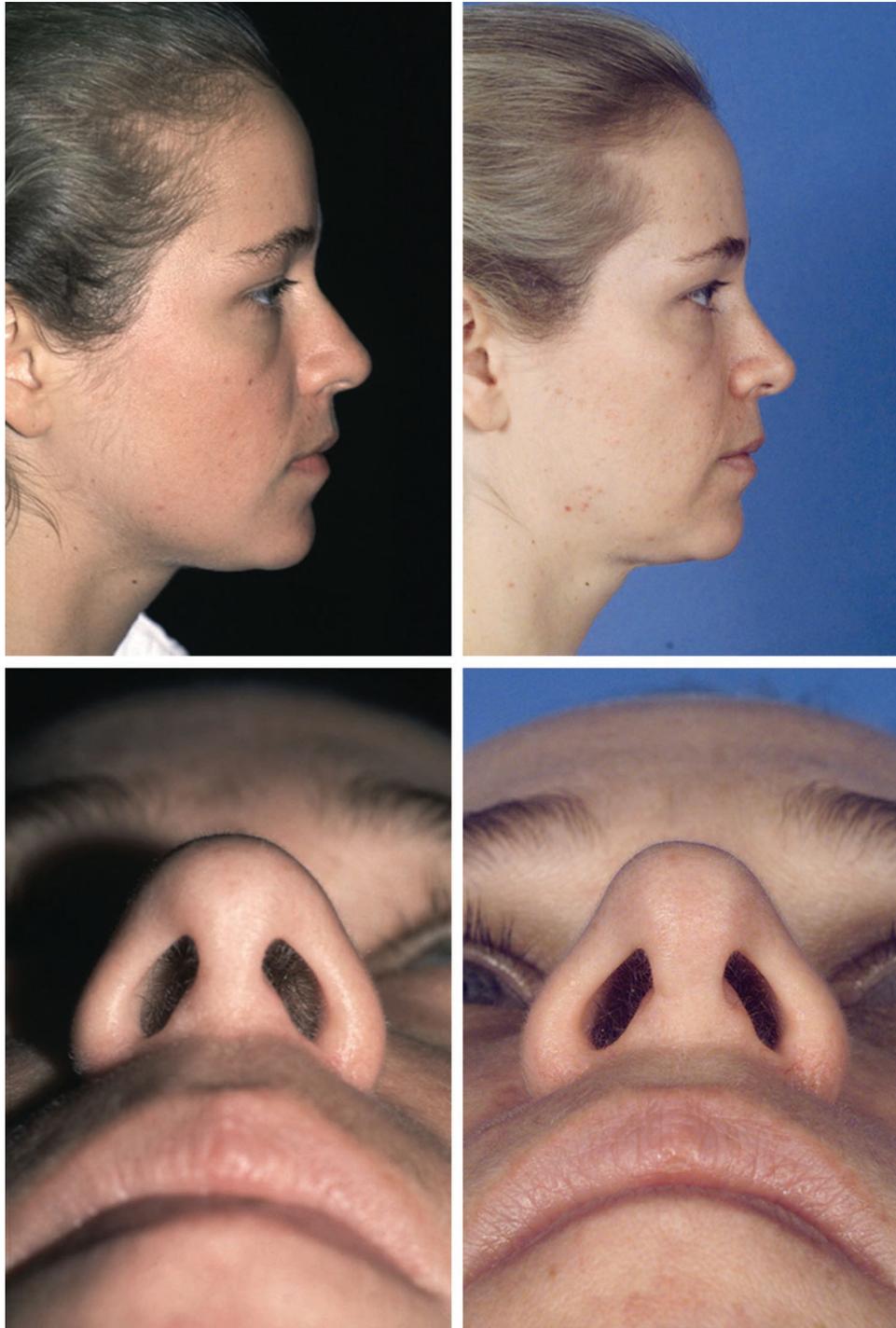


FIG. 8. The lateral crura suture, preoperative and 5-year postoperative photographs.

overprojected tip with a wide nasolabial angle (Fig. 13). If the suture is placed in the same anteroposterior position, then it results only in retraction of the columella. If the suture is placed between the cephalic margin of the medial crura and the caudal septal angle, then flattening and widening of the columella are not observed.

#### *The Tip Rotation Suture*

The tip rotation suture consists of a loop that is passed caudal to or through the medial genu, in effect harnessing the lower lateral cartilages.<sup>2</sup> The suture is then anchored to the antero-caudal septum. This not only rotates the tip cephalically, it also widens and retracts the

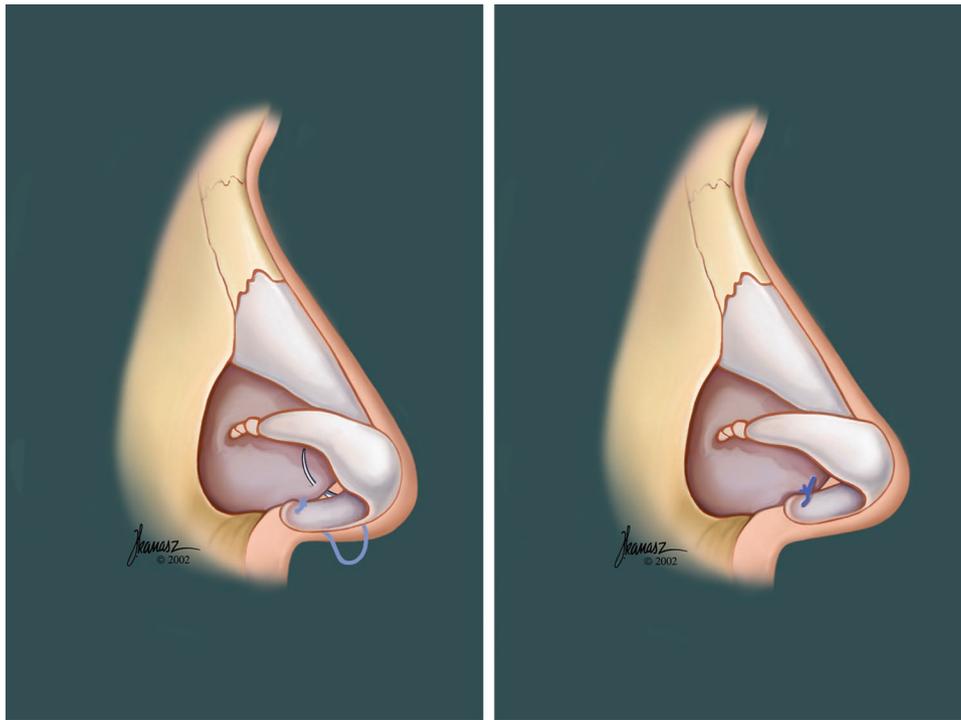


FIG. 9. Increased tip projection with the medial crura anchor suture. (Left) The suture is passed through the medial crura footplates. (Right) The medial crura are anchored to the antero-caudal septum.

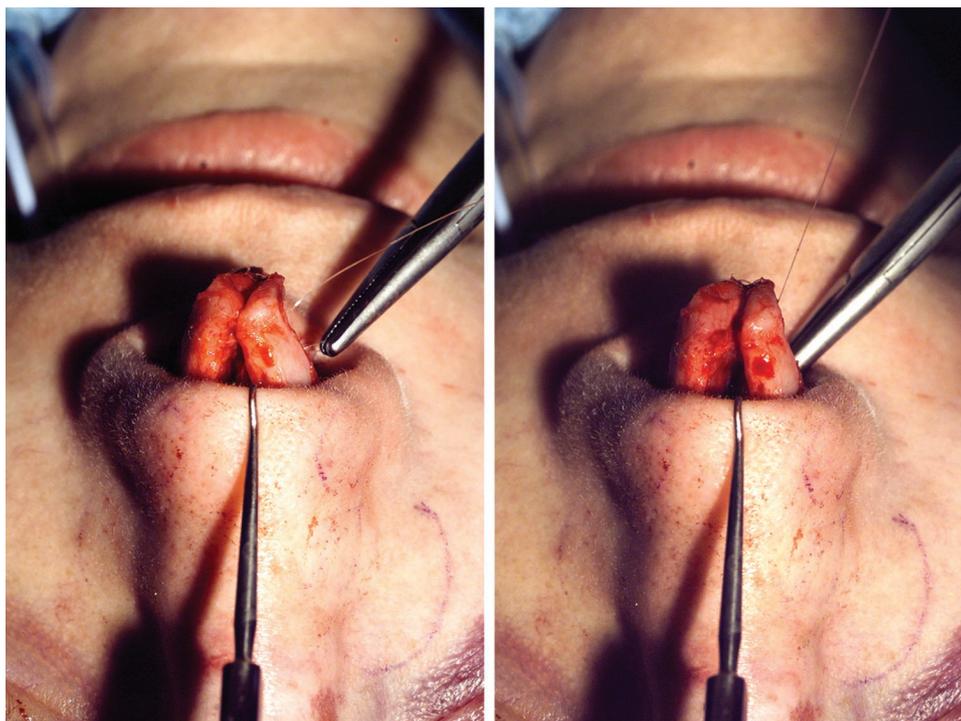


FIG. 10. Intraoperative view of the medial crura anchor suture. (Left) Medial crura anchor suture before tightening. (Right) Widening of the interdomal distance as the suture is tightened.

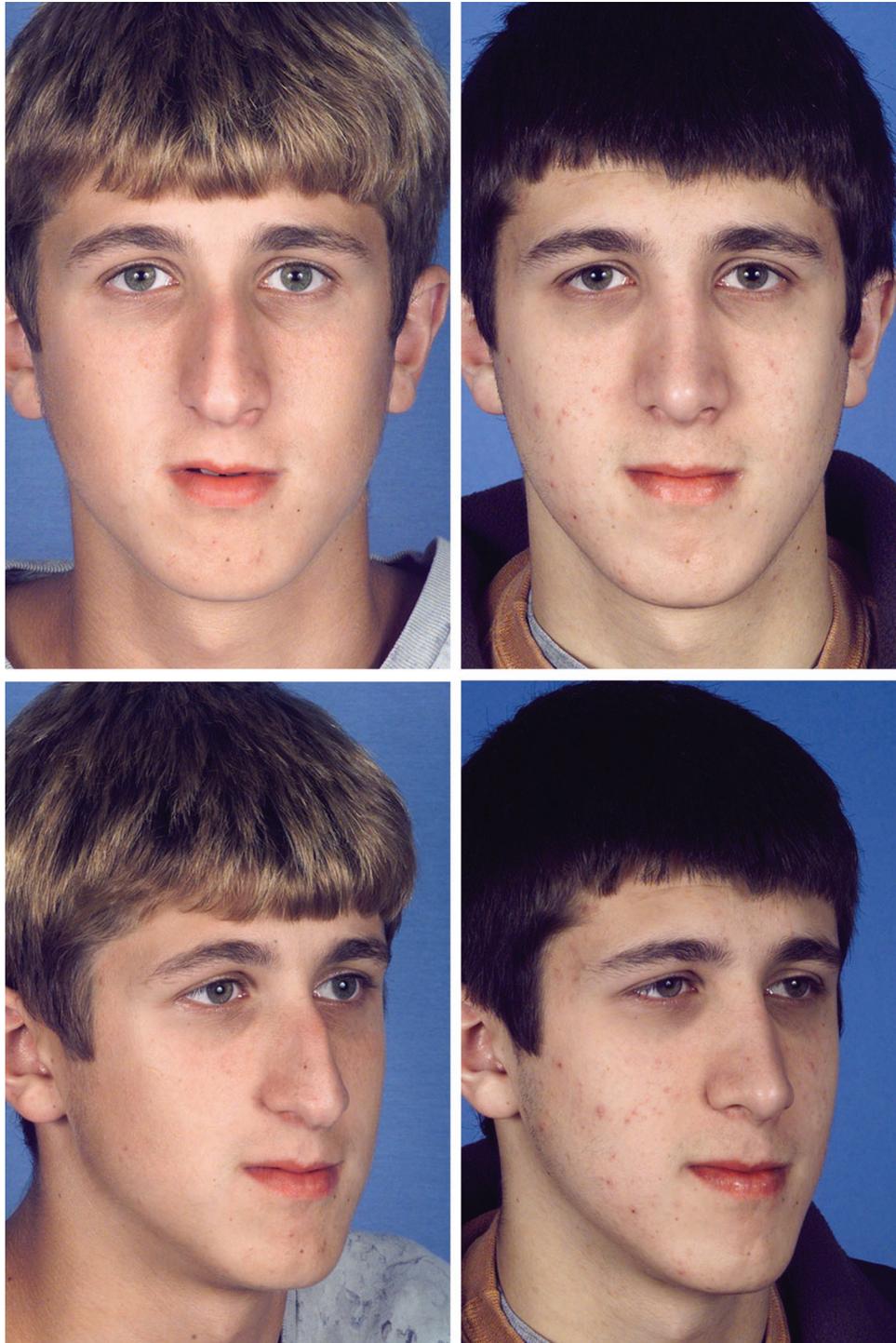


FIG. 11. The medial crura anchor suture, preoperative and postoperative photographs.

lobule and the anterior portion of the columella (Fig. 14). If a medial crura suture is not used before placement of this suture, then the tip rotation suture may result in flattening of the columella. If the suture is extended from the cephalic margin of the medial crura to the caudal septal angle, then flattening and widening of the columella are not observed.

#### *The Medial Crura Footplate Suture*

The footplate suture is a U-stitch that is placed through an incision in the membranous septum.<sup>3</sup> The effects are approximation of the footplates, narrowing of the columella base, and improvement of undesirable nostril shape (Fig. 15). If the footplates are approximated

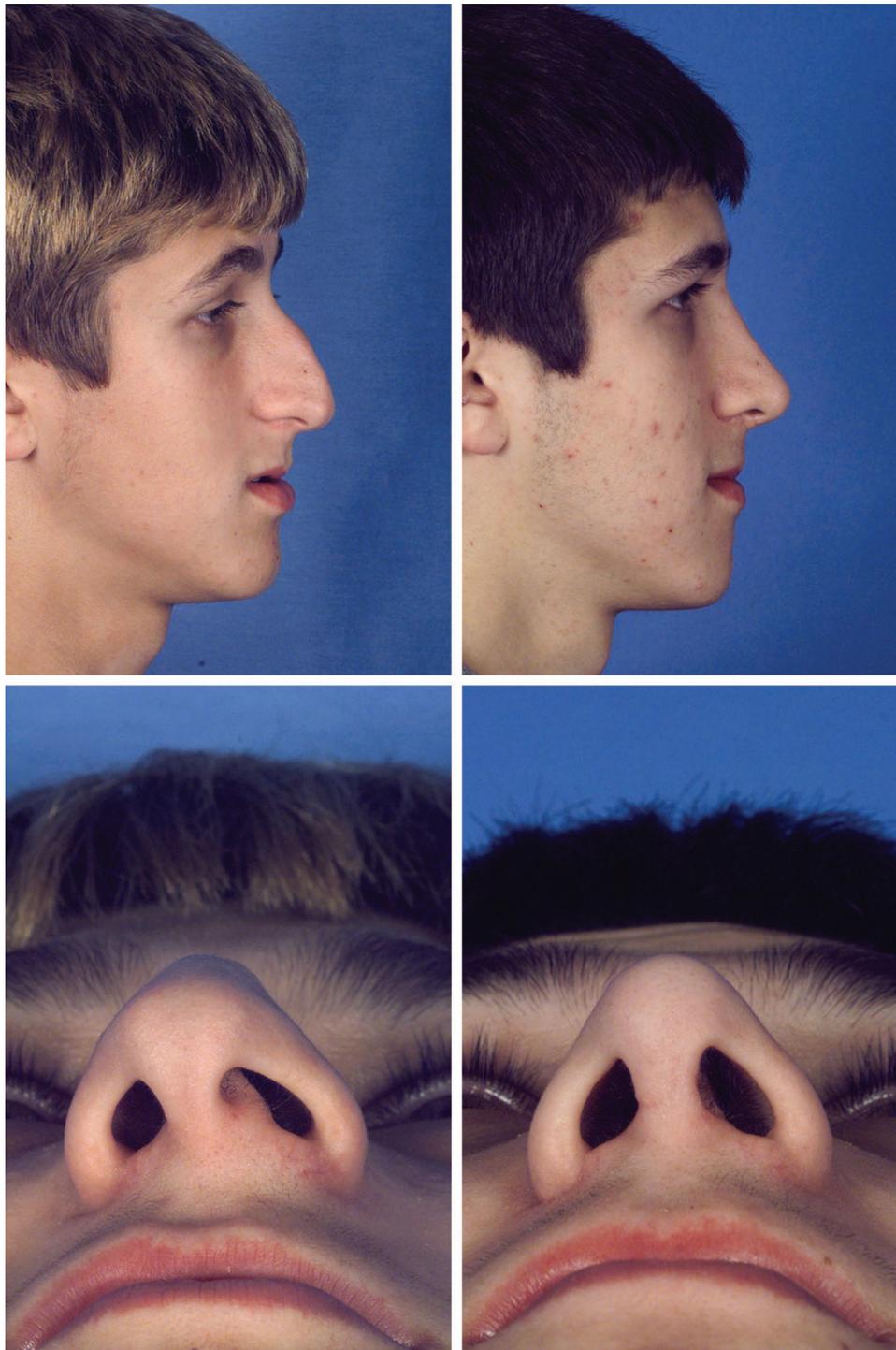


FIG. 12. The medial crura anchor suture, preoperative and postoperative photographs.

without resection of the intervening soft tissue, then slight caudal advancement of the base of the columella occurs. Removal of soft tissue between the footplates and the medial crura before placement of the suture through the footplates avoids additional protrusion of the columella in the profile view.

This change is beneficial for most patients, however, because divergent footplates often result in retraction of the columella base.

*The Lateral Crura Convexity Control Suture*

This suture is used to alter the convexity of the lateral crura. It is placed as a horizontal

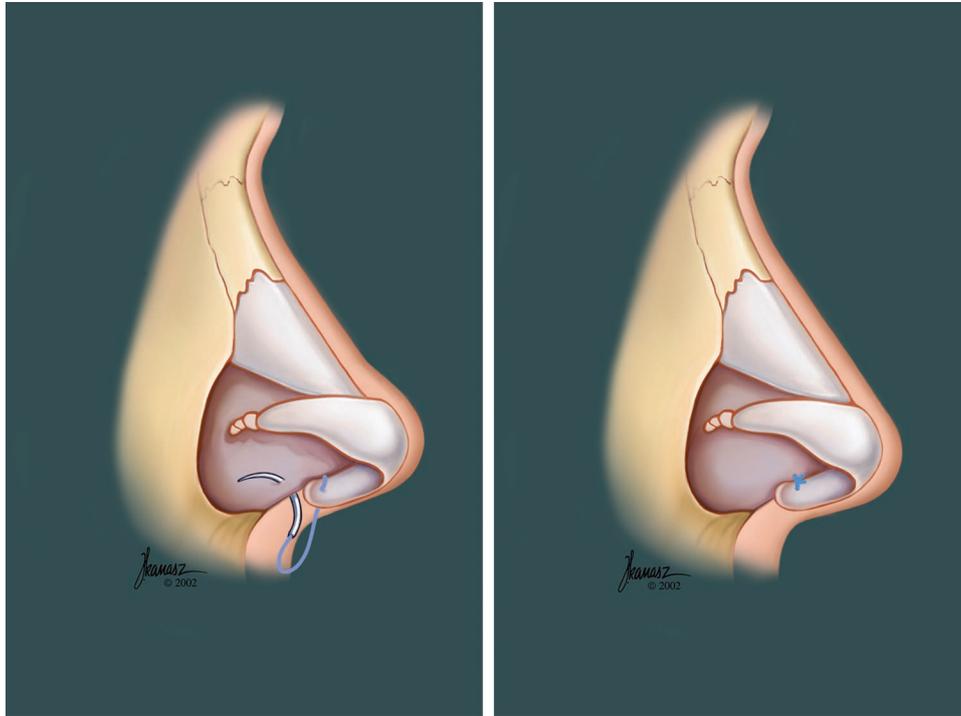


FIG. 13. Decreasing tip projection with the medial crura anchor suture. (*Left*) The suture is passed through the medial crura footplates. (*Right*) The medial crura are anchored to the caudal septum, near the nasal spine, resulting in decreased tip projection.

mattress suture in the lateral crus. The convexity of the lateral crura is controlled by the degree to which the suture is tightened (Fig. 16). Depending on the position, direction, and magnitude of the suture tightening, other changes may occur. If the lateral crura are simply straightened, then the suture results in a minimal increase in tip projection and caudal rotation of the domes. These changes are directly proportional to the severity of the lateral crura convexity. This suture invariably results in narrowing of the external valve, which may or may not affect nasal function at rest. Significant tightening of the suture may result in concavity of the lateral crura, further reducing the external valve opening. This suture is beneficial for correction of excessive convexity of the lateral crura.

#### DISCUSSION

An overwhelming majority of rhinoplasties performed today include one or more sutures to alter nasal tip morphological features. The intent of this report is to share with readers the planned and unintended dynamic changes that occur when sutures are used to reshape the tip.<sup>4-13</sup> In addition, undesired changes in the lower lateral cartilages can be anticipated

or avoided. Illustrations of the lower lateral cartilages often fail to make surgeons aware of the fact that the medial and lateral crura are in different planes and therefore cannot be considered two-dimensionally. Minor repositioning of the sutures in the lower lateral cartilages can produce vastly different results. This is illustrated in Figure 4, in which cephalic or caudal rotation of the lateral crus is produced simply by placing the transdomal suture more cephalically or more caudally. The difference between the two suture positions is only 2 to 3 mm.

Success with surgical treatment of the nasal tip is enhanced by in-depth insights into the behavior of the lower lateral cartilages when altered with sutures. The primary function of each suture placed in the lower lateral cartilages is generally evident to surgeons and is the reason for placement of the suture. However, the changes that occur in the cartilages are multiple and are exerted in three dimensions. A medial crura-septal suture placed to narrow the nasal tip would also increase columella protrusion, rotate the lower lateral cartilages caudally, and increase lobule size. If those additional effects of the suture are not desired, then an interdomal or transdomal suture

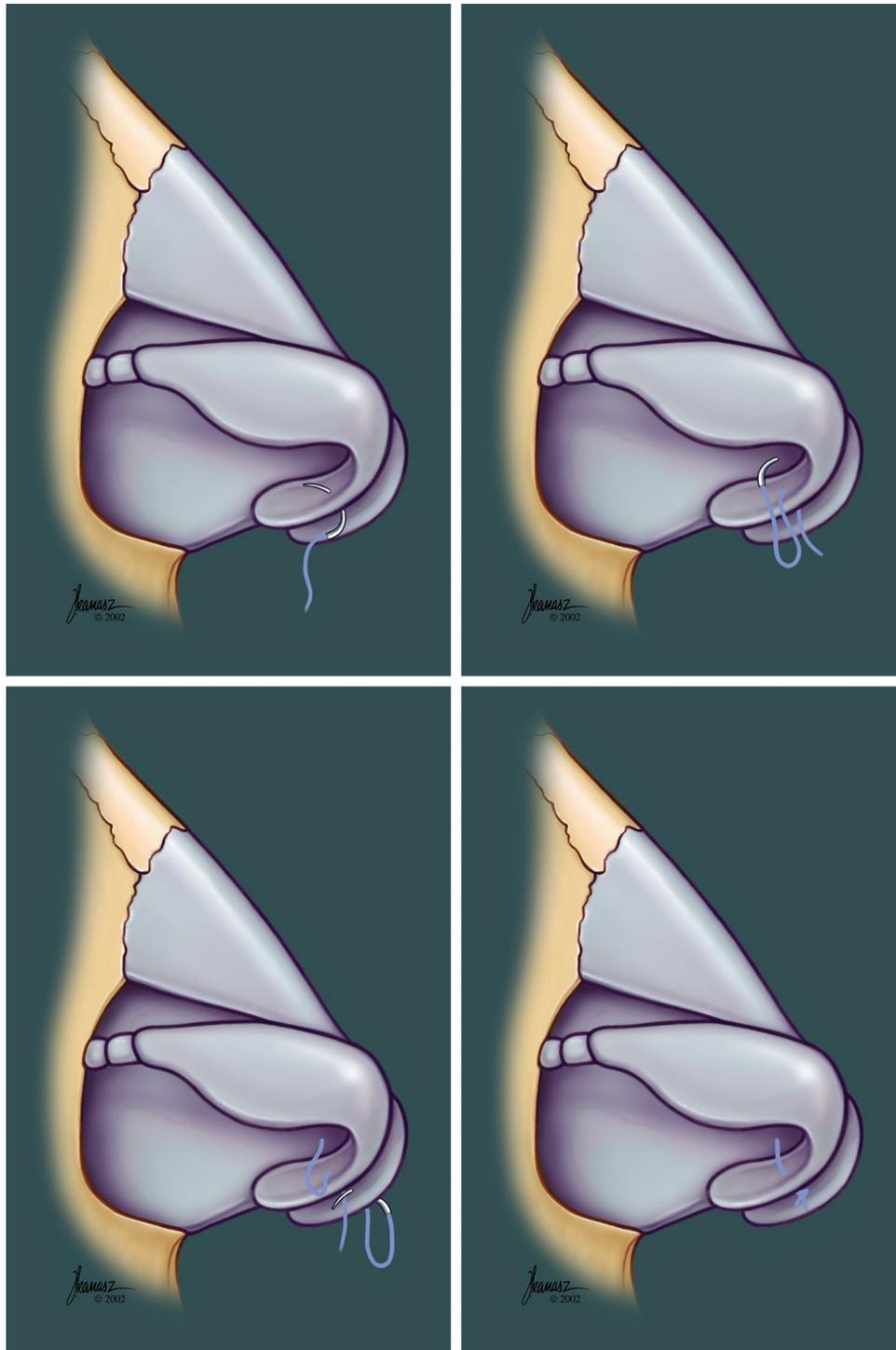


FIG. 14. The tip rotation suture.

might be more suitable for tip narrowing and should be considered.

Intraoperatively, the surgeon can determine the exact effect of each suture placed by observing the movement of the lower lateral cartilages as the suture is tightened. The degree to which a suture is tightened typically governs

the magnitude of the response observed in the cartilages. As the desired cartilage movement is obtained intraoperatively, the first knot should be grasped and stabilized with smooth forceps at that specific level of tightness while additional knots are being placed. This ensures that the desired primary effect is not overshadowed

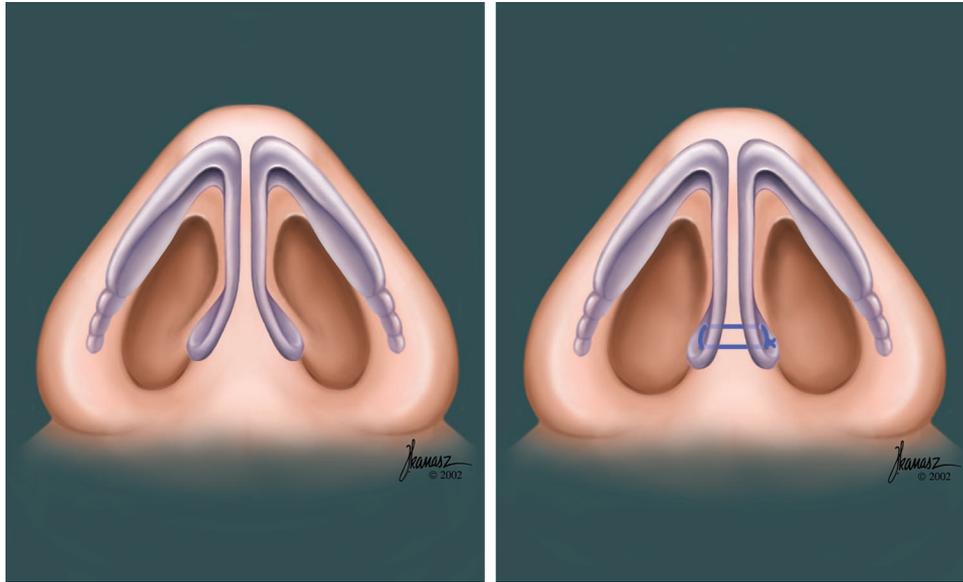


FIG. 15. The medial crura footplate suture.

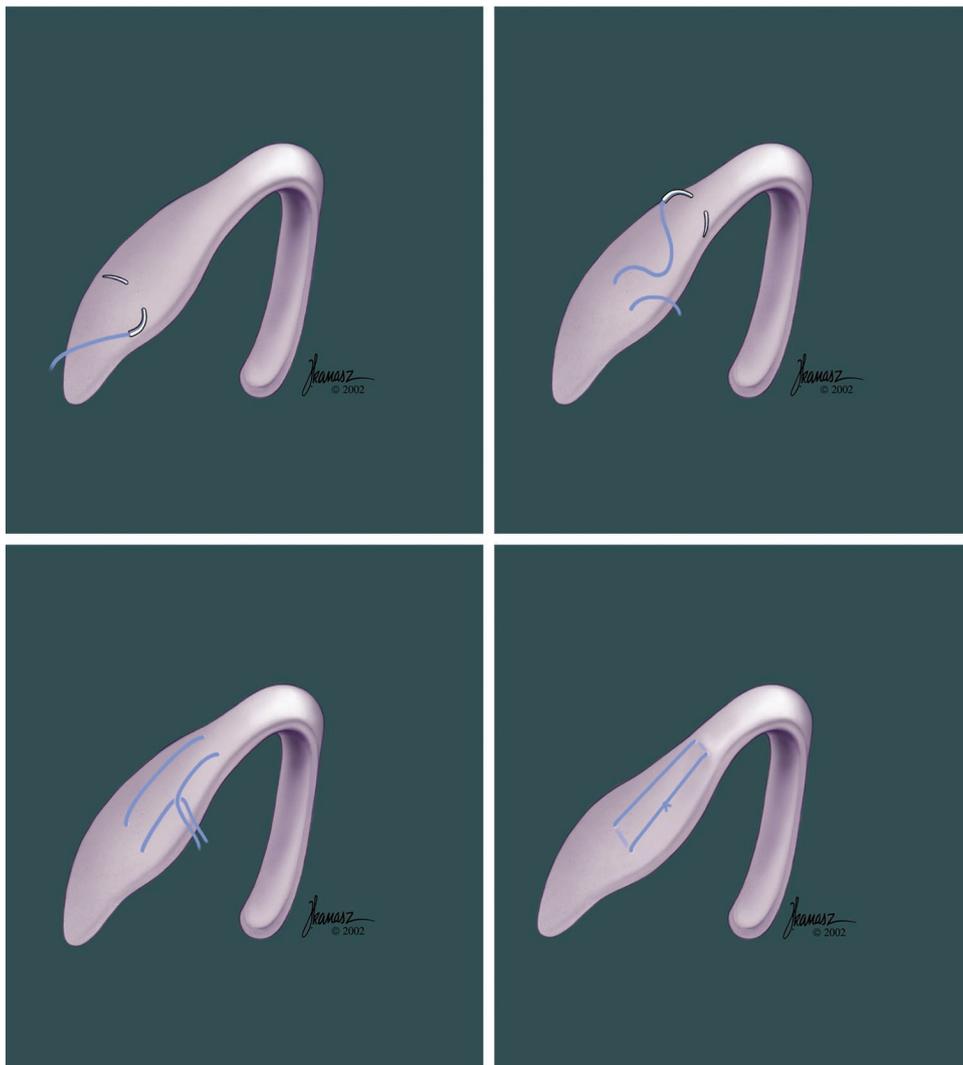


FIG. 16. The lateral crura convexity control suture.

by overcorrection and excessive secondary changes in the lower lateral cartilages. Careful observation of the effects (intended or unintended) and inspection of the vestibular lining for inadvertent penetration and exposure of sutures may avoid subsequent undesirable effects and complications. If needle fixation is part of the suture placement process, then the interplays may not be observed immediately. However, many of these changes are inevitable and ultimately occur, altering the results. These changes may not match the intended aesthetic objectives and may result in suboptimal outcomes.

It is also important to note that the sutures cannot be used interchangeably; each suture has a specific purpose, although some seem to be providing the same effects. One example is the interdomal and transdomal sutures. Both sutures narrow the tip. However, the interdomal suture is indicated when there is a wide angle between the medial genu and the domes are shaped optimally. Conversely, a transdomal suture would be a better choice when the interdomal distance is ideal but the domal arches are too wide and the lateral crura are more cephalically oriented.

The order in which the sutures are placed is also very important. Fixation of the central structures (e.g., with placement of the medial crura suture) not only renders placement of the other sutures more effective but also, in some situations, eliminates the need for additional sutures. Our preference is to place the medial crura suture and approximate the footplates if necessary. The medial genu suture is used deemed necessary. Next, the interdomal or transdomal suture, or both, is used as dictated by the tip anatomical features (as noted above). Insertion of a lateral crura suture is the next step if the lateral crura are convex. A medial crura-septal suture is added if tip projection must be increased for a patient with a short columella and an optimal lobule size. Cephalic rotation of the tip is then achieved with a tip rotation suture. In most cases, this must be performed in conjunction with removal of the membranous septum and removal of a wedge of caudal septum based

anteriorly, especially if significant rotation is intended. The lateral crura convexity control suture is used instead of the lateral crura spanning suture if the interdomal distance is ideal.

#### CONCLUSIONS

Consideration of the lower lateral cartilages must be three-dimensional in nature. Alterations produced by sutures are predictable and based on suture location. The magnitude of change can be further controlled by the degree to which the sutures are tightened. Each suture accomplishes a specific goal. Although some sutures may have similar effects from one view, they differ in function from another view and thus are not to be used interchangeably.

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#### REFERENCES

1. Tebbetts, J. B. Shaping and positioning the nasal tip without structural disruption: A new systematic approach. *Plast. Reconstr. Surg.* 94: 61, 1994.
2. Baker, S. R. Suture contouring of the nasal tip. *Arch. Facial Plast. Surg.* 2: 34, 2000.
3. Gruber, R. P. Suture correction of nasal tip cartilage concavities. *Plast. Reconstr. Surg.* 100: 1616, 1997.
4. Fontana, A., and Muti, E. Alar lateral crus in nasal tip surgery. *Aesthetic Plast. Surg.* 21: 43, 1997.
5. Neu, B. R. Suture correction of nasal tip cartilage concavities. *Plast. Reconstr. Surg.* 98: 971, 1996.
6. Rohrich, R. J., and Adams, W. P., Jr. The box nasal tip: Classification and management based on alar cartilage suturing techniques. *Plast. Reconstr. Surg.* 107: 1849, 2001.
7. Vuyk, H. D. Suture tip plasty. *Rhinology* 33: 30, 1995.
8. Berman, W. E. Surgery of the nasal tip. *Otolaryngol. Clin. North Am.* 8: 563, 1975.
9. Adamson, P. A. Refinement of the nasal tip. *Facial Plast. Surg.* 5: 115, 1988.
10. Tardy, M. E., Jr., Patt, B. S., and Walter, M. A. Transdomal suture refinement of the nasal tip: Long-term outcomes. *Facial Plast. Surg.* 9: 275, 1993.
11. Biant, T. D., Paradisgarten, A., and Jansen, V. Surgery of the nasal tip. *Can. J. Otolaryngol.* 2: 217, 1973.
12. Guyuron, B., Uzzo, C. D., and Scull, H. A practical classification of septonasal deviation and an effective guide to septal surgery. *Plast. Reconstr. Surg.* 104: 2202, 1999.
13. Guyuron, B. Footplates of the medial crura. *Plast. Reconstr. Surg.* 101: 1359, 1998.