

Optimising Results of Nasal Tip Rotation Applying Combination of Nasolabial Angle and Lip–Columellar Angle in Tandem in Patients Operated by “Cock-up” Alar Cartilage Flaps Technique

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Abstract

Background Setting the angle of tip rotation is of utmost importance in achieving satisfactory results in rhinoplasty. Conventionally the upward rotation of the tip requires shortening of the septum by caudal resection and shortening of the lateral walls by cephalic trim of the alar cartilages. The results are usually assessed subjectively. We describe the use of objective parameters to ensure accuracy of nasal tip rotation in patients operated with “cock-up” alar cartilage flaps, a modification of the cephalic trim.

Methods Fifteen patients with a long nose having adequate width of lateral crura, desiring a shorter nose with upward tip rotation, were included in the study. Values of preoperative and desired nasolabial angle (from morphed images), and the derived columellar–labial angle were documented. Nasal tip rotation was set to the derived angle and maintained using cock-up alar cartilage flaps. The outcome was evaluated by digital measurements of the nasolabial angle and patients’ feedback by Rhinoplasty Outcome Evaluation (ROE) score.

Results Satisfactory tip rotation and an aesthetic supratip area could be achieved. The difference in preoperative and postoperative nasolabial angles was statistically significant (p value < 0.0001). The difference in desired and the obtained nasolabial angle was not significant (p value 0.085). The results were maintained on subsequent follow-up.

Conclusion Application of angles in practice and use of K-wire template helps us achieve accurate and consistent results. Cock-up flap is an effective technique—to obtain an open nasolabial angle and a desirable supratip region by making use of tissues otherwise discarded.

Keywords

- ▶ nasal tip rotation
- ▶ alar cartilage flaps
- ▶ nasolabial angle

Introduction

An aesthetically pleasing nose must have a smooth contour of the dorsal profile line, preferably with a small break from the tip. This supratip break should not be too deep so as to create a step and must have adequate fullness resulting in a

“subtle transition zone.” Besides this, the lobule must have a properly inclined tip, indicated by an obtuse nasolabial angle (▶ Fig. 1).

Many a times the nasal tip may have to be rotated upward to get the desired inclination. Upward rotation of the nasal tip is a maneuver that requires precise planning and



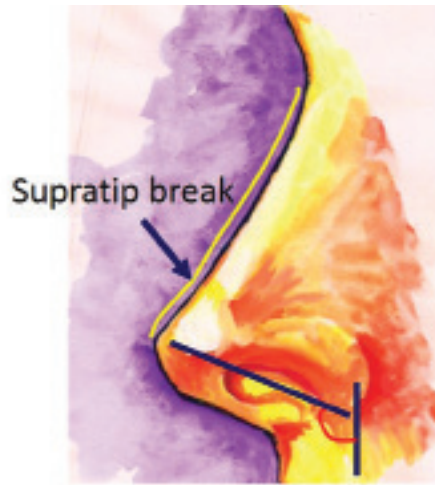


Fig. 1 Components of an aesthetically pleasing nose: (a) Dorsal profile line should have a smooth contour, a supratip break that should not be too deep to create a step, at the same time must have adequate fullness resulting in a “subtle transition zone.” (b) Well-defined and properly inclined tip (indicated by the nasolabial angle).

execution. The two main challenges encountered during this step include (1) setting the desired angle and (2) ensuring that the change is maintained with adequate stability. To achieve these two objectives with reasonable certainty, we have devised a technique using a K-wire template. Gruber’s technique of alar cartilage flaps was used for achieving tip rotation.¹

Nasal tip inclination is independent (of disposition) of nearby structures and is expressed as the “nasolabial” angle which is ~105 to 108° in females and 100 to 103° in males.¹ There is some ambiguity associated with the word “nasolabial” as there is a variation in definition in the literature.^{2,3} As per the current definition, the term is a misnomer as the angle does not depend on the relationship of the nose with the upper lip. The two lines forming this angle are (1) a line drawn through the anterior and posterior ends of the nostril (nostril axis) and (2) the vertical facial line passing through the glabella and perpendicular to the *Frankfort horizontal* (► Fig. 2a). However, the above lines cannot be drawn on patient’s body as they either pass through the core or through a cavity. Second, this is a virtual angle, as the two limbs of

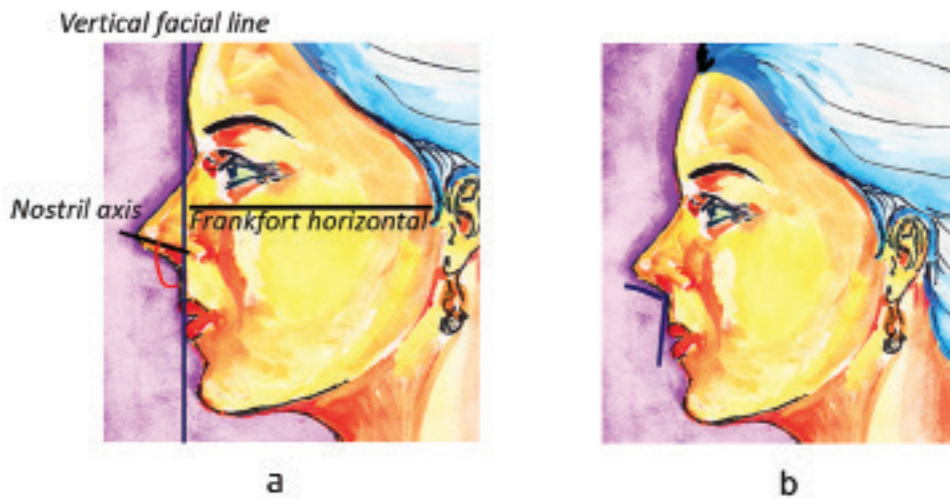


Fig. 2 (a) Nasolabial angle—the southward angle between the vertical facial line (perpendicular to Frankfort horizontal) and line drawn through the nostril axis. (b) Lip-columellar angle.

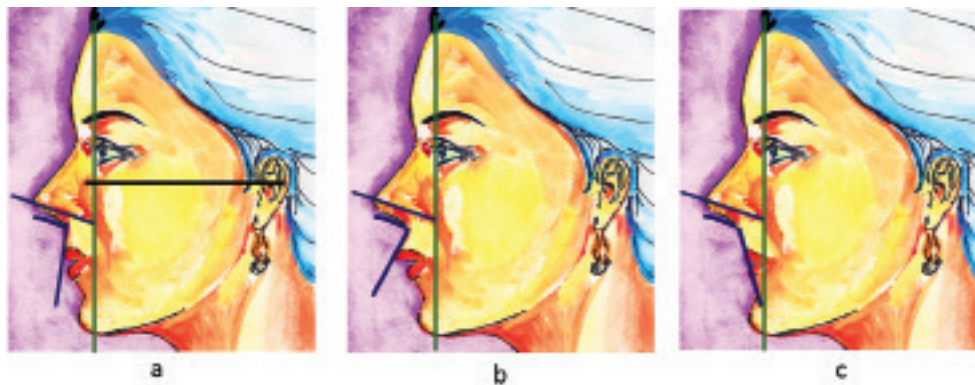


Fig. 3 The nasolabial angle may be the same but the lip-columellar angle varies as per the inclination of the lip and must be individually calculated for each patient. (The vertical line is shifted posteriorly for the clarity of illustration of lip-columellar angle)

the angle do not actually meet in three dimensions of human body. Only when these lines situated in three dimensions are projected on two dimensional (flat) surface or as a photograph, the angle can be measured using a digital goniometer or a software. This is an absolute measurement, as the vertical facial line or the plumb line, is always constant. The angle is independent of nearby structures like lip, columella, and nasal dorsum, and hence it is used for preoperative and postoperative assessment of tip rotation. It cannot be measured on the body surface and is not of much use as a guideline for tip rotation.

To overcome this difficulty, we have to depend on a parameter which can be actually measured on the patient's body. The "lip-columellar" angle is the angle the columella forms with the upper lip (► Fig. 2b). It can be measured on a three-dimensional body surface and may be used intraoperatively as an interim guide to set the tip rotation. The lip-columellar angle depends on the variables like inclination of the lip and inclination of columella. For a given tip inclination, the nasolabial angle may be the same, but the lip-columellar angle may vary according to the lip inclination (► Fig. 3). For this reason it should not be used in preoperative and postoperative analysis of tip rotation.

While deciding the degree of tip rotation, the desired change in nasolabial angle must be determined first using photographic analysis and morphing. As this value is not useful as intraoperative guide, the change must be expressed as a new lip-columellar angle and the rotation be set to that value. As the lip-columellar angle depends upon certain variables, it must be calculated separately for each patient. Application of this angle should be restricted to use as an intraoperative guide only. Using it for evaluation of results may lead to errors as it is a dependent parameter. The absolute value of nasolabial angle is a better parameter for evaluation of change of tip rotation. However, the lip-columellar angle is a practical parameter and used as a surrogate marker for nasolabial angle intraoperatively.

The usual technique recommended to achieve an open nasolabial angle is to shorten the septum by caudal resection and shorten the lateral walls by cephalic trim of the lower lateral cartilages⁴ (► Fig. 4). However, alone these maneuvers may be inadequate and require additional harnessing. These maneuvers leave a framework gap between the upper two-thirds and lower third of the nose because of division of the piriform ligaments (fibrous attachment between the upper and lower lateral cartilages) and Pitanguy's ligament (fibrous attachment between the domes and the septal angle) (► Fig. 5). Limitations of these maneuvers include inadequacy of rotation and stability.⁵⁻⁷ The cock-up flaps raised from the cephalic portion of the alar cartilage are pulled up and hitched to the cartilaginous dorsum of the nose to overcome this pitfall.

Material and Methods

This is a prospective study comprising of 15 patients (4 men and 11 women) operated for rhinoplasty with a mean age of 27.93 years. All procedures contributing to this work comply

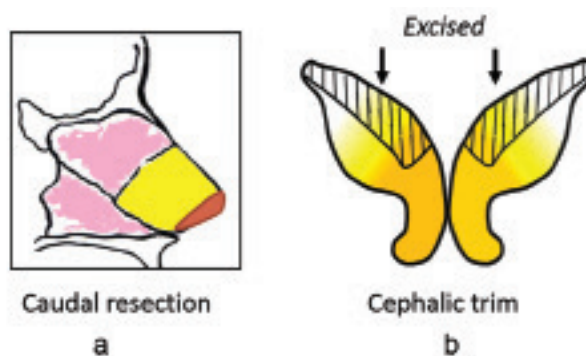


Fig. 4 Maneuvers for tip rotation include (a) shortening the septum by caudal resection (highlighted in red) and (b) shortening the lateral walls by cephalic trim.

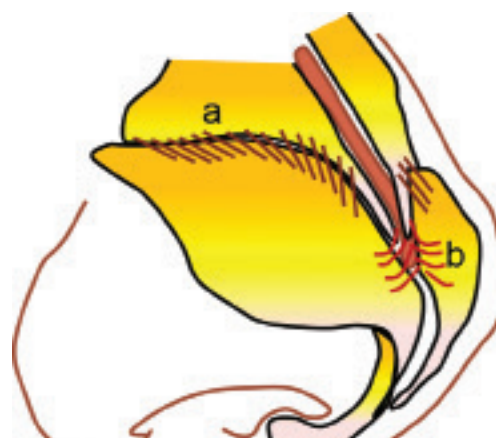


Fig. 5 (a) The piriform ligament between the upper and lower lateral cartilages. (b) The Pitanguy ligament.

with the ethical standards of the relevant national and institutional guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Patient with a long nose and an apparent wide lateral crurae (craniocaudal dimension) desiring a shorter nose with superior tip rotation were included. Patients, who despite having an acute nasolabial angle did not wish it to be altered, were excluded. Patients with narrow alar cartilages or with a normal or shorter nasal length were also not included. Photographs were taken in frontal, lateral, oblique, and basal views. Planning of tip rotation was done on the lateral view photographs (► Fig. 6). The nasolabial angle was measured using a photo editing software. The images were then morphed to attain the desired nasolabial angle, which appeared harmonious with the rest of the face (► Fig. 6b). The planned modifications and the expected results were discussed with the patients and after their inputs, the "proposed" or desired nasolabial angle was finalized. Desired nasolabial angle and lip-columellar angle were calculated from the morphed image. The lip inclination was not morphed, thus allowing us to accurately calculate the lip-columellar angle for the given settings as discussed earlier in "aesthetic considerations." A 0.8-mm "K" wire was bent at this angle preoperatively and sterilized for intraoperative use. The stability of the 0.8-mm K wire along with its malleability allows multiple adjustments, making it a very effective intraoperative tool. The following three angles were documented before the operation.

1. The nasolabial angle.
2. The proposed (desired) nasolabial angle.
3. The desired lip–columellar angle (derived from 1 and 2).

Intraoperatively, the newly set lip–columellar angle was checked using the K-wire template. Postoperatively, the outcome was evaluated by measuring the obtained nasolabial angle digitally. Besides this, patients' feedback was assessed by the Rhinoplasty Outcome Evaluation (ROE) questionnaire⁸ (►Table 1).

Operative Technique

The operative technique used was similar to “tails of lateral crus” technique described by Gruber¹ and the modified Kazanjian flying wings procedure.⁹ All patients underwent the procedure under general anesthesia. Infiltrating solution (7 mL/kg of lignocaine 2% + adrenalin 1 in 100,000), with an average required volume of 8 mL was injected at proposed incision site and dissection planes. Open approach was used in all patients. Other procedures like septoplasty, hump reduction, and osteotomies and so forth, if indicated,

were completed prior to tip manipulation. Septal shortening was done by excising the desired amount of caudal part of the septum. Flaps from the lateral crurae were then raised (►Fig. 7). The cephalic excess of the lateral crura was marked leaving behind a minimum cartilage width of 6 mm, ensuring sufficient support for the rim. The incision was made through the cartilage on the marked line from lateral to medial extending well beyond the dome up to the medial crura. Unlike in a conventional cephalic trim, this cephalic portion of the lateral crus was not fully detached from the rest of the alar cartilage, but kept attached at the medial end resulting in a flap (►Fig. 7b). This procedure was repeated in the same manner on the opposite side. At the pivot point, these raised flaps were then flipped toward the midline in a vertical orientation, with the superficial surfaces oriented medially and eventually becoming the deep surfaces after full transposition, while the original deep surface now becoming superficial. The flaps were then hitched with appropriate pull to the exposed part of the septal dorsum using three interrupted sutures (►Fig. 7c). The area corresponding to the base of the flaps and the septal angle was

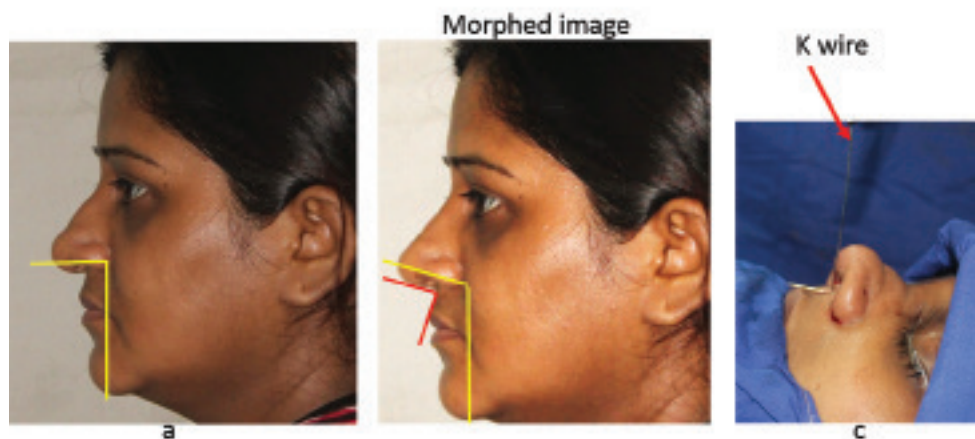


Fig. 6 Setting the angle: (a) Patient's nasolabial angle is calculated (yellow). (b) The image is morphed to determine a pleasing and desired nasolabial angle (yellow). The desired lip-columellar angle is decided (red) and a K wire is bent conforming this angle. (c) The K wire is used to set the lip-columellar angle intraoperatively.

Table 1 Rhinoplasty Outcome Evaluation (ROE) score of Alsarraf

Question 1: Do you like how your nose looks?
Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)
Question 2: Do you breathe well through your nose?
Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)
Question 3: Do you believe your friends and people who are dear to you like your nose?
Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)
Question 4: Do you think the current appearance of your nose hampers your social or professional activities?
Always (0), Frequently (1), Sometimes (2), Rarely (3), Never (4)
Question 5: Do you think your nose looks as good as it could be?
Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)
Question 6: Would you undergo surgery to change the appearance of your nose or to improve your breathing?
Certainly yes (0), Very likely yes (1), Possibly yes (2), Probably no (3), Certainly no (4)

ROE score is calculated by adding the six scores obtained and dividing it by 24 to express it as a percentage.

kept free of sutures to allow mobility of the lobule. If the flaps are transposed without flipping, a dog ear deformity may appear in the supra-tip region (►Fig. 7d). The pull on the flaps was adjusted using temporary sutures. After every such manipulation, the skin-soft tissue cover was repositioned and a temporary suture was taken at the columella to assess the adequacy of tip rotation by comparing with the prebent K-wire template. Once the desired rotation according to the derived lip-columellar angle and visual assessment of the tip was obtained, appropriate placed sutures were taken for fixation of the flap to the dorsum with Nylon 4-0 (►Fig. 8). These sutures provide stability to the tip and counter the gravitational forces effectively. Besides this, the flaps also provide fullness in the supratip area and the twist at the pivot point creates an aesthetic supratip break. These cartilage flaps were placed and sutured in a different manner in cases with septal deviation without airway obstruction, where the nasal septum needed to be exposed by separating it from the upper lateral cartilages. In these cases, the cock-up flaps were aligned parallel to the anterior septal border, mimicking the orientation of spreader grafts and sutured between the upper lateral cartilages and the septum. This maneuver supports the internal valve. Cock-up flaps, thus, not just have aesthetic utility, but functional value as well. Patients were evaluated after a period of at least 9 months. The mean follow-up was 14 months.

Results

The mean preoperative nasolabial angle for the entire group was 88.93° and the proposed (desired) angle measured 101.2° . The mean of postoperative (obtained) nasolabial angles measured at 9 month follow-up was 100° . The preoperative, proposed (desired), and postoperative (obtained) nasolabial angles and the additional maneuvers employed were recorded (►Table 2).

All the patients were satisfied with the acquired rotation of the tip and overall result. Feedback from patients was taken using the Rhinoplasty Outcome Evaluation (ROE) questionnaire⁸ (►Table 3).

The paired *t*-test was used to detect the significance between the groups and the results were analyzed statistically. The difference between the preoperative and postoperative nasolabial angle was significant with *p*-value of less than 0.0001. Besides this, the proposed nasolabial angle was also compared with the obtained nasolabial angle. With a *p*-value of 0.085, this difference was not statistically significant, implying success in achieving the desired rotation. The follow-up examination showed satisfactory tip rotation and supratip break. Six patients have been followed-up for 2 years with preserved results substantiating the efficiency of the technique in countering gravitational forces.

Besides the caudal resection and cock-up flaps, some additional maneuvers were also performed to achieve the overall

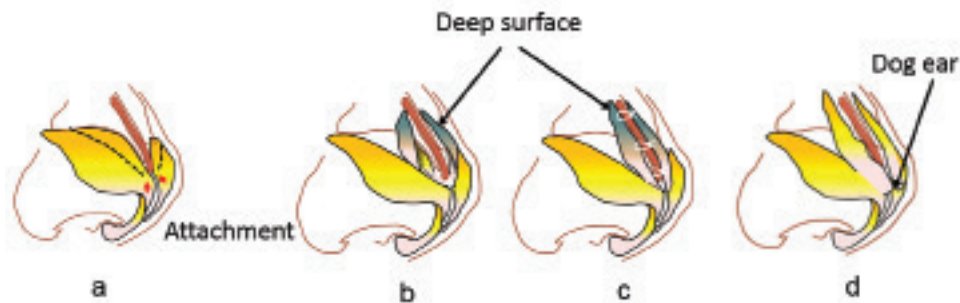


Fig. 7 Flap Design. (a) The incisions were same as in the cephalic trim, but the medial end was kept intact. (b) The flaps were flipped with the deep surface (gray) now becoming superficial. (c) The flaps were secured to the cartilaginous dorsum with three nonabsorbable sutures. (d) Incorrect way of transposing flaps without flipping when superficial surface (yellow) remains superficial) resulting in a dog ear deformity at the pivot point.

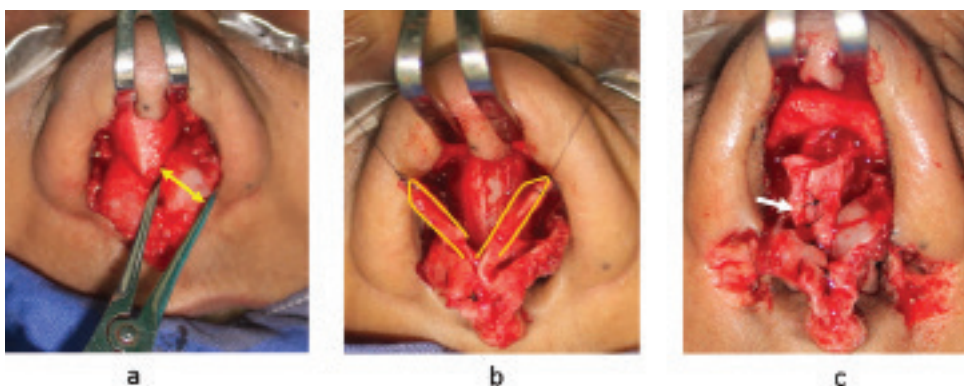


Fig. 8 (a) Alar cartilage width measured using a caliper, (b) bilateral alar cartilage flaps raised, and (c) transposed to the nasal dorsum (white arrow).

Table 2 Details of all patients operated by use of cock-up alar cartilage flaps

Sr. no.	Age (yr)	Sex	Angles (degrees)				Additional maneuvers
			Preoperative nasolabial angle	Proposed/ desired nasolabial angle	Derived lip-columellar angle	Obtained nasolabial angle	
1	35	F	90	105	89	103	–
2	25	F	87	103	86	101	Osteotomies, tip-modifying sutures
3	34	F	89	102	87	100	Osteotomies, alar wedge resection, tip-modifying sutures
4*	29	M	93	97	91	99	Osteotomies
5	18	F	91	105	88	107	Osteotomies, tip-modifying sutures
6	23	F	91	100	92	96	Tip-modifying sutures
7	27	M	92	99	86	97	Osteotomies, tip-modifying sutures
8	33	F	80	100	89	103	Osteotomies, alar wedge resection, tip-modifying sutures
9*	29	M	90	98	90	100	Alar wedge resection, tip-modifying sutures
10	18	F	92	104	89	104	Osteotomies, tip-modifying sutures
11	22	F	85	100	86	97	Alar wedge resection, tip-modifying sutures
12	38	F	93	105	88	99	Osteotomies, tip-modifying sutures
13*	25	F	88	103	87	101	Osteotomies, alar wedge resection
14*	35	M	87	97	90	95	Alar wedge resection
15	28	F	86	100	89	98	Osteotomies, alar wedge resection, tip-modifying sutures

*Flaps oriented as spreader grafts.

Table 3 Comparison between preoperative and postoperative Rhinoplasty Outcome Evaluation (ROE) scores of patients

Sr. no.	Preoperative ROE score (%)	Postoperative ROE score (%)
1	29.16	75
2	50	87.5
3	33.33	83.33
4	20	66.66
5	41.66	75
6	37.5	83.33
7	29.16	70.83
8	25	75
9	20	87.5
10	62.5	83.33
11	45.83	70.83
12	50	91.66
13	33.33	75
14	37.5	83.33
15	41.66	75

desired aesthetic result. Out of the 15 patients, osteotomies were done in 10 patients, tip modifying sutures taken in 11, and alar wedge resection in 7. The percentage of patients requiring osteotomies (66.67%) and alar wedge resections (46.67%) was comparable to their use in another study on Indian patients.¹⁰ There was a significant improvement in ROE scores of all patients, implying the overall patient satisfaction was good (►Table 2).

The following are some examples to substantiate our results:

Patient 1

A 34-year-old woman desired correction of her long and broad nose having a bulbous tip (►Fig. 9a). Preoperative nasolabial angle was 89° (►Fig. 9b). Proposed nasolabial angle was 100°. Intraoperatively, width of alar cartilage was 9 mm, of which 3 mm cephalic width was raised as a medially based flap and transposed to the nasal dorsum. Caudal septal resection, osteotomies, suture modification of the tip, and alar wedge resection were also performed. Postoperative profile shows a well-inclined tip, with the obtained nasolabial angle of 102° (►Fig. 10). The frontal view is seen in ►Fig. 11, the oblique view shows an improved appearance

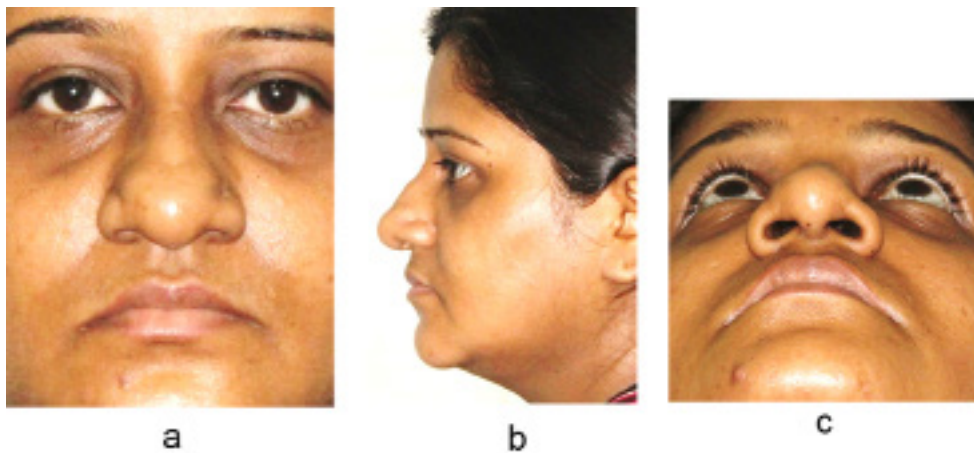


Fig. 9 (a) A 34 year old woman with long and broad nose. (b) Preoperative nasolabial angle was 89°. (c) Basal view of the patient.



Fig. 10 (a) Preoperative lateral view with nasolabial angle measuring 89°. (b) Postoperative profile shows an aesthetic appearance of tip and supratip region. Projected nasolabial angle was 100° and obtained angle was 102°.

(►Fig. 12) and the increase in projection can be seen in the basal view (►Fig. 13).

Patient 2

A 33-year-old woman had a long broad nose, supratip volume deficiency, and an acute nasolabial angle (►Fig. 14). In addition to the cock-up alar cartilage flaps, osteotomies, and alar wedge resection were also done. The nasolabial angle changed from 80 to 103° (►Fig. 15). Frontal view shows a narrower dorsum, desirable supratip volume, and an aesthetically pleasing tip (►Fig. 16). The increase in projection could be appreciated on basal view (►Fig. 17).

Patient 3

An 18-year-old girl with a drooping tip desired a superior rotation of the tip. Her preoperative frontal view is shown in ►Fig. 18a. The preoperative nasolabial angle measured on lateral view was 91° (►Fig. 18b). Following correction, the

profile shows an improvement in nasal tip rotation reflected by an increase in the nasolabial angle to 107° (►Fig. 19) and the frontal view shows appreciable aesthetic dorsal lines (►Fig. 20). The columellar strut and alar wedge resection have resulted in an improved appearance of the lobule in the oblique and basal view (►Fig. 21).

Patient 4

A 29-year-old man had deviated nose with asymptomatic deviated nasal septum. Nasal and septal deviation can be appreciated on the basal view (►Fig. 22). The septum was separated from the upper lateral cartilages and the deviation was corrected by septoplasty. Instead of placing the alar flaps on the dorsum, they were placed between the septum and the upper lateral cartilages, mimicking the orientation of spreader grafts (►Fig. 23). Postoperative profile shows a marginal increase in the nasolabial angle (►Fig. 24), but correction of deviation is satisfactory in frontal (►Fig. 25) and basal views (►Fig. 26).



Fig. 11 (a) Preoperative frontal view of a 34-year-old woman. (b) The postoperative frontal view at 1 month shows a comparatively narrow and well-defined dorsum and the bulbous tip has been corrected.



Fig. 12 The postoperative oblique view shows an improvement in tip rotation and superior appearance of the dorsum. The gain in projection and correction of alar flaring with teardrop appearance of nostrils is seen on the basal view.

Discussion

When nasal tip rotation is desired, it must be performed with caution and precision. The accuracy of this maneuver can be ensured by using a K-wire template bent a desired angle that is decided by detailed preoperative analysis.

Cock-up flap uses the otherwise resected excess strip from cephalic part of the alar cartilage to permit controlled

manipulation of the nasal tip. The reinforcement of the flaps to the dorsum with three interrupted sutures aids in long-term maintenance of tip rotation. As described, the flaps can also be aligned as spreader grafts between the upper lateral cartilages and the septum in certain situations. Slight errors in caudal septal resection can also be compensated by adjusting the anchorage at an appropriate position on the dorsum.

The lateral crural flaps or “tails of the lateral crus” technique was first described by Gruber.¹ It involves anchoring only the medial portion of the cephalic lateral crura to the nasal midvault. This prevents drooping of the tip and secures the tip cartilages to the septum. However, its usefulness to set the nasolabial angle and contouring the supratip area of the dorsum was not explored. We have included the whole length of the lateral crus in the flap and flipped the surfaces to avoid the dog ear. We have also extended the incision further medially so as to raise the flap well beyond the dome to place the base of the flap at the middle crus. As the domes are totally free from flap attachment, it allows proper placement of domal sutures if indicated.

Kuran et al have used the cock up flaps in an alignment mimicking spreader grafts in all cases.¹² We have judiciously used this option only in cases where the cartilaginous septum has been separated from the lateral cartilages along the entire dorsal border for correction of deviation. As mentioned by Kuran et al, these flaps are not substitutes to spreader grafts and in severe cases these flaps need to be supplemented with additional cartilage to provide stability and prevent nasal valve collapse. However, in patients with mild septal deviations without airway obstruction, cock-up flaps can be effectively used to support the internal valve.

Alar cartilage flaps have also been employed by Bohuli et al to show improvement in tip rotation by subjective assessment.⁷ In both the above studies and also in the original description by Gruber, the degree of rotation achieved has been evaluated only subjectively, preventing



Fig. 15 Postoperative profile shows correction of supratip volume deficiency with a subtle transition zone and a desirable tip inclination. Preoperative nasolabial angle was 80°. Proposed nasolabial angle was 100° and the angle obtained was 103°.



Fig. 13 The postoperative oblique view shows an improvement in tip rotation and superior appearance of the dorsum. The gain in projection and correction of alar flaring with teardrop appearance of nostrils is seen on the basal view.



Fig. 16 In the frontal view, the osteocartilaginous vault and the lobule appear narrow, and bulbous tip is corrected.



Fig. 14 (a) Frontal view of a 33-year-old woman showing a long and broad nose. (b) Profile shows a supratip depression and drooping tip. (c) Basal view shows inadequate projection.

comparison and future standardization. We used the prebent K-wire template for lip-columellar angle intraoperatively. Measurements of preoperative and postoperative nasolabial angles have shown reasonable accuracy in setting the angle. The difference in preoperative and postoperative nasolabial angle was statistically significant. We have also compared the proposed nasolabial angle and the obtained postoperative nasolabial angle. This difference was not statistically significant implying the effectiveness of our technique in achieving the desired angle and rotation. The technique does involve some “trial and error” with use of temporary draping of the tip framework by the skin envelope and a



Fig. 17 The gain in projection can be seen on the basal view.

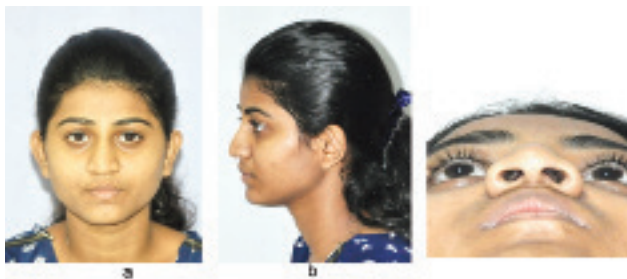


Fig. 18 (a) Frontal view of an 18-year-old woman. (b) Profile view shows an acute lip-columella angle with a drooping tip. (c) Basal view shows flaring of nostrils and decreased projection of tip.

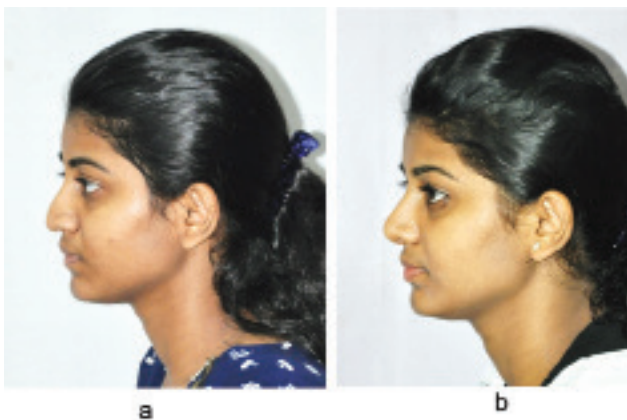


Fig. 19 Postoperative profile shows correction of tip ptosis. Preoperative nasolabial angle was 91°. Projected nasolabial angle was 105° and angle achieved postoperatively was 107°.



Fig. 20 The postoperative frontal view shows a well-defined dorsum and the tip has an aesthetically pleasing appearance.



Fig. 21 The postoperative oblique view shows the improvement in tip rotation and appearance of dorsum. The gain in projection and correction of alar flaring with teardrop appearance of nostrils is seen on the basal view.

suture at the columellar incision. However, this is worth the effort as the accuracy of the result is ensured. With experience, getting the desired effect does not require more than two attempts.

Conclusion

Although the angles have been described in theory, their use in practice has been limited. We have explored the use of these angles to improve the accuracy of the results and facilitate standardization. Cock-up flap is a useful technique that uses locally available tissue to hitch the alar cartilages to gain volume and simultaneously maintain the supratip

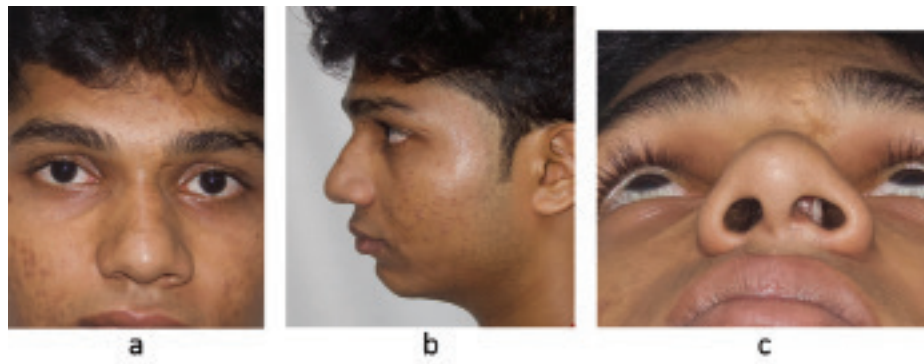


Fig. 22 A 29-year-old man with (a) deviated nose. (b) Profile view with a nasolabial angle of 93° . (c) Deviated caudal edge of septum.

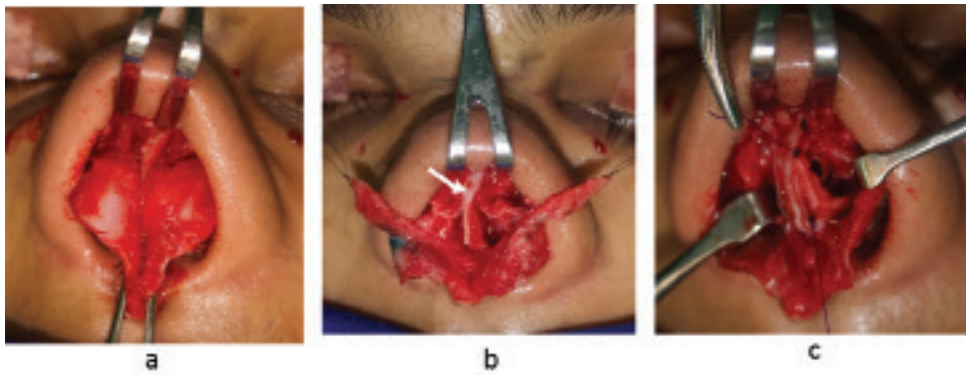


Fig. 23 (a) Wide alar cartilages. (b) The septum (white arrow) exposed by separation from the upper lateral cartilages. Alar cartilage flaps raised (c) flaps sutured between the upper lateral cartilages and the septum, oriented as spreader grafts.

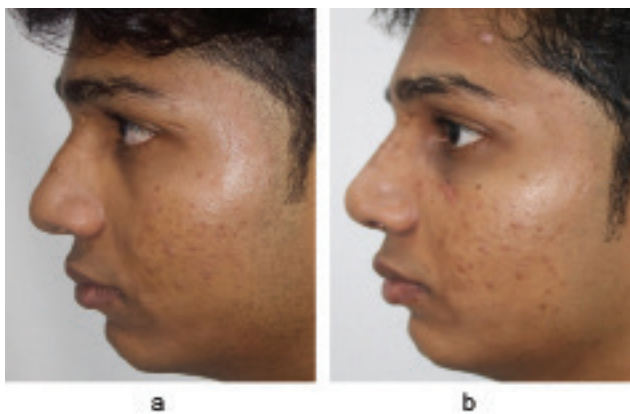


Fig. 24 Increase in nasolabial angle from 93° to 99° . The projected nasolabial angle was 97° .



Fig. 25 The nose appears narrow and nondeviated on the frontal view.

break. However, the usefulness can be improved upon by detailed preoperative analysis, applying the angles in combination, and using the K-wire template technique. Taking the measurements of all the angles may involve human error. We tried to minimize this by ensuring that a single person takes all the measurements; still, the technique cannot be termed foolproof. The values obtained might not be error free; yet, it is a reliable tool to quantify the change in nasal inclination.

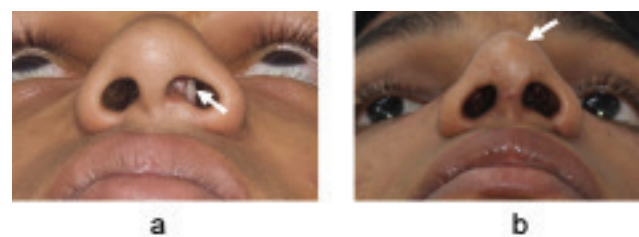


Fig. 26 In the basal view, the deviation (white arrow in a) is corrected and the tip shows a better appearance (white arrow in b).

Conflict of Interest

None.

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