

Immediate Functional and Cosmetic Open Rhinoplasty Following Acute Nasal Fractures: Our Experience With Asian Noses

Chin-Ho Wong, MBBS, MRCS, MMed (Surg), FAMS; and
Rollin K. Daniel, MD, MSc, FACS, FRCS (C)

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Abstract

Background: Closed reduction and splinting are generally recommended in the acute management of nasal fractures. Although open reduction is recommended for more severe nasal fractures, immediate functional and cosmetic open rhinoplasty following nasal fractures has not been described for Asian noses.

Objectives: The authors document their experiences with combining open reduction of acute nasal fractures with simultaneous cosmetic correction of preexisting aesthetic concerns in an Asian population.

Methods: Twenty-five Asian patients underwent primary functional and cosmetic open rhinoplasty immediately following acute nasal fracture. Grafts consisted of autologous material, including septum, concha, rib, and deep temporal fascia. Prior to opening the nose, anatomical reduction of the bony vault fractures was performed. Spreader grafts were used to stabilize the fractured or dislocated dorsal septum as well as to straighten the nose. Aesthetic refinement of the nose included lengthening, refining the tip, and increasing tip projection and was performed according to the patients' aesthetic desires. Patient satisfaction was subjectively reported on a 1 to 10 scale.

Results: Mean follow-up was 17 months (range, 10–24 months). Twenty-three patients rated the results of their procedures as 7 or higher. Functionally, all patients were breathing as well or better postoperatively compared with their preinjury functional state. One patient (4%) underwent a secondary filler procedure for a slight dorsal irregularity.

Conclusions: Immediate cosmetic and functional open rhinoplasty is safe, predictable, and effective in Asian patients.

Level of Evidence: 4

Keywords

Asian, cosmetic, trauma, fracture, rhinoplasty, open rhinoplasty, nasal injury



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The primary treatment goal for traumatic nasal fractures is to reestablish the premorbid functional and cosmetic appearance of the nose. Acute management of traumatic nasal fractures remains variable, but it is generally recommended that closed reduction and nasal packing be performed within 3 weeks of injury.^{1–6} However, the incidence of posttraumatic nasal deformities is significant, with a reported incidence of secondary rhinoplasty ranging from 9% to 50%.^{6–13} For moderate to severe nasal fractures, the rate of secondary revision is probably closer to the high end of that range.^{9,12} Acute open rhinoplasty has the advantage of allowing accurate anatomical reduction of

the fracture and is particularly beneficial in managing fracture/dislocation of the septum.^{14–17} Increasingly, acute

Dr Wong is an Adjunct Assistant Professor at Duke-NUS Graduate Medical School in Singapore. Dr Daniel is a Clinical Professor in the Department of Plastic Surgery at the University of California in Irvine, California.

Corresponding Author:

Dr Chin-Ho Wong, Mount Elizabeth Novena Specialist Center, 38 Irrawaddy Rd, #08–42, 329563 Singapore.
E-mail: wchinho@hotmail.com

open reduction is being recommended for moderate to severe nasal fractures.^{16,17} Accordingly, to treat patients with moderate to severe traumatic nasal deformities, we prefer the open approach.

A subset of patients who sustain nasal fractures also present with a longstanding desire to improve the appearance of their nose. Thus, the nasal injury presents an opportunity to address this desire. Conventional wisdom, however, cautions against ambitiously changing the aesthetics of the nose in the presence of nasal and septal fractures as the unstable bony foundation renders maneuvers that project the tip or lengthen the nose unpredictable and presents greater perceived risks of poor outcomes, particularly the possibility of exacerbating deviation of the nose. This report details our experience performing immediate open rhinoplasty after traumatic nasal fractures to restore function and simultaneously enhance nasal aesthetics in an Asian population, in whom there have been few documented studies regarding functional and cosmetic open rhinoplasty following nasal fractures.

METHODS

Between January 2009 and January 2012, 76 patients presented to the junior author's (C.H.W.) hospital with nasal fractures. Of these, 25 underwent immediate functional and cosmetic open rhinoplasties for traumatic nasal injuries, and their data were retrospectively reviewed for inclusion in this study. For these patients, a detailed history along with external and internal nasal examinations was performed for all patients, and functional aspects of the procedure were emphasized. A detailed discussion was undertaken, guided by preinjury photographs depicting the cosmetic appearance of the nose. For the 25 patients who expressed a longstanding desire to enhance the aesthetic appearance of the nose, a specific operative plan that had a functional but also a cosmetic component was then formulated. The patients were encouraged to be very specific about their cosmetic goals for the procedure, and they usually identified no more than 3 aspects for which they desired improvement (eg, a more refined tip, a higher dorsum, a longer nose). As these were trauma cases, our approach was totally autologous. Preoperative 3-dimensional (3D) computed tomography (CT) scans (Figure 1) were routinely performed to evaluate the extent of the nasal fractures, location of airway obstruction, and, importantly, the nasal septum.

All open rhinoplasty was performed within 3 weeks of the injury under general anesthesia. Prior to opening the nose and guided by CT scans, precise anatomical reduction of the fracture was achieved by Walsham and Asch forceps. The osteocartilaginous vault was then exposed with transcolumellar and infracartilaginous incisions, and the upper lateral cartilage (ULC) was separated from the dorsal septum. Septoplasty and septal harvest were then performed, allowing central relocation of the septal strut, a fundamental aspect in the management of nasal fractures⁹ that is particularly important in patients with preex-



Figure 1. Three-dimensional computed tomography (CT) scans such as this one are routinely performed preoperatively to evaluate the nasal septum, the extent of nasal fractures, and airway obstructions. These CT scans guide the preoperative planning and intraoperative technique. This patient's CT scan shows a comminuted nasal pyramid fracture as well as a septal fracture.

isting septal deviations (which are especially common in Asian noses). When available, cartilage from the septum was harvested during septoplasty, but it was generally inadequate to achieve the desired aesthetic goals. Therefore, conchal and rib cartilage were used when necessary. The caudal septum was then examined; if it was dislocated off the anterior maxillary crest, it was relocated in the midline and secured with a permanent suture of 4-0 Prolene (Ethicon, Inc, Somerville, New Jersey). Buckled caudal septums that hindered reduction were excised when necessary. If lengthening of the nose was planned, spreader or extended spreader grafts were applied to stabilize the reduced septum. The ULC was then sutured to the septum–spreader graft composite, further strengthening and stabilizing the septum. This maneuver also served to indirectly stabilize the fractured nasal bones, as they were firmly attached to the ULC. When stability and reduction of the osteocartilaginous vault was satisfactory, we proceeded to the cosmetic component of the procedure; the nose was lengthened, the tip refined, or the tip projection increased. An example of some patient-specific intraoperative steps in this procedure is shown in Figure 2.

One year postoperatively, patients were asked by the surgeon (C.H.W.) to verbally rate their satisfaction with the functional and cosmetic outcome of their procedure on a scale of 1 to 10, with 10 being the best possible score.

RESULTS

Of the 25 patients included in this study, 21 were men and 4 were women. Their ages ranged from 17 to 53 years. The

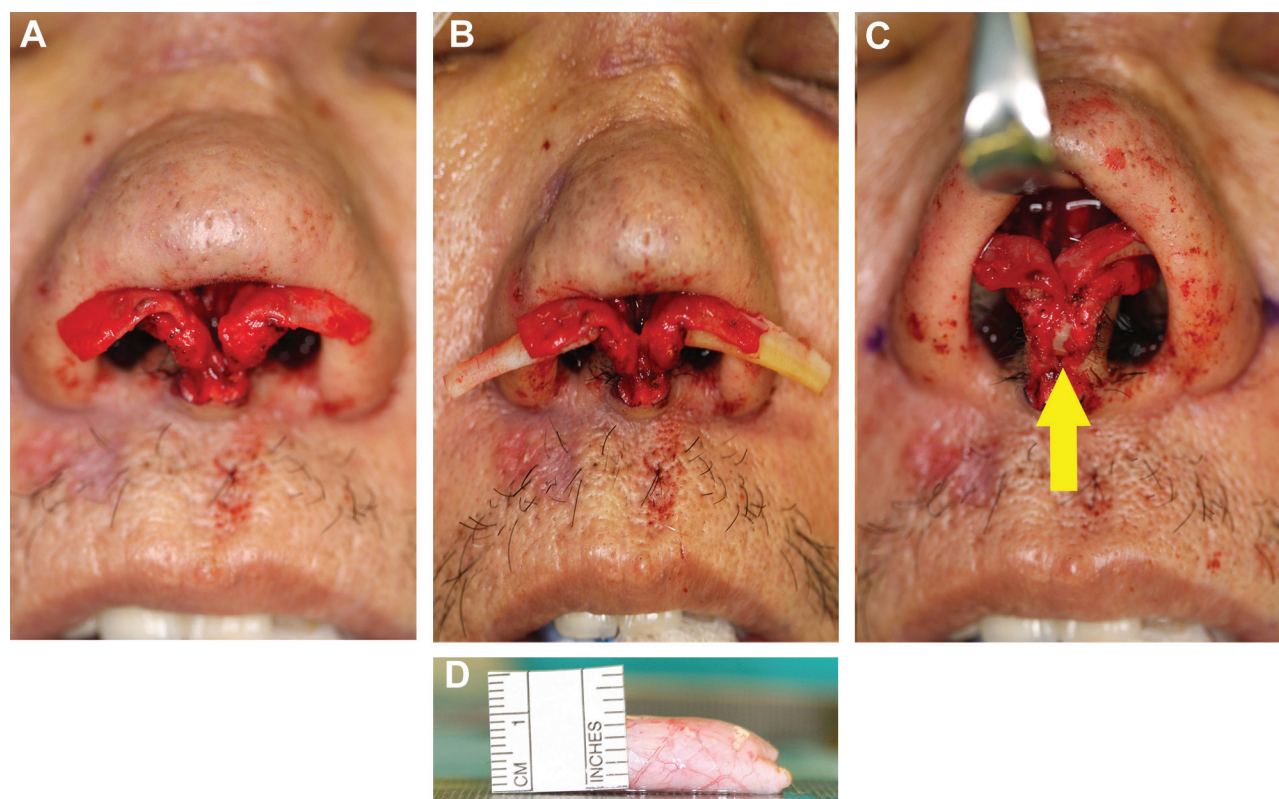


Figure 2. This series shows an example of the intraoperative technique. (The patient's clinical results are shown in Figure 5.) Extended spreader grafts are placed and the nose is lengthened with a septocolumellar graft (not shown). This patient's lower lateral cartilage was very contracted and cephalically positioned. (A) A very conservative cephalic trimming, leaving 7 mm of the lateral crura, is performed and the lateral crura are then transected laterally and repositioned more caudally. (B) In total, 4 mm of the lateral crura is recruited into the medial crura to lengthen them (a lateral steal procedure). (C) The medial crura are secured in a more projected position by suturing them to the septocolumellar graft (yellow arrow). (D) The lateral crura are in turn reconstructed with lateral crural strut grafts and positioned more caudally. The dorsum is augmented with 1.8 mL of diced cartilage wrapped in deep temporal fascia.

causes of injury included low-velocity trauma such as being punched during an altercation or falling on one's face, as well as high-velocity trauma such as a road traffic accident and falling from heights. Twenty-two patients presented with isolated nasal fractures and 3 patients presented with other associated facial fractures. Of these, 2 patients had associated orbitozygomatic fractures and 1 had a frontal sinus fracture. These were treated with open reduction and internal fixation simultaneous to open rhinoplasty. Twenty-two patients were primary cases, whereas 3 patients gave a history of 1 or more previous rhinoplasties or septoplasties. Mean follow-up was 17 months (range, 10-24 months).

As a result of inadequate septal cartilage, conchal cartilage was harvested during septoplasty in 7 patients, and rib cartilage was harvested in 15 patients. For dorsal augmentation, we preferred the use of finely diced cartilage wrapped in deep temporal fascia, as popularized by Daniel.¹⁸⁻²⁰ Accordingly, when a significant dorsal augmentation was planned, the deep temporal fascia was also harvested.

The majority of patients reported high satisfaction with their procedure at 1 year postoperatively. Twenty-three (92%) patients rated the outcome as 7 or higher. Subjective assessment indicated that all patients were breathing as well postoperatively as they were preoperatively, or better. One patient (4%) underwent a secondary filler procedure because of slight irregularity in the dorsum. None of our patients required a secondary rhinoplasty.

Clinical results are shown in Figures 3 through 5. Collectively, these patients demonstrate both the spectrum of Asian noses that can be successfully managed with the immediate open approach and the range of patients' aesthetic desires, from refinements to major cosmetic changes.

DISCUSSION

Our approach of performing immediate functional and cosmetic open rhinoplasty following nasal fractures in Asian patients is relatively new and perhaps quite controversial. Although the literature is sparse with regard to

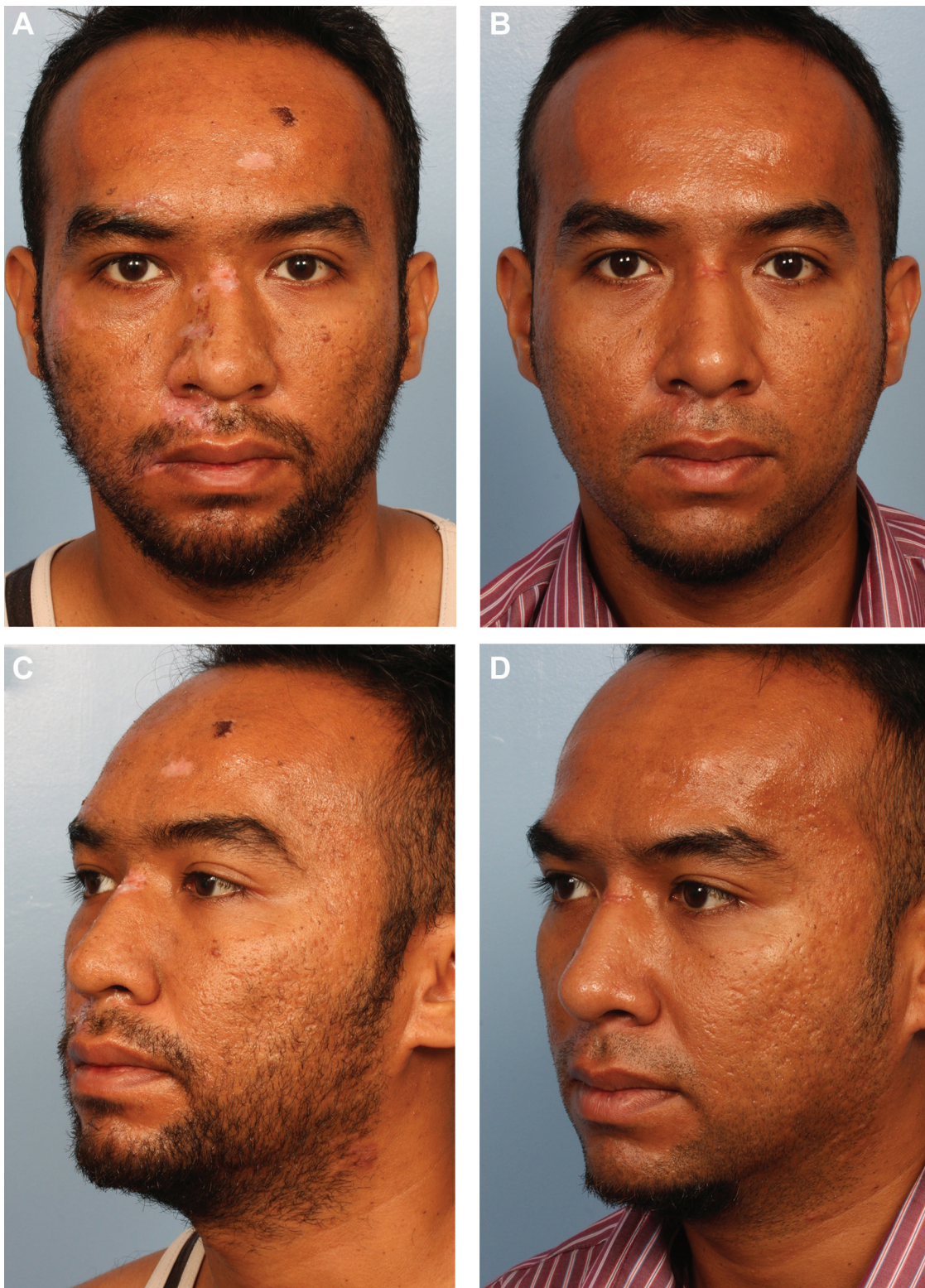


Figure 3. (A, C, E) This 34-year-old man was involved in a traffic accident. He sustained a severe nasal fracture and deviation causing a blocked airway on his left side. His computed tomography scans are shown in Figure 1; they revealed a comminuted nasal pyramid fracture as well as a septal fracture. Aesthetically, he requested a more refined, projected, and cephalically rotated tip, and he disliked his deep radix as well. (B, D, F) One year after open rhinoplasty (performed 12 days after the initial injury), the patient was breathing better and was pleased with the postoperative outcome. During the procedure, a 1-mm dorsal reduction was performed. Septoplasty was also performed and spreader grafts placed. A long columellar strut graft was placed and the medial crura were sutured to the caudal septum to increase tip projection. The patient's radix was augmented with a folded piece of deep temporal fascia. His satisfaction rate for this procedure was 9 on a scale of 1 to 10.

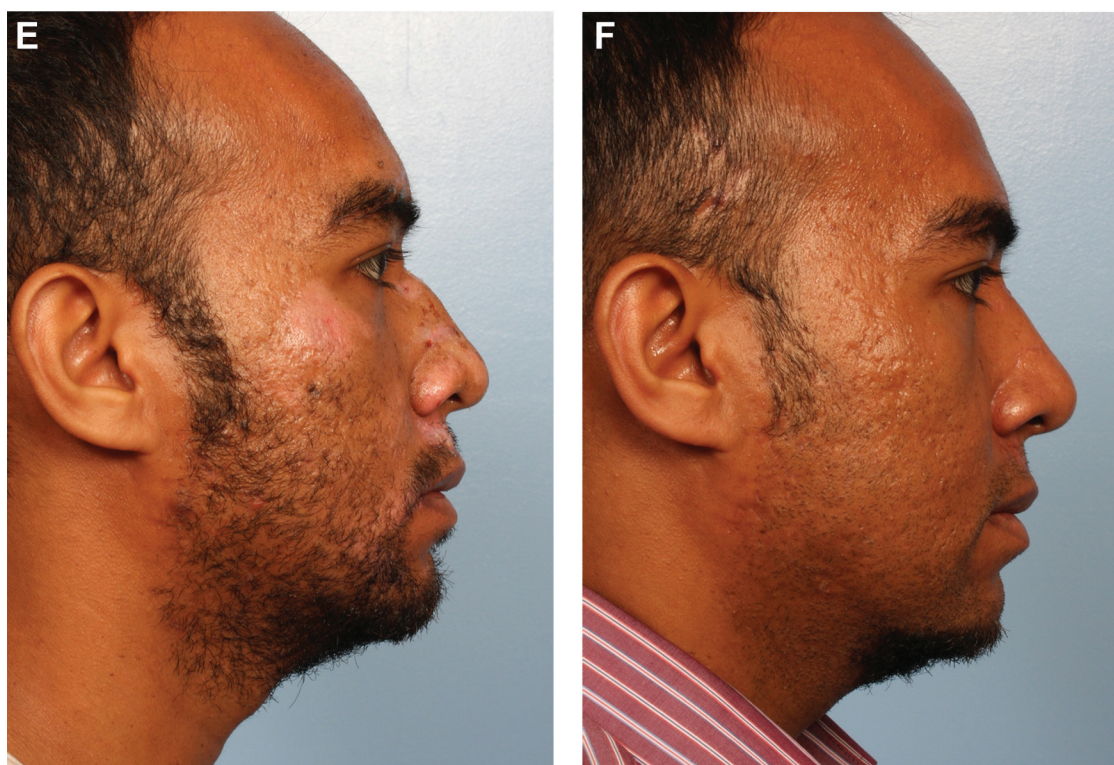


Figure 3. (continued) (A, C, E) This 34-year-old man was involved in a traffic accident. He sustained a severe nasal fracture and deviation causing a blocked airway on his left side. His computed tomography scans are shown in Figure 1; they revealed a comminuted nasal pyramid fracture as well as a septal fracture. Aesthetically, he requested a more refined, projected, and cephalically rotated tip, and he disliked his deep radix as well. (B, D, F) One year after open rhinoplasty (performed 12 days after the initial injury), the patient was breathing better and was pleased with the postoperative outcome. During the procedure, a 1-mm dorsal reduction was performed. Septoplasty was also performed and spreader grafts placed. A long columellar strut graft was placed and the medial crura were sutured to the caudal septum to increase tip projection. The patient's radix was augmented with a folded piece of deep temporal fascia. His satisfaction rate for this procedure was 9 on a scale of 1 to 10.

managing acute nasal fractures in Asian noses,²¹ closed reductions are generally recommended,³⁻⁸ and definitive rhinoplasty is traditionally reserved for patients with secondary deformities.²² Immediate open rhinoplasty following nasal fractures has been suggested for patients with complex septal fracture dislocation or injuries involving the perpendicular plate of the ethmoid or vomerine groove to enable more precise functional correction of septal deviation.⁶ Open reduction of acute nasal fractures in Asian noses has rarely been discussed. Our aim in this study was to utilize such an approach to achieve predictable, functional correction of nasal deviation.

Incorporating a primarily cosmetic component into open rhinoplasty procedures following acute nasal fractures has also not been presented in the literature, to our knowledge. Complex and technically challenging procedures such as lengthening the nose and projecting the tip are considered risky in a fractured nose, as the unstable base is deemed to increase the risk of a poor outcome, particularly an exacerbation of nasal deviation. However, our experience demonstrates that definitive open rhinoplasty with functional and cosmetic components immedi-

ately following nasal fractures can be safely performed with gratifying results in Asian patients.

Because of significant differences in the anatomy of Asian and Caucasian noses, the approaches required for each are fundamentally different. Simplistically, Asian rhinoplasties are augmentation procedures, whereas Caucasian rhinoplasties are reduction procedures. In the Asian nose, the bony vault is usually much shorter in its length and height.^{23,24} Accordingly, osteotomies are not commonly required in aesthetic Asian rhinoplasties in the absence of significant bony asymmetries.²⁵ Thus, in the case of nasal fractures in Asian patients, precise reduction and stabilization with spreader grafts provide a reliable stable bony platform on which to build the nose. In contrast, precisely reducing the bony pyramid to manage the bony vault is an integral part of cosmetic Caucasian rhinoplasty. When the bones are already fractured, they are difficult to control and precise reduction is difficult to achieve. Based on fundamentally different anatomy and cosmetic requirements, it should be stressed that our experience with Asian noses may not be directly applicable or translatable to Caucasian noses.



Figure 4. (A, C, E) This 21-year-old man was assaulted and sustained a nasal fracture and deviation causing a blocked airway. Aesthetically, he requested that his nose be made slightly higher and longer and his tip more refined and projected. (B, D, F) One year after open rhinoplasty (performed 5 days after the initial injury), the patient was breathing well and shows a lengthened and more projected nose. Intraoperatively, the patient's ninth rib and deep temporal fascia were harvested. Precise reduction was performed and his nose was opened. Septoplasty was performed to correct his deviated septum and airway blockage. To project and lengthen his nose, a septocolumellar graft (shown in Figure 6; fashioned from a straight and strong piece of septal cartilage) was placed, secured in the midline by extended spreader grafts (fashioned from the rib cartilage). Nasal length and tip position were then fixed by securing the medial crura to the septocolumellar graft with two 4-0 PDS mattress sutures (Ethicon, Inc, Somerville, New Jersey). A half-length diced cartilage wrapped in deep temporal fascia was used to augment the upper half of the nasal dorsum. His satisfaction rate for this procedure was 8 on a scale of 1 to 10.

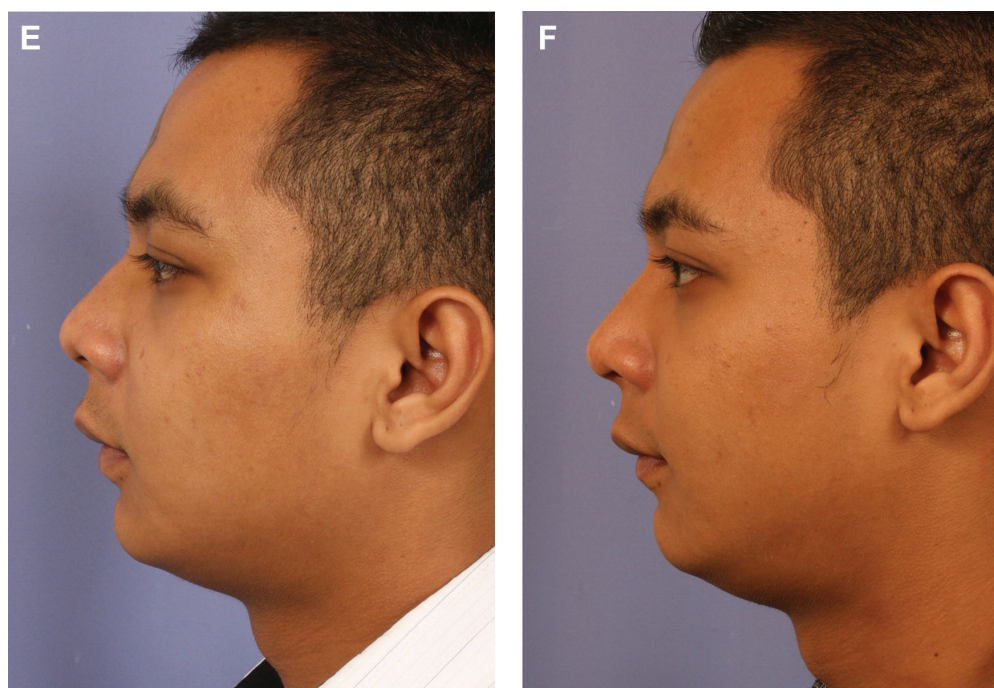


Figure 4.(continued) (A, C, E) This 21-year-old man was assaulted and sustained a nasal fracture and deviation causing a blocked airway. Aesthetically, he requested that his nose be made slightly higher and longer and his tip more refined and projected. (B, D, F) One year after open rhinoplasty (performed 5 days after the initial injury), the patient was breathing well and shows a lengthened and more projected nose. Intraoperatively, the patient's ninth rib and deep temporal fascia were harvested. Precise reduction was performed and his nose was opened. Septoplasty was performed to correct his deviated septum and airway blockage. To project and lengthen his nose, a septocolumellar graft (shown in Figure 6; fashioned from a straight and strong piece of septal cartilage) was placed, secured in the midline by extended spreader grafts (fashioned from the rib cartilage). Nasal length and tip position were then fixed by securing the medial crura to the septocolumellar graft with two 4-0 PDS mattress sutures (Ethicon, Inc, Somerville, New Jersey). A half-length diced cartilage wrapped in deep temporal fascia was used to augment the upper half of the nasal dorsum. His satisfaction rate for this procedure was 8 on a scale of 1 to 10.

Diced cartilage wrapped in deep temporal fascia (DC-F) was used for dorsal augmentation in our patients. The advantages of DC-F have been reported extensively.¹⁸⁻²⁰ In our study, we also found this technique very versatile and effective in augmenting the dorsum. The degree of augmentation required can be precisely controlled with the volume of cartilage, and the results are very natural. In a trauma setting—where there is the need for many large, strong structural grafts to stabilize the osteocartilaginous vault as well as to project and lengthen the tip—DC-F best utilizes the available remnant cartilage and minimizes the amount of cartilage needed. In the majority of our patients, a single rib measuring 3.5 to 4 cm was all that was required. This, in turn, minimized the length of the incision, the duration of the procedure, and the postoperative pain from the rib harvest. The volume of cartilage used ranged from 0.4 to 1.8 mL. An additional role and advantage of DC-F is that it functions to smooth dorsal irregularities and to camouflage persistent minor bony displacements.

The septocolumellar graft (Figure 6) is our preferred graft to simultaneously lengthen and increase the tip projection of the Asian nose. This graft reliably provides the rigidity necessary for thicker and more sebaceous Asian

skin. A piece of quadrangular-shaped septocolumellar graft of approximately $1.5 \times 1.5 \text{ cm}^2$ and fashioned from a piece of fairly rigid and straight cartilage, preferably from the septum, is firmly secured in the midline to the caudal septum and sutured at 2 levels. Anteriorly, it is sandwiched by and sutured to the extended spreader grafts. More posteriorly, it is secured to the caudal septum by a figure-of-8 suture. This maximizes the stability and rigidity of the septocolumellar graft. As described by Daniel,²⁶ this construct resembles a “tomahawk” when in place. The medial crura can then be projected onto and precisely sutured to this composite to simultaneously increase nasal length and tip projection. This technique is suitable for the Asian nose as it provides the strong structural support needed to project and lengthen even a nose with the thickest and most sebaceous skin.

A short nose with a cephalically rotated tip is commonly seen in our patients.²³ This anatomy presents a unique challenge in simultaneously attempting to significantly lengthen and caudally derotate the nose. When we perform the cephalic trim, we do so very conservatively and only to achieve the necessary mobility, attained by separating the lateral crura from the upper lateral cartilage. Aggressive

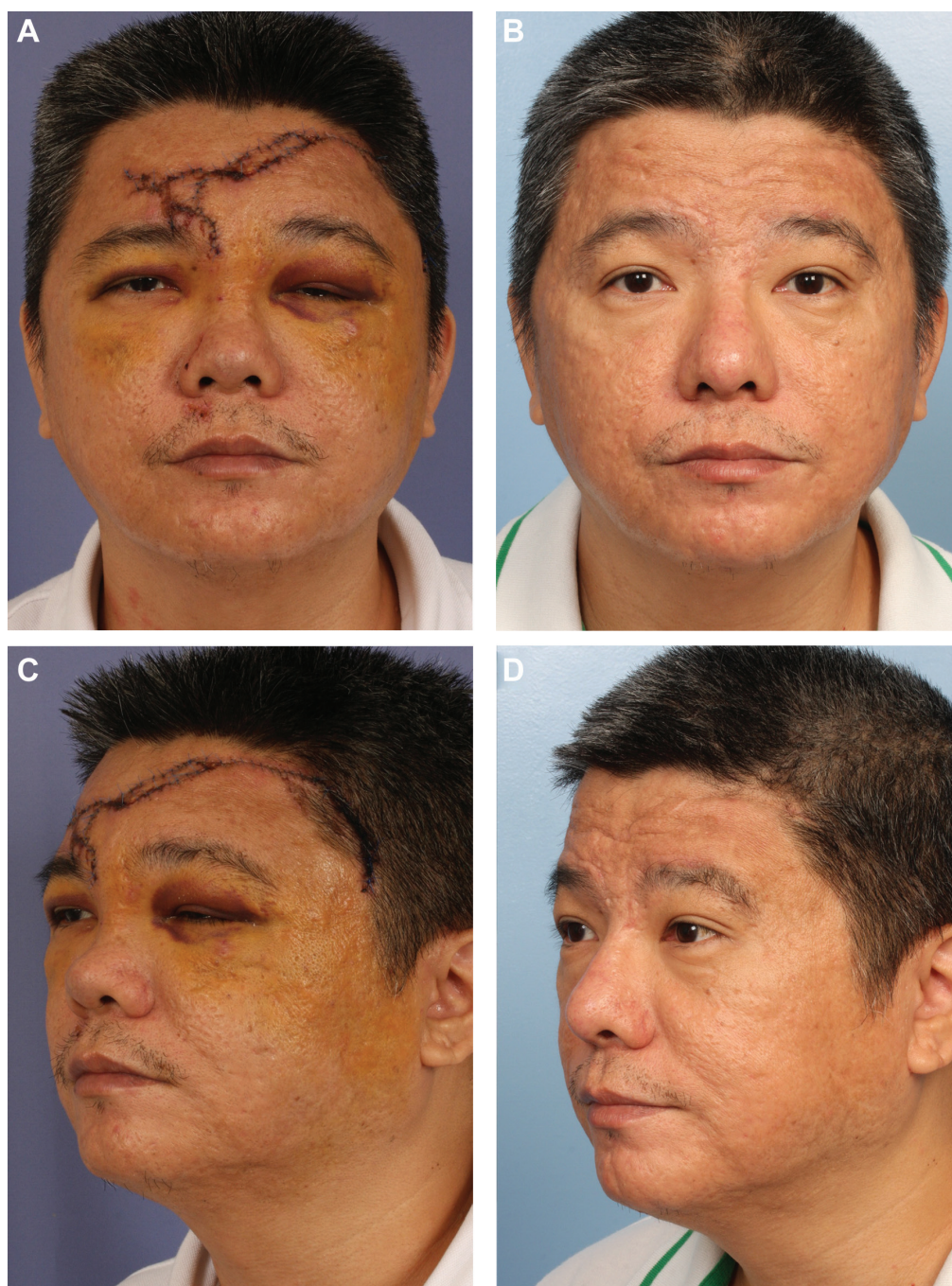


Figure 5. (A, C, E) This 40-year-old man was involved in a traffic accident. He sustained multiple forehead lacerations, a depressed nasal fracture, and dislocation of the nasal septum. Aesthetically, he requested significant dorsal augmentation, lengthening of his nose, and refinement of his tip (this patient had a very short nose and extremely thick and sebaceous skin preoperatively). (B, D, F) Eighteen months after open rhinoplasty (performed 14 days after the initial injury), the patient was breathing well and was very pleased with his outcome. His full intraoperative procedure is depicted in Figure 2. A profound change in the aesthetics of his nose was achieved using the immediate open rhinoplasty approach, despite nasal fractures and “unfavorable” skin quality. His satisfaction rate for this procedure was 9 on a scale of 1 to 10.

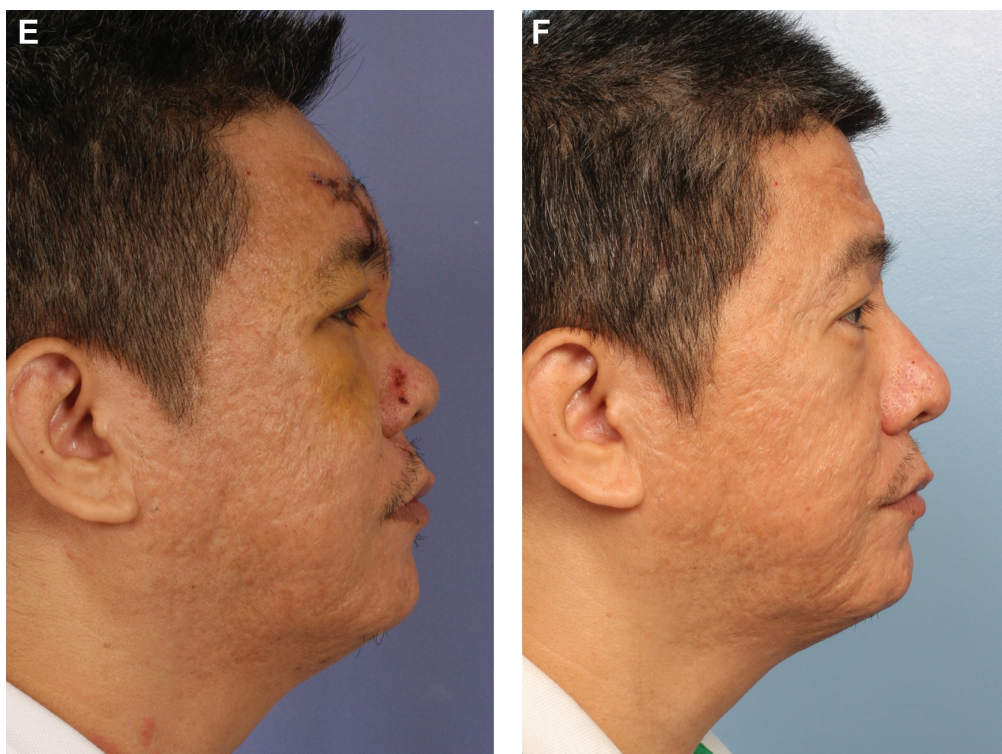


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cephalic trimming would over-cephalically rotate the tip. The length of the medial and lateral crura limits the degree of tip projection that can be achieved by tethering the tip to the anterior nasal spine medially and to the piriform aperture laterally when it is maximally stretched. With regard to the orientation of the lateral crura, cephalic positioning in a Caucasian nose would be considered a malposition. However, such orientation is the dominant phenotype in Asian noses. Hence, cephalically oriented lateral crura should not be considered a malposition in Asian patients. As the lateral crura do not support the alar lobule, projecting the tip to a significant degree may result in a groove between the well-supported tip and the poorly supported alar lobules. This gives the appearance of the tip being distinct from the alae. The continuation of the dorsal aesthetic line onto the tip gives the nose an unaesthetic “sausage”-like appearance. This, of course, is not an effect unique to the Asian nose. A short nose with cephalically positioned lateral crura has a predisposition for this deformity, which is often noticeable in both unoperated noses and anatomically prone noses in which a silastic L-strut implant has been inserted.^{27,28}

We have found the lateral crural strut graft described by Gunter and Friedman²⁹ to be very effective in

simultaneously solving the 2 primary problems that contribute to the difficulty of significantly projecting the Asian nose: (1) inadequate lower lateral cartilage length (LLC) and (2) poor support of the alar lobules by the lateral crura. This graft can be used to reconstruct the shortened lateral crura resulting from the “lateral-steal” procedure that, in effect, lengthens the medial crura and allows the tip to project freely.³⁰⁻³² This also allows the lateral crura to be repositioned caudally so that the alae can be supported. This maneuver prevents the potential of alar grooving with projection of the tip. The lateral tripod support provided by the lateral crura strut graft complements the medial tripod support provided by either the columellar strut or the septocolumellar graft.

The limitations of our approach should be emphasized. First, preoperative assessment is compromised by post-traumatic swelling. The severity of nasal deviation is often masked by swelling, and blocked airways in the nose may be caused by postinjury mucosal swelling, septal deviation, or a combination of both. It is important to review preinjury photographs with the patient to fully understand his or her desired aesthetic and functional goals. Patient selection is critical, and we are highly particular in choosing

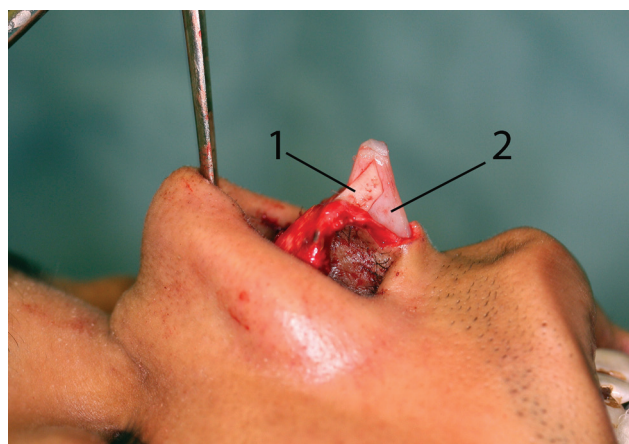


Figure 6. In this patient with a nasal fracture and a blocked airway (Figure 4), a septocolumellar graft (2) is placed to simultaneously lengthen the nose and project the tip (which the patient specified as his cosmetic goals). This graft, when sutured in place, resembles a tomahawk and is kept securely straight and in a midline position by the extended spreader grafts (1), bolstering it on either side anteriorly. More posteriorly, a figure-of-8 suture is placed to connect the graft to the caudal septum. This dual-level suturing provides the construct the necessary rigidity to simultaneously lengthen the nose and project the tip.

patients to whom we offer the cosmetic component. If a patient states at any point that he or she only wishes to restore the preinjury nasal appearance, a purely functional procedure—either closed reduction or open rhinoplasty—is performed according to the patient's needs. Key in our consideration is the patient's clarity and specificity in his or her requested changes. Good candidates for combined correction are generally slightly dissatisfied with their noses preinjury, and the injury then serves as a stimulus for them to address those aspects that they dislike. We notice that the outcome of immediate open rhinoplasty gives many of our patients a profound sense of confidence resulting from the improved aesthetic of their nose. This new sense of self-awareness prompts many patients to request additional cosmetic procedures such as skin resurfacing and blepharoplasty.

CONCLUSIONS

Open structural rhinoplasty that addresses functional and cosmetic concerns can be safely and reliably performed immediately following nasal fractures in Asian patients. A stable osteocartilaginous vault, achieved by both precise reduction of the fractures and the septum and by the reinforcement of spreader grafts, is the prerequisite to successful aesthetic improvement of the nose. We demonstrated that, despite characteristically thick skin and weak cartilage, it is possible to profoundly refine the Asian tip by providing a very strong projection into the skin envelope with cartilage grafts. This makes structural and cosmetic

rhinoplasty a successful and viable method when presented with the unique anatomical challenges of the Asian nose.³³

Disclosures

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