Open Septorhinoplasty: Operative Technique and Grafts

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SUMMARY

In this case series, the senior author details his series of patients who had undergone open septorhinoplasty for functional and/or aesthetic purposes in the Otorhinolaryngology Department at the Hospital Universiti Kebangsaan Malaysia (HUKM), Kuala Lumpur between January 2003 and September 2005. There were 23 patients, consisting of 15 men and 8 women from different Malaysian ethnic groups. Discussion on open septorhinoplasty with regards to operative technique, grafts and implants is presented from an otorhinolaryngologist's point of view.

KEY WORDS:
Open septorhinoplasty, Technique, Grafts

INTRODUCTION

Septorhinoplasty surgery remains as one of the most challenging operations in the field of facial plastic surgery - a domain gradually embarked upon by the contemporary otorhinolaryngologists. Despite the advances and the multiple techniques that have been described in the literature, it can be a steep learning curve and a daunting task no less for the aspiring rhinoplasty surgeon. While it is said that beauty is in the eye of the beholder, the surgeon's attention to functional, reconstructive, and aesthetic principles is paramount in ensuring optimum septorhinoplasty results, much to the satisfaction of both the patient and the surgeon.

Septorhinoplasty is a complex operation that requires precise preoperative diagnosis to select the appropriate surgical technique, partly because of its dual role and central importance for both nasal function and facial form. As the debate between the open and closed approach and the ideals of facial contour rages on, new techniques are formulated with greater attention to the nasal anatomic variability in men and women across different ethnic groups. Proponents of the closed or endonasal approach emphasize on its advantages namely absence of external incisions, and less dissection required, therefore, minimizing soft tissue trauma and subsequent scarring. It is less dependence on postoperative steroids to reduce postoperative swelling. However, exposure of the surgical field is very limited and tip supporting mechanism tends to be compromised with time[1].

On the other hand, the open or external approach offers a much more superior exposure of the nasal tip for inspection of the nasal osteocartilaginous framework without anatomic distortion, therefore allowing proper remodeling of the nasal framework. The surgeon can be assured of accuracy while performing detail suturing and resection manipulation. It also offers unparalleled accuracy for structural diagnosis and placement or manipulation of graft, if needed, under direct vision. Being a tertiary referral centre, the open approach also facilitates the teaching and learning of nasal anatomy and surgical techniques. The open approach is also recommended for revision or secondary septorhinoplasty. On contrary, opponents argued that the transcolumellar incision used for surgical access in this technique produces scarring[2]. However, given all these advantages, the transcollumellar incision scar is indeed a small price to pay.

Here, the senior author, a proponent of the open septorhinoplasty approach, reviews his surgical patients who had undergone this approach for various reasons.

MATERIALS AND METHODS

All cases of open septorhinoplasty for functional and cosmetic purposes presenting at Hospital Universiti Kebangsaan Malaysia (HUKM), Kuala Lumpur between January 2003 and September 2005 performed by the senior author were reviewed. Cases where the transcollumellar endonasal transseptal approach was used as a neurosurgical access were excluded from this study. There were a total of 23 patients, of which 15 (65.2%) were males and 8 (34.8%) were females. Mean age at presentation was 30 years (range 16-54). Indians constituted 69.6% of the patients (16/23), Chinese 17.4% (4/23), and Malays 13.4% (3/23). The patients were reviewed with respect to nasal deformity on presentation, surgical technique, types of grafts used and the postoperative outcome.

RESULTS

The demographic data of all the patients who underwent open septorhinoplasty are shown in Table I.

On presentation to the Otorhinolaryngology Clinic at HUKM, the patients were assessed by the senior author. All the above patients complained of nasal blockage and/or cosmetic inadequacies. A detailed history was obtained; physical examination and nasal endoscopy was performed. In a twisted nose, whether post-traumatic (Fig. 1 and 2) or non-traumatic (Fig.3), nasion and nasal tip are in the same vertical

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plane with the mid-vault deviated to one-side. In contrast, in a crooked nose, the nasion, mid-vault and the nasal tip are in a straight line off the vertical plane. A saddle nose, owing to the loss of the dorsal aspect of the quadrilateral cartilage, has supratip depression, shortening of the nose and often, overrotation of the tip. On the contrary, an overprojection of the nasal dorsum results in a dorsal hump deformity. The nasal tip can also be deformed in many ways- underprojected, overprojected, rotated, abnormally shaped among others. Photographs for preoperative documentation were taken from 5 views: frontal, base, top, right and left 45° oblique. The nasal deformity on presentation can be summarized as in Table II.

Majority (60.9%) of the patients presented with twisted nose. There were two patients (patients 1 and 19) who underwent endonasal septoplasty earlier elsewhere but the residual deformity in the form of crooked nose and prominent dorsal hump compelled correction via the open septorhinoplasty approach. There was history of obvious nasal trauma elicited in 7 of the 23 (30.4%) patients. All of the patients had deviated nasal septum of varying severity. There was a history of allergic rhinitis in 34.5% of the patients, the incidence being more in the non-traumatic group.

All patients were orotracheally intubated and head was slightly extended. With an oropharyngeal pack in place, both nostrils were packed with cotton pledgets soaked in cocaine and adrenaline (1:1000 concentration) for vasoconstriction. Local anesthesia in the form of ropivacaine 2mg/ml and adrenaline 1:80,000 was injected into the nasal tip, columella, nasal septum, along the site for the proposed marginal incision, and along the lateral nasal wall. Bilateral transoral greater palatine block was performed then. All cases were approached via a combined either inverted V or Z-shaped transcollumellar incision with bilateral alar marginal incisions using a size-15 scalpel blade. The marginal incision along the caudal margin of the lateral crura was extended down the columella to meet the columellar incision. With the aid of an Aufricht retractor and a small curved scissors, the soft tissue plane was dissected below the superficial muscular aponeurotic system (SMAS) superiorly and laterally to expose the upper lateral cartilage and the lateral crura respectively. The middle nasal vault was exposed in the

Table I: Patient Data

Patient	Age	Sex	Race	Trauma	Deformity	Graft/Implant	Hospital Stay (days)	Complication	Follow up (as of June 06)
1	16	F	M	+	crooked nose	QCSG	4	-	9 months
2	24	F	I	+	twisted nose	QCSG	4	tip paraethesia, depressed alar deformity	40 months
3	24	M	C	+	twisted nose	SBG	4	nasal obstruction	3 months
4	35	M	C	+	saddle nose	SBG	4	-	3 months
5	37	M	C	-	crooked nose	QCSG	5	-	32 months
6	19	F	I	-	crooked nose	QCSG	4	alar deformity	32 months
7	38	M	I	+	twisted nose	QCSG	5	tip paraethesia + alar deformity	31 months
8	16	M	I	-	twisted nose	MSG	4	synechae	23 months
9	44	M	I	-	underprojected tip	MSG	4	-	22 months
10	16	M	I	-	twisted nose	MSG	5	-	20 months
11	26	F	I	-	twisted nose	QCSG	4	-	20 months
12	32	M	I	-	twisted nose	QCSG	4	-	9 months
13	20	F	I	-	crooked nose	QCSG	5	-	3 months
14	22	F	I	-	saddle nose	MSG	4	-	15 months
15	16	M	I	+	twisted nose	QCSG	5	-	14 months
16	46	F	I	-	saddle nose	MDSG + CCSG	5	alar deformity	14 months
17	45	M	I	-	twisted nose	QCSG	6	-	12 months
18	54	F	I	-	twisted nose	QCSG	4	-	12 months
19	40	M	I	-	dorsal hump	MSG	5	-	11 months
20	22	M	M	-	twisted nose	QCSG	6	-	10 months
21	38	M	I	-	twisted nose + dorsal hump	MDSG+ QCSG	7	-	9 months
22	35	M	C	-	twisted nose	MSG	5	-	9 months
23	22	M	M	+	twisted nose	MDSG+ QCSG	3	-	9 months

QCSG = Quadrangular cartilage spreader graft
SBG = Septal bone graft
MSG = Medpore spreader graft
MDSG = Medpore dorsal support graft
CCSG = Conchal cartilage spreader graft

Table II: Nasal deformity at presentation

Nasal deformity	Trauma		Non trauma		Total
	AR	Non-AR	AR	Non- AR	
Crooked nose	1	1	2	-	4
Dorsal hump	-	-	1	-	1
Twisted nose	1	3	2	8	14
Twisted nose & Dorsal hump	-	-	-	1	1
Saddle nose	-	1	1	-	2
Underprojected tip	-	-	-	1	1

AR = Allergic rhinitis

Table III: Types of grafts used for various nasal deformities

Deformities	Grafts	Number
Crooked nose	Quadrangular cartilage spreader graft	4
Dorsal hump	Medpor spreader graft	1
	Septal bone graft	1
	Quadrangular cartilage spreader graft	8
Twisted nose	Medpor spreader graft	3
	Medpor dorsal support graft + Quadrangular cartilage spreader graft	1
Twisted nose & dorsal hump	Medpor dorsal support graft + Quadrangular cartilage spreader graft	1
	Medpor spreader graft	1
	Medpor dorsal support graft + conchal cartilage spreader graft	1
Saddle nose	Septal bone graft	1
Underprojected tip	Medpor spreader graft	1

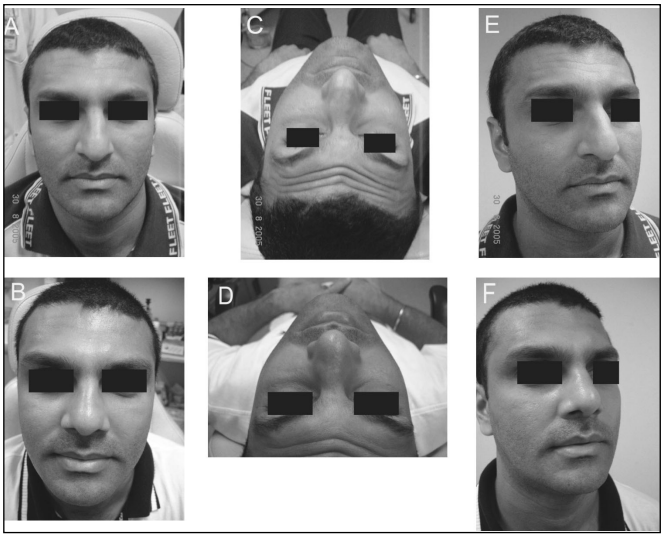

Fig. 1: A, C, E, Preoperative view of a 38 year-old Indian patient with a non-traumatic twisted nose and dorsal hump. B, D, F, Postoperative views after surgery (Medpor dorsal support graft and quadrangular cartilage spreader graft were used).

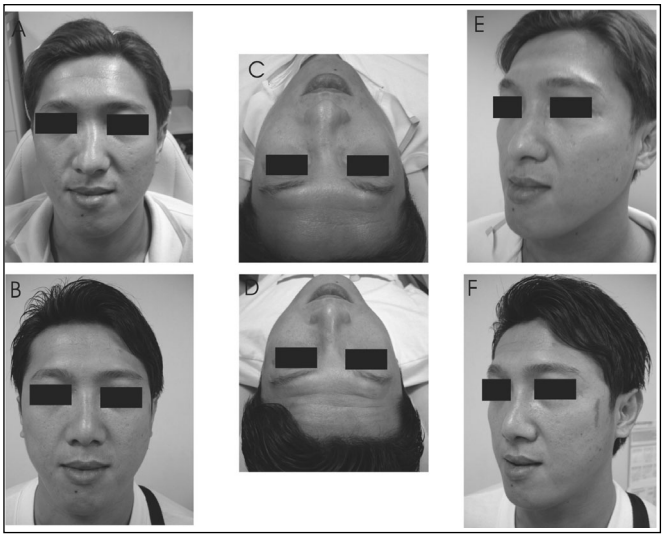

Fig. 2: A, C, E, Preoperative view of a 33-year old Chinese patient with a posttraumatic twisted nose. B, D, F, Postoperative views after surgery (Medpore spreader graft was used).

Fig. 3: A, C, E, Preoperative view of a 35-year old Chinese patient with a congenital non-traumatic twisted nose. B, D, F, Postoperative views after surgery (Medpore spreader graft was used).
(Note: Consent have already been obtained from all patients)

midline. The interconnecting ligaments over the medial crura were split exposing the caudal portion of the septal cartilage. Bilateral mucoperichondrial flap of the cartilaginous septum was elevated, with the dissection continuing over the perpendicular plate of the ethmoid bone and vomer upward and extends over the nasal crest of the maxillary bone and medial floor of the nose downward. After completion of the degloving exposure, bipolar electrocautery was used for hemostasis. The entire osteocartilaginous framework was then evaluated.

Suitable grafts in the forms of autograft (septal bone, conchal cartilage, quadrangular cartilage spreader grafts) or allograft (porous high-density polyethylene- Medpor®, Porex Surgical, Georgia, USA) were placed in the area of defect. The types of grafts used for various nasal deformities are shown in Table III. Autogenous graft in the form of spreader graft from the septal cartilage was the graft of choice. It was used in 14 (60.1%) patients. In another three (13.0%) patients, more than one graft was used, mainly as quadrangular cartilage spreader graft and Medpore as dorsal support graft or spreader graft.

The patients with an underprojected tip and saddle nose had tip-recontouring performed to elevate the nasal tip. On completion, the skin flap was returned to its normal anatomical position and the transcolumellar incision closed with nylon 5/0 sutures while the bilateral alar marginal incision with Vicryl 4/0 sutures.

Postoperatively, the patients were prescribed a course of amoxycilin/clavulanate for ten days. Adhesive dressing (Steri-strip) was applied to all noses post-surgery to minimize soft tissue swelling and graft displacement. Patients who also underwent osteotomy had additional Plaster of Paris (POP) applied to the nasal dorsum for about a week. The average length of stay in the hospital was 4.6 days (range 3 -7 days).

The patients were followed up postoperatively. The removal of the transcollumellar sutures, Steri-strip and POP was performed on the 7th day post -surgery. On follow-up, the patients were reviewed with respect to his/her improvement in symptom scores for nasal patency and aesthetic improvement. While the patient's satisfaction was entirely subjective, nasal endoscopy was performed to evaluate patency of the nasal airway. At present, 17 (73.9%) patients are still on active follow-up with a mean duration of 13 months while 6 (26.1%) defaulted at an average of three months. One patient had intranasal synechae formation, which was released later at follow-up using local anaethesia. Two patients had transient tip paraethesia with minimal alar depression. Another two had alar deformity which required revision surgery. So far, there have been no cases of infection, implant extrusion or epistaxis. Functionally, all except one patient experienced subjective improvement in the nasal airway. Therefore the postoperative nasal obstruction rate was 1 of 17 (5.9%) patients.

The scale of patient's level of satisfaction was subjective[3]. Among those still on active follow-up, 13 of 17 (76.4%) patients were satisfied (their result met or exceeded their expectations) with the cosmetic improvement. However, two patients (patients no. 2 and 7) with minimal alar depression were moderately satisfied (would have hoped for more improvement but generally accepted the result and do not wish to have it revised). Two (11.7%) patients had obvious alar deformities and underwent revision surgery. After the revision surgery, one patient (no. 6) was still dissatisfied with the looks whereas the other patient (no. 16) was moderately satisfied. Both remained on follow-up for possible revision surgery in the near future.

DISCUSSION

Trauma accounted for most cases of twisted nose[4], with other causes being congenital or prior nasal surgery, although in this series the majority was non-trauma patients. Besides the obvious cosmetic defect, patients with twisted nose frequently have troublesome nasal obstruction due to the narrowed airway. As such, history of allergies (eg. allergic rhinitis) should be elicited and proper medical management commenced before the definitive corrective functional surgery. This will allow the surgeon to determine the severity of the functional problems contributed by the structural defect.

The gateway to the nose for the otorhinolaryngologist is the septum. Twisted nose comprises distortion of the midvault osteocartilaginous framework in various possible combinations. Majority of patients with twisted noses in this series have significantly deviated septum[4]. The objective of surgery is to achieve or restore a straight, midline and supportive septum. It is important to address the septal deformity for an otorhinolaryngologist to achieve optimum results. Also, an adequate L-shaped dorsal and strut of the quadrilateral cartilage (about 6-8mm) should be maintained at all times to preserve the dorsal and caudal support. Very often, grafts (autograft or allograft) are needed to resist the memory effect and prevent recurrence of the curved septum in this group of patients. A septum dislocated off the maxillary crest should be repositioned.

To simplify the understanding of the osteocartilaginous framework, one can divide the external nose structure into thirds. The upper third comprises the nasal bones and extends down to the osseocartilaginous junction (rhinion); the middle third, also called the middle nasal vault, is made up of the upper lateral cartilages (ULCs) and septum, and the lower third comprises the lower lateral cartilages (LLCs) and the anterior septal angle/caudal septum. Most twisted noses have some form of anatomic distortion of the lower two-thirds[4]. The internal nasal valve is another region that must not be overlooked in the preoperative assessment. It is bordered medially by the septum, inferiorly by the nasal floor, laterally by the inferior turbinate, and superiorly by the caudal border of the ULC. Any compromise in the surrounding boundaries would render the valve susceptible to collapse, resulting in nasal obstruction by the patient. Once the boundary of the nasal valve area is interfered, repair by autogenous grafts or allografts is essential.

Deformity of the upper third involving the nasal bones in 6 of the 18 patients with twisted noses required medial and lateral osteotomies prior to spreader grafts insertion. As evidenced by the two patients who still had some deformity despite an earlier septoplasty, involvement of the middle third in twisted or saddle noses was more difficult to correct due to the inherent tension memory effect of the ULC and septum. The ULC needed to be mobilized away from the septum but the mucoperiochondrium has to be kept intact to maintain the vascularity to the mobilized ULC and prevent scarring in the nasal valve region[4,5]. However, in the presence of a crooked dorsum, predicting the anatomy of the ULC and their relation to the septal dorsum may not be that straightforward. Furthermore, when separating the ULC from the dorsal septum, it can be difficult or impossible to create a straight medial margin without resecting even more ULC, therefore making a spreader graft mandatory[5].

Deformity of the lower third is usually caused by deformity in the caudal septum or the nasal tip. An open approach would allow direct visualization of the tip problem and subsequent tip-plasty under direct vision. In this case if the nasal valve area is not compromised, the use of spreader graft may not be necessary.

While autogenous grafts are the gold standard for augmentation in open septorhinoplasty, allograft can still be used for well-selected patients. The patient should be counseled regarding the available options for the graft. Appropriate graft selection should be a joint decision between the surgeon and the patient. Autogenous materials incite much less inflammatory response with low rates of resorption, extrusion and infection, though it may be

associated with donor site morbidity and longer operating time. More often, autogenous grafts are used for reconstruction. First described by Sheen[6], spreader graft was designed to address the aesthetics of the dorsal lines and the problem of nasal valve collapse with subsequent nasal obstruction. The graft acts to widen the nasal valve angle and significantly improve the nasal airway. In the literature, the spreader grafts were found to be most successful in correcting severe middle nasal vault deformity and internal nasal valve related airway problems[7,8]. In this series, nine selected patients were predisposed to excessive narrowing of the middle nasal vault and nasal valve collapse. In the patient with both twisted nose and prominent dorsal hump, spreader graft was used along with Medpor in an attempt to prevent future vestibular contraction, as advocated by Sheen[6].

The graft was harvested from the quadrilateral cartilage and subsequently trimmed and shaped according to the size of the defect and the strength of support needed. Using the quadrangular septal cartilage is advantageous to the otorhinolaryngologists because it is locally available in the same surgical field and the ease of contouring the cartilage. If quadrangular septal cartilage is inadequate, the conchal cartilage can be harvested instead. The spreader graft was then placed unilaterally or bilaterally between the upper lateral cartilage and the septum with Prolene 5/0 suture fixation. Other options described include placing the graft in mucoperichondrial pockets with no suture fixation, but both methods were equally effective[8].

Onlay ("camouflage") grafts harvested from conchal cartilage was indicated in 1 patient with saddle nose as the ULC and nasal bone was depressed[9]. An onlay graft is particularly useful in cases where the ULC or nasal bones are depressed without associated airway problem[4]. Conchal cartilage is easily available, easy to carve, has low donor site morbidity and less metabolically demanding, thus undergoes less resorption[10].

Bone grafts were used in three patients where more rigid augmentation was needed. Septal bone was easily available within the same surgical field from either the bony septum, sphenoid rostrum or the maxillary crest. Iliac crest bone provides ample supply of relatively flat bone, but is associated with donor site morbidity like pain and hematoma. The rigidity of bone grafts makes them less suitable for areas like the nasal tip. Iliac bone graft was not utilized in this case series.

Synthetic grafts have the advantage of being in abundant supply, reduces operating time and donor site morbidity. Previous surgery or patient's apprehension about increased surgical morbidity from a second operative site may contribute to the surgeon's decision to use a non-autogenous graft[11]. In the literature, other than Medpor, other materials that have been used include expanded polytetrafluoroethylene (Gore-Tex, W.L. Gore and Associates) and dimthylsiloxane polymer (Silastic, Dow Corning Corp.)

Medpor allograft offers some advantages in nasal reconstruction. The internal pores of varying sizes facilitate fibrous and vascular tissue ingrowth, therefore allowing mechanical stabilization, with less risk for infection and extrusion. It is easily available locally in numerous shapes and sizes, and is readily sculpted after being soaked in hot water. Besides being malleable, it incites minimal foreign body reaction as compared to silicone implant (no capsulation occurs) [10]. As such, it is the senior author's preferred choice of allograft, if need be.

Silastic, a silicone-based implant, was never used as it is notorious for the high rates of infection and extrusion, especially in thin-skinned individuals[12], due to lack of fibrous or vascular ingrowth into the implant. Other complication like graft migration and dorsal cyst formation had also been documented[13].

Gore-Tex, composed of fibrillated polytetrafluoroethylene (PTFE), shares common advantages as the Medpor. It is highly biocompatible, allowing tissue ingrowth, with minimal inflammatory response, and low rates of infection, extrusion and resorption. However, with its soft consistency, it does not provide a robust structural integrity for augmentation[10]. Again, the senior author has no experience with this implant in this case series.

Ethnicity is also a factor to be taken into consideration during septorhinoplasty as it significantly affects the surgical techniques used and the eventual outcome. In this series, incidentally, majority of the patients were of Indian origin. As compared to the Malays or Chinese, they tend to possess the nasal geometry of the Caucasians rather than the Oriental due to their ancestral roots. Caucasian nose is more greatly projected at tip and nasion as compared to the Oriental nose[14]. On the contrary, non-Caucasian noses have thick skin, weak cartilage, flat broad dorsum with underprojected tip, widened alar base and shorter nasal bones[15]. Thickness of the skin affects the prominence of the underlying cartilages, ease of tissue dissection and the degree of nasal tip sculpting. The transcollumellar incision should also be placed lower in the non-Caucasian noses because augmentation will advance the columellar skin cephalically[15].

In his critical analysis of his rhinoplasty experience, Foda[3] documented his complication rates as follows: septal flap tear 2.8%, alar cartilage injury 1.8%, post-operative nasal trauma 1%, epistaxis 2%, infection 2.4%, prolonged edema 17%, nasal obstruction 0.8%, and unsightly transcolumellar scar 0.8%. The overall patient satisfaction rate was 95.6%. So far in this series, while the complication rates for residual deformity was higher; there have been no cases of post-operative epistaxis, infection, graft extrusion or keloid scar formation.

The biggest limitation of the evaluation of this series is the fact that it is non-blinded and the only evaluator is the surgeon. Assessment was also purely subjective, whether cosmetic or functional. Therefore in the future, patients should undergo acoustic rhinomanometry to objectively document the improvement in the nasal airway. Lack of long-term follow-up in this study is another limitation. Some patient also defaulted soon after the surgery with no meticulous follow-up to assess for long-term results and possible complications.

CONCLUSION

Septorhinoplasty continues to evolve through various new techniques and modifications with the main goal to improve functional nasal airway and to restore cosmetic harmony to the face. Optimum results is very much dependant on the surgeon's attention to functional, aesthetic, and reconstructive principles. However, the best intention and efforts for the betterment of the patients must be balanced by the surgeon's initiative to keep improving his clinical acumen and surgical skills.

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