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Rhinoplasty in unilateral cleft lip nasal deformity

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Abstract
An operation is described for correction of unilateral cleft lip nasal deformity which has had considerable uniformity of success and is applicable to both mild and severe degrees of deformity. Our proposed repair technique is performed through an external rhinoplasty approach and depends on repositioning of the displaced and deformed cartilages together with the reinforcement of the structural support of the nose by using multiple cartilage grafts. This surgical technique was used in 18 consecutive adult patients with unilateral cleft lip nasal deformity and yielded consistently good long-term functional and cosmetic results.

Key words: Nose; Rhinoplasty; Cleft lip

Introduction

Within the last twenty years, a few surgeons have developed sophisticated techniques to correct the nasal deformity associated with unilateral cleft lip at the time of primary cleft lip repair.[1–3] However, most surgeons limit the primary repair to simply closing the floor of the nose while repairing the lip and leave the majority of the nasal deformity to be dealt with at a secondary stage after full nasal development has been reached.

Regardless of the timing of repair; the management of the nasal deformity associated with a cleft lip remains a difficult technical challenge.

The literature is full of techniques described to correct cleft lip nasal deformity, as the complexity of the anatomical abnormality encountered does not lend itself to a single, straightforward procedure.[4–12]

The characteristic features of the cleft lip nose are well-known and have been depicted well in the literature, with more than 20 abnormal anatomical components described in the unilateral cleft lip nasal deformity.[11,13] However, it is the abnormalities of the lower third of the nose that most stigmatize the cleft nose deformity. This deformity results secondary to the maxillary underdevelopment on the cleft side which leads to an abnormal muscle tension that affects mostly the cartilaginous framework of the nose leading to its distortion, with the subsequent development of the characteristic nasal deformity. In the classical unilateral cleft lip nasal deformity the pathological anatomy encountered includes a deformed malpositioned alar cartilage on the cleft side (Figure 1a) with its medial crus depressed and deviated with the columella to the normal side. The dome is displaced ventrally leading to an asymmetric

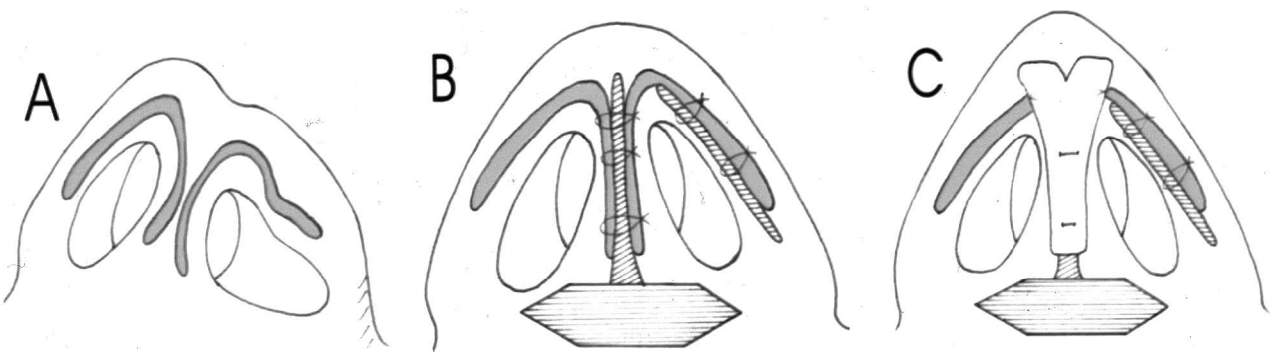

Fig. 1

Schematic diagram of the surgical technique adopted. A. Base view showing the pre-operative abnormal anatomy. B. After insertion of the pre-maxillary implant, columellar graft, and lateral crural strut graft. C. An extended tip graft fixed with its leading edge extending beyond the existing domes to increase tip projection and camouflage any underlying asymmetry.

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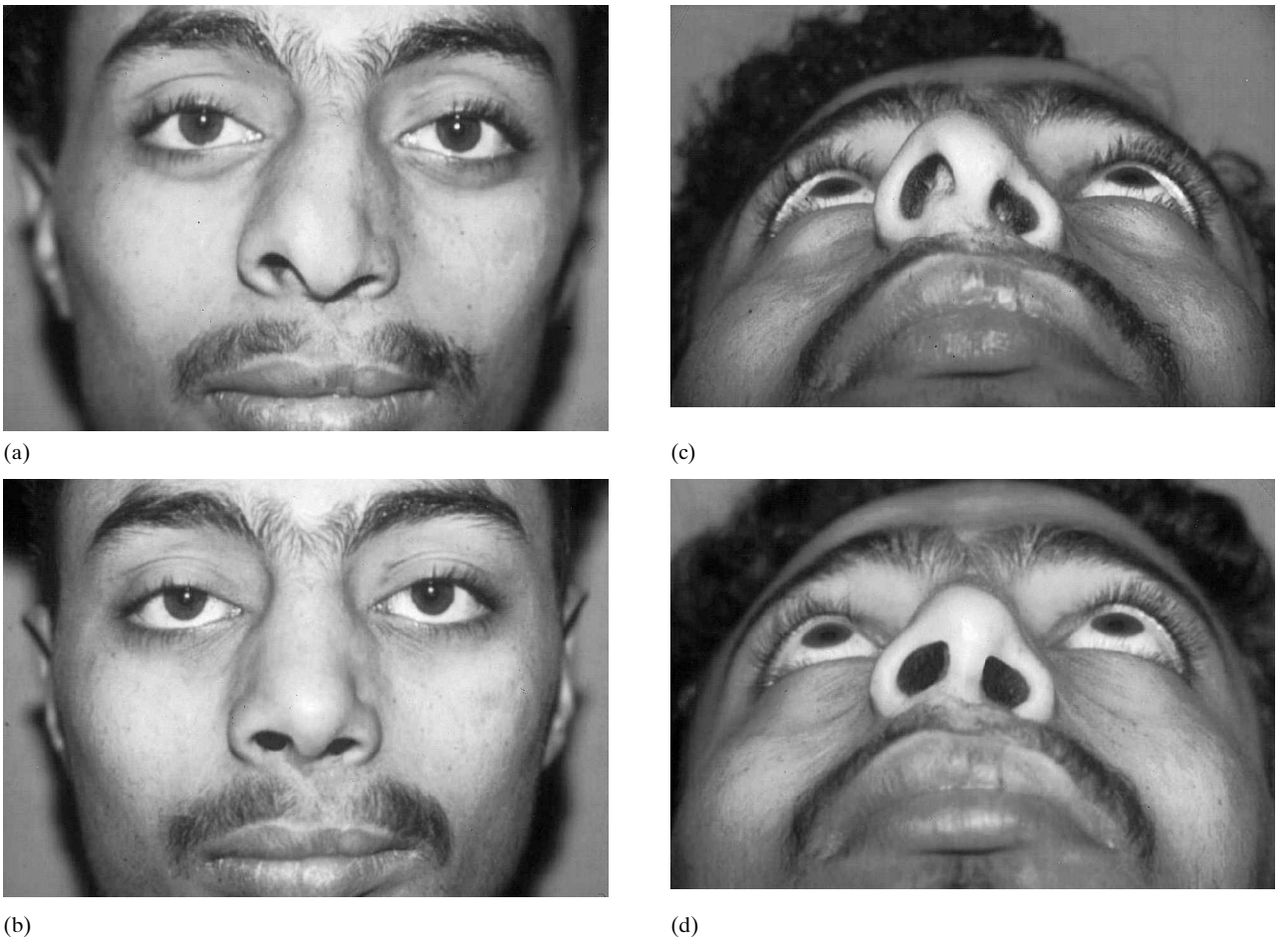

(a) (c)

(b) (d)

FIG. 2

Pre-operative (a) frontal and (c) basal views of a 24-year-old male with unilateral cleft lip nasal deformity. Same views (b, d) of the patient 19 months post-operatively.

tip with variable degrees of bifidity. The lateral crus is caudally displaced, buckled, and joins the medial crus at an obtuse angle resulting in a flattened ala with a horizontally displaced nostril. The caudal part of the septal cartilage is deviated to the non-cleft side leading to nostril asymmetry (Figures 2c and 3c). Additional findings include; convex dorsum with depressed nasal tip and a crooked nose with its cartilaginous part deviated to the normal side due to the underlying septal deviation and the asymmetrical attachment of upper lateral cartilages.

On planning for surgical repair of the unilateral cleft lip nasal deformity, the goal should always be to achieve as much asymmetry as possible to the normal side, however, the degree of symmetry achieved is usually inversely proportional to the severity of the deformity. The authors present a surgical technique for the management of the unilateral cleft lip nasal deformity which has had considerable uniformity of success in achieving nasal symmetry.

Materials and methods

The current study included 18 adult patients presenting for rhinoplasty following the primary repair of congenital unilateral cleft lip deformity. All cases were operated upon using the external rhinoplasty approach, starting with a complete septoplasty followed by a combination of repositioning and augmentation of the distorted anatomical framework of the nose. The cases were periodically followed up for a mean period of 28 months (range 18–42 months) and photographic documentation was performed using the standard rhinoplasty views.

Surgical technique

With the patient in the supine position and after an adequate level of general endotracheal anaesthesia is obtained, the nose and septum are infiltrated with one per cent xylocaine and 1:100 000 units of epinephrine. Time is allowed to elapse for the vasoconstrictive and anaethetic effect of the infiltrated solution while the patient is prepped and draped in the usual sterile fashion.

The nasal septum is approached first where a curved hemitransfixation incision is carried along the caudal edge of septal cartilage which is usually found dislocated off the anterior nasal spine and prolapsed in the nostril on the non-cleft side. The membranous septum is elevated on both sides thus denuding the caudal part of the septal cartilage. The septal flap elevation is continued posteriorly in a strict submucoperichondrial plane until the bony septum is reached where the dissection is continued in the

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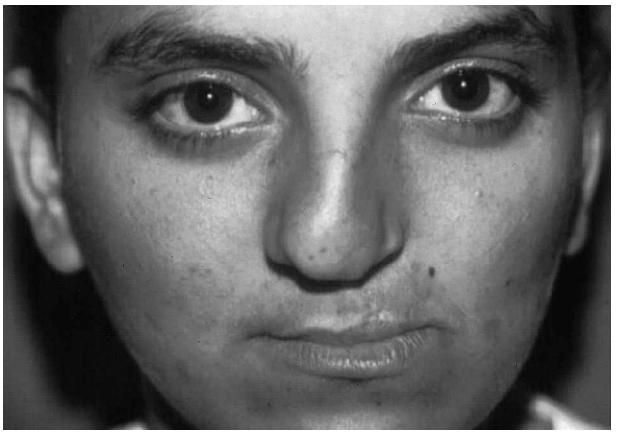
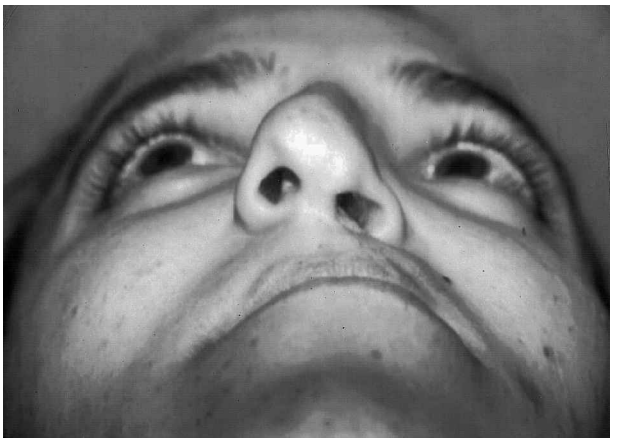
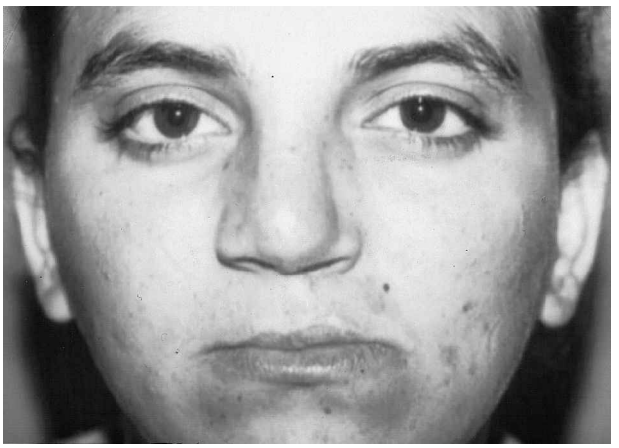


(a)



(c)



(b)

(d)

FIG. 3

(a), (c), Pre-operative views of a 16-year-old female with unilateral cleft lip nasal deformity. (b), (d), Post-operative views of the patient showing a maintained degree of correction three years after the repair.

submucoperiosteal plane. The septal cartilage is found to be dislocated off the maxillary crest towards the non-cleft side, thus a horizontal strip of the dislocated cartilage is excised parallel to the maxillary crest using a #15 blade to decrease the vertical height of septal cartilage and allow its placement in the groove on the maxillary crest. The repositioned cartilage is fixed in the midline using a figure-of-eight suture of 5/0 vicryl between the ventral part of the caudal septal cartilage and maxillary periosteum. On proceeding posteriorly, the remaining part of the septal cartilage and the bony septum are usually found deviated towards the cleft side. The deviated part of cartilage is removed using a Cottle elevator, leaving a minimum of 1 cm dorsal strip of cartilage, while the bony deviation is taken down using a Becker double action scissors after full elevation of the mucoperiosteum on both sides of the bony septum. A piece of the excised septal cartilage is crushed and interposed between the septal flaps to reskeletonize the nasal septum. After correction of the caudal septal deviation the membranous septum is found stretched and redundant on the non-cleft side thus a 3–4 mm strip of membranous septum is trimmed off prior to closure of the hemitransfixation incision using interrupted 5/0 chromic catgut sutures.

Finally the septal flaps are brought to the midline and mattressed together using 4/0 chromic catgut sutures in a running fashion in order to obliterate the dead space and minimize the need for intranasal packing.

After completing the septoplasty, attention is directed to the nasal reconstructive part of the procedure. An external rhinoplasty approach is used where bilateral marginal incisions are started laterally along the caudal edge of the lateral crus, dissection is continued medially down the length of the columella where they are connected via an inverted V-shaped transcolumellar incision. The columellar skin is elevated off the medial crura very meticulously to avoid any injury of underlying cartilages. Dorsal skin elevation is continued upwards in the supraperiochondrial avascular plain until the bony dorsum is reached where the periosteum is undermined using a Joseph-type periosteal elevator. Any hump present is taken down very conservatively at this stage, the bony

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part of the hump is taken down by rasping, while the cartilaginous part is lowered using sharp dissection with a #15 blade.

The cartilaginous dorsum is usually found deviated to the non-cleft side due to deviation of the dorsal part of the septal cartilage and the asymmetric attachment of the upper lateral cartilages to the septum. To correct such dorsal deviation the upper lateral cartilages are separated from the dorsal cartilaginous septum extramucosally and reattached at the exact same level using 5/0 PDS horizontal mattress sutures. Prior to the reattachment of the upper lateral cartilages, a spreader graft, if needed, is fashioned out of septal cartilage and placed on the concave side of dorsal cartilaginous septum between it and the upper lateral cartilage to camouflage any residual dorsal deviation.

Attention is now directed to the alar cartilages, after removing the connective tissue and fat often found between the cartilages, the alar cartilage on the cleft side is usually found to be ventrally recessed due to the deficient maxilla. To make up for the deficient bony platform, premaxillary augmentation is performed using a mersiline mesh implant (Figure 1b). The medial crura are spread apart and dissection is continued between the crural footplates using fine tenotomy scissors to create a premaxillary pocket in which a roll of mersiline mesh (2–3 cm long by 1 cm thick) is inserted. If the anterior nasal spine is found to be markedly displaced from midline, it is chiseled off to avoid subsequent displacement of the mesh implant.

A columellar strut is fashioned out of the previously resected septal cartilage and is placed between the medial crura deep down to rest on the premaxillary mesh (Figure 1b). The medial crus on the cleft side is freed and advanced upward onto the columellar strut until its dome is brought up to a normal height with respect to the dome of the non-cleft side. The medial crus of the cleft side is then fixed in its new position to the columellar strut and the opposite medial crus using 5/0 PDS horizontal mattress sutures and both domes approximated by 6/0 Prolene sutures.

An extended shield-type tip graft is fashioned out of septal cartilage and fixed to the underlying columellar strut-medial crural complex using 6/0 Prolene sutures (Figure 1c). To correct the caudally displaced buckled lateral crus a lateral crural strut cartilage graft is placed in a pocket between the lateral crus and underlying vestibular skin (Figure 1b) and fixed to the lateral crus by 6/0 Prolene vertical mattress sutures.

This lateral crural strut helps correcting the web or baffle effect caused by the flattening of lateral crus and its caudal displacement into the vestibule.

Finally, attention is directed to the bony vault, where if any wide or broad nasal bones are present, medial and lateral osteotomies are performed in a routine fashion and nasal bones are mobilized, brought to the midline, and narrowed to the desired extent. At conclusion of the procedure, the nasal skin is redraped to its normal anatomical position and the external rhinoplasty incisions are closed starting with the transcolumellar incision which is closed using a deep 6/0 PDS suture to take the tension off the skin which is then closed using interrupted 6/0 Prolene sutures. The marginal incisions are closed with interrupted 5/0 chromic sutures. Routine external nasal taping and splinting is then performed.

Results

Out of the 18 cases included in the study 10 were males (55.5 per cent) and eight females (44.5 per cent). Their ages ranged from 15-24 years with a mean age of 17.4 years. All patients had the primary repair of their unilateral cleft lip deformity done within the first six months of life and had no subsequent attempts at nasal surgery before being enrolled in this study. The proposed surgical technique yielded consistently good functional and aesthetic results, as all 18 cases reported a subjective improvement in the shape of their nose as well as in their breathing capabilities. The periodic follow-up of the patients for a mean period of 28 months (range 18–42 months) showed maintained good long-term functional and cosmetic results (Figures 2, 3). A second stage adjustment of nostril symmetry was required in four cases (22.3 per cent) and was performed at least six months following the initial surgery.

Discussion

A successful repair of cleft lip-type nasal deformity requires a thorough understanding of the presenting deformity and a detailed analysis of the anatomical factors contributing to the development of such a deformity. The external rhinoplasty approach provides an excellent exposure for analysis of the deformity to be done under direct vision with the cartilaginous framework lying in its original deformed position undisturbed by any traction thus allowing for a better assessment of the pathology of the existing deformity. The goal in any repair of unilateral cleft lip nasal deformity is to achieve as much symmetry as possible between the cleft and non-cleft sides of the nose. Many authors have described repair techniques that depend mainly on repositioning of the displaced and deformed cartilages present on the cleft side without adding any structural support to the nasal framework.[6,7,11,13–15] This leaves the repositioned cartilages in a vulnerable position to face the intrinsic forces of 'cartilage memory' as well as the extrinsic forces resulting from the healing process and unequal muscle tension. These intrinsic and extrinsic forces with time will result in an inevitable amount of displacement of the repositioned cartilages leading to variable degrees of recurrence of the deformity. To avoid such a problem in our proposed technique after repositioning the displaced and deformed cartilages, the structural support of the lower two-thirds of the nose was augmented by multiple cartilage grafts thus resulting in a stronger and more stable nasal framework.

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We used many grafts for structural support and augmentation, namely; premaxillary graft, upper lateral cartilage spreader graft, columellar strut, extended tip graft and lateral crural strut. All grafts were fashioned out of autogenous septal cartilage, which was excised during the septoplasty part of the procedure except for the premaxillary augmentation where Mersilene mesh was used.

Placing the mesh implant in the premaxillary area helped in making up for the deficiency in the maxillary bony platform, provided a stable foundation for the base of the columellar strut to rest on, and improved the acute nasolabial angle that is a common finding in these cases. The columellar strut, beside its major role in adding to the central support and projection of the nasal tip, also served as a pillar on which the medial crus and dome of the cleft side could be advanced. Using the extended shield-type tip graft added considerably to the central support provided by the columellar strut, and increased the tip projection and definition. Additionally, whenever it was not possible to bring the domes of alar cartilages to the same level, as in cases of severe underdevelopment of the alar cartilage on the cleft side, the tip graft proved very helpful in camouflaging any residual underlying tip asymmetry. The horizontally oriented wide nostril on the cleft side is one of the major stigmas of the cleft nose deformity (Figures 2c and 3c). This problem was significantly improved after correcting the caudal septal deviation, increasing the tip projection, and the upward advancement of medial crura with its attached vestibular skin thus changing the wide transverse nostril into an anterior-to-posterior oval one (Figures 2d and 3d). This nostril re-orientation was maintained by cartilage grafting of the columella and the ala on the cleft side, which form the medial and lateral boundaries of the nostril. However, in four cases (22.3 per cent) with severe lateral displacement of the ala and a very wide nostril only partial improvement of nostril symmetry was possible by the above mentioned manouevres. Accordingly, a secondary stage was necessary to improve nostril symmetry in which nostril floor excision combined with simple in-rolling of the nostril margin was performed. A minimum period of six months was allowed before planning the second stage to give a chance for full healing to occur so that proper judgement on the amount of nostril adjustment could be made.

This procedure does not correct all cleft nasal deformities, we do not believe that any single method can consistently correct the complete spectrum of all deformities encountered in the cleft lip nose. However, it is our hope that the presented technique adds to the surgeon's armamentarium and that the reader will be stimulated to modify the technique presented according to the individual needs of each case.

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