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Original article

Crooked Nose Anatomical Correction and Camouflage

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ABSTRACT

Background: The crooked nose is unquestionably the most severe deformity of the nasal septum due to the simultaneous involvement of very important functional and aesthetic element. **Subjects and Methods**: A prospective study was conducted including twenty four patients, to who suffers crocked nose. Parameters used for evaluation were taken intraoperative, one week and three months postoperatively. **Results**: combination of both techniques; anatomical repair and camouflage was reliable and gives more satisfactory result, however; Must of morbidity comes from lateral osteotomies in forms of asymmetrical of nasal bone prolonged edema more than three months , excessive narrowing of the nose, hematoma and ecchymosis, residual nasal deviation and residual functional obstruction , inverted v incision deformity, slight lateral depression, late cartilage graft resorbtion , and fat absorption after grafting, lacrimal system injury. **Conclusion:** This study revealed that the anatomical correction combined with camouflage technique is safe and reliable for management of crooked nose, it is gives good results for patient and solutions to aesthetic problems and functional too , the combination of both techniques gives better results without adding any significant complications, and fat grafting is better to do first to cases who is need revision rhinoplasty.

Keywords: Crooked Nose, Anatomical Correction, Camouflage, nasal deviation

INTRODUCTION

The crooked nose is unquestionably the most severe deformity of the nasal septum due to the simultaneous involvement of very important functional and aesthetic elements [(1)]. As everyday interpersonal relations are primarily conducted face-to-face, deviation of the nasal pyramid from the median line is immediately obvious even to the least observant [(2)]. The crooked nose is a generic term used to define all deformities which involve the nasal pyramid deviation in relation to the facial mediosagittal plane [(3)]. The crooked nose is the result of complex deformities which may involve the bony nasal pyramid, the upper and lower lateral cartilages and, especially, the nasal septum, leading to cosmetic and functional complaints [(4)]. Crooked nose also may occur as a congenital or idiopathic deformity. Sometimes nasal septal deformities occurs during child delivery are estimated to be 1.25–23% of newborns [(5)]. For the patient the consequences are severe in both functional and esthetic terms, as great difficulty in nasal respiration is always combined with unsightly deformity that cannot be hidden. Still more important than the social aspect of the crooked nose is its psychological impact on the person concerned [(1)]. In general nasal axis deviations are classified into 3 categories; linear (I-shaped), C-shaped, or S-shaped. In the C-shaped crooked nose one side of the dorsum is concave, and the other side is convex [(5)]. The dorsum and tip in an I-shaped crooked nose (linear) are shifted to one side of the vertical midline of the face [(6)].

The nasal deviation itself can be produced by both extrinsic and intrinsic forces, which result in distortion of the septal cartilage. Extrinsic forces include those secondary to deviation of the nasal pyramid, such as forces acting through the attachments of the upper lateral cartilages (ULC) and forces resulting from deviation or injury to the vomer, perpendicular plate of the ethmoid, or maxillary crest. Release of these extrinsic forces may allow correction of the cartilaginous septal deformity, whereas failure to achieve complete release contributes to recurrence. Intrinsic forces, in contrast, may be secondary to the growth and development of the septal cartilage or may result from injury to the cartilage itself. These forces must be overcome by weakening the cartilage and overpowering the deforming forces with grafts [(7)].

We operated 24 consecutive patients to treat and correct the crooked nose by rhinoplasty with the combined anatomical reconstruction and camouflaging technique

SUBJECTS AND METHODS

We operated 24 consecutive patients to treat and correct the crooked nose by rhinoplasty with the combined anatomical reconstruction and camouflaging technique. The surgeries carried out in Plastic Surgery Unit in Zagazig University Hospital between February of 2018 and January 2019.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion Criteria:

1. Patient's ages range from 16-45 years
2. All the patients submitted to rhinoplasty in order to correct a crooked nose, with six month of postoperative follow-up.

Exclusion Criteria:

1. Those patients with facial asymmetry
2. Psychic patient and those with unrealistic expectation

B. Methods

1. Operational design

- Preoperative computed tomography pre- and post-operative photos.
- **Analysis of the nose**

A vertical line will be drawn from the exact midpoint between the medial canthi, nasal analysis will begin with noting the deviation of the nose from the midline of the face. Beginning with the upper third of the nose, the width of the bony pyramid will be assessed as well as the length of the nasal bones. The length of each nasal bone will be assessed individually. Analysis continued with evaluation of symmetry of the middle third of the nose.

We attempted to determine the relationship of upper lateral cartilage with nasal bones particularly lf there was any narrowing or step off deformity

The lower third of the nose included the medial and the lateral crura of lower lateral cartilage, the lower lateral cartilage may have asymmetry due to intrinsic deformities.

The septum was analyzed for deviation, particularly those with deflection that were high dorsal or caudal .

The area of the internal nasal valve has high importance in this region, which is formed by the caudal free edge of upper lateral cartilage, the septum and the nasal floor.

2. Technique

Preoperative marking

- All patients will be marked for nasion, rhinion, meridian of the nose, nasal bones and cartilages, lines of osteotomies and clomullar incision and midline of face.

Operative

- All patients will be done under hypotensive general endotracheal anesthesia with injection of 70:100cc of 1/200000 epinephrine solution infiltration subcutaneous and submucous.
- All patients will be approached externally through a midcolumellar inverted-V and marginal incisions and degloving were done under the Superficial Musculoaponeurotic System (SMAS), this open approach provides direct visualization of

the anatomic structures and offers unlimited access to the septum, bony structures, and tip cartilag**es** , the caudal border of the septal cartilage is exposed with the division of the anterior septal ligaments then a vertical incision is made along the dorsum. With a fine elevator and perichondrium of the ULC is elevated about a centimeter on both sides and continue to extend dissection to subperiosteal plane over the bony dorsum if a bony correction is to be performed, we freed the upper lateral cartilage from the anterior dorsal of the nasal septum to allow those structure to reorient them self in the midline.

- We reduce the bony hump first with 6mm straight osteotom, excised of less bone on deviated side to prevent excessive reduction in nasal bone height on that side after correction osteotomy, and we used rasping to remove any irregularities on nasal bone after bony reductions (differential medial osteotomies).
- Reduction of dorsal septum performed with number 11 blade and the upper later cartilage preserved no resection is perform on ULC, in our cases removal of nasal hump performed in all cases except two cases due to absent of hump.
- To closed open roof deformity Lateral osteotomies and in-fracture performed to all patients ,it began at pyreform crista just above the level of inferior turbinate we follow a high-low-high direction tell the level of intercanthal line, a periosteal elevation along osteotomies line was done to provide a maximum bone mobility.
- To access the septum we dissecting between the upper lateral cartilage and the septum, but in some severely deviation of caudal septum we accessed the septum by dissecting between the two lateral crura of lower lateral cartilage.
- Septoplasty was done in all patients, in form of removal of cartilaginous septum preserving L-Strut; we leave a 10 mm width on each caudal and dorsal side of L-strut.
- Scoring on concave side in remaining septum in cases with c-shape or s-shape noses to degrees the strength of this side of septum this process will made the septum cartilage more capable to straightening and reshaping himself.
- We placed unilateral spreader grafts between the septum in it is concave side and ULC to balance dorsal asymmetry (camouflage) in a dorsal deviation, and on lay alar grafts in some cases just above the lower lateral cartilage, those grafts harvested from septum or ear cartilage or costal cartilage to camouflage and providing patent airway in all patient.
- Columellar strut were done to patient who underwent accessing the septum by dissecting between the two lower cartilages to support the nasal tip.
- Suturing the upper lateral cartilage to the septum and suturing the to lateral crura were done by 5/0 vicryle, the medial crura of the alar cartilages were sutured to the caudal L-strut to achieve rotation and projection of the nasal tip, closing of the wound were done by 5/0 vicryle.
- As a second procedure to patients who have minor irregularities in skin due to contractions and adhesions of soft tissues after surgery and also to augmentation of dorsal nasal that happened from over resection in cartilage reshaping, we will harvested fat fragments under local anesthesia using a 3mm multiorifice cannula attached to a 10mm syringe to allows harvesting of 2 to 3 mm fat fragments we harvested about 10 ml of fat ready for injection from about 25ml of lipoaspiration, harvested fat washed with Ringer lactate ,fat is injected in retrograde manner using 1.2 or 1.4 blunt tip cannulas with gentle pressure on plunger we will follow patients for about 2 to 3 months from fat grafting. (Figures 1,2).

Post- operative:

The nose were packed for one day and a patient but nasal splint for one week and lay in head elevated position, ice packs was administrated for 24 hour, antibiotic were given in five days stitch removal after five days. (Figures 1,2)

Statistical analysis

Data were checked, entered and analyzed using SPSS 20, software for Windows. Data were expressed as number

and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one. The significance level was set at P < 0.05. T-test was used for quantitative data, and chi-square test.

RESULT

Twenty four patients with crooked nose were included in this study, table (1) showed that Age of patients ranged between 16 to 45 years with a mean value of 22.16±4.81, table (2) showed that patients included in the study were 22 males and 2 females, table (3) showed that all patients shows deviation of meridian of the nose off the sagittal plane (the line passes through nasion and rhinion). these deviation were symmetrical in 6 patients (25%) and asymmetrical either c-shape in 14 patients (58.3%) and s-shape in 4 patients (16.7%), table (4) showed that 20 patients (83.3%) had hump and 6 patients (28%) had lateral depressions and 8 patients (33.3%) had airway obstructions and one patients (4.2%) had saddle nose, table (5) showed that all patients were open approached and all of them had Mobilization of the nasal bone, Spreader graft, On-lay graft and Septal cartilage harvested, strut done in 50% and fat grafting in 25% and costal cartilage graft in one patient, table (6) showed that Early post-operative complication was prolonged edema in 10 patients (41.7%) and 17 patients (70.8%) had hematoma and ecchymosis, table (7) showed that late post-operative complication were Asymmetrical nasal bone (4.2%), Excessive narrowing (4.2%), Residual nasal deviation (8.3%), Residual functional obstruction (8.3%), Pseudo deviated nose (8.3%), Inverted V deformity (4.2%), Secondary procedure (Fat graft) (25%) and Fat absorbed after fat graft (8.3%), table (8) showed that **Patient satisfaction were good** (58.3%), (33.3%) were fair and (8.3%) were bad results

Table 1. Age distribution among studied groups

	Age
Mean± SD	**22.16±4.81**
Median (Range)	**21.0 (16-38)**

Table 2. Sex distribution among studied group

		N	%
Sex	**Male**	**22**	**91.7**
	Female	**2**	**8.3**
	Total	**24**	**100.0**

Table 3. Type of crooked nose distribution among studied group

		N	%
Type	**C-shap**	**14**	**58.3**
	S-shap	**4**	**16.7**
	Stright	**6**	**25.0**
	Total	**24**	**100.0**

Table 4. Associated pathology

		N	%
Hump	**No**	**4**	**16.7**
	Yes	**20**	**83.3**
Lateral depression	**No**	**18**	**75.0**
	Yes	**6**	**25.0**
Airway obstruction	**No**	**16**	**66.7**
	Yes	**8**	**33.3**
Saddle nose	**No**	**23**	**95.8**
	Yes	**1**	**4.2**

Table 5. Operation data distribution among studied group

		N	%
Approach	**Closed**	**0**	**0.0**
	Open	**24**	**100.0**
Mobilization of the nasal bone	**No**	**0**	**0.0**
	Yes	**24**	**100.0**
Strut	**No**	**12**	**50.0**
	Yes	**12**	**50.0**
Spreader graft	**No**	**0**	**0.0**
	Yes	**24**	**100.0**
On-lay graft	**No**	**0**	**0.0**
	Yes	**24**	**100.0**
Fat grafting	**No**	**18**	**75.0**
	Yes	**6**	**25.0**
Septal cartilage harvested	**No**	**0**	**0.0**
	Yes	**24**	**100.0**
Costal cartelage graft	**No**	**23**	**95.8**
	Yes	**1**	**4.2**

Table 6. Early post-operative complication

		N	%
Edema	**No**	**14**	**58.3**
	Yes	**10**	**41.7**
Hematoma and ecchymosis	**No**	**7**	**29.2**
	Yes	**17**	**70.8**

Table 7. Late complication

		N	%
Asymmetrical nasal bone	**No**	**23**	**95.8**
	Yes	**1**	**4.2**
Excessive narrowing	**No**	**23**	**95.8**
	Yes	**1**	**4.2**
Residual nasal deviation	**No**	**22**	**91.7**
	Yes	**2**	**8.3**
Residual functional obstruction	**No**	**22**	**91.7**
	Yes	**2**	**8.3**
Pseudo deviated nose	**No**	**22**	**91.7**
	Yes	**2**	**8.3**
Inverted V deformity	**No**	**23**	**95.8**
	Yes	**1**	**4.2**
Infection	**No**	**24**	**100.0**
	Yes	**0**	**0.0**
Septal perforation	**No**	**24**	**100.0**
	Yes	**0**	**0.0**
Secondary procedure (Fat graft)	**No**	**18**	**75**
	Yes	**6**	**25**
Fat absorbed after fat graft	**No**	**22**	**91.7**
	Yes	**2**	**8.3**
Overall com	**No**	**17**	**70.8**
	Yes	**7**	**29.2**

DISCUSSION

Generally there are two techniques chosen by surgeons to treat the crooked nose problems that affect the patient's life with aesthetic or functional problems, the first technique is the septoplasty with mobilization of the nasal bones and mobilization with reshaping the cartilage (septorhinoplasty) anatomical correction [8, 9], with administrate internal packing and external splint, this approach makes release of all extrinsic deforming forces acting on nose as well as correction of all intrinsic deformities extrinsic forces are those acting on nasal pyramid to Couse deviation while (intrinsic deforming) forces are those acting during development and growth of deviated nose, the second technique is a camouflage technique performed by on lay graft, spreader graft and fat grafting.

In our study we used combination technique combination of anatomical reconsideration and camouflage technique simultaneously in all patients either there is functional problem or not, also we used delayed fat grafting in six of our cases as a second process to resolve minor irregularities of contractions and adhesions of soft tissue and for dorsal augmentation and this was compatible with **Porter and Toriumi** [10], **Toriumi and Ries** [11] and **Nasr et al.** [12] who advocated combination of both technique, **Allison and Joseph** [13] stated that more is better in that adding more of the techniques to resolve the asymmetries as rhinoplasty outcome are not measured in weeks or months as forces of scaring and soft tissues contraction exert effects for many years without adding combinations [12].

Rohrich et al. [8] and **Mckinney and Shively** [9] used only anatomical correction while **(Byrd and colleges) , (Sheen and colleges)** and **(Gilbert and colleges)** advocated case of camouflaging technique only to get straight nose appearance by simple way and even use of spreader graft to improve comprised airway however if the upper lateral cartilage is truly avulsed or trauma has

effected adjacent structures such as lateral crura, a spreader graft may not lead to a perfectly straight nose[12], also a dorsal on lay graft may be inappropriate for patients with dorsal hump [7].

In our study we used open approach to provide direct visualization of anatomical structures involved in crooked nose, this approach was used by most of surgeons today and this maybe the cause of our good result, however **Jang et al.** [14] did his series on crooked nose by endonasal technique (closed approach) and this could be the reason for four times more unsatisfactory result than other studies due to limited exposure of anatomical structures.

In our study must of our patients are males (91.7%) with age range 21 years and this was compatible with other authors as males are more exposed to trauma in this age group which is the main cause of crooked nose ,in our study c shape type of crooked nose was the majority by (58.3%) of our patient and straight deviated (25%) and s-shape (16.7%) and this was compatible to **Okur et al.** [3] who had c-shape type (48.1%).

As associated pathology Hump as associated pathology was in 83.3% in our study similar to **Nasr et al.** [12] and **Foda** [15] as all this studies did up on Egyptian patients and hump might augment the need of rhinoplasty.

In this study, septoplasty was done in (100%) of patients similar to **Lisandra et al.** [16] and **Nasr et al.** [12], **Foda** [15] and **and Shively** [9] did septoplasty in (90%) of their patients.

In our study complications especially late complications were similar to other authors who performed similar anatomical or camouflage technique or combined technique; **Hoffmann** [17], **Allison and Joseph** [13], **Lisandra et al.** [16] and **Nasr et al.** [12] combination technique did add any significant complications.

In our study we obtained a non-satisfactory result in (8.3%) among our patients and this was comparable to **Porter and Toriumi** [10] and **Nasr et al.** [12] who obtained non satisfactory result in (11%) and (12.5%) respectively of their patients in whom they used combined technique and there result were lower in comparable to of **Okur et al.** [3] and **Kim et al.,** [18] who used a single technique only (anatomical only and camouflage only) respectively as they got up to (23%) non-satisfactory result, the non-satisfactory result were duplicated by **Jang et al.** [14] who carried out the study through endonasal approach and obtained up to (50%) non-satisfactory result due to difficult visualization exposure.

Overall revision rhinoplasty is about (2.5%) , however this rate maybe higher in cases of crooked nose up to (10%) as in a study of **Lisandra et al.** [15] and **Nasr et al.** [12], however in our study it is only (3.9%) as we used fat grafting as secondary procedure before revision rhinoplasty as this technique had proven to degrees the needs for revision, we had a good result about (66.7%) of patients who have fat grafting as a second procedure this result were compatible to other study of **Juan** [19] which has Patients satisfaction was good in 80% of his cases, particularly in cases of post rhinoplasty deformity .

Conclusion: This study revealed that the anatomical correction combined with camouflage technique is safe and reliable for management of crooked nose, it is gives good results for patient and solutions to aesthetic problems and functional too, the combination of both techniques gives better results without adding any significant complications, and fat grafting is better to do first to cases who is need revision rhinoplasty.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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