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Original Article

Comparative Study between A unilateral and Bilateral Spreader Grafts with Collumellar Strut to Overcome C-shaped Crooked Nose

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ABSTRACT

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Background: Correction of a crooked nose is one of the most difficult surgeries in rhinoplasty. Although different treatments for crooked nose surgery have been developed, the best treatment option remains debatable due to the intricacy and diversity of the deformity.

Aim: This study aims to compare functional and aesthetic outcomes between a unilateral and bilateral spreader grafts with columellar strut in management of C-shaped crooked nose.

Patients and Methods: Twenty patients with C-shaped deviated nose were recruited and assessed for eligibility at Al-Azhar University Hospitals [Al-Hussein and Bab El-Shaarya University Hospitals]. Patients were divided into two equal groups; [group A] included patients treated with a unilateral spreader graft with columellar strut and [group B] included patients treated with a bilateral spreader graft with columellar strut, follow-up was 6 months.

Results: The clinical C shaped nose, the Cottle's test and the CT nose for deviation were improved in 90% of cases in [group B] and 80% of cases in [group A] with no statistically significant differences between both groups. There was a statistically significant increase in the mean ROE among group B in comparison with group A [86 ± 5.7 vs. 74.5 ± 8.3 , respectively] [P value=0.002]. Regarding the post-operative complications, nasal blockage occurred in 3 patients [15%], contact dermatitis in 5 patients [25%], and scar hypertrophy in 3 patients [15%] and under correction in 2 patients [10%] of the studied patients.

Conclusion: Bilateral spreader grafts with columellar strut is superior to the unilateral spreader grafts regarding post-operative nasal assessments and the rhinoplasty outcome evaluation.

Keywords: C-Shaped; Deviated Nose; Columella Strut; Spreader Graft.



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INTRODUCTION

A crooked nose is a typical complaint from individuals seeking professional evaluation for cosmetic concerns or facial asymmetry. As one of the most difficult abnormalities to fix in rhinoplasty patients, a patient's unrealistic expectations might put the surgeon under unnecessary stress [1].

The nasal axis deviates from the midline, resulting in a crooked nose. In addition to causing respiratory difficulties, this scenario is unsightly. A crooked nose can be either an I-shaped, C-shaped, reverse C-shaped, or S-shaped deformity, with each kind being named by the part of the nasal pyramid that is most damaged. A significant difficulty for rhinoplasty surgeons is the correction of crooked noses with long-term functional and aesthetic success [2].

The correction of the crooked nose is very complex and requires the use of a wide range of surgical techniques: closed or open access, modified septoplasty, extracorporeal septum reconstruction ["L-Strut"], complete detachment of the infrastructure from the fixating soft tissue, various osteotomies including intermediate osteotomy as well as osteotomy of the nasal root, bony wedge resection, resections of cartilage, cartilaginous transplants such as spreader grafts [uni- or bilateral], batten grafts, asymmetrical hump resections, suture techniques and camouflage with cartilaginous grafts. The intricacy and variety of crooked nose deformities make the most appropriate treatment strategy debatable, despite the fact that multiple techniques have been described for crooked nose surgery [3].

When it comes to figuring out the middle vault's contour and keeping it structurally sound, spreader grafts are considered the gold standard. Applying internal lateral pressure to the upper lateral cartilages, the spreader graft essentially acts as a splint on the dorsal septum. When an open technique is used, the spreader grafts and the septum can be easily sutured together, as can the upper lateral cartilages. Suturing spreader grafts at both the caudal septum level and a cephalic position is of utmost importance [4,5].

According to the purpose and success of asymmetric grafting, which involves placing a thick graft on the concave side and a thin graft on the convex side, asymmetric spreader grafting is anticipated to perform better when utilizing bilateral spreader grafts [6].

It was proposed that a unilateral spreader graft might be used to provide bilateral symmetry at the nasal dorsal aesthetic lines. This graft would be put on the concave side of the nose and would serve as an additional layer of upper lateral cartilage. Additionally, spreader grafts placed unilaterally avoid the middle vault's unintended broadening impact that might occur with bilateral grafts [7].

Nose deformity repair goes beyond only straightening the nasal structure. Patients undergoing deviated nose repair may have trouble receiving a satisfactory evaluation if the correction of nasal tip and columella deviation and asymmetry of the nostrils is not fully executed. To fix lower lateral cartilage deformities, a columellar strut transplant, medial crura height

correction, or lateral crural correction may be necessary. In cases where an uneven or twisted tip or deviated columella is caused by the medial crura, the only permanent solution is to straighten the crura with a columellar strut graft [8].

In order to better understand how to handle a C-shaped crooked nose, this study compared the functional and aesthetic effects of unilateral and bilateral spreader grafts with columellar strut.

PATIENTS AND METHODS

This comparative study included 20 patients complained of C-shaped deviated nose. Patients were divided into two equal groups; group A that included patients treated with a unilateral spreader graft with columellar strut and group B that included patients treated with a bilateral spreader graft with columellar strut, the duration of study was 2018-2024. The follow-up was 6 months. Patients were recruited and assessed for eligibility from Al-Azhar University Hospitals [Al-Hussein and Bab El-Shaarya University Hospitals]. The study protocol was approved by Institution Research Board [IRB] of faculty of medicine - AL Azhar University. Informed verbal consent was obtained from each participant sharing in the study

The Inclusion criteria were adult patients > 18 years with C-shaped nasal deviation.

The Exclusion criteria included patients who aren't fit for surgery or with I or S shaped nasal deviation or with previous surgery for crooked nose.

General examination and nasal examination were performed preoperatively. The nasal examination included aesthetic analysis and intranasal examination. All patients were put under general anesthesia for completion of open rhinoplasty.

For functional purposes, septoplasty was done in addition to turbinoplasty if indicated to improve functional outcome as following: An open rhinoplasty approach facilitates nasal correction. The alar cartilages were separated, the septal angle identified, and a thorough submucoperichondrial dissection of the septum was performed. The upper lateral cartilages were then separated from the septum. The dorsum was lowered if required by component reduction and a harvest of septum was carried out, maintaining an L-shaped strut of at least 10 mm. If displaced from the vomer, the base of the L-shaped strut was freed and sutured to the midline. Bilateral or unilateral Spreader grafts were used to correct c shaped nasal deviation. The procedure involves releasing the upper lateral cartilages from the lower lateral cartilages, separating them from the dorsal septum, performing osteotomies on the side or medial.

For structural support and to straighten the crooked middle vault, spreader grafts, typically in the shape of septal extension grafts, can be placed between the dorsal septum and the upper lateral cartilages. A deformity in the septum might be covered with a bilateral graft and fastened using many mattress sutures. The concave side of the deformity is the best spot to implant a unilateral spreader graft because it will lateralize displace the upper lateral cartilage, which will bow in towards

the deviation. The nasal tip and columella are securely supported by the caudal ends of expanded spreader grafts.

For Aesthetic purposes, a lengthy columnar strut was positioned so that it extended significantly beyond the alar domes. Subsequently, the columella was attached to the lip using 6-0 prolene sutures under the skin. A 6-0 monocryl was used to close the intranasal incisions.

Follow-up:

Post-operative complications were recorded. Subjective evaluation of postoperative aesthetic results was done by Rhinoplasty outcome evaluation [ROE] questionnaire. Post-operative functional evaluation was performed subjectively using NOSE scale and objectively using Acoustic Rhinometry.

Statistical Analysis of Data:

Data were analyzed using Statistical Program for Social Science [SPSS] version 24. Quantitative data were expressed as mean \pm SD. Qualitative data were expressed as frequency and percentage. The results were considered: Non-significant when the probability of error is more than 5% [$p > 0.05$], significant when the probability of error is less than 5% [$p < 0.05$], highly significant when the probability of error is less than 0.1% [$p < 0.001$].

RESULTS

A total number of 20 patients were included in the following study. The mean age of all studied patients was 31.2 ± 8.5 years. There were 15 males [75%] and 5 females [25%]. As regards the cause, it was traumatic in 15 patients [75%] and congenital in 5 patients [25%] of the studied patients. In terms of the patients complain, it was functional complain in 2 patients [10%], Aesthetic complain in 1 patient [5%] and both functional and Aesthetic complain in 17 patients [85%] [Table 1]. The difference between the two study groups regarding all the above variables was not significant strategically [$P > 0.05$] [Table 2].

All studied patients were assessed preoperatively by Cottle's test and CT nose. All studied patients [100%] had C shaped nose clinically and was confirmed by CT. All patients [100%] had positive Cottle's test [Table 3]. Postoperatively, the C shaped nose was improved in 80% of the patients in group A and in 90% of the patients in group B [$p = 0.5$], Cottles test and the CT nose for deviation were positive in 2 cases only in group A and in one cases only in group B [$P = 0.5$] [Table 4].

In terms of ROE %, it was significantly higher in group B than in group A [86 ± 5.7 vs 74.5 ± 8.3] [$P = 0.002$] [Table 5].

According to the postoperative complications, there was nasal blockage in 3 patients [15%], contact dermatitis in 5 patients [25%], scar hypertrophy in 3 patients [15%] and under correction in 2 patients [10%] of the studied patients [Table 6].

Figures [1 to 4] represented two patients, one of each group [provided with patient permission].



Figure [1]: Pre and post frontal views [left photo; -anteroposterior C-shaped crooked nose/right photo; -straight dorsum] for a patient from the unilateral spreader graft.



Figure [2]: Pre and post basal view [left photo;-ill-defined tip, asymmetrical nostril and caudal septal deviation to the right side /right photo;-well-defined tip, Symmetrical nostril] of the same patient.



Figure [3]: A patient from the bilateral spreader graft. It represented pre and post frontal views [left photo; -anteroposterior C-shaped crooked nose/right photo; -straight dorsum].



Figure [4]: pre and post basal view [left photo;-ill-defined tip, asymmetrical nostril and caudal septal deviation to the right side /right photo;-well-defined tip, Symmetrical nostril] of the same patient.

Table [1]: Demographic description of all studied patients:

		Studied patients [N = 20]	
Age [years]	Mean \pm SD	31.2 \pm 8.5	
	Min – Max	18 – 43	
Sex	Male	15	75%
	Female	5	25%
Cause	Traumatic	15	75%
	Congenital	5	25%
Complaint	Functional	2	10%
	Aesthetic	1	5%
	Functional & Aesthetic	17	85%

Table [2]: Comparisons of demographic data as regards operative procedure in all studied patient.

		Group A [N = 10]		Group B [N = 10]		Stat. test	P-value
Age [years]	Mean	30.1		32		0.54	0.595
	\pm SD	9.2		8.1			
Sex	Male	8	80%	7	70%	0.26	0.606
	Female	2	20%	3	30%		
Cause	Traumatic	8	80%	7	70%	0.26	0.606
	Congenital	2	20%	3	30%		
Complain	Functional	1	10%	1	10%	1.05	0.589
	Aesthetic	1	10%	0	0%		
	Both	8	80%	9	90%		

Table [3]: Description of pre-operative assessment in all studied patients

		Studied patients [N = 20]	
Clinical C shaped nose	Negative	0	0%
	Positive	20	100%
Cottle's test	Negative	0	0%
	Positive	20	100%
CT nose	Normal	0	0%
	C shaped deviation	20	100%

Table [4]: Comparisons of post-operative assessment as regard operative procedure in all studied patient:

		Group A [N = 10]		Group B [N = 10]		Stat. test	P-value
Clinical C shaped nose	Improved	8	80%	9	90%	$X^2 = 0.39$	0.531 NS
	Positive	2	20%	1	10%		
Cottle's test	Improved	8	80%	9	90%	$X^2 = 0.39$	0.531 NS
	Positive	2	20%	1	10%		
CT nose for deviation	Improved	8	80%	9	90%	$X^2 = 0.39$	0.531 NS
	Positive	2	20%	1	10%		

Table [5]: Comparisons of ROE [Rhinoplasty outcome evaluation %] as regard operative procedure in all studied patient:

ROE [%]	Mean ±SD	Group A [N = 10]	Group B [N = 10]	Stat. test T = 3.6	P-value 0.002 S
		74.5	86		
	8.3	5.7			

Table [6]: Description of post-operative complications in all studied patients

Studied patients [N = 20]			
Post-operative complications	Nasal blockage	3	15%
	Contact dermatitis	5	25%
	Scar hypertrophy	3	15%
	Under correction	2	10%

DISCUSSION

Following surgery, comparisons of the two groups' nasal features showed that the clinical C-shaped nose, the Cottle's test, and the CT nose for deviation all got better in 90% of cases in group B and 80% of cases in group A. There were no statistically significant differences between the two groups [P value = 0.531].

Moosavizadeh et al.^[9] conducted a study where 66 individuals with a C-type deviated nose underwent a unilateral spreader graft. The results showed that the spreader graft is a safe and effective way to fix crooked noses; 33 patients had it placed on the convex side of their nasal deformity, and 33 patients had it placed on the concave side. In cases of C-type nose deformities, the aesthetic and functional outcomes were better when the speeder graft was placed on the convex side of the nose rather than the concave side.

The degree of nasal obstruction and the effect of the modified Cottle maneuver was shown to diminish significantly following spreader graft implantation, according to a study by **Sun et al.**^[10] on 32 patients with internal nasal valve stenosis from excessive septal deviation and nasal obstruction.

The mean return on investment [ROI] for group B was significantly higher than that of group A [86±5.7 vs. 74.5±8.3, respectively] when comparing the two groups [Rhinoplasty result evaluation %; P value=0.002]. One possible explanation for this improvement is that the cartilaginous memory can be more effectively countered by the bilateral spreader grafts.

In a similar vein, **Sirinoglu et al.**^[11] showed that full-thickness excision of the severely deviated portion and rebuilding with bilateral spreader grafts can effectively fix severe septal deviation. There was a notable improvement in the nasal profile and a substantial correction of the septal deviation when comparing the images taken before and after the procedure. An impressive level of patient satisfaction was attained, as shown by the statistical analysis of the DAS-59 scale responses.

Furthermore, a prior research conducted by **Chen et al.**^[12] successfully realigned a deviated cartilaginous vault in 32 patients. The procedure involved utilizing a caudal septal extension graft in conjunction with unilaterally extended spreader grafts to create a new center of the lower third. Post-operatively, the patients' anthropometric measurements revealed notable enhancements in dorsal deviation angle, nasal tip projection, and nostril shape. No discernible change was observed in the nasolabial angle. Eight patients [25.0%] reported fair results, seven patients [21.9%] reported great results, fourteen patients [43.7%] reported good results, and three patients [9.4%] reported no change.

The researchers **Kavuzlu and Şahin**^[13] showed that 25 patients with a C-shaped crooked nose were successfully corrected using a cross-spreader graft. They also found that the patients' post-operative mean nasal obstruction symptoms evaluation [NOSE] and rhinoplasty outcome evaluation [ROE] scores were significantly better than their preoperative values. The deviation angle measurements showed a statistically significant improvement between the preoperative and postoperative periods.

Hernot et al.^[14] conducted a comparative study with forty patients who had crooked nose deformities. The patients were randomly assigned to either an isolated osteotomy or an osteotomy with bilateral spreader graft placement. The patients who had the latter procedure reported better aesthetic results and better breathing function after the procedure.

Concerning post-operative problems in all patients examined, this study found that 3 patients [15%] experienced nasal blockage, 5 patients [25%], 3 patients [15%] had scar hypertrophy, and 2 patients [10%] were undercorrected.

Mir Abbas et al.^[15] conducted a retrospective study on the functional and aesthetic outcomes of rhinoplasty with spreader grafts in 30 patients with post-traumatic deviated noses. The results showed that 22 patients did not experience any residual deformity after the operation, 7 patients had residual deformity that did not necessitate revision, and only 1 patient would require revision surgery. Twenty patients reported being happy with the results after the procedure, nine said their

nose looked better after the procedure compared to before, and one patient was unhappy with the outcome. At the one-year follow-up, just two patients had reported unilateral partial nasal blockage, and overall, obstructive symptoms improved following surgery.

In addition, a study conducted by **Aydođdu et al.** [16] compared the effectiveness of spreader grafts and auto-spreader flaps in preventing nasal obstruction in 48 patients who underwent rhinoplasty. The study indicated that both groups experienced an improvement in postoperative nasal airflow; however, when it came to patient satisfaction surveys after the procedure, the auto-spreader flap group reported higher levels of satisfaction than the spreader graft group.

Conclusion: This study offers an effective technique to correct C-shaped crooked nose deformity that can be used safely with satisfying aesthetic results. Bilateral spreader grafts with columellar strut is superior to the unilateral spreader grafts regarding post-operative nasal assessments and the rhinoplasty outcome evaluation.

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