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Applied surgical methods and outcomes in crooked nose rhinoplasty

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Abstract. – OBJECTIVE: In this retrospective and multicentric study, we investigated applied surgical methods in rhinoplasty for crooked nose deformity.

PATIENTS AND METHODS: The retrospective data for 300 crooked nose deformity cases (191 males and 109 females) were used in our study. Classification of the initial deformities was performed as (1) I-shaped crooked nose deformity, (2) C-shaped crooked nose deformity, (3) Reverse C-shaped crooked nose deformity, and (4) S-shaped crooked nose deformity. As an operation technique, L-strut septoplasty was performed. The applied surgical methods in rhinoplasty to correct the crooked nose are evaluated and classified.

RESULTS: Our results showed that initial deformities in crooked nose patients were I-shaped crooked nose deformity (34%), C-shaped crooked nose deformity (28%), Reverse C-shaped crooked nose deformity (21.3%), and S-shaped crooked nose deformity (16.7%). L-strut septoplasty was performed, and the results of the applied methods to correct the crooked nose were evaluated and classified. It was noticed that more than one procedure was applied to each case: (1) double-side lateral osteotomy (86.6%), (2) wedge bone resection on one side of the osteotomy (7.3%), (3) single-side lateral osteotomy (6%), (4) symmetric spreader grafts (56%), (5) asymmetric spreader grafts (10.6%), (6) shaving of the transverse wing of dorsal septum (8%), (7) correction of deviated dorsal septum (16.3%), (8) displaced anterior nasal spine (12.6%), (9) clocking suture (dorsal septal rotation suture) (9%), (10) dorsal septal scoring and splinting graft (8.3%), and equalizing lateral cruses (12.6%).

CONCLUSIONS: I-shaped and C-shaped crooked nose deformities were mainly detected in crooked nose deformity patients. Correcting the crooked nose, double-side lateral osteotomy, and symmetric spreader grafts were the most applied techniques to correct the crooked nose. Other rhinoplasty techniques were also applied to these patients; more than one technique was needed.

Key Words:
Crooked nose, Rhinoplasty, I-shaped crooked nose deformity, C-shaped crooked nose deformity, Double lateral osteotomy, Symmetric spreader grafts.

Introduction

The crooked nose is the most severe abnormality of the nasal septum because it affects the nose's ability to function and appearance. Since most of our day-to-day interactions occur face-to-face, even the slightest deviation of the nasal pyramid from the median line is immediately noticeable[1].

Understanding the crooked nose might help to understand other anomalies of the face. The bony top third and the cartilaginous lower two-thirds of the nose may deviate in asymmetrical noses. As demonstrated below, sinusoidal deflection is typical, and the deviation's endpoint could be in the middle of the chart. Specific anatomical abnormalities typically make optimal surgical care more complex, often contributing to nasal blockage. Correcting nasal obstruction is an integral part of proper care that is often overlooked in favor of addressing contour defects[2,3].

One of the most challenging tasks for a septorhinoplasty surgeon is to fix a crooked nose. The surgeon's first order of business in

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correcting an asymmetric nose is to determine what caused it in the first place. To devise a successful surgical strategy, doctors must arrive at a correct diagnosis. The surgeon must consider proportions, symmetry, and restoring normal nasal function while formulating a treatment plan for the patient[1,2,4].

When the nose is not in line with the center vertical line of the face, this is known as a deviated nose. Nasal blockage is a functional issue caused by a deviated nose[5,6]. Surgeons should consider functional and cosmetic options[5] when attempting to correct nasal deviation, one of the most challenging parts of rhinoplasty. The nasal bone, septum, and lateral cartilage (both upper and lower) must all be crooked to produce a crooked nose[7].

The nasal septum, particularly its dorsal segment, is the source of much of the difficulty in correcting a crooked nose. Although it is possible to correct a deviated nasal septum significantly from a functional aspect, an L-shaped structure must be maintained to keep the nasal pyramid in place. However, in the case of the crooked nose, its structure must also be altered, as the deformity will persist otherwise[1].

This was a retrospective, international research of rhinoplasty techniques for correcting a crooked nose.

Patients and Methods

This retrospective and multicentric study was conducted in the Otolaryngology Departments of Eskişehir Osmangazi University, Kırıkkale University, in Prof. Dr. Cemil Taşçıoğlu City Hospital, Istanbul; and Private Office of Dr. Azizli, Dr. Oğuzhan Oğuz Wellnose Clinic, and Dilber Private Clinic, according to the rules outlined in the Declaration of Helsinki. Ethics committee approval was taken from the Ethics Committee of TR Governorship of Istanbul, City Health Directorate, Istanbul Prof. Dr. Cemil Taşçıoğlu City Hospital (Date: 04.07.2022, Number: E-48670771-514.99/226).

Subjects

A total of 300 patients with crooked noses1 (191 males and 109 females) who underwent rhinoplasty surgery between 2017 and 2022 and completed a one-year postoperative period were included in the study. The patients were selected among all the patients who applied to the Otolaryngology Departments of Eskişehir Osmangazi University and Istanbul Prof. Dr. Cemil Taşçıoğlu City Hospital; and Private Office of Dr. Azizli, Dr. Oğuzhan Oğuz Wellnose Clinic, and Dilber Private Clinic. The mean age of the patients was 31.96±7.05 (ranging from 17 to 51).

Inclusion criteria

- Development of crooked nose deformity before rhinoplasty;
- At least 1-year follow-up since the initial rhinoplasty operation.

Exclusion criteria

The study did not include patients who did not come for postoperative follow-up.

Methods

1. Classification of the initial deformities was performed and four categories were detected as follows:

- I-shaped crooked nose deformity;
- C-shaped crooked nose deformity;
- Reverse C-shaped crooked nose deformity;
- S-shaped crooked nose deformity.

2. As an operation technique, L-strut septoplasty was performed. The applied methods other than L-strut septoplasty to correct the crooked nose were evaluated and classified.

If one side needed more support, a thicker spreader graft was placed on that side. If there was excessive bone on one side due to the septal deviation, a double osteotomy was performed on that side. If there was no excessive bone, a single osteotomy was performed. More than one procedure was applied to each case:

- Double-side lateral osteotomy;
- Wedge bone resection on one side of the osteotomy;
- Single-side lateral osteotomy;
- Symmetric spreader grafts,
- Asymmetric spreader grafts;
- Shaving the transverse wing of the dorsal septum;
- Correction of deviated dorsal septum;
- Displaced anterior nasal spine;
- Clocking suture (dorsal septal rotation suture);
- Dorsal septal scoring and splinting graft;
- Correction of an asymmetric alar rim;
- Equalizing lateral cruses.

Statistical Analysis

The data collected in this study were analyzed using the SPSS for Windows 16.0 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics (mean, standard deviation, minimum, maximum,

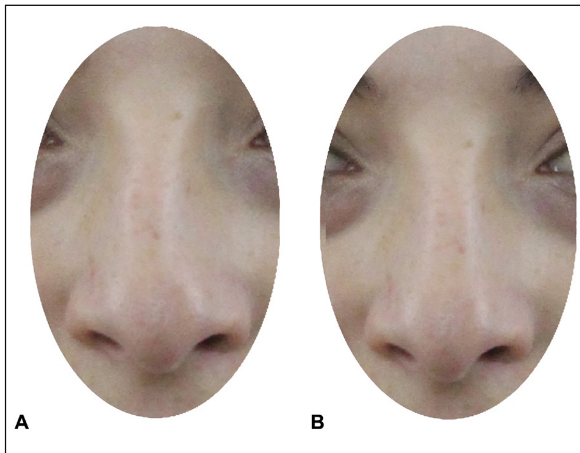

Figure 1. Crooked nose case 1. **A**, Before treatment. **B**, After treatment.

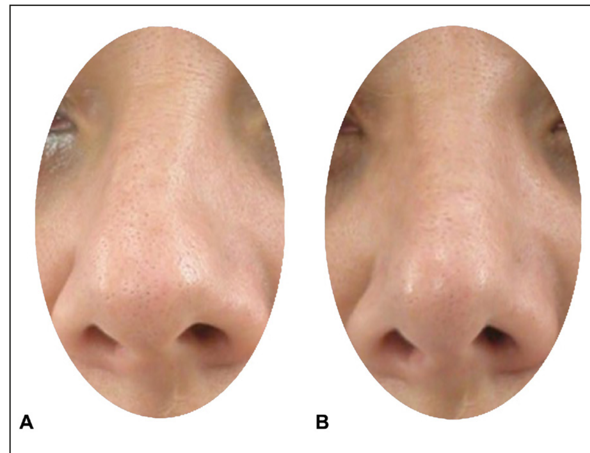

Figure 2. Crooked nose case 2. **A**, Before treatment. **B**, After treatment.

and quartiles) were applied. A value of $p<0.05$ was considered statistically significant.

Results

In this retrospective study, there were 300 patients with crooked noses (Figures 1A, 1B, 2A, and 2B). 191 of them were males (63.7%) and 109 of them were females (36.3%). The results of the classification of the initial deformities were as below:

- I-shaped crooked nose deformity: 102 patients (34%);
- C-shaped crooked nose deformity: 84 patients (28%);
- Reverse C-shaped crooked nose deformity: 64 patients (21.3%);
- S-shaped crooked nose deformity: 50 patients (16.7%).

The results of the applied methods to correct the crooked nose are evaluated and classified as follows:

- Double-side lateral osteotomy: 260 patients (86.6%);
- Wedge bone resection on one side of the osteotomy: 22 patients (7.3%);
- Single-side lateral osteotomy: 18 patients (6%);
- Symmetric spreader grafts: 168 patients (56%);
- Asymmetric spreader grafts: 32 patients (10.6%);
- Shaving the transverse wing of dorsal septum: 24 patients (8%);
- Correction of deviated dorsal septum: 49 patients (16.3%);
- Displaced anterior nasal spine: 38 patients (12.6%);
- Clocking suture (dorsal septal rotation suture): 27 patients (9%);
- Dorsal septal scoring and splinting graft: 25 patients (8.3%);
- Equalizing lateral cruses: 38 patients (12.6%).

Discussion

In clinical practice, a “crooked nose” refers to any situation in which the nasal pyramid is asymmetrical relative to the midline of the nose[8]. This can make it look like a muddled C or S, or entirely off to one side. The patient has severe functional and aesthetic effects, as extreme difficulty in nasal respiration is usually accompanied by unattractiveness[1].

Physiopathologically, this occurs because the cartilaginous nasal septum is subject to extrinsic and intrinsic tissue deforming stresses, which might lead to relapse if not released after surgery[9]. Deviated nasal bones, upper lateral cartilages, and linkages with the vomer, ethmoid, and maxillary crest exert forces on the septum from the outside, making up the extrinsic forces. Whether the deviation in cartilaginous tissue was caused by the improper formation of the septal cartilage or trauma that altered the tissue ultrastructure, the deviated tissue always retains an inherent inclination to restore to its original location[1].

This study investigated current rhinoplasty techniques for correcting a crooked nose. We found that 34% of those with a crooked nose initially had an I-shaped deformity, 28% had a C-shaped

deformity, 21% had a reverse C-shaped deformity, and 16% had an S-shaped deformity. The crooked nose was fixed by L-strut septoplasty.

Osteotomy to correct bony deviation, septal deviation correction, dorsal septum manipulation to correct upper lateral cartilage deviation, and functional problem correction (manipulation for correction of internal valve collapse and hypertrophy of the inferior turbinate) are the primary components of deviated nose correction[10]. The ideal features of a lovely nose are symmetry in the tip and nostril. Asymmetry in the tip, columella, or nostrils after surgery will likely leave the patient unhappy and damage the surgeon's reputation. As a result, "tip and columella deviation" and "bony and mid-vault framework deviation" should be the primary targets of surgical correction[5].

Deviation of the tip usually occurs when the caudal anterior septum has been moved from the maxillary crest. One method to fix the problem is repositioning the septum on its support pedestal. At the posterior septal angle, a triangular wedge of cartilage is removed to achieve this. A robust and permanent suture is then used to anchor the septum base to the maxillary crest's periosteum[2].

Nose shape and structure depend on a dorsal septal strut measuring between 1 and 1.5 millimeters. Saddling, columellar retraction, and tip ptosis come from a breakdown of this L-strut. In these cases, it is necessary to reconstruct the 1.5-cm septal L-strut. The distorted septum can be excised, and the L-strut can be replaced with harvested material via an external technique. Some people have had success using irradiation ribs or calvaria bones. Since it is outside the nasal field, another group can harvest the costal cartilage while the nose is opened[2].

Both the breathing function and the cosmetic line from the brow to the nasal tip can be restored by placing a spreader graft in a C-shaped deviation on the concave side. Positioning the spreader graft on the side with a space between the septum and the upper lateral cartilages is vital in linear deviation of the nasal pyramid. Spreader grafts can permanently fix the deviation and disguise any remaining crookedness in either situation[1]. Guyuron et al[7] recommend using bilateral spreader grafts to more effectively combat cartilaginous memory, and Rohrich et al[6] also suggest this approach. When managing the projection and rotation of the nasal tip, a "septal extension graft" is recommended instead of a spreader graft on the concave side[1].

A septal crossbar graft[1], which is ideal for correcting significant abnormalities of the dorsal septum. Both the crossbar and spreader grafts are based on the idea that the dorsal pillar of an L-shaped structure needs to be strengthened so that the structure can be straightened and reshaped via many incisions without suffering undue damage. Because of the need for excellent visibility and pinpoint accuracy, as well as the placement of sutures in locations inaccessible via the closed method, the open method is used to implant the septal crossbar graft. Compared to a single spreader graft, the septal crossbar graft can be considered as an intra-septal graft, providing more space between the septum and the upper lateral cartilages. For extreme cases of septal deviation, the septal crossbar graft offers the best protection against the reversion of correction due to cartilaginous memory. If the nasal pyramid deviates more than 5 mm from the median line, a septal crossbar graft is indicated[1].

Osteotomy for bony deviation, septal manipulation for correction of internal valve collapse and hypertrophy of the inferior turbinate, and manipulation of the dorsal septum for the correction of upper lateral cartilage deviation are the primary components of deviated nose correction. Nose and tip asymmetry repair is crucial because patients are less likely to give positive aesthetic feedback if they are unhappy with the appearance of their noses. Lower lateral cartilage issues, such as medial crura deviation, medial crura height disparity, and lateral crura asymmetry or deformity, are the most common causes of tip asymmetry, deviated columella, and the associated nostril asymmetry. Septal deviation, both caudal and dorsal, is a more significant underlying cause and should also be addressed[5].

Double mattress sutures[11], scoring and splinting grafts[11], the cut-and-suture technique[12], spreader grafts[12], and dorsal septal rotation sutures (clocking sutures)[13] are the surgical approaches used to rectify dorsal septal deviation. Combinations of two or more techniques are typically used in dorsal septal repair procedures[5].

Conclusions

I-shaped and C-shaped crooked nose deformities were mainly detected in patients with crooked nose deformity. Most often used procedures for straightening a crooked nose include a double-sided lateral osteotomy and a

symmetric spreader graft. These patients had a variety of rhinoplasty[14] procedures, often requiring more than one approach.

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Conflict of Interest
The authors declare no conflict of interest.

Ethics Approval
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Informed Consent
There is no need for informed consent because the data were evaluated retrospectively.

Authors' Contributions
Elad Azizli: Planning, designing, literature survey, data collection, active intellectual support. Oğuzhan Oğuz: Planning, designing, literature survey, data collection, active intellectual support. Nuray Bayar Muluk: Planning, designing, literature survey, statistical analysis, writing, active intellectual support, submission. Hüseyin Sarı: Planning, designing, literature survey, data collection, active intellectual support. Muhammet Dilber: Planning, designing, literature survey, data collection, active intellectual support. Yavuz Uyar: Planning, designing, literature survey, active intellectual support. Cemal Cingi: Planning, designing, literature survey, data collection, active intellectual support, English editing.

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Availability of Data and Materials
All data for this study is presented in this paper.

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