Types of Used Grafts and Postoperative Outcome of Augmentation Rhinoplasty for Saddle Nose Deformity

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Abstract

Objective: To assess our last 3-year experience with augmentation rhinoplasty regarding type of used grafts, type of operation and postoperative complications.

Patients and Methods: This study comprised all cases (n=113) of augmentation rhinoplasty (41 males, 36.3%) that were performed at King Fahad Hospital, Jeddah, during January 2010 to December 2012. Their ages ranged from 17 to 43 years (Mean ± SD: 29.5 ± 8.8 years). All patients underwent detailed history taking, clinical examination, routine and special investigations, including photography. Patients graded into type I saddle nose deformity (n=30), i.e. mild; type II (n=162), i.e., moderate; and type III (n=34), i.e., severe. All patients were operated upon, using one of either autologous grafts, i.e., iliac crest bone (37 cases), septal cartilage (55 cases), auricular cartilage (3 cases) and costal cartilage (3 cases), or non-autologous graft materials, i.e., Medpor (10 cases), or silicone (5 cases).

Results: Most augmentation rhinoplasty patients were females (72, 63.7%). Allografts were used significantly more than autografts for female patients than for male patients (p=0.004). Allografts were significantly more used for severe nasal deformity (i.e., type III), while autografts were more used for mild and moderate cases of nasal deformities (p<0.001). Trauma constituted 43.4% of the causes of saddle nose. About one fifth of our patients underwent revision rhinoplasties (20.4%). For patients who had allografts, there were significantly more revision rhinoplasties compared with those with autografts (40% vs. 18.3%, respectively, p=0.043). Postoperative complications occurred more significantly among cases with allografts than cases with autografts (p=0.049). Postoperative complications occurred in 13 patients (11.5%). Among patients with allografts four had complications (26.7%) while among patients with autografts, 9 patients had complications (9.2%). The main postoperative complications were displaced graft (5, 4.4%), visible edges (4, 3.5%) and infection (3, 2.7%). Graft absorption occurred in one case (0.9%).

Conclusions: Our patients are mainly young and females with type II saddle nose deformity. Traumatic causes constitute a high proportion for cases of nasal deformity. About one fifth of cases undergo revision augmentation rhinoplasty.

Key Words: Augmentation rhinoplasty – Saddle nose – Allografts – Autografts – Saudi Arabia.

Introduction

THE “saddle nose” deformity results from a disruption in the nose’s integral support mechanisms [1]. Congenital, iatrogenic, and traumatic etiologies may cause a deficient or deformed nasal dorsum that requires correction with dorsal augmentation [2]. Rhinoplasties, whether for cosmetic or functional reasons, have been progressively increasing over the past decade. This surgical procedure may require the addition of a material to augment the nose [3].

Treatment of saddle noses challenges the surgeon to provide esthetic form and functional improvement despite the presence of a limited amount of tissue to work with. The previous emphasis on alloplastic materials was a testament not only to the poor results obtained with autogenous tissues but also the unwarranted promise of the “miracles of modern chemistry”. Only in the last 5 years have multiple surgeons begun to achieve outstanding results using autogenous tissues efforts [4].

Reconstructive surgeons must not only reestablish facial aesthetic contours but also rebuild the nose’s structural framework while preserving or restoring nasal function [1]. Augmentation rhinoplasty is mainly performed to increase the projection of the nasal dorsum on the profile view. The nasal tip may also be augmented. Grafts may be placed to conceal irregularities of the bony dorsum and of the upper or lower lateral cartilages [5].
Types of Used Grafts & Postoperative Outcome

Augmentation rhinoplasty is planned to reshape the anatomic features of the nose into a new more pleasing relationship with the surrounding facial features [6]. It can remarkably improve the patient’s face [7].

Reconstruction of the nasal dorsum requires a material that provides structural support and long term augmentation. Different grafting materials are available for augmentation rhinoplasty. These include synthetic implants (alloplasts), allogenous materials, obtained from cadavers or autologous implants, harvested from the patient’s own tissue [8].

The main non-autologous materials include Medpor, silicone, silastic, Gore-Tex and the acellular dermis product [9]. In some cases, a combination of autologous and nonautologous materials may be necessary [10].

The aim of this study is to assess our last 3-year experience with augmentation rhinoplasty regarding: Cause of saddle nose, type of used grafts, type of operation and postoperative complications.

Patients and Methods

This study comprised all cases of augmentation rhinoplasty (n=113) that were performed at King Fahad Hospital, a tertiary referral hospital in Jeddah, during the period from January 2010 to December 2012. Jeddah City is the largest city in Makkah Al Mukarramah Province, the largest sea port on the Red Sea and the second largest city in Saudi Arabia after the capital city Riyadh. Its population is almost 4 million. Almost half of them are non-Saudis, mainly from different Asian and African countries [11].

Patients who underwent augmentation rhinoplasty were 41 males (36.3%) and 72 females (63.7%). Their ages ranged from 17 to 43 years (Mean±SD: 29.5±8.8 years).

All patients underwent detailed history taking, clinical examination, routine and special investigations, including photography.

Patients with saddle nose deformity were graded according to Daniel and Brenner’s new classification [4] into type I (n=30), i.e. mild saddle nose deformity; type II (n=162), i.e., moderate saddle nose deformity; and type III (n=34), i.e., severe saddle nose deformity.

Within the study period, all patients suffering from saddle deformity of nose were operated for augmentation rhinoplasty, using one of these autologous grafts i.e. iliac crest bone (37 cases), septal cartilage (55 cases), auricular cartilage (3 cases) and costal cartilage (3 cases). On the other hand, 15 cases underwent augmentation rhinoplasty with non-autologous graft materials, i.e., Medpor (10 cases), or silicone (5 cases).

Operative technique:

Injection of the nasal soft tissues with lidocaine and epinephrine/20000 sol. to allow adequate vasoconstriction and decrease in traoperative bleeding. Augmentation was performed via an endonasal (83 cases) or an open rhinoplasty approach (30 cases), depending on the complexity of the augmentation. The endonasal approach required an inter-cartilaginous or trans-cartilaginous incision. An open approach involved elevation of the skin and soft tissue envelope via a trans-columellar incision.

The entire cartilaginous skeleton of the lower and upper lateral cartilages were exposed. Dissection proceeded in a submuscular aponeurotic plane since dissection superficial to this plane results in compromise of the vascular supply to the soft tissues and makes the dissection very difficult. At the bony cartilaginous junction, the periosteum over the nasal bones was elevated and the dissection was carried in this plane up to the nasofrontal angle. The entire nasal skeleton was adequately visualized.

Once the anatomy and the defects were adequately visualized, any further cartilage or bone harvest was performed. The most frequent areas for augmentation were the nasal dorsum, the nasal tip and to fill defects or camouflage irregularities of the nasal sidewalls. Grafts were fashioned and sculpted to the desired size and shape and are sutured in the desired location. The graft was secured in place with carefully placed, multiple 5-0 clear polydioxanone sutures. If an endonasal approach was chosen and if the recipient pocket can be created precisely, the graft was introduced without the need for fixation.

Nasal tip augmentation was done for all cases by lateral corporal steal technique was applied in cases with type I saddle nose while graft and lateral corporal steal technique were applied in cases with types II and III saddle nose.

Postoperatively, the patients were prescribed a course of amoxicillin/clvaulanate for 5 days. Adhesive dressing was applied to all the noses to
minimize soft tissue swelling and graft displacement. The average follow-up duration was 12 months, and the length of hospital stay was 5-7 days.

The removal of sutures, dressing, and nasal splint was performed on the 5th postoperative day. On follow-up, the patients were reviewed with respect to their improvement in symptoms and aesthetic improvement. Nasal endoscopy was performed to evaluate patency of the nasal airway.

Study data were analyzed using SPSS version 21.0. Descriptive statistics were tabulated, and measures of association were calculated using $X^2$ analysis. $p < 0.05$ was considered statistically significant.

Results

Table (1) shows that most augmentation rhinoplasty cases were operated upon using autografts (98, 86.7%), while in 15 cases (13.3%) allografts were used. Medpor was the main allograft (66.7%) while septal cartilage and iliac crest were the main autografts (56.1% and 37.8%, respectively).

Figs. (1,2) show two Arab male patients with saddle noses due to trauma before and after autograft augmentation rhinoplasty. Fig. (3) shows a female patient from Chad with saddle nose before and after silicone allograft augmentation rhinoplasty.

Table (1): Types of grafts used in augmentation rhinoplasty.

<table>
<thead>
<tr>
<th>Types</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allografts:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicone</td>
<td>5</td>
<td>33.3</td>
</tr>
<tr>
<td>Medpor</td>
<td>10</td>
<td>66.7</td>
</tr>
<tr>
<td><strong>Autografts:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septal cartilage</td>
<td>55</td>
<td>56.1</td>
</tr>
<tr>
<td>Iliac crest</td>
<td>37</td>
<td>37.8</td>
</tr>
<tr>
<td>Auricular cartilage</td>
<td>3</td>
<td>3.1</td>
</tr>
<tr>
<td>Costal cartilage</td>
<td>3</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Table (2) shows that most augmentation rhinoplasty patients were females (72, 63.7%). Allografts were used significantly more than autografts for female patients than for male patients ($p=0.004$). Most of our patients had type II deformity (71.7%). Allografts were significantly more used for severe nasal deformity (i.e., type III), while autografts were more used for mild and moderate cases of nasal deformities ($p<0.001$). Nasal deformity was mainly congenital (56.6%). However, trauma constituted 43.4% of the cases. There were no significant differences between augmentation rhinoplasties regarding type of used grafts according to etiology of saddle nose deformity ($p=0.130$). About one fifth of our patients underwent revision rhinoplasties (20.4%). For patients who had allografts, there were significantly more revision rhinoplasties compared with those with autografts (40% vs. 18.3%, respectively, $p=0.043$). Postoperative complications occurred more significantly among cases with allografts than cases with autografts ($p=0.049$). Postoperative complications occurred in 13 patients (11.5%). Among patients with allografts four had complications (26.7%) while among patients with autografts, 9 patients had complications (9.2%). The main postoperative complications were displaced graft (5, 4.4%), visible edges (4, 3.5%) and infection (3, 2.7%). Graft absorption occurred in one case (0.9%).

Table (2): Comparison between allograft and autograft rhinoplasty.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Allograft (n=15)</th>
<th>Autograft (n=98)</th>
<th>Total (n=113)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
<td>40</td>
<td>41</td>
<td>36.3</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>58</td>
<td>72</td>
<td>63.7</td>
</tr>
<tr>
<td><strong>Type of deformity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>0.0</td>
<td>15</td>
<td>15.3</td>
</tr>
<tr>
<td>II</td>
<td>6</td>
<td>40.0</td>
<td>75</td>
<td>76.5</td>
</tr>
<tr>
<td>III</td>
<td>9</td>
<td>60.0</td>
<td>8</td>
<td>8.2</td>
</tr>
<tr>
<td><strong>Etiology of deformed nose:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Congenital</td>
<td>11</td>
<td>73.3</td>
<td>53</td>
<td>54.1</td>
</tr>
<tr>
<td>Traumatic</td>
<td>4</td>
<td>26.7</td>
<td>45</td>
<td>45.9</td>
</tr>
<tr>
<td><strong>Operation:</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Primary</td>
<td>9</td>
<td>60.0</td>
<td>81</td>
<td>87.1</td>
</tr>
<tr>
<td>Revision</td>
<td>6</td>
<td>40.0</td>
<td>17</td>
<td>18.3</td>
</tr>
<tr>
<td><strong>Complications (1):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>11</td>
<td>73.3</td>
<td>89</td>
<td>90.8</td>
</tr>
<tr>
<td>Present</td>
<td>4</td>
<td>26.7</td>
<td>9</td>
<td>9.2</td>
</tr>
</tbody>
</table>

(1) Postoperative complications were displaced graft (5, 4.4%), visible edges (4, 3.5%), infection (3, 2.7%) and graft absorption (1, 0.9%).

All complications were managed accordingly, including antibiotics administration, secondary augmentation rhinoplasty after 6 months, for patients with uneventful sequelae.
Fig. (1): A 25-year old Arab patient who underwent a road traffic accident that resulted in moderate saddle nose. An iliac crest bone graft was used for dorsal augmentation of the nose by closed technique.

Fig. (2): An 18-year old Arab male patient who presented with saddle nose due to history of trauma 10 years back that ended up with septal necrosis and saddling. Treatment was done with rib bone grafting with open technique.

Fig. (3): 35 year black patient from Chad who presented with saddle nose. A silicone of dorsal nasal augmentation was used by open technique.
Discussion

Augmentation of the nasal dorsum is one of the most difficult tasks for the rhinoplasty surgeon. Saddle noses are difficult to correct because of the need to provide strong structural support to the nose while at the same time achieving an aesthetic dorsum [12]. There are many materials available for augmentation of the nasal dorsum [13,14].

Our last 3-year experience (January 2010 till December 2012) with augmentation rhinoplasty cases with saddle nose admitted or referred to King Fahad Hospital in Jeddah mounted to 113 cases with variable types of saddle noses. The majority of our cases were operated upon using autografts (86.7%), while allografts were used in 13.3% of the cases. Medpor was the main allograft while septal cartilage and iliac crest were the main autografts.

Brenner and Hilger [15] noted that, in augmentation rhinoplasty for saddle nose deformities, autologous materials are superior to exogenous materials. Chauhan and Guri-prasad [8] added that alloplastic implants are another alternative for nasal augmentation. Their advantages are ready availability in shapes and sizes and no donor site morbidity.

Turegun et al., [16] stated that the ideal graft material should be biocompatible, stable to re-absorption and resistant to infection. Among allografts, Medpor can be a good option for augmentation of the nasal dorsum. However, Chuangsawanichand Lohsiriwat [7] added that silicone is also an alloplastic material commonly used for rhinoplasty. Despite the availability of prefabricated implants, the silicone implants can be manually carved to a desired shape both pre-and intra-operatively. Silicone rubber is pliable yet does not warp, making the intra-operative handling and placement easy.

Guerrerosantos et al., [17] stated that many surgeons prefer to use autologous tissue whenever possible, offering stability, as well as resistance to infection and extrusion over time.

Our patients were relatively young, whose age ranged from 17 to 43 years. Almost two thirds of our patients were females (63.7%). These characteristics may indicate the commonest indication for augmentation rhinoplasties in our group of patients, i.e., cosmetic purposes.

It has been noted that autografts were most commonly used in our patients than allografts (86.7% and 13.3%, respectively). However, our study revealed that allografts were significantly more used for augmentation rhinoplasties in female patients than in male patients. This finding may be explained by the fact that using autografts for augmentation rhinoplasty necessitates an additional surgical incision and perhaps a subsequent scar in another part of the patient’s body at the donor site, a condition that is usually less acceptable by female patients than male patients who are always highly sensitive about their bodies.

In this regard, Gendeh [18] emphasized the importance of establishing a good preoperative rapport with augmentation rhinoplasty patients regarding the best choice from among the available graft materials that would help increase the potential for satisfaction with the postoperative results. The psychology of the patient should be kept in mind to avoid conflicts over the postoperative appearance of nose and a subsequent revision operation.

A high proportion of our augmentation rhinoplasty patients had their saddle nose deformities (43.4%) due to trauma.

This finding is in agreement with that stated by Isac et al., [12], who noted that most of the nose deformities are the result of trauma (septal hematomas or abscesses, fractures of quadrilateral cartilage as a result of different trauma which is one of the main causes of morbidity or extensive septal surgery.

In our patients, allografts were more used for the severe type of nasal deformities (i.e., type III), while autografts were more used for the mild and moderate types.

This finding is in agreement with that stated by Razmpa et al., [19], who noted that, in augmentation rhinoplasty, though autologous cartilage is widely recognized by most surgeons to be the standard against which other materials must be judged, being the most acceptable and reliable long-term graft, however, the lack of reliable tissue resources in severe types of saddle nose deformities leads to the attempts to choose different allografts for substitution.

The proportion of those who underwent revision augmentation rhinoplasty in the present study was relatively high (20.4%). This is due to the fact that our hospital is a tertiary care referral hospital in Jeddah. Many primary augmentation rhinoplasty-
cases, who had unsatisfactory outcome for their augmentation rhinoplasties in other hospitals, are usually referred to our hospital for re-assessment and re-operation.

The proportion of using allografts for our patients with revision augmentation rhinoplasty was significantly higher than that for patients with primary rhinoplasty. This finding has been explained by Razmpa et al., [19], who stated that despite the superiority of autogenous materials in nose reconstruction, lack of safe materials in revision rhinoplasty cases present challenges to surgeons for which allorgrafts may be the preferred choice.

Within the follow-up period of 12 months for our patients, complications were noted in 13 patients (11.5%). Patients with allografts sustained significantly more complications than patients with autografts. The main complications were displaced graft, visible edges and infection, while graft absorption occurred in one case. No systemic or life-threatening complications occurred.

Abdel-Khalek et al., [3] noted that the autologous grafts are the graft of choice in augmentation rhinoplasty because of their low rate of infection, rejection, resorption, extrusion, low donorsite morbidity, easy reshaping and due to their more natural look. However, Jag and Yu (2012) noted that the disadvantages of autologous materials are donor site morbidity, absorption and difficulty in contouring.

Winkler et al., [20] stated that complication rate for augmentation rhinoplasty varies from 4% to 18.8%. In individual hands, this rate generally falls as surgical experience accumulates. Skin and associated soft tissue complications occur in up to 10% of cases. According to estimates, severe systemic or life-threatening complications occur in 1.7-5% of rhinoplasty cases.

Murrell [21] stated that grafts can also be noticeable due to poor design; visible graft edge is the common example. This situation should be rare but can be rectified with graft removal, carving, and replacement. Occasionally, a graft can be inhabited in place without removal.

In conclusion, our patients are mainly young and females with type II saddle nose deformity. Traumatic causes constitute a high proportion for cases of nasal deformity. About one fifth of cases undergo revision augmentation rhinoplasty.

The outcome of cases that undergo augmentation rhinoplasties with allografts is still inferior to that of autografts. With proper preoperative choice of graft material and surgeons gaining more operative skills we expect to minimize the incidence rates for complications and revision augmentation rhinoplasty.

References