A Novel Technique for Spreader Flap by Folding the Dorsal Hump in Patients Undergoing Primary Rhinoplasty

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Objectives: We describe our novel modified spreader flap, which involves keeping the large cartilaginous septal T hump attached to the upper lateral cartilages to increase the thickness and length of the flap. Our objectives were to assess hump reduction and recurrence, nasal axis deviation, dorsal width, internal nasal valve grade, and Rhinoplasty Outcome Evaluation (ROE) score preoperatively and one year postoperatively.

Materials and Methods: In a prospective study that included 21 patients who met the criteria, patients were followed up for 1 year after surgery, with an assessment of the dorsal projection, tip projection, axis deviation, dorsal width, and internal nasal valve grade. In addition, the modified Cottle maneuver and Rhinoplasty Outcome Evaluation score were also performed and obtained, respectively.

Results: Our novel technique was performed in 20 patients (95.2%). In 1 additional patient, we added a regular auto-spreader flap on the contralateral side. One year postoperatively, the axis was found in the midline in all patients (100%). Assessment of internal valve collapse showed that collapse was reduced to grade 0 in 13 patients (61.9%) and grade 1 in 8 patients (38.1%). There were no hump recurrences or visible irregularities. The results showed a statistically significant difference between the pre- and postoperative values in dorsal projection, dorsal width, and rhinoplasty outcome evaluation score.

Conclusions: This novel technique shows promising statistically significant results in reducing dorsal hump projection and width, correcting axis deviation, and improving internal nasal valve and rhinoplasty outcome evaluation score, while being less cartilage and time-consuming.

Key Words: dorsal hump, nasal deformity, novel technique, rhinoplasty, spreader flap

Rhinoplasty is considered one of the most common esthetic surgical procedures. It corrects external nasal deformity and some aspects of nasal function. One common presentation of nasal deformity is the presence of a dorsal hump, which may be surgically removed with the closure of the defect using different techniques.1 Anatomically, the cartilaginous dorsal hump comprises the dorsal part of the septum and upper lateral cartilages (ULC). Hump reduction might require midvault reconstruction as various other deformities, including a narrow dorsum, inverted V deformity, saddling of the dorsum, and collapse of the internal nasal valve, may occur if no reconstruction is made.2 In 1984, Sheen suggested that using a strip of cartilage placed along the nasal dorsum as a spreader graft was an effective method for treating midvault abnormalities.3 Recently, excess ULCs have been used to reconstruct the midvault to maintain the nasal framework stability. This technique is called the “spreader or auto-spreader flap”.4 The auto-spreader flap technique was first described by Fomon in 1950, but it did not become well known until the 1990s when Berkowitz used the term “spreader flap” to describe it.5,6 Moubayed and Most reviewed the indications of auto-spreader flaps, which include cartilaginous or bony-cartilaginous humps with a minimum height of 2 mm, particularly if it was accompanied by a long and thin dorsum, short nasal bones,
thin ULCs, positive Cottle test, and thin skin. They also mentioned relative contraindications, including severe asymmetric dorsal esthetic lines, deviated nasal dorsum, bony sidewall collapse, weakness of the lower lateral cartilage, and deviated nasal tip. As the ULC thickness in these cases is not more than 5 mm, they require thicker cartilaginous support such as a spreader, extended spreader graft, or septal extension graft harvested from the septal, conchal, or costal cartilages. Spread flap technique does not require harvesting the septal cartilage graft, thus reducing the invasiveness of the procedure and the intraoperative duration. Regarding hump utilization, Cottle was the first to propose hump reinsertion, a technique that Skoog further modified.9 The advantages of hump reinsertion include a smooth, stable dorsum, internal nasal valve support, septal cartilage preservation, and surgical time reduction. However, hump reinsertion has a major drawback; the graft’s reduced visibility and palpability in case of insufficient reduction or displaced graft.10 The present study describes our modified spreader flap, which involves keeping the large cartilaginous septal T hump attached to the ULC to increase the thickness of the flap. Our objectives were to assess hump reduction and recurrence, nasal axis deviation, dorsal width, internal nasal valve grade, and Rhinoplasty Outcome Evaluation (ROE) score before and 1 year after surgery.

MATERIALS AND METHODS

This prospective study reviewed the medical records and photographs of patients who underwent rhinoplasty or septorhinoplasty using our modified spreader flap technique at a tertiary hospital in Riyadh, Saudi Arabia. The study was conducted between December 2019 and June 2021. All patients underwent primary open rhinoplasty performed by the senior author, a facial plastic surgery consultant, and a professor. This study was approved by the institutional review board. We included patients who met the following criteria: a crooked nose, deviation of midvault to one side, presence of a mainly cartilaginous hump, primary rhinoplasty, preoperative positive Cottle test, and a hump height > 3 mm and length > 5 mm. Exclusion criteria included revision surgery, other paranasal sinus surgery, midvault collapse patients with congenital nasal deformities, and no significant hump or hump < 3 mm in height or < 5 mm in length.

Twenty-one patients met the inclusion criteria and were included in the study. Informed written consent was obtained from the individuals included in the study. Patients were followed up for 1 year after surgery. Intraoperatively, we measured the dorsal hump height by drawing a vertical line through the alar-facial sulcus and described the ideal height of the rhinion as 18 to 22 mm from this line and the ideal tip projection as 28–32 mm. Axis deviation and dorsal width were assessed via the brow-tip esthetic lines drawn from the medial brow, curving slightly around the superior orbital rim and passing through the lateral radix, and extending to the nasal tip defining points. This should follow an unbroken curved path to determine the normal straight axis and width.11 The internal nasal valve grade was measured using endoscopic examination with a validated grading system created by Patel et al based on the visibility of the middle turbinate (MT). This grading system is as follows: Grade 0, where the head of MT is visible; Grade 1, where the MT is partially obscured; and Grade 2, where the MT is not visible.12 Internal nasal valve collapse was further confirmed using a modified Cottle test.13 Functional and cosmetic patient satisfaction scores were measured using the validated Arabic version of the ROE score;14 the patients were reassessed 1 year postoperatively. Measurements were taken using a ruler with the patient lying supine.

Surgical Technique

Surgeries were performed under general anesthesia using an open rhinoplasty approach. Local infiltration anesthesia with 1% lidocaine in 1:200,000 epinephrine with a total quantity ranging from 10 to 15 mL was applied to the nasal dorsum, sidewalls, tip, columella, caudal margin of the lower lateral cartilage, and septum. An inverted V trans-columellar incision was made in the narrowest part of the columella and connected with a bilateral marginal incision at the caudal margin of the lower lateral cartilage. The Ptanguy ligament was resected. The flap dissection was performed in the supraperichondrial and subperosteal planes until the nasal bones were reached. At the site of the anterior septal angle, septonplasty was started. Separation of connective tissue between the medial crura was performed to reach the caudal end of the septum. Subperichondrial and subperosteal septal flap elevations were achieved. Before septal cartilage harvesting, if needed, the hump was addressed. Our modification of the spreader flap was in this step of the surgery, where the bony hump was rasped, and the cartilaginous hump was preserved. The cartilaginous hump was assessed and then transsected from the convex side of the dorsal septum (septal T) but was kept attached to the ULC of the concave side of the dorsal septum (Fig. 1A–D). The cartilage was then bent and placed between the concave side of the dorsal septum and the attached ULC (Fig. 1E–F). Occasionally, in the case of stiff cartilage, a simple partial incision of the attached side of the hump was made to facilitate bending of the combined hump and ULC flap. In 1 case that had significant convexity of the dorsal septum, a minimal portion of the cartilaginous hump was preserved for use as a regular auto-spread flap, in addition to the technique described previously for the concave side. The flap on the dorsal septum was secured using 5–0 polydioxanone suture at the cephalic, middle, and caudal points. Other nasal deformities were addressed accordingly. Trans-columellar incision closure was performed using a 6–0 nylon suture, and marginal and transseptal closures were performed using 5–0 polyglactin 910 sutures. Internal nasal splints were placed bilaterally and secured using 2–0 silk sutures. An external nasal splint was placed over the nasal dorsum. The internal nasal splints and external splints were removed in the clinic 7 days post-surgery. Figure 2 shows the immediate preoperative and postoperative appearance of the nose (see Video, Supplemental Digital Video 1, Supplemental Digital Content 1, http://links.lww.com/SCS/E266). Figure 3 showed illustration of the technique for more clarification.

Statistical Analysis

Descriptive statistics were reported using the mean ± standard deviation for continuous variables. Categorical variables were reported as frequencies and percentages. A paired t-test was used to assess the preoperative and postoperative differences in dorsal projection, dorsal width, axis deviation, internal nasal valve grade, and ROE score. A two-proportion z-test was used to assess the pre-postoperative axis deviation: P-value at ≤0.05 was considered statistically significant. SPSS software (version 21.0; IBM Bangalore) was used for the statistical analysis.

RESULTS

The modified spreader flap technique was performed on 21 patients. The age of the patients ranged from 17 to 2654
37 years, with the mean age being 25.90 ± 5.56 years (Supplemental Digital Table 1, Supplemental Digital Content 2, http://links.lww.com/SCS/E267). Of the 21 patients, 16 were female (76.2%), and 5 were male (23.8%). Nineteen patients did not report any comorbidities or previous nasal or facial surgeries (90.5%). However, 1 patient had a previous history of oromaxillofacial surgery, and another had previously undergone septoplasty, in which neither the auricular nor rib cartilage was used for reconstruction. Clinical examination revealed that the patients only had type 3 or 4 Fitz-Patrick skin types; 11 patients had type 3 skin (52.4%), and the rest had type 4 skin (47.6%).

Open septorhinoplasty with our modified spreader flap technique was performed in 20 patients (95.2%). In one patient, we added a regular auto-spreadder flap on the contralateral side. The preoperative axis was in the midline in 3 patients (14.3%), deviated toward the left in eight patients (38.1%), and toward the right in 10 patients (47.6%). One year postoperatively, the axis was in the midline in all patients (100%). The internal valve collapse assessment showed that 12 (57.1%) patients had grade I collapse, and 9 (42.9) patients had grade II collapse preoperatively. One year postoperatively, the internal valve collapse was reduced to grade 0 in 13 patients (61.9) and to grade I in 8 patients (38.1%). (Supplemental Digital Table 1, Supplemental Digital Content 2, http://links.lww.com/SCS/E267) also depicts the preoperative and postoperative dorsal projections and dorsal widths, respectively. The mean preoperative dorsal projection was 22.95 ± 2.27; 1 year postoperatively, it was reduced to 18.86 ± 1.35, with a mean difference of 4.09 ± 1.38. The difference between the preoperative and 1-year postoperative dorsal projection values was statistically significant (P < 0.001) (Supplemental Digital Table 2, Supplemental Digital Content 3, http://links.lww.com/SCS/E268). Similarly, preoperative and 1-year postoperative dorsal width were statistically significant.

FIGURE 1. Shows the surgical technique used in our modification of the spreader flap. (A) Complete exposure of the cartilaginous hump after degloving and elevation of the bilateral septal flaps. (B) At the convex side of the dorsal septum, using a no. 15 blade, the incision starts at the most cephalic portion of the hump that connects the septal T and ULC as one flap. (C) The completely transected flap is attached to the ULC of the concave side of the dorsal septum. (D) The flap is then completely separated from the septum. (E) Using forceps, the cartilage is bent and placed between the concave side of the dorsal septum and the attached ULC. (F) Complete bending of the flap is achieved and secured on the dorsal septum using a 5–0 polydioxanone suture at the cephalic, middle, and caudal points.

FIGURE 2. Shows intraoperative photographs before and after completion of the surgery with the modified spreader flap. A–D are preoperative, whereas E–H were taken immediately after the surgery.
(P < 0.001) with a mean of 14.29 ± 1.88 and 12.81 ± 1.08, respectively, with a mean difference of 1.48 ± 1.03 (Supplemental Digital Table 2, Supplemental Digital Content 3, http://links.lww.com/SCS/E268). Figure 4 represents the box and whisker plot for the preoperative and 1-year postoperative dorsal projection values, and Figure 5 represents the box and whisker plot preoperative and 1-year postoperative dorsal width values.

The preoperative and 1-year postoperative ROE scores were 6.62 ± 2.85 and 19.76 ± 2.47, respectively, which were significantly different (P < 0.001). Figure 6 shows the box and whisker plot for the ROE score presurgery and postsurgery. In reference to preoperative and postoperative axis deviation, there was a significant difference with only 3 (14.3%) patients having a midline axis preoperatively, whereas postoperatively, the axis was midline in all patients. This was statistically significant (P < 0.001) (Supplemental Digital Table 1, Supplemental Digital Content 2, http://links.lww.com/SCS/E267). Figures 7 and 8 show the preoperative and postoperative images of patients who underwent this novel technique.

FIGURE 4. Shows the box and whisker plot for dorsal projection before and after surgery.

FIGURE 5. Shows the box and whisker plot for dorsal width before and after surgery.
DISCUSSION

The portion between the caudal ends of the nasal bone and ULC is primarily called the middle nasal vault. The stability of the middle nasal vault chiefly depends on the T-shaped structure referred to as “septal T” formed by the ULCs and the cartilaginous nasal septum. When there is a deformity associated with the septal T, a nasal hump predominantly comprising both bony and cartilaginous elements will form.

To eliminate this nasal hump and simultaneously achieve an esthetically pleasing nasal structure, en bloc resection of the nasal hump was the procedure of choice by plastic surgeons. However, because of rising awareness and interest in minimally invasive procedures over the past 3 decades, various surgical techniques addressing the middle nasal vault hump have emerged. The disadvantages of the conventional techniques include reduced stability of the middle nasal vault, breathing difficulty because of deformed and malposed internal nasal valves, and asymmetric appearance and formation of inverted V deformity along the lateral nasal walls.15,16

The drawbacks above led to the invention of the spreader technique by Sheen in 1984, which showed great outcomes.3 However, this technique also entails certain risks, such as possible instability of the septum while obtaining the graft and transpositioning of the graft postoperatively, both resulting in unesthetic outcomes.17,18

The disadvantages of spreader grafts include the graft plummeting into the mucoperichondrial pocket and postsurgical dislodgement of the graft. Moreover, this procedure is time-consuming and increases intraoperative duration.19

To the best of our knowledge, this study is the first to describe such a novel technique. We combined the advantages of the spreader graft and auto-spread flap by combining the septal T cartilage from the hump and excess ULC. This increases the thickness and prevents the need for harvesting cartilage for midvault reconstruction. However, we found that reconstruction of the midvault with a spreader graft takes more time, ~10 to 30 minutes more as performed by the senior author, depending on where the cartilage is harvested from. Using this technique, there is no need to harvest cartilage from the septum, auricle, or rib; instead, the thickness and length of the flap are utilized by folding the excess septal cartilage and ULC hump, thereby providing good esthetic and functional outcomes. Intraoperative time was limited to 3 to 5 minutes in such cases. Statically good outcomes were achieved with no recurrence of the hump, deviation, or internal nasal valve compromise for at least 1 year. In our study, all patients were satisfied with the results, and they did not have any functional or esthetic complaints requiring revision surgery.

In 2016, Hassanpour et al compared the spreader graft and auto-spread flap for rhinoplasty in a study that included 25 subjects in each technique arm. The clinical outcomes of the study revealed that both procedures yielded satisfactory esthetic and functional results. However, the ease of application of the auto-spread flap procedure was slightly superior. Additionally, the postoperative healing time was shorter for this technique than that for the spreader technique.20

The results of our study are in accordance with those of the aforementioned study and those of the study conducted by Naguib et al in 2020. In the latter, both the auto-spread flap and spreader graft for surgical correction of nasal deformity showed notable improvements in terms of esthetic satisfaction score at the 3-month and 6-month postoperative follow-up visits, which is similar to our findings.21

FIGURE 6. Shows the box and whisker plot for ROE score before and after surgery.

FIGURE 7. A 30-year-old woman with a significant hump and axis deviation underwent open septorhinoplasty with our modified spreader flap for midvault reconstruction. A–F are preoperative. G–L show 1-year postoperative status and successful management of the hump and axis deviation.
We found that our technique provides a combination of spreader graft and auto-spreader flap advantages and avoids some of the drawbacks of these techniques. All patients were satisfied with the cosmetic and functional outcomes measured using the ROE score. A year after the procedure, we did not encounter midvault instability, hump recurrence, axis deviation, or internal nasal valve collapse in any of our patients. We found this technique to be effective and minimally invasive by eliminating the need for cartilaginous grafts, which is less time-consuming intraoperatively, with excellent esthetic and functional outcomes.

The limitations of our study were the small sample size and short follow-up time. We plan to conduct multicentric case-control and randomized clinical trials with objective measures to prove further that our novel technique is favorable as it combines the advantages of both spreader grafts and auto-spreader flaps.

This novel technique is promising as it has attained statistically significant clinical outcomes in reducing dorsal hump projection and width, correcting axis deviation, improving internally significant clinical outcomes in reducing dorsal hump projection and width, correcting axis deviation, improving internally stable during the 1-year follow-up visits. There were no reported postoperative recurrences of functional or esthetic issues. All patients were satisfied with the results and had uneventful healing with no need for revision surgery.

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