

# Outcome after Dorsal Hump Resection versus Hump Remodeling and Re-insertion: A Randomized Controlled Trial

Original  
Article

*Amr Mohamed Elemam, Hazem Mohamed Ragheb Dewidar, Ahmed Mohamed Shawky, Mahmoud Sayed Elfouly, Mohamed Abd Elmottaleb Sabaa*

*Department of Otolaryngology, Faculty of Medicine, Cairo University, Egypt.*

## ABSTRACT

**Background:** Preservation of the middle nasal vault has become a main concern in primary rhinoplasty surgery. This research elucidates the outcome of the hump re-insertion technique as a method to reconstruct the mid-vault in primary rhinoplasty after dorsal hump resection in comparison to the hump resection with no dorsal grafting technique.

**Patients and Methods:** This study was a randomized controlled trial, conducted on forty patients, divided into 2 groups: Group (A) included 20 patients underwent dorsal hump remodeling and reinsertion, while group (B) involved 20 patients subjected to hump resection with no dorsal grafting. Patients were assessed by the Nasal Obstruction Symptom Evaluation (NOSE) score, the active anterior rhinomanometry, Visual Analogue Scale (VAS) scale and photography.

**Results:** Both groups showed significant improvement in NOSE scores postoperatively. there was a superiority in group A with mean score 23 compared to group B with score 27.5 ( $P=0.005$ ). 65% of group (A) patients showed improvement to VAS 4 compared to 20% for group B ( $P=0.004$ ). Postoperative mean nasal airway resistance comparison was statistically insignificant ( $P=0.2$ ). There was more effective narrowing in dorsal width of nasal bones in group A.

**Conclusion:** Hump remodeling and re-insertion technique is more superior in the aesthetic outcome with more natural looking dorsum and narrowing of the dorsal nasal width. Additionally, it decreases in the need for osteotomies and avoids their consequences. Hump reinsertion is useful as a rescue procedure in case of excessive dorsal resection.

**Key Words:** Dorsal hump resection, Dorsal reconstruction, Hump re-insertion, Primary rhinoplasty.

**Received:** 25 January 2022, **Accepted:** 7 March 2022

**Corresponding Author:** Amr Mohamed Elemam, MSc, Department of Otolaryngology, Faculty of Medicine, Cairo, Egypt, **Tel.:** +20-01024263781, **E-mail:** amr.alamam@kasralainy.edu.eg

**ISSN:** 2090-0740, 2022

## INTRODUCTION

The goal of Rhinoplasty surgery is to provide a normal and aesthetic nasal appearance while preserving the nasal functions<sup>[1]</sup>. There are considerable differences in skin type and thickness, dorsal hump height and width, as well as connection of the dorsal hump to the other defining profile characteristics. Each of these aspects must be considered during the planning and implementation of dorsal hump reduction<sup>[2]</sup>. The reduction of the dorsal hump is frequently the principal aim for patients seeking rhinoplasty, numerous reconstruction procedures, including spreader grafts, flaps, osteotomies, as well as camouflage operations, have already been used to correct the open roof deformity following nasal hump reduction surgery<sup>[3]</sup>. The hump reinsertion technique was first described by /Skoog (1966)<sup>[4]</sup>. A modification of the Skoog technique was introduced by Hall *et al.*, 2004 which achieves simultaneous dorsal reduction, open roof correction with preservation of the middle nasal vault and natural contouring of the nasal dorsum<sup>[5]</sup>. Hump reinsertion is a graft method that utilizes the hump that was removed as

an autologous transplant. The benefits of this approach include a smooth, stable dorsum that supports the internal nasal valves and reduces the operative time<sup>[6]</sup>.

## PATIENTS AND METHODS:

This study was a randomized controlled trial, with two parallel groups, conducted on forty patients with dorsal nasal hump deformity, from February 2020 to August 2021, in one university hospital and approved by the institutional review board (Approval code: MD-64-2020). Patients were randomized using sealed envelopes (1:1 allocation) into two groups: Group (A) included twenty patients underwent dorsal hump remodeling and reinsertion, while group (B) involved twenty patients subjected to hump resection with no dorsal grafting

### 2.1. Patient selection

Patients aging more than 18 years presented with dorsal nasal hump deformity were included. However, patients younger than 18 years old, patients with history of previous

nasal operation, patients with recent nasal trauma (of less than 3 months duration), patients with contraindications to general anesthesia or operation and combined deformity (crooked nose, nasal twist) were excluded.

## **2.2. Preoperative:**

Pre-operatively, patients were subjected to full history taking emphasizing on history of previous nasal trauma or surgery. Functional evaluation included subjective assessment using the NOSE scoring system and objective assessment using anterior active Rhinomanometry. Aesthetic evaluation included patient's assessment of their problem according to a Visual analogue scale (VAS) and photography.

The NOSE scoring system was based on asking the patient five questions regarding his nasal patency with the score on a scale from 0 (no problem) to 4 (severe problem). The result was obtained by multiplying the raw score by 5 to obtain a score from 100. Thus, a higher score indicated worse symptoms. Active Anterior Rhinomanometry was done to measure the nasal resistance using the Rhinomanometer (NR7D; Mercury electronics Scotland Ltd., Glasgow, UK.) present in our institution. The patients were asked to score their nasal deformity according to a Visual analogue scale (VAS) with score from 0 (severe deformity) to 4 (no deformity).

All surgeries for both groups were performed by the same surgeon.

## **2.3. Technique**

Under hypotensive general anesthesia, the patient was placed in a slightly reversed Trendelenburg's position. Operative planning and marking the important structures externally were done and infiltration by lidocaine 2% and 1:200,000 adrenaline injected into the nasal bridge, the alar cartilages, and the areas of the lateral in-fracture. The procedure began as a standard open rhinoplasty by means of a trans-columellar inverted V incision with bilateral standard marginal extensions. After exposure of the entire nasal dorsum, the dorsal hump was resected in one piece with a scalpel no. 11 used to separate the cartilaginous part of the hump (Figure 1). The bony part of the hump was divided with a Rubin straight osteotome with a tungsten-carbide rasp used to smoothen the bony surface after hump resection.

In group (A) patients, the hump was first denuded from any underlying soft tissues including the remnant of nasal septum and then reduced to the desired size. For the cartilaginous part, a scalpel no. 15 was used to remove the underlying soft tissue and for the bony part, a diamond burr was used to taper the edges of the hump (Figure 2). The remodelled hump was then reinserted on the patient

dorsum to ensure appropriate size. This gave the advantage of correction of any excess dorsal reduction over the incremental method of dorsal reduction surgery (Figure 3). With the dorsal soft tissues retracted, two non-absorbable 5.0 sutures were passed through the corresponding medial edges of the upper lateral cartilages with one suture at the cephalic end and the other at the caudal end of the upper lateral cartilage. Paramedian and lateral osteotomies were then performed only in cases of wide nasal dorsum. No osteotomies were performed in cases with a narrow nasal bridge as to avoid the related morbidity and complications. Septoplasty was then performed (if needed), with silicon nasal splints sutured on either side of the septum to stabilize the septum and prevent collapse of the hump. The hump was then placed into position under the arch created by the sutures (Figure 4). In group (B) patients, closure of the open book created by hump resection was done by medial and lateral osteotomies without any dorsal onlay grafting of any kind. After completion of the hump resection and closure of the open book created after dorsal hump resection, tip surgeries were tailored according to the patient's individual needs. All incisions were closed meticulously using 5/0 vicryl sutures with a light pack inserted. Steri-strips and a thermal splint were applied to keep the nasal bones in place. Post-operatively, all patients were given non-steroidal anti-inflammatory drug in the form of ibuprofen (400 mg tab as needed for ten days) and a low dose steroid in the form of prednisone (5mg tab twice daily for 5 days then tapered to once daily for another 5 days). Nasal packs were removed after one day and patients were discharged from the hospital and the external nasal splint was removed after 14 days.

## **2.4. Postoperative**

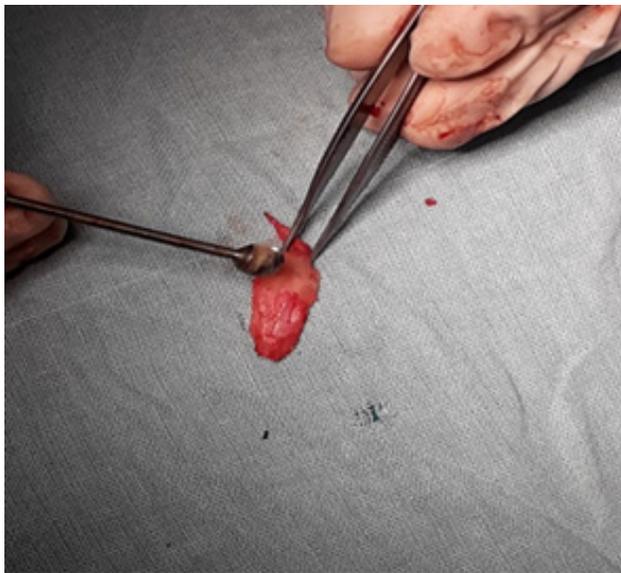
Post-operatively, assessment was done by NOSE scores and VAS scale (at 1 month follow up), and by active anterior rhinomanometry and digital photography (at 3 months follow up). By using preoperative and postoperative photographs with dimensions adjusted (interpupillary distance = 3.7 mm), the postoperative dorsal width and ventral width was measured to the closest mm. Analysis of the frontal view of the nose was carried out by comparing the change in dorsal and the ventral width of the nasal pyramid, both at the level of the medial canthi and at the level of the inferior margin of the orbital rim (Figure 5).



**Fig. 1:** Cartilaginous hump resection.



**Fig. 3:** Assessment of the remodelled hump before insertion.



**Fig. 2:** Remodelling of the bony hump.



**Fig. 4:** Dorsal hump secured in place using sutures.



**Fig. 5:** Pre-operative (left) and post-operative (right) assessment of the frontal view at inter-canthal line level (blue dashed line) and at inferior orbital rim level (orange dashed line). Black arrow: dorsal inter-canthal width, Violet arrow: ventral inter-canthal width, Light blue arrow: dorsal infra-orbital width, Dark blue arrow: ventral infra-orbital width.

**Statistical Analysis:**

Data were coded and entered using the statistical package SPSS version 25. Data was summarized using mean and standard deviation for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using unpaired t test. For comparing categorical data, Chi square ( $\chi^2$ ) test was performed. Exact test was used instead when the expected frequency is less than 5. *P-values* less than 0.05 were considered as statistically significant.

**RESULTS:**

In this study, ages ranged from 19 to 39 with a mean of  $25 \pm 5$  SD years in group (A) and  $27 \pm 5$  SD years in group (B) which was statistically insignificant ( $P=0.1$ ). Regarding sex distribution, group (A) included 10 males and 10 females while group (B) had 8 males and 12 females with statistically insignificant ( $P=0.5$ ) (Table A).

Regarding the cause of the nasal hump 35 of our patients (87.5%) gave history of nasal trauma while 5 of our patients (12.5%) had dorsal hump not associated with trauma.

Both groups showed significant improvement in NOSE scores postoperatively, there was a superiority in group A for improving the nasal function subjectively with a statistically significant difference ( $P=0.005$ ) (Table B).

When analyzing the improvement in postoperative patient's satisfaction scores measured by VAS, there was statistically significant difference between both groups ( $P= 0.004$ ), with group (A) patients found to be more superior in the improvement of VAS (Figure 6).

The improvement of nasal function as measured objectively by rhinomanometry was found to be of none significance between study groups with a p value of 0.246 and 1 for inspiration and expiration respectively (Table C).

When comparing changes in measures of postoperative frontal view, there was more effective narrowing in dorsal width in both levels noted after hump remodeling group (Figure 7) in expense of the ventral width level of medial canthus which was excessively widened while in hump resection group narrowing was noted more in ventral width in both levels while the dorsal width was widened (Figure 8).

Analysing the need for lateral osteotomy using Chi-square test showed statistically significant difference between both groups ( $P= 0.001$ ). Five patients (25%) in group (A) needed lateral osteotomy to narrow the excessively wide nasal dorsum in contrast to group (B) where all the twenty patients (100%) needed lateral osteotomy for closure of the open roof after hump reduction (Table D).

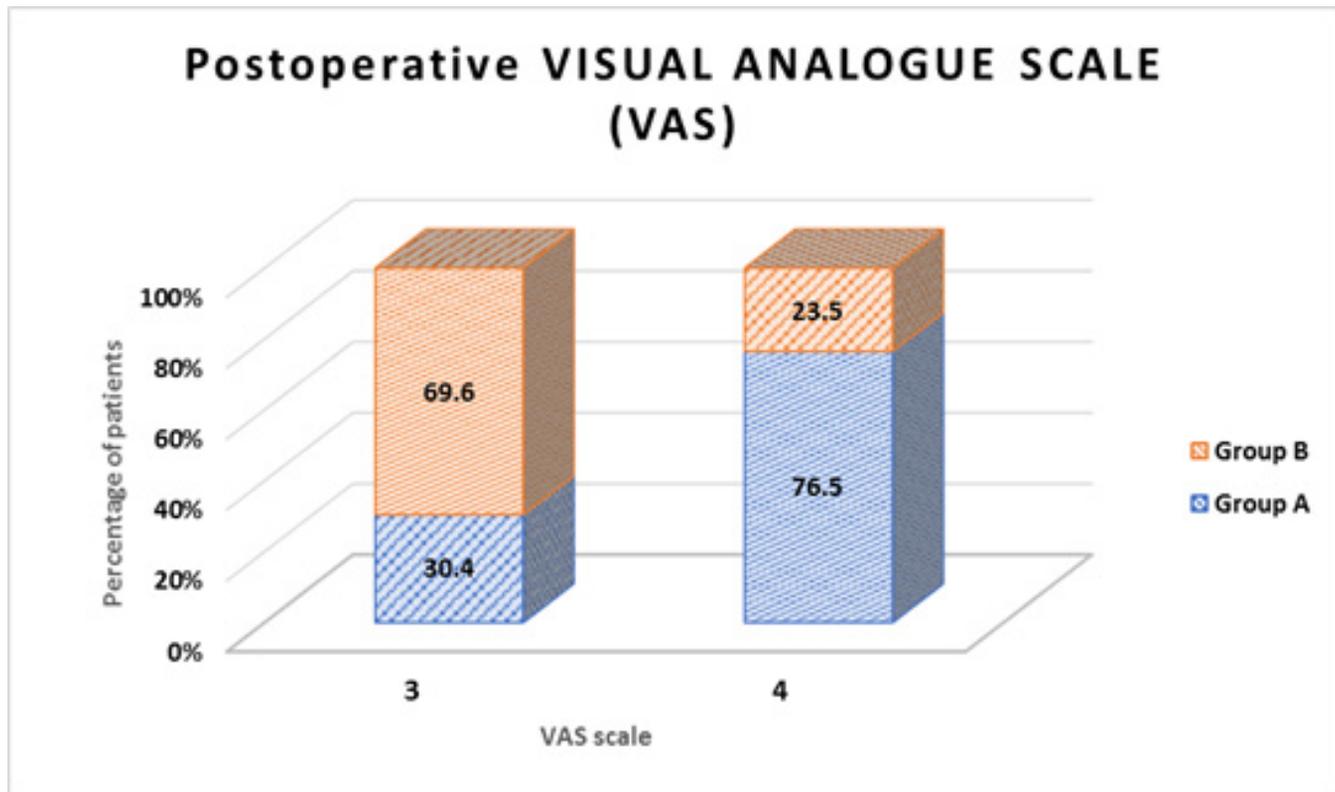
None of the patients in either group had postoperative complications in the form of epistaxis or major nasal deformity. One patient in group A had moderate periorbital edema and ecchymosis which persisted for 3 months postoperative and resolved with prolonged medical treatment in the form of tapered low dose systemic steroids. Two patients in group B had bilateral nasal obstruction which persisted for 2 and 4 months respectively and resolved with prolonged medical treatment in the form of alkaline nasal wash and frequent suctioning of nasal crusting (Figure 9).

**Table A:** Age and sex distribution.

	Group A		Group B		T	P
Age (in years) Mean± S.D.						
Range	25 ± 5 19 - 38		27 ± 5 20 - 39		-1.474	0.149
Sex	N	%	N	%	$\chi^2$	
Males	10	55.6	8	44.4	0.404	0.525
Females	10	45.5	12	54.5		
<i>t: Independent Samples t-test      <math>\chi^2</math>: Chi-square test</i>						

**Table B:** Postoperative NOSE score among study groups.

Postoperative	Group A		Group B		t	P
Nose score						
Mean± S.D.	23.0	±	5.0	27.5	±	4.4
Range	15.0	-	30.	20.0	-	35.0
<i>t: Independent Samples t-test      *: statistically significant</i>						

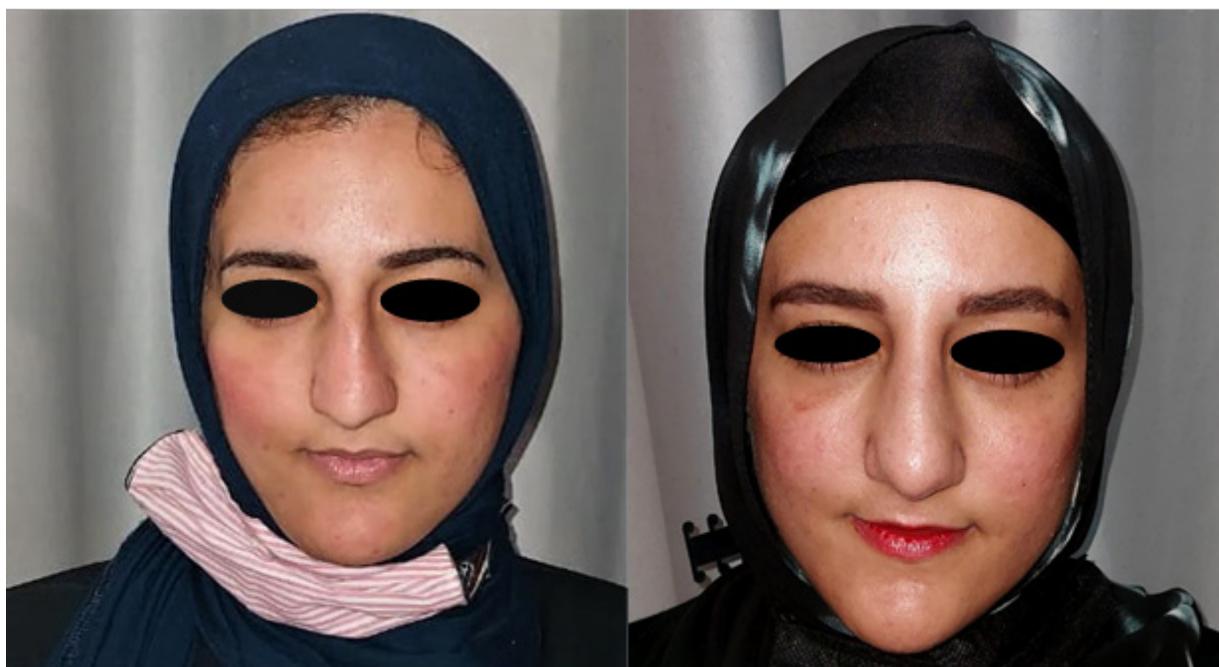


**Fig. 6:** Postoperative Visual analogue score (VAS) among study groups.

**Table C:** Postoperative anterior rhinomanometry among study groups.

Anterior rhinomanometry	Group A	Group B	T	P
Inspiration Mean± S.D.	0.3 pa/ml/sec ± 0.1 pa/ml/sec	0.4 pa/ml/sec ± 0.1 pa/ml/sec	-1.178	0.246
Range	0.2 - 0.5	0.2 - 0.5		
Expiration Mean± S.D.	0.2 pa/ml/sec ± 0.1 pa/ml/sec	0.2 pa/ml/sec ± 0.1 pa/ml/sec	0.001	1
Range	0.1 - 0.3	0.1 - 0.3		

*t: Independent Samples t-test*



**Fig. 7:** Pre-operative (left) and post-operative (right) after hump remodeling.



Fig. 8: Pre-operative (left) and post-operative (right) after hump resection.

Table D: Comparison between both groups regarding lateral osteotomy.

Lateral osteotomy	Group A		Group B		$\chi^2$	P
	N	%	N	%		
Yes	5	25.0	20	100.0	24.000	0.001*
No	15	75.0	0	0.0		

$\chi^2$ : Chi-square test      \*: statistically significant

## Complications

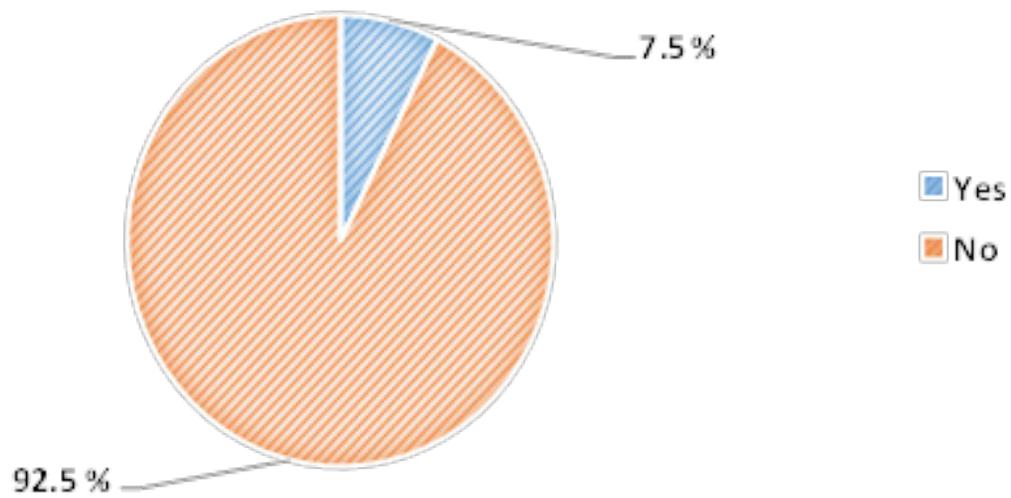


Fig. 9: Postoperative complications among study groups.

## DISCUSSION

A dorsal profile that is aesthetically attractive is a primary characteristic of nose beauty<sup>[7]</sup>. The dorsal hump reduction can be performed in either an en bloc or gradual fashion<sup>[8]</sup>.

Regnault and Alfaro<sup>[9]</sup> in 1980 performed the hump reinsertion technique in a large series of 305 patients. Fifty percent of them had large and crooked noses. All were operated through the closed approach. Eighty nine percent of the patients were satisfied with the result and 2% required a revision mostly because of the visibility of the graft. They concluded that the graft act as internal splint with a very natural dorsal appearance, but graft visibility or palpability was a problem in minority of patients.

We used in our study the hump remodeling and reinsertion technique in group (A) patients with suturing of the reinserted hump to the Upper Lateral Cartilages (ULCs). The technique used was consistent with Costantinidis and Frympas<sup>[10]</sup> in 2016 who found that the procedure allowed reduction of an obtuse naso-frontal angle provided that a long hump with a significant bony segment was resected. Another advantage for hump reinsertion is that it is useful as a rescue procedure in case of excessive dorsal resection. However, it has some minor disadvantages of prolongation of the operative time compared to hump resection without dorsal grafting. Another disadvantage noted by some patients is the visibility and palpability of the reinserted hump.

In our study, objective assessment of nasal function was done active anterior rhinomanometry. The mean nasal airway resistance decreased significantly from 0.5 Pa/mL/sec to 0.3 Pa/mL/sec during inspiration and from 0.4 Pa/mL/sec to 0.2 Pa/mL/sec during expiration regarding group (A) and from 0.6 Pa/mL/sec to 0.4 Pa/mL/sec during inspiration and from 0.4 Pa/mL/sec to 0.2 Pa/mL/sec during expiration regarding group (B). The difference was not significant when comparing both groups with each other with a p value of 0.246 and 1 for inspiration and expiration respectively.

Regarding group (A), the authors could not find a literature review showing the effect of hump reinsertion on nasal function. To our knowledge, this is the first study for objective evaluation on hump reinsertion on nasal function. Regarding group (B), our results were similar to Tugrul *et al.*, 2019<sup>[11]</sup> in a study of the effect of reductive rhinoplasty on nasal function. They found in their study of 415 patients that the mean airway nasal resistance by rhinomanometry improved significantly from 0.42 pa/ml/sec preoperatively to 0.31 pa/ml/sec postoperatively with a p value of 0.005.

In our study analyzing photography in frontal view was done for objective assessment of the esthetic outcome. When comparing changes between both groups in measures of postoperative frontal view, there is more effective narrowing in dorsal width in both levels noted after hump remodeling group in expense of the ventral width level of medial canthus which was widened (this is probably because suturing the reinserted hump on the ULCs) while in hump resection group narrowing was noted more in ventral width in both levels while the dorsal width was widened.

Regarding group (A), our results were consistent with Giacomini *et al.*<sup>[12]</sup> in 2019 who analyzed the impact of hump re-insertion without osteotomy and hump resection with osteotomy on the frontal view. Results showed that hump reinsertion allowed narrowing of the dorsal aspect of the upper two thirds of the nasal dorsum while the use of hump resection and lateral osteotomy is effective in narrowing the ventral aspect of the middle third of the nasal dorsum. Regarding the ventral width in the hump re-insertion group, the results showed excessive widening at level of medial canthus from 1.2 cm to 1.7 cm (which was like our study). This excessive widening of the ventral width in our study is probably because of re-inserted hump and less use of lateral osteotomies in this group.

Regarding group (B), Kortbus *et al.*, 2006<sup>[13]</sup> showed similar results in their study of quantitative analysis following hump reduction and lateral osteotomy. Results showed narrowing of the ventral width of the nose with statistical significance while dorsal width of the nose is maintained despite expectations that it might widen (dorsal width was widened in our study) following reduction rhinoplasty and lateral osteotomy. This mild widening in dorsal width in our study is probably because of hump reduction and lateral osteotomy without the addition of medial oblique osteotomy in most of the cases (which is expected to narrow the dorsal width). Gruber *et al.*<sup>[14]</sup> in 2016 concluded that reduction of the nasal dorsal width is facilitated by a medial oblique osteotomy alone if it is placed at the lateral aspect of the apex of the open roof.

The main cause of postoperative edema and ecchymosis in rhinoplasty is soft tissue injury during osteotomy. The severity of edema and ecchymosis depends on the degree of soft tissue and vessels injury during subperiosteal de-gloving of nasal dorsum and during osteotomies<sup>[15]</sup>. In our study, we found that hump reinsertion technique decreased the need for lateral osteotomies (so minimize the post-operative edema and ecchymosis) with statistically significant difference and a p value of 0.001. Five patients (25%) in group (A) needed lateral osteotomy to narrow the excessively wide nasal dorsum in contrast to group

(B) where all the twenty patients (100%) needed lateral osteotomy for closure of the open roof after hump reduction. The short period for the follow up was a limiting factor in our study. Further studies are warranted to confirm our preliminary results on the long term.

## **CONCLUSION**

---

Hump remodeling and re-insertion technique is more superior in the esthetic outcome with more natural looking dorsum and narrowing of the dorsal nasal width. The technique is useful for re-shaping the nasal width and profile with a persistent and harmonious correction of the dorsal frontal dimension of the nose. This allows maintaining the natural narrow nasal root with good esthetics, function, and low local morbidity. Additionally, it decreases in the need for osteotomies and avoiding their consequences. Hump reinsertion is useful as a rescue procedure in case of excessive dorsal resection. The re-inserted graft prevents the inward collapse of the ULCs, and the sutures prevent displacement of the graft and increase the nasal valve angle.

## **ETHICAL**

---

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all individual participants included in the study.

## **CONFLICT OF INTEREST**

---

There are no conflicts of interest.

## **REFERENCES**

---

1. Ansari, K., Asaria, J., Hilger, P., & Adamson, P. A. (2008). Grafts and implants in rhinoplasty-techniques and long-term results. *Operative Techniques in Otolaryngology-Head and Neck Surgery*, 19(1), 42-58.
2. Azizzadeh, Babak, and Michael Reilly (2016). Dorsal Hump Reduction and Osteotomies. *Clinics in plastic surgery* 43, no. 147.
3. Taş, B. M., & Erden, B. (2020). Comparison of nasal functional outcomes of let down rhinoplasty and open technical rhinoplasty using spreader graft. *European Archives of Oto-Rhino-Laryngology*, 1-7.
4. SKOOG, T. (1966). A method of hump reduction in rhinoplasty: a technique for preservation of the nasal roof. *Archives of Otolaryngology*, 83(3), 283-287.
5. Hall, J. A., Peters, M. D., & Hilger, P. A. (2004). Modification of the Skoog dorsal reduction for preservation of the middle nasal vault. *Archives of facial plastic surgery*, 6(2), 105-110.
6. Öztürk, G. (2020). A Novel Hump Reinsertion Technique to Reconstruct the Nasal Dorsum. *Journal of Craniofacial Surgery*, 31(3), 737-740.
7. Barrett, D. M., Casanueva, F., & Wang, T. (2017). Understanding approaches to the dorsal hump. *Facial Plastic Surgery*, 33(02), 125-132.
8. Sykes, J. M., Tapias, V., & Kim, J. E. (2011). Management of the nasal dorsum. *Facial Plastic Surgery*, 27(02), 192-202.
9. Regnault, P., & Alfaro, A. (1980). The Skoog rhinoplasty: a modified technique. *Plastic and reconstructive surgery*, 66(4), 578-590.
10. Constantinidis, J., & Fyrmpas, G. (2016). Reinserting the hump in primary rhinoplasty: the gain is three-fold. *Plastic and Reconstructive Surgery Global Open*, 4(10).
11. Tugrul, S., Dogan, R., Hassouna, H., Sharifov, R., Ozturan, O., & Eren, S. B. (2019). Three-Dimensional Computed Tomography Volume and Physiology of Nasal Cavity After Septorhinoplasty. *Journal of Craniofacial Surgery*, 30(8), 2445-2448.
12. Giacomini, P. G., Boccieri, A., Fuccillo, E., Di Mauro, R., & Di Girolamo, S. (2019). Lateral osteotomy plus hump resection vs hump re-modeling without lateral osteotomy: impact on frontal nasal view. *Acta Otorhinolaryngologica Italica*, 39(2), 92.
13. Kortbus, M. J., Ham, J., Fechner, F., & Constantinides, M. (2006). Quantitative analysis of lateral osteotomies in rhinoplasty. *Archives of facial plastic surgery*.
14. Gruber, R. P., Garza, R. M., & Cho, G. J. (2016). Nasal Bone Osteotomies with Nonpowered Tools. *Clinics in plastic surgery*, 43(1), 73-83.
15. Taşkın, Ü., Batmaz, T., Erdil, M., Aydın, S., & Yücebaş, K. (2017). The comparison of edema and ecchymosis after piezoelectric and conventional osteotomy in rhinoplasty. *European Archives of Oto-Rhino-Laryngology*, 274(2), 861-865.

**Journal Name : EJENTAS**  
**Article No:EJENTAS-2201-1465**  
**Queries and Remarks**

<b>Query No</b>	<b>Details Required</b>	<b>Author Responses</b>
Q1	A running head short title was not supplied; please supply a short title of up to 40 characters that can be used	