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ORIGINAL ARTICLE

Different Approaches for Lateral Osteotomy in Rhinoplasty: A prospective study

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Abstract

Background: ***Rhinoplasty is the most prevalent cosmetic procedure performed globally. Lateral osteotomy is a part of rhinoplasty that is achieved at the end of it and following modification of the nasal hump and tip.***

Aim and objectives: ***To assess the significance of postoperative edema and ecchymosis of different approaches for lateral osteotomy in rhinoplasty and to evaluate the learning curve and operative time to each approach.***

Patients and methods: ***This prospective research was done on 21 cases with primary nasal deformity who underwent one of three approaches: Transcutaneous perforating lateral osteotomy, Endonasal continuous lateral osteotomy or Visible lateral osteotomy in the university hospitals, Faculty of Medicine, Al-Azhar university and private clinics.***

Results: ***There was no significant variance among the three approaches concerning complications. There was a significant improvement in the 3 approaches, which increased over time. In the Transcutaneous approach, the operative time was 2.6 ± 0.1. Four patients had fast, two with medium and 1 with a slow learning curve. In the Endonasal approach, the operative time was 3.4 ± 0.2. One patient had a fast, six had a medium, and 0 had a slow learning curve. In the visible approach, the operative time was 4.6 ± 0.4. Two patients had a fast learning curve, one had a medium, and 4 had a slow learning curve.***

Conclusion: ***Transcutaneous, Endonasal and Visible lateral osteotomy can be effective techniques for rhinoplasty, and osteotomy type did not affect edema and ecchymosis and should follow a general rule.***

Keywords: Lateral Osteotomy; Rhinoplasty; Ecchymosis

1. Introduction

Globally, rhinoplasty is the most prevalent cosmetic procedure. Although this procedure employs a variety of techniques, the process is similar. Lateral osteotomy, a significant component of rhinoplasty, is typically performed after modifiable nasal hump and tip procedures.[1,2]

Osteotomy of the nasal bones, the least controllable stage of rhinoplasty, is among the most hazardous procedures. The primary indications for osteotomy consist of correcting open roof deformity after the removal of the nasal hump, as well as crooked nose and broad dorsum correction.[3,4]

Lateral osteotomy, which demands a great deal of energy from both the hard and soft tissues of the nose, must be performed with stability and without any unwanted changes. Rees and Ford approved external osteotomy on account of its less severe trauma on soft tissues, mucous membranes, and periosteum.[5,6]

Bruising and swelling are two frequent symptoms seen soon after rhinoplasty. They may be difficult for the doctor and patient to use and restrict the precise assessment of the result after surgery. Potential patients may even avoid rhinoplasty because of these squeals.[7] Reducing edema and ecchymosis has been the subject of several therapies and concepts, with mixed results. Intraoperative hypotension, nasal packing, ice packs, administration of corticosteroids, tranexamic acid, decongestants, fibrin sealants, lidocaine with epinephrine, and herbal agents like arnica Montana, papain & a-chymotrypsin are all part of the medical treatment plan. Postoperative head elevation and drainage tubes are also given. Some of the surgical changes that have been suggested include changing the order of osteotomies, utilizing a diamond burr or a sharp guarded micro-osteotome, maintaining the periosteal connection, and performing either an external or internal perforated or continuous lateral osteotomy.[8,9]

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This work aimed to assess the significance of postoperative edema and ecchymosis in different approaches for lateral osteotomy in rhinoplasty and to evaluate the learning curve and operative time of each approach.

2. Patients and methods

This prospective research was done on 21 cases with primary nasal deformity who underwent one of three approaches: transcutaneous perforating lateral osteotomy, Endonasal continuous lateral osteotomy, or Visible lateral osteotomy in the university hospitals, Faculty of Medicine, Al-Azhar University, and private clinics.

Inclusion criteria: Primary rhinoplasty, age: 21-50 years and sex: male and female cases.

Exclusion criteria: Revision or 2ry cases, patient with comorbidities (cardiovascular, DM, bleeding diathesis…etc. and the use of continuous medications as anticoagulants, etc.), previous nasal trauma and any psychological issues.

Follow-up: All patients were followed up for up to six months during wound healing and complication management.

Ethical Consideration: The Institutional Review Board of AL-Azhar University's Department of Plastic and Reconstructive Surgery approved the study protocol. Each participant in the trial provided informed written and oral agreement, which included information about the risks of surgery, donor site morbidity, and flap failure. Confidentiality and personal privacy were protected at every stage of the study.

Methods:

All patients received general anaesthesia. Proper sterilization and draping techniques were used in the surgical area.

Transcutaneous perforating lateral osteotomy: Infiltrate the outside and inside of the nasal cavity with 2 millilitres of a solution containing 1% lidocaine and 1:100,000 epinephrine. Wait 5–7 minutes before making an incision. Insert a sharp 2-mm osteotome percutaneously into the bony nasal pyramid's midpoint, parallel to the maxillary horizontal surface, at the inferior orbital rim and nasofacial junction level. Utilizing a subperiosteal plane, move the osteotome laterally down the frontal process of the maxilla and the lateral nasal sidewall to the site of the original osteotomy, being careful not to damage the angular artery. Position the osteotome at an angle so that one edge strikes the bone and strikes it with the mallet to obtain maximum force per centimetre squared while minimizing damage. At that moment, the desired result is signalled by a shift in both sensation and sound. Many osteotomies are performed along a line that extends from the pyriform aperture to the nasofrontal junction and back to the dorsum, with 2 mm intervals between each. Proceed with the opposite nasal wall using the same method. Osteotomies should be done inside the percutaneous puncture site to prevent ecchymosis and vascular damage and to keep soft tissues retracted. In order to properly utilize an internal osteotome, one must rely on one's "feel." When removing the osteotome, be careful not to sever the angular arteries; instead, sweep downward. To control bleeding and prevent ecchymosis after surgery, apply pressure from side to side. Once the bilateral osteotomies have been finished, the nasal bones will be repositioned by performing a greenstick fracture. Gently press the thumb and forefinger together for this task. If further pressure is needed, insert the osteotome again and check for ample spaces between perforations along the line of the prior osteotomy. Avoid stitching the osteotomy incisions. Alternatively, utilize a metal contoured dorsal compression splint for one week and cover the areas with flesh-colored Steri-strips (Seaway Surgical, Toledo, OH).

Endonasal continuous lateral osteotomy: Use 2 mL of 1% lidocaine and 1:100,000 epinephrine to infiltrate the lateral nasal sidewalls externally and intranasally. Allow 5 to 7 minutes to pass prior to incising. Patients received an endonasal low to high continuous lateral osteotomy utilizing a 4 mm curved guarded osteotome. A marking pen defined the anticipated osteotomy line to ensure an exact path of the osteotomy. The periosteum was lifted, and the osteotome was engaged and moved along the sulcus of the frontal process of the maxilla (nasofacial groove) with a tapping stroke of the mallet. The osteotome was softly curved medially as it neared the infraorbital rim, then continued superiorly until it reached the intercanthal line. Similar measures were taken on the opposite side. After the nasal bones were fully mobilized, digital pressure was utilized to ensure appropriate alignment.

Figure 1. Endonasal lateral osteotomy along the nasofacial groove.

Visible lateral osteotomy: For external and intra nasal infiltration, use 2 milliliters of a solution containing 1% lidocaine and 1:100,000 epinephrine. Wait at least 5 to 7 minutes before

making any cuts. The dissection was performed through the subperichondrium to preserve the maximum soft tissue on the skin flap. Caution was exercised throughout the subperiosteal raising from the Keystone region to prevent damage to nearby vessels. The subperiosteal dissection was continued along the frontal processes of the maxilla and the lateral nasal wall. We performed a subperiosteal dissection somewhat laterally to the intended osteotomy line for better field visibility during surgery. The osteotomy site could be seen clearly after drawing back the skin envelope of the nose and the lower lateral cartilage. First, we utilized a 2 mm straight, unprotected osteotome to perform a medial oblique osteotomy at an angle of 15° to 20°. Next, the predetermined osteotomy line executed the internal perforating lateral osteotomy, ensuring that the osteotome was held perpendicular to the bone as was practically possible. The osteotomy was done carefully not to harm the Webster's triangle at the distal two-thirds point of the lateral side wall. The osteotomy was performed upward by the low-to-high method. We were cautious not to harm the intranasal mucosa beneath the nasal bone to maintain a solid and vascular bony stump. The lateral osteotomy was performed more appropriately thanks to the direct view, maintaining the intranasal mucosa and adjacent vasculature, including the angular and lateral-nasal arteries. Terminating the lateral osteotomy at the point where it joined the medial osteotomy was common practice. Applying gentle pressure with a finger to induce an inward fracture was the next step after repeating the technique on the other side. Specifically, direct vision allowed for the precise repositioning of the nasal bones according to the surgical plan by revealing a bony gap around 1-2 mm inward and retaining intranasal mucosa. When needed, we utilized other conventional techniques, such as tip plasty augmentation or rasping the uneven margins of the bone. The periosteum incision was made 2-3 mm lateral to the intended osteotomy spot to allow direct site visualization visualization. The targeted fracture line was visible under direct vision, and the bone stump and vasculature were stabilized by the intact intranasal mucosal lining, which also acted as a splint.

Postoperative:

Early Phase: (2Weeks)

Removal of: Pack after 24-36 hours, septal stent after 10 days, tap after 10-15 days and cast after 10-15 days.

Evaluation: Aesthetic outcome, early complications, edema and ecchymosis, late complications, operative time and learning curve.

Subjective: On 2nd and seventh days, using a scoring system modified by Kara and Gokalan.[10]

Objective: Skin-Soft Tissue Envelope Thickness at 1st and 3rd months by Ultrasonography.[11]

3. Results

Table 1 showed that the mean age was 26.7 ± 8.33. Males were 10(47.62%) while females were 11 (52.38%)

Table 1. Demographic data

Age, years	26.7 ± 8.33
Sex	
Male	10 (47.62%)
Female	11 (52.38%)

Data were expressed as mean (±) standard deviation (SD), or Numbers (N), and percentage (%)

Table 2 displayed that there was no significant variance among the 3 approaches concerning complication.

Table 2. Complications

	TRANSCUTANEOUS (N=7)	ENDONASAL (N=7)	VISIBLE (N=7)	P VALUE
INTRA OPERATIVE COMPLICATIONS				
NO	7	7	7	1
COMPLICATIONS				
STEP OFF	2	0	0	0.1
SCARE	2	0	0	0.1
ASYMMETRY	0	3	1	0.11
COLLAPSE	0	0	1	0.34
EARLY COMPLICATIONS AT 2^{ND} DAY				
EDEMA				
G1	3	2	0	0.30
G2	3	3	3	8
G3	1	2	4	
ECCHYMOSIS				
G1	4	2	0	0.18
G2	2	3	3	1
G3	1	2	4	
AT 7^{TH} DAY				
EDEMA				
G1	4	2	2	0.70
G2	3	4	4	2
G3	0	1	1	
ECCHYMOSIS				
G1	4	3	3	0.91
G2	2	2	3	1
G3	1	2	1	

Table 3 showed that there was high significant improvement in the 3 approaches which increase by time.

Table 3. Ultrasound results

TYPE OF LATERAL OSTEOTOMY	NASION				RHINON				TIP		
	Transcutaneous	Endonasal	Visible	P	Transcutaneous	Endonasal	Visible	P	Transcutaneous	Endonasal	Visible
PRE-OPERATIVE	2.05±0.2	1.93±0.22	2.12±0.21	>0.05	0.92±0.12	0.82±0.1	1.05±0.1	>0.05	1.21±0.32	1.33±0.3	1.33±0
ONE MONTH POST OP.	3.21±0.32	3.25±0.2	5.01±0.52	<0.001	1.53±0.16	2.01±0.22	2.51±0.43	<0.001	2.05±0.3	3.02±0.1	2.02±0
THREE MONTHS POST OP.	2.93±0.4	1.99±0.1	4.75±0.51	<0.001	1.12±0.4	1.82±0.19	2.32±0.27	<0.001	1.93±0.12	2.98±0.6	1.97±0
P VALUE	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001

Table 4 showed that in Transcutaneous approach, operative time was 2.6 ± 0.1. Four patients had fast, 2 patients had medium and 1 had slow learning curve. In Endonasal approach, operative time was 3.4 ± 0.2. One patient had fast, 6 had medium and 0 had slow learning curve. In visible approach, operative time was 4.6 ± 0.4. Two patients had fast learning curve, 1 had medium and 4 had slow learning curve

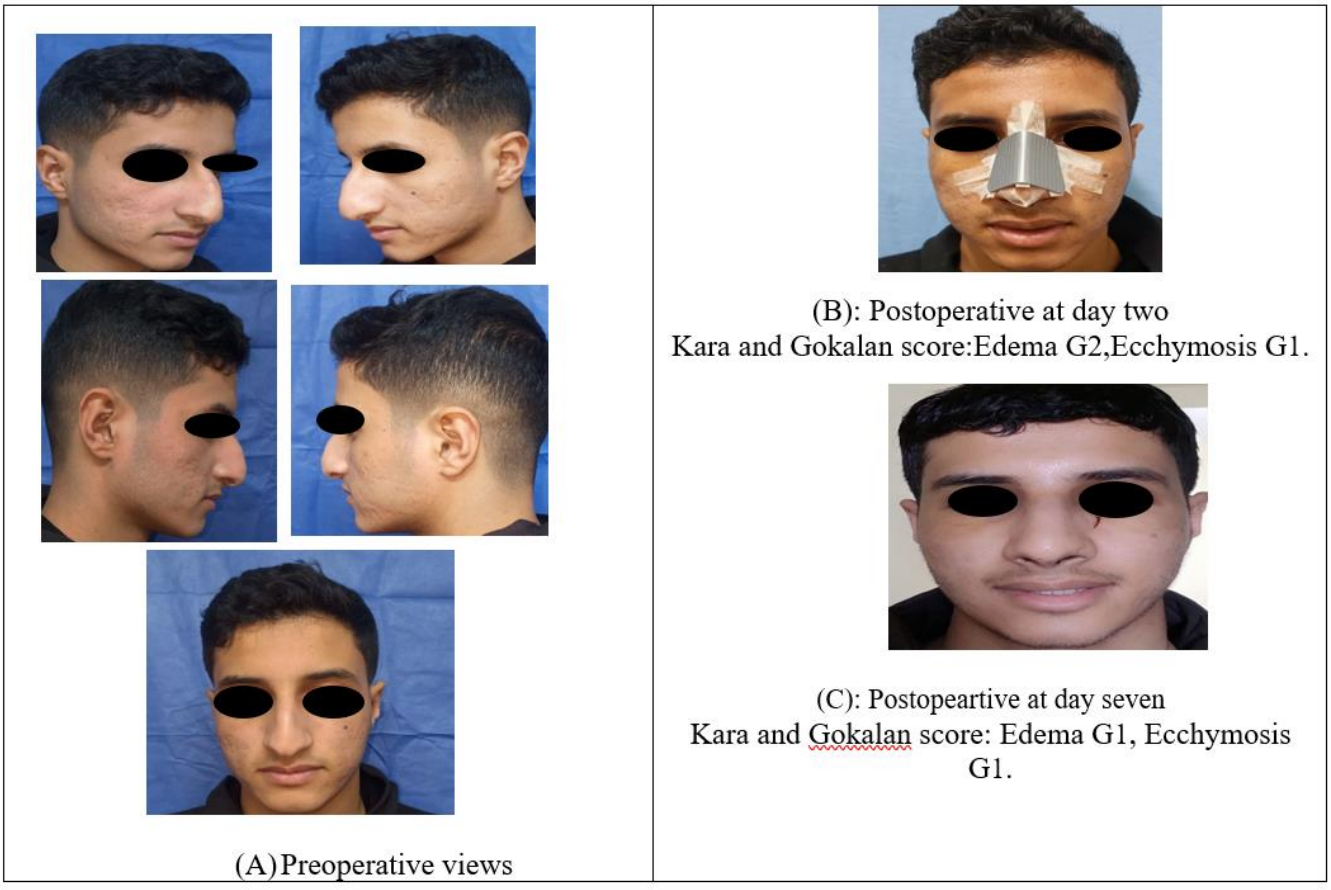
Table 4. Operative time and Learning curve

	TRANSCUTANEOUS (N=7)	ENDONASAL (N=7)	VISIBLE (N=7)	P VALUE
OPERATIVE TIME	2.6 ± 0.1	3.4 ± 0.2	4.6 ± 0.4	<0.001
LEARNING CURVE				
FAST	4	1	2	0.018
MEDIUM	2	6	1	
SLOW	1	0	4	

CLINICAL CASES

Case 1 (Transcutaneous approach)

Male patient 23 years old with deformed nose.

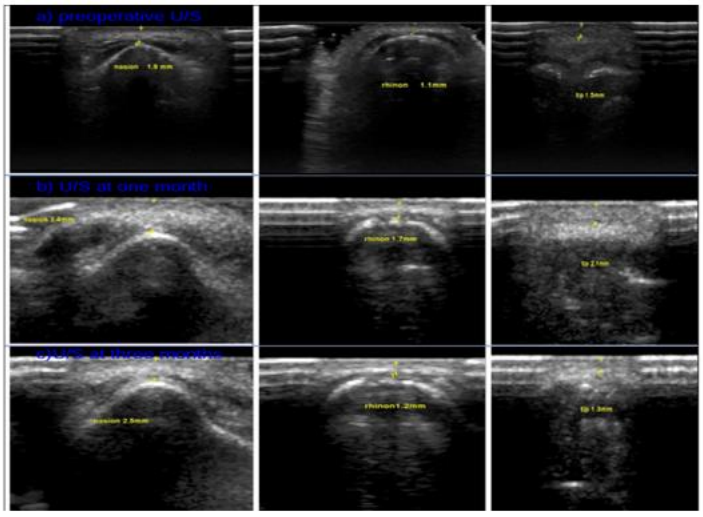


(A)Preoperative views

(B): Postoperative at day two
Kara and Gokalan score:Edema G2,Ecchymosis G1.

(C): Postopeartive at day seven
Kara and Gokalan score: Edema G1, Ecchymosis G1.

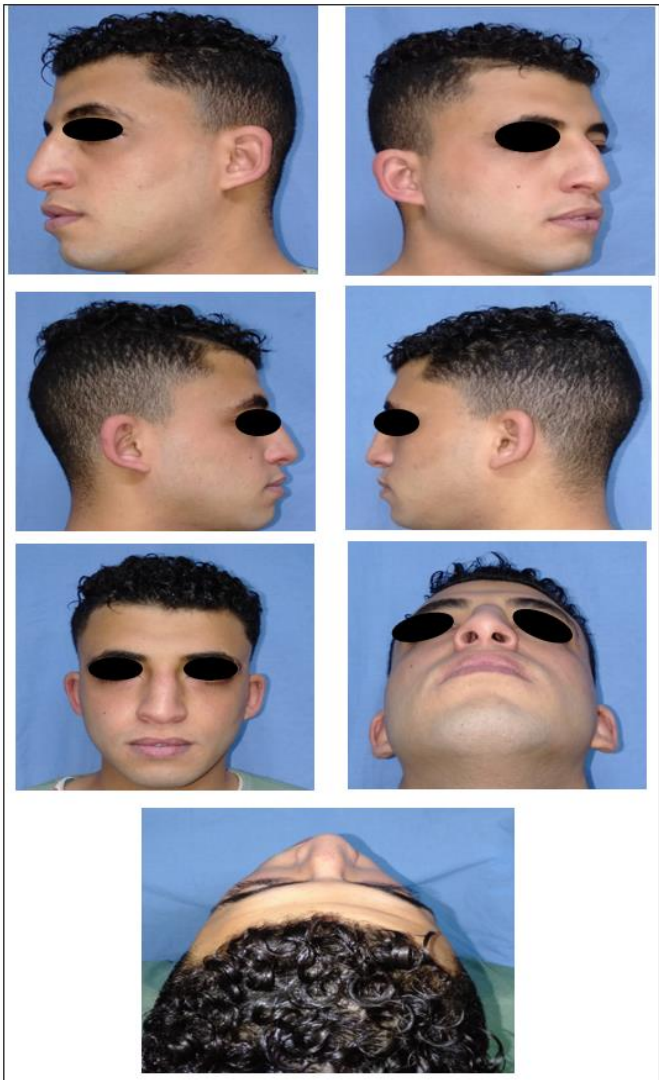
(D):Six months postoperative.



(D): Skin and soft tissue envelop thickness by Ultrasound (a)preoperative, (b)one month postoperative. (c) three months postoperative.

Figure 2. Photos of Case 1 (Transcutaneous approach)

Case 2: (Endonasal approach)
Male patient 24 years old with deformed nose.

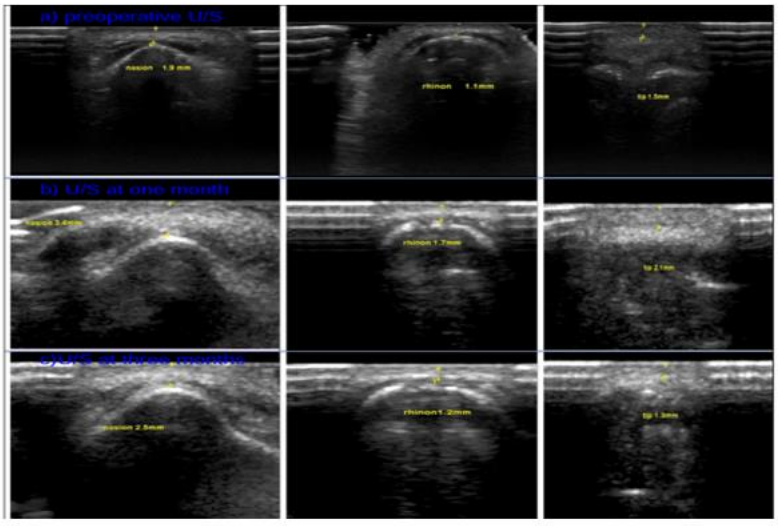


(A):Preoperative views

(B): Postoperative at day two.
Kara and Gokalan score: Edema G2, Ecchymosis G2.

(C): Postoperative at day seven.
Kara and Gokalan score: Edema G1, Ecchymosis G1.

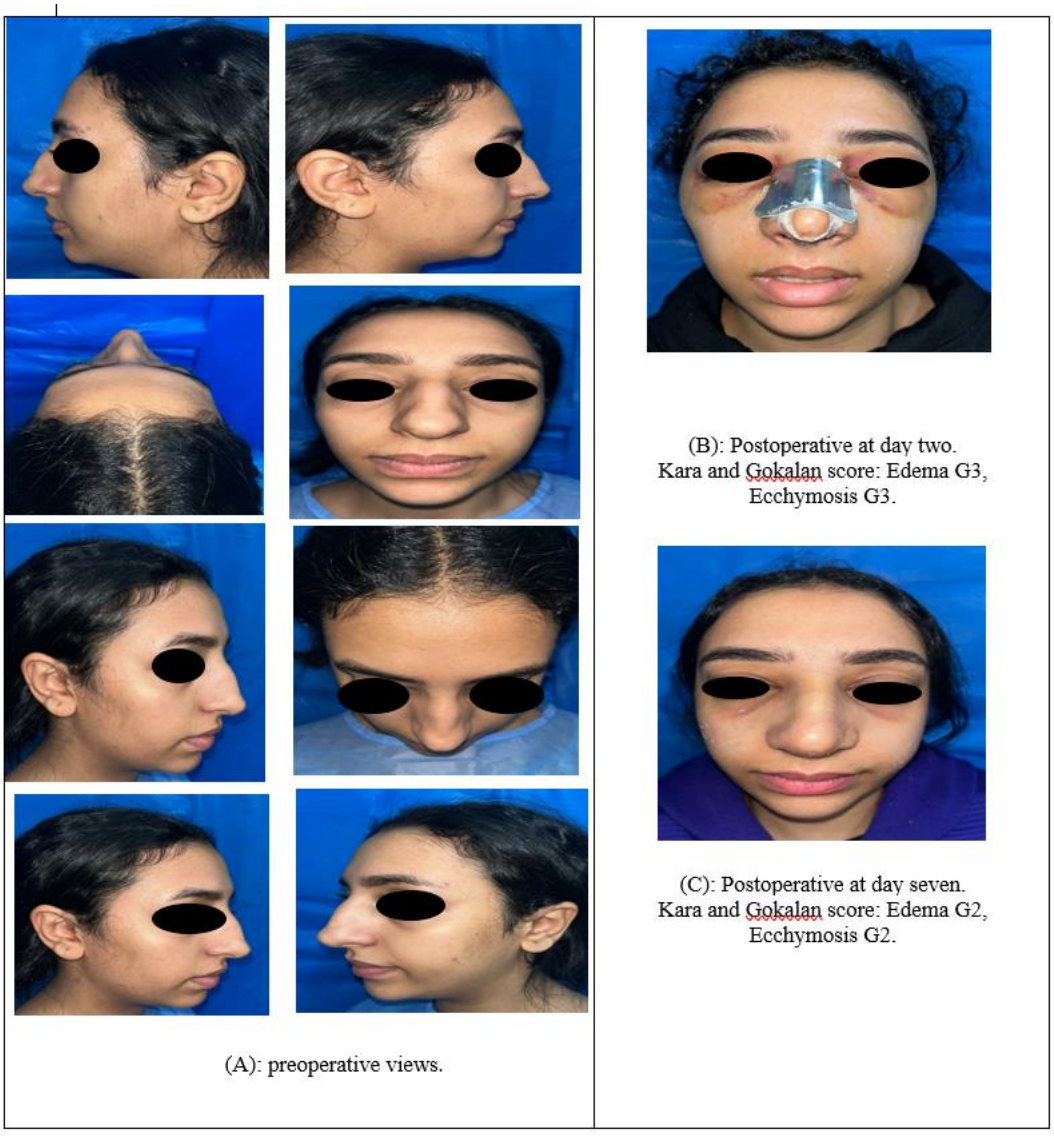
(D): Six months postoperative.



(D): Skin and soft tissue envelop thickness by Ultrasound (a)preoperative, (b)one month postoperative. (c) three months postoperative.

Figure 3. Photos of case 2 (Endonasal approach)

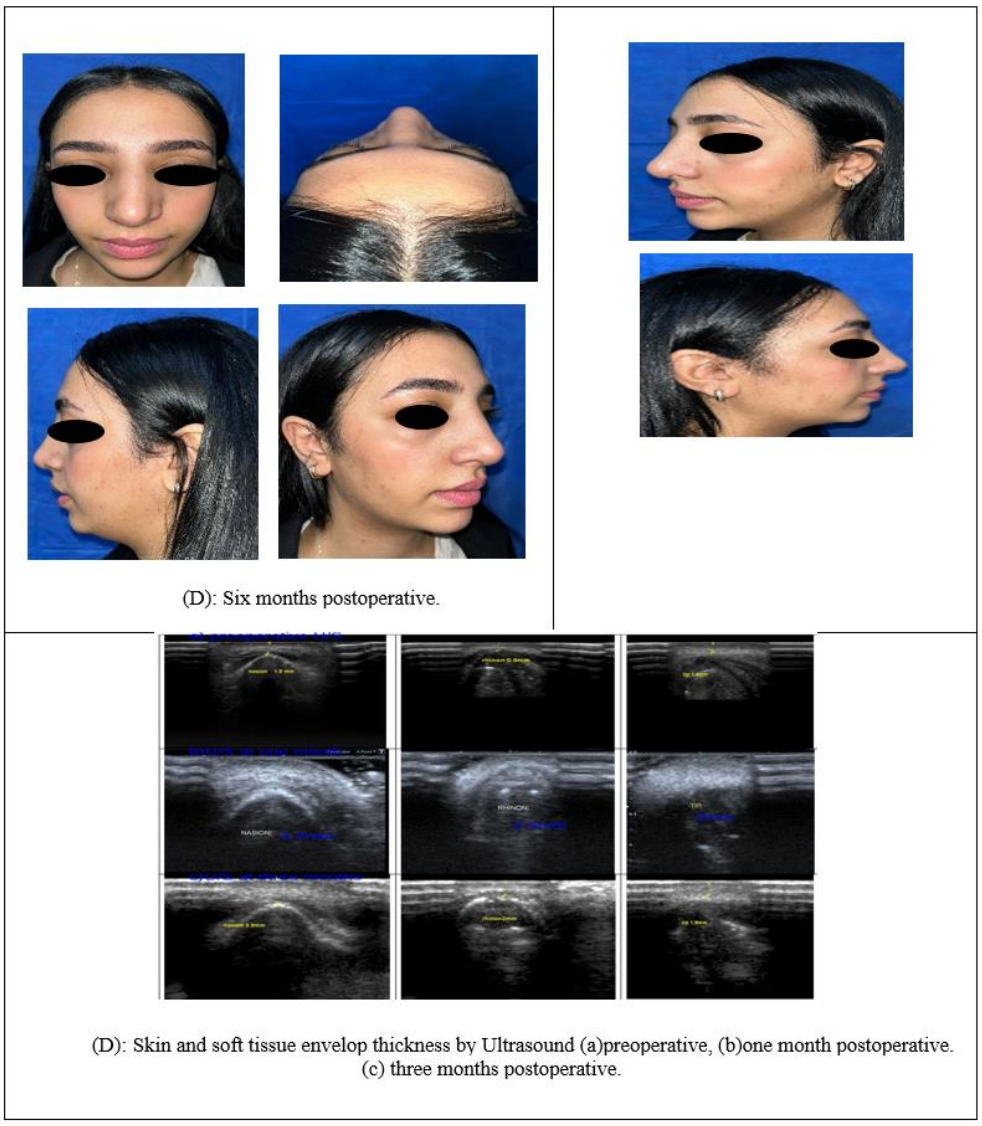
Case 3 (visible approach)
Female patient 23 years old with deformed nose



(A): preoperative views.

(B): Postoperative at day two.
Kara and Gokalan score: Edema G3, Ecchymosis G3.

(C): Postoperative at day seven.
Kara and Gokalan score: Edema G2, Ecchymosis G2.



(D): Six months postoperative.

(D): Skin and soft tissue envelop thickness by Ultrasound (a)preoperative, (b)one month postoperative. (c) three months postoperative.

Figure 4. Photos of case 3 (visible approach)

4. Discussion

The current research discovered that the study population's mean age was 26.7 ± 8.33 years; 11 (52.38%) cases were females, and 10 (47.62%) cases were males.

Similarly, our results align with those of Darwish et al.,[12], who stated that the mean age of their studied cases was 30 years, ranging from 18 to 48 years. 16 (80%) cases were females, and 4 (20%) cases were males.

The present research reported no statistically significant variance among the three approaches concerning complication.

Our results correlate with those of Motamed et al.,[13], who showed that the most prevalent ecchymosis on the first day was in grade one. On the first day, 29 (34.5%) from the external route and 35 (41.7%) from the internal route demonstrated grade 1 ecchymosis, with no significant distinction between the two techniques. The most prevalent ecchymosis on the third day was grade one. On the third day, 32 (38.1%) utilizing the external approach and 35 (41.7%) utilizing the internal route displayed grade 1 ecchymosis, with not a significant distinction between the two routes (p=0.34). The majority of patients had no ecchymosis on the seventh day. Seventy-three patients (86.9%) in the external route and 74 (88.1%) in the internal approach without ecchymosis, and no significant distinction existed in osteotomy type or ecchymosis.

The most prevalent oedema rate on the first day was in grade 2. On the first day, 36 (42.9%) in the external route and 40 (47.6%) in the internal route had grade 2 oedema, with no significant distinction between the two routes. The most prevalent oedema type on the third day was grade 2. On the third day, 38 (45.2%) in the external route and 39 (46.4%) in the internal approach had grade 2 oedema, and the oedema rate did not vary significantly among the two procedures (p=0.9). On the seventh day, oedema had mainly resolved, with 64 (76.2%) in the external type and 64 (76.2%) in the internal treatment experiencing no oedema. There was no significant distinction

in oedema between the two groups on the seventh day.

In contrast, our results disagreed with Abdulkareem & Hama,[14] who displayed that during the first eight days after the surgery, the percutaneous group experienced less periorbital oedema than the endonasal group, indicating a significant distinction in postoperative oedema among the two types of lateral osteotomies. They reported a significant variance between the two techniques concerning periorbital ecchymosis throughout the eight days following the operation. For example, less periorbital ecchymosis was detected in cases with a percutaneous group than in the endonasal group.

The current research showed a highly significant improvement in the three approaches, which increased over time.

Our findings are in line with those of Hernot et al.,[15], who revealed that esthetic improvement at the end of 6 months was evaluated with the patients by comparing the preoperative and postoperative photographs of the patients and assessing their satisfaction. They found that 36 patients of Group II were aesthetically and functionally more satisfied than 32 patients of Group I.

As regards the transcutaneous approach, we revealed that the mean operative time was 2.6 ± 0.1; 4 patients had fast learning curves, two patients had medium learning curves, and 1 had a slow learning curve. In the Endonasal approach, the mean operative time was 3.4 ± 0.2, 1 patient had fast learning curves, 6 had medium learning curves, and 0 had a slow learning curve. In the visible approach, the mean operative time was 4.6 ± 0.4, 2 patients had fast learning curves, 1 had medium learning curves, and 4 had slow learning curves.

Similarly, our results align with Hernot et al.,[15] who reported that the average surgery duration was ≤ 1½ h and surgeries beyond this time limit were considered prolonged. Of the 100 cases operated, 52 were completed within the average time limit, while 48 cases were prolonged. In Group I, 11 (22%) cases were of average duration, whereas 39 (78%) cases were prolonged. In Group II, 41 (82%) cases were of average duration, whereas 9 (18%) were prolonged.

4. Conclusion

Transcutaneous, Endonasal, and Visible lateral osteotomies can be effective, successful techniques for rhinoplasty. The osteotomy type did not affect edema and ecchymosis and should follow a general rule. Further study is required to further understand the variables that influence lateral osteotomy problems.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

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