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Research Paper

External VS Internal Lateral Osteotomy in Primary Open Rhinoplasty

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ABSTRACT:

BACKGROUND:

osteotomies are commonly used in rhinoplasty to improve irregularities in the brow- tip aesthetic line and correct open roof deformities (diastasis of the nasal bones) associated with bony dorsum reduction. They can be performed laterally, medially, or intermediately. Lateral osteotomy could be done through either internal (endonasal) or external (percutaneous) approaches depending on surgeon preference and experience.

OBJECTIVE:

Is to compare results between internal and external lateral osteotomy in primary open rhinoplasty in regard to post-operative ecchymosis and edema, mucosal tear, Bone alignment and irregularities, nasal patency and Scaring in the external approach.

PATIENTS AND METHODS:

60 patients underwent primary open rhinoplasty in otorhinolaryngology / head and neck surgery department in Al-Shaheed Ghazi Al-Hariri hospital for surgical specialties in medical city complex at Baghdad for period from first of October 2018 to first of October 2019. Twenty five patients underwent internal lateral osteotomy and 35 patients underwent external lateral osteotomy. Assessed preoperatively by detailed history, examination, photography and subjectively using NOSE and ROE scores. Then they were followed up regularly at 2nd and 7th day post-operative to evaluate edema and ecchymosis scoring according to the scoring system of Kara and Gokalan, mucosal tear also checked using endoscopy. Then seen at 1st, 3rd, 6th months to assess bone alignment and irregularities, nasal patency and scar (for external lateral osteotomy approach).

RESULTS:

Edema was more prominent among the internal group in 2nd and 7th days with p value of (0.0001, 0.0004) respectively. Ecchymosis also was more prominent in internal group at 2nd and 7th days with p value of (0.0001). All patients in internal group had mucosal tear at 2nd day with significant p value (0.0001). Bone alignment and irregularities were more obvious among internal group with p value of (0.0001). Nasal patency scale was better among external group with p value of (0.031). Scar was imperceptible and did not bather the patients in external group.

CONCLUSION:

External lateral osteotomy is a safe and precise method offered a more predictable pathway and less post-operative complications.

KEYWORDS: rhinoplasty, osteotomy, internal lateral osteotomy, external lateral osteotomy.

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INTRODUCTION:

Rhinoplasty is a challenging procedure in facial plastic surgery and care must be given to facial aesthetics and nasal function. It is technically difficult to achieve excellent results and, as the surgery is on the most prominent part of the face and outcome is visible to all, so careful planning is necessary. [(1)] The presence of the prominent dorsal hump is one of the main reasons that the patients seek for cosmetic rhinoplasty.

Anatomy

SKIN-SOFT TISSUE ENVELOPE

The appearance of the nose is determined by the manner in it drapes over the modified skeleton.

SKELETAL FRAMEWORK

The skeletal framework of the nose may be divided into thirds: the upper third consisting of the osseous vault; the middle third consisting of the upper lateral cartilage; and the lower third consisting of the lower lateral cartilage. The nasal septum, consisting of a bony and a cartilaginous portion, provides support in all three sections and divides the nasal cavity into two lateral halves. [2]

Osseous Vault

The bony vault is made of nasal bones and the frontal process of the maxilla, it is pyramidal in shape, the narrowest portion at the intercanthal line. The average length of the nasal bone is 25 mm, although it may differs significantly from one to another. The nasal bones fuse with the perpendicular plate of the ethmoid bone. This confluence is called the keystone area.[3] The bony pyramid of the osseous vault may be mobilized with osteotomies during rhinoplasty.

Nasal valves

The nasal valve has traditionally been divided into two 3D-areas:

1) Internal nasal valve bounded by: septum, caudal end of the upper lateral cartilage, inferior turbinate and floor of the bony aperture.
2) External nasal valve bounded by: septum, columella, lateral crus of the lower lateral cartilage, fibro fatty alar lobule and nasal sill.[4]

Nasal valve angle: The angle is bound by the septum and by the inferior edge of the upper lateral cartilage and the inferior turbinate; this angle widens with muscular contraction and narrows with negative pressure on inspiration. The nasal valve is normally 10 to 15 degrees in white patients and wider in nonwhites. [5]

Preoperative assessment:

The patient assessment:

It is essential to obtain a clear history of the patient's complaint and symptoms. Identification of any structural, congenital, traumatic, cosmetic and/or functional issues is crucial. [1]

It is important that surgeons recognize potentially problematic patients, as high-risk patients are unlikely to be satisfied with surgical results. [6]

ANALYSIS OF THE FACE:

Facial symmetry is reported to be the basis for a beautiful face, although minor asymmetry may be associated with the perception of beauty. [7]

Analysis of facial proportions is performed using the 'rule of thirds' and the 'rule of fifths' to assess the face from a frontal view as seen in figure one. Powell and Humphrey described the ideal angles of the facial aesthetic triangles. Other elements to consider are the fullness and position of the lips and protrusion of the chin [1]

Figure 1: Rule of thirds' and the 'rule of fifths' [1]

ANALYSIS OF THE NOSE:

Inspection of the external nose for skin quality, deviation, length of nose, tip projection, tip rotation, columellar show and basal view.

Inspection of the internal nose by anterior rhinoscopy and nasal endoscopy and continuing the examination with Palpation.

Photographic review:

The standard photographic views obtained for rhinoplasty are frontal, left and right lateral, left and right oblique and basal.

Additional views, which can be of use, are the close-up frontal view, superior view, base-radix view and bird's-eye view. [1]

SUBJUCTIVE ASSESSMENT:

Nasal Obstruction Symptoms Evaluation (NOSE)[8]

Osteotomies

Osteotomies are commonly used to improve irregularities in the brow- tip aesthetic line and correct open roof deformities (diastasis of the nasal bones) associated with bony dorsum reduction. They can be performed laterally, medially, or intermediately. [9]

Lateral osteotomies:

Classifications: The position of the osteotomy may be described by the starting and ending points along the pyriform aperture and relative to the midline. A low osteotomy is positioned further off the midline while a high osteotomy is positioned more medially, or higher on the lateral nasal wall. Each type of osteotomy has an indication. [10] The fracture line of the lateral osteotomy should be as low as possible to allow a large lateral wall for infracture and to prevent the palpable step deformity that results when osteotomies are positioned too high on the nasal sidewall near the dorsum.[11] Lateral osteotomies can be linear or perforating, internal or external. The ideal trajectory is described as high- low- high.

Internal lateral osteotomy:

Is initiated with a mucosal stab incision made just lateral to the anterior face of inferior turbinate. The curved, guarded 4-mm osteotome is placed into the incision on the margin of the pyriform aperture, the osteotome should be transitioned roughly parallel to the facial plane and directed toward the medial canthal area. The osteotomy should then curve anteriorly and superiorly to terminate at the level of the medial canthus, midway between the dorsal line and the medial canthus.

External lateral osteotomy:

It is preferred when maintenance of support is critical, such as in revision rhinoplasty, because there is far less disruption of periosteal support and the intact periosteum stabilizes and splints the mobilized segments, enhancing precise healing. A series of perforations are made at fixed intervals along the desired fracture trajectory and then completed with minimal manual manipulation, [9]

Consequences and Complications of Osteotomy:

a\ Operative trauma:

- Excessive local bleeding.
- Ecchymosis.
- Edema.
- Pain. [12]

b\ Functional Complications: The main adverse event is reduction of the airway.

c\Aesthetic complications: An irregular dorsal line related to uneven nasal bones is one of the most common reasons for revision rhinoplasty. [13]

PATIENTS AND METHODS:

Study design:

This is a prospective comparative study conducted on 60 patients their clinical information collected from outpatient clinic in otorhinolaryngology / head and neck surgery department in Al-Shaheed Ghazi Al-Hariri hospital for surgical specialties in medical city complex at Baghdad for period from first of October 2018 to first of October 2019. Authorized committee approval was obtained. Informed consent regarding the surgery, photography, participation in the study and publishing results was taken from all patients.

SELECTION CRITERIA:

INCLUSION CRITERIA:

Adult patients 18 years and older and seeking rhinoplasty for hump or combined deformity.

EXCLUSION CRITERIA:

Revision rhinoplasty, Patients seeking rhinoplasty for congenital deformities, Patients having chronic rhinosinusitis with or without nasal polyposis or any nasal pathologies such as allergic rhinitis requiring different management, psychologically unstable patients and patients with unrealistic expectations, Patients requiring only tip plasty or alar base reduction.

PRE-OPERATIVE ASSESSMENT:

All patient were thoroughly assessed by taken full history trying to identify high risk patients understand their motivation and expectations, full analysis of face, internal and external nose, palpation, standard

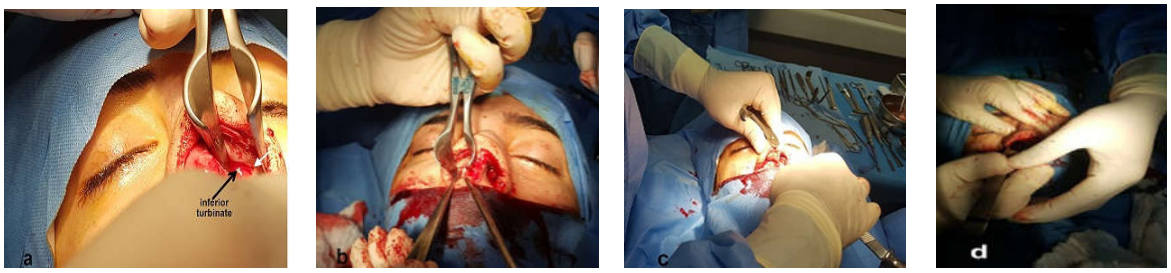
photography and subjective assessment using NOSE scale.

Nasal patency scale	
(0-20)	Not a problem
(21-40)	Very mild problem
(41-60)	Moderate problem
(61-80)	fairly bad problem
(81-100)	Sever problem

Pre-operative investigation:
In form of complete blood count, renal function test, bleeding, clotting profiles, virology screen, electrocardiography and chest x- ray obtained for all patients.

Surgical approach:
Sixty patients were operated under general anesthesia, oral endotracheal tube in midline position with pharyngeal pack using hypotensive technique. The patient was positioned in supine position with reversed Trendelenburg position and 30 degree head elevation with fixation of the head via head ring and open septorhinoplasty was the surgical approach.

Group1: 25 patients subjected to internal (endonasal) lateral osteotomy.



a: Mucosal incision just lateral to anterior end of inferior turbinate (white arrow), b: Periosteal elevation, c & d: endonasal lateral osteotomy left and right respectively.

Group 2: 35 patients subjected to external (percutaneous) lateral osteotomy.

a & b: stab skin wound created midway between medial canthus and pyriform aperture: multiple bone perforations along planned line through same incision.

Post-operative care and follow up:
Patients nursed in our ward, Stayed overnight for 24 hrs. On second day post-operative bilateral anterior nasal packs were removed, patients checked for edema and ecchymosis according to the scoring system of Kara and Gokalan Scoring system for edema: Grade 1 – No coverage of iris with eyelids, Grade 2 - Slight coverage of iris with swollen eyelids, Grade 3 - Full coverage of iris with swollen eyelids, Grade 4 – Full closure of eyes.
Scoring system for ecchymosis: Grade 1 - Ecchymosis up to the medial one-third part of lower and /or upper eyelid, Grade 2 - Ecchymosis up to the medial two-third part of the lower and/or upper eyelid. Grade 3 - Ecchymosis up to the full length and /or upper eyelid and mucosal tearing by anterior rhinoscopy and endoscopic evaluation. Patients discharged home on oral antibiotics in form of cefexime capsule 400 mg once daily for 2 weeks and oral analgesia (acetaminophen tab 500mg three times per day), nasal wash at least four times per day, and local fucidin ointment to apply at sites of incisions. Instructions to avoid physical activities, sneezing and coughing with mouth opened given to all patients. Seven days later first visit was scheduled patient also checked for edema, ecchymosis and mucosal tearing.

Patients followed up in 1st, 3rd, and 6th months to check for scaring (in cases of external lateral osteotomy), bone alignment and irregularities. NOSE scale and ROE score used to evaluate nasal patency and patients satisfaction respectively.

RESULTS:

In this study there was 60 patients underwent open primary rhinoplasty, they were two groups. Group 1 had 25 patients underwent internal lateral osteotomy, Group 2 had 35 patients underwent external lateral osteotomy.

Table (1) :Distribution of patients according to periorbital ecchymosis score.

Ecchymosis grade		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
Post-op day 2						0.0001*
	Grade I	-	-	24	68.6	
	Grade II	7	28.0	10	28.5	
	Grade III	18	72.0	1	2.9	
Post-op day 7						0.0001*
	Grade I	6	24.0	30	85.7	
	Grade II	18	72.0	4	11.4	
	Grade III	1	4.0	1	2.9	

Table (2) :Distribution of patients according to periorbital edema score.

Edema grade		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
Post-op day 2						0.0001*
	Grade I	6	24.0	29	82.8	
	Grade II	9	36.0	5	14.3	
	Grade III	9	36.0	1	2.9	
	Grade IV	1	4.0	-	-	
Post-op day 7						0.0004*
	Grade I	10	40.0	31	88.5	
	Grade II	12	48.0	3	8.6	
	Grade III	2	8.0	1	2.9	
	Grade IV	1	4.0	-	-	

Table (3) :Distribution of patients according to the presence of mucosal tear.

Mucosal tearing		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
Post-op day 1-3	Yes	25	100.0	9	25.7	0.0001*
	No	-	-	26	74.3	
Post-op day 7-10	Yes	-	-	-	-	-
	No	25	100.0	35	100.0	

Table (4) :Distribution of scar.

Postoperative Scaring		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
1 month	Yes	-	-	8	22.9	
	No	25	100.0	27	77.1	
3 months	Yes	-	-	-	-	-
	No	25	100.0	35	100.0	
6 months	Yes	-	-	-	-	-
	No	25	100.0	35	100.0	

Table (5) :Distribution of bone alignment and irregularities.

Bone alignment & Irregularities		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
1 month	Yes	7	28.0	3	8.6	0.046*
	No	18	72.0	32	91.4	
3 months	Yes	15	60.0	13	37.1	0.080
	No	10	40.0	22	62.9	
6 months	Yes	21	84.0	13	37.1	0.0001*
	No	4	16.0	22	62.9	

Table (6):Distribution of patients according to nasal patency scale.

Nasal patency scale		Internal Lateral Osteotomy		External Lateral Osteotomy		P value
		No	%	No	%	
Pre-op	0-20	2	8.0	5	14.3	0.902
	21-40	7	28.0	9	25.7	
	41-60	7	28.0	7	20.0	
	61-80	5	20.0	7	20.0	
	81-100	4	16.0	7	20.0	
1 month	0-20	1	4.0	3	8.6	0.883
	21-40	13	52.0	19	54.3	
	41-60	10	40.0	12	34.3	
	61-80	1	4.0	1	2.9	
	81-100	-	-	-	-	
3 months	0-20	13	52.0	27	77.1	0.024*
	21-40	8	32.0	8	22.9	
	41-60	4	16.0	-	-	
	61-80	-	-	-	-	
	81-100	-	-	-	-	
6 months	0-20	13	52.0	26	74.3	0.031*
	21-40	8	32.0	9	25.7	
	41-60	4	16.0	-	-	
	61-80	-	-	-	-	
	81-100	-	-	-	-	
	P value	0.0001*		0.0001*		

DISCUSSION:

Rhinoplasty is common procedure. Most patients seek surgery need some sort of bony correction whether due to dorsal hump, deviation or wide nasal bone base. So osteotomy is an integral part of the procedure and a great deal of care is required in execution to produce the desired appearance and maintain the function of the nose.

Ecchymosis:

In 2nd post-operative day: The internal group had higher and more severe grade of ecchymosis than external group, the highest percentage (72%) had grade III while in group 2, only 1 patient (2.9%) had grade III. Giving us a p value of 0.0001 which is statistically significant.

In 7th post-operative day: Ecchymosis subsided in all patients in both groups, but in the internal group remained of higher grade as (72%) had grade II while (85.5%) the majority in external group had

grade I. collectively giving us a p value of 0.0001. In similar study conducted by Hashemi M et al [14] the difference was significant (P = 0.011). Our results agree with the above study, could be explained by the fact that preservation of periosteum and the more predictable pathway in external technique provides excellent control and the reduction in the intranasal complication and postoperative morbidity. Concurred by the findings published by Gryskiewicz JM et al [15], Rohrich RJ et al [16], Giacomarra V et al [17], and Sinha V et al [18]. While in study conducted by Yucel OT et al [19], Gholami M et al [20], Motamed S et al [21], Kilic C et al [22], stated that there was no significant difference in ecchymosis grades between the two groups in 2nd and 7th post-operative day.

Edema:

In 2nd post-operative day: The edema grade was more severe in the internal group as majority (36%) had grade II and III for each, and (4%) had grade IV while in the external group majority (82.8%) had grade I and none of them had grade IV edema. Showing us a p value of 0.0001.

In 7th post-operative day: There was improvement in severity of edema and lower scores in both groups but still more prominent among internal group as the majority (48%) had grade II, and (4%) had grade IV while in the external group majority (88.5%) had grade I, and none had grade IV. Giving us a p value of 0.0004. This agree with studies conducted by Sinha V et al [18], Hashemi M et al [14], Gryskiewicz JM et al [15], Rohrich RJ et al [16] and Giacomarra V et al [17]. On other hand our findings disagree with those of Yucel OT et al [19], Gholami M et al [20], Motamed S et al [21] found that there was no significant difference in edema scores between the two groups.

Mucosal tear:

In 2nd post-operative day endoscopy done to evaluate mucosal tear in lateral nasal wall, in internal group all patients (100%) had mucosal tears of different severity while in external group only (25.7%) had mucosal tear. Resulting a p value of 0.0001. One week later none of the patients in both groups had any tear, this could be attributed to the healing process. This agree with a study done by Rohrich RJ et al [16], Giacomarra V et al [17] and Sinha V et al [18]. Disagree with a study conducted by Kilic C et al [22].

Bone alignment and irregularities:

1st month: Among internal group (28%) had asymmetries and irregularities while in external group (8.6%) had irregularities giving a P value of 0.04.

3rd month: (60%) in internal group had some sort of bony asymmetries on other hand (37.1%) in external group had bony irregularities. With p value of 0.08.

6th month: In the internal group (84%) had some degree of bony irregularities while among external group (37.1%) had irregularities. Giving p value of 0.0001. Which disagree with a study conducted by Gholami M et al [20] Concluding No significant difference was noted between the two groups in terms of step off deformity, though our study evaluated bony results without focusing on certain deformity and longer follow up.

Scar:

Scar was evaluated exclusively among external group patients.

1st month: (22.9%) had visible scaring and (77.1%) with no noticeable scaring. Resulting a p value of 0.01.

3rd and 6th months: None of them (100%) had any noticeable scaring.

This agree with a study done by Hinton AE et al [23] and disagree with a study by Gryskiewicz JM et al [15].

Nasal patency:

1st month: In internal group the majority (52%) had mild problem, (40%) had moderate problem, (4%) had no problem and the last patients (4%) had fairly bad problem while in external group (54.3%) patients had mild problem, (34.3%) had moderate problem, (2.9%) had fairly bad problem and (8.6%) had no problem. Giving p value of 0.883.This could be attributed to post-operative mucosal edema and crustations.

3rd month: In the internal group at 3rd month scoring was the majority (52%) had no problem, (32%) had mild problem and (16%) had moderate problem. While in external group (77.1%) had no problem, (22.9%) had mild problem. Resulting a p value of 0.024

6th month: Among internal group (52%) had no problem, (32%) had mild problem and (16%) had moderate problem in contrast to external group (74.3%) had no problem, (25.7%) had mild problem. Resulting in a p value of 0.03. Generally speaking though there was improvement in nasal obstruction in both groups, but subjectively the scoring were better in the external group. Disagreeing with results in a study done by Helal MZ et al [24] they concluded that there was no

statistically significant difference to judge that either internal or external lateral osteotomy caused more narrowing of the nasal airway.

CONCLUSION:

- ✓ External lateral osteotomy was safe with more predictable approach.
- ✓ Post-operative edema and ecchymosis was much less sever in the external approach.
- ✓ Rate of mucosal tear was significantly less in the external approach.
- ✓ Bone alignment and irregularities were significantly better in external approach.
- ✓ Nasal patency scores were better in the external approach.
- ✓ Skin wound (in external approach) was nearly invisible and did not bather the patients.

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