Original Article

Comparison of the Effect of Two Low to High Lateral Osteotomy Methods, Percutaneous and Internal On the Tear Trough and Scleral Show in Patients Undergoing Esthetic Open Rhinoplasty

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ABSTRACT

Background: We aimed to compare the effect of two low to high lateral osteotomy methods, percutaneous and internal on the tear trough and scleral show in patients undergoing esthetic open rhinoplasty.

Methods: This prospective single-blind randomized clinical trial study was conducted on 80 patients in two groups of 40 candidates for rhinoplasty surgery referred to Imam Khomeini Hospital in Ahvaz, southern Iran in 2021. In the first group, lateral osteotomy was performed internally and in the other group, percutaneously. Then, the changes in tear trough and scleral show before surgery, one and three months after surgery were compared between two groups.

Results: The median of the medial limbus in the percutaneous group was about 0.38 higher than the internal group, but no significant difference was observed (P=0.322). Moreover, the median medial canthus in the percutaneous group compared to the internal group had no statistically significant difference (P=0.163). There was no significant difference in the average lateral limbus changes between the two groups (P=0.389). The median scleral show in all times before surgery, one and three months after surgery in the percutaneous group was higher than in the internal group, but the differences were not significant. In addition, the median scleral show changes before and three months after surgery in the percutaneous group were not remarkably different from the internal group (P=0.290).

Conclusion: Both techniques are almost similar in terms of periorbital effect after surgery in the early stages and 3 months after surgery. More multicenter studies with higher sample size and longer follow-up period seem necessary.

KEYWORDS
Rhinoplasty; Lateral osteotomy; Scleral show; Tear trough

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INTRODUCTION

Rhinoplasty is known as one of the most common cosmetic surgeries in Iran and many countries around the world[1]. This type of surgery has many different techniques, but they all have similar steps. One of the most important stages of rhinoplasty is the lateral osteotomy stage,

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which usually takes place at the end of rhinoplasty and after correcting the hump and tip of the nose[2, 3]. The purpose of doing it is to narrow the roof of the nose after removing the hump and straightening the bones and reducing the width of the base of the nose pyramid. Therefore, this technique should be accurate and feasible, in such a way that it is effective in reducing post-operative problems such as ecchymosis and edema[4-6].

There are different techniques to perform lateral osteotomy to achieve the beauty of the nose pyramid, the main ones are 1- perforating external osteotomy, and 2- internal continuous[7, 8]. In most cases, external lateral osteotomy is performed using two techniques, including low to low (LL) and low to high (LH). The main difference between these two techniques is the amount of bone movement after osteotomy, the direction of osteotomy and the amount of bone fracture[9-11].

There is no consensus among surgeons about the best internal and external approach. Some surgeons defend the external method and believe that this method reduces trauma to soft tissue, mucosa and periosteum, confirmed by Ford et al.[12]. On the other hand, Tardy and colleagues are supporters of the internal method, which is performed with a 2-3 mm osteotome without protection, and they believe that this method reduces edema, ecchymosis, and mucosal damage[12]. Considering the importance of sub-units of the peri-ocular region, including the tear duct and scleral show in the harmony of the face, and since the findings of previous researches show the effect of rhinoplasty on the structures around the ear as well as the inevitable edema and ecchymosis caused by osteotomy[13], therefore, we aimed to determine the effect of different techniques (including percutaneous and internal osteotomy techniques) used in this type of surgery on changes in the tear duct and scleral show.

METHOD AND MATERIALS

In this randomized, prospective, single- blinded clinical trial with a parallel group, 80 patients who were candidates for rhinoplasty operation referred to the surgery center of Imam Khomeini Hospital in Ahvaz, Iran, between April and July of 2021 were included. The inclusion criteria were age over 18 years, width of the narrow nasal bridge area, absence of contraindications for rhinoplasty surgery and patient's consent to participate in the study.

Patients with wide nasal bridge area, graves ophtalmopathy, chronic diseases, history of fracture of the zygomatic bone, history of nasal fracture, sunken globe with a prominent lacrimal bone edge, drooping eyelids with excess skin, and individuals with a history of rhinoplasty were excluded from the study.

Patients were fully aware of the surgical procedures and complications of rhinoplasty surgery. All surgical procedures and techniques were performed by a maxillofacial surgeon who was familiar with percutaneous and internal ostomy.

All the surgical procedures were performed by open method and under general anesthesia. It was performed with middle columellar V incision to reveal the nasal structure in the subperiosteal and subperichondrial levels. After the appearance of the nasal skeleton, the mucoperi flaps of the septal chondrium were raised, the cartilaginous grafts were removed from the cartilaginous septum in order to reconstruct the nose. After that, the dorsal hump was removed with a Rubin osteotome and a rhinoplasty type was performed just before the internal oblique osteotomy. In one group, lateral osteotomy was performed through the skin in the form of Stap Incision Using a 2 mm osteotome and maintaining Webster's triangle, low to high stoma was performed on both sides. Osteotomy was performed by Postage-Stamp multi-puncture method. In the other group, internal osteotomy was performed with a left and right crow's osteotome, by cutting the nasal mucosa in the preform opening and creating a subperiosteal tunnel in the stoma line, maintaining Webster's triangle up to the intercanthal line using the low to high method. When the osteotomies were completed, a greenstick fracture was created with bilateral gentle pressure. Finally, an intranasal mesh was placed, which was removed 24 hours after the surgery.

All patients were evaluated in two stages: during operation for visible bleeding, and follow-up of patients one and three months after surgery. Evaluation of changes in the depth of the lacrimal gutter was done before, one and three months after the operation. In this method, a supersonic ultrasound machine (iexplorer) was used. The probe used in the study was of a linear type with a resolution of 75 micrometers and a frequency of 10 MHz. All images were taken by an experienced radiologist. First, the patient was placed in a sitting position and the head was in a natural position, and

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three points of the medial canthus, medial limbus, and lateral limbus were marked and the distance between these points was measured. To measure the area of the scleral show, the area of the white of the eye was measured by marking in Adobe Photoshop CS5 software from the medial tragus to the lateral tragus and from the conjunctiva from top to bottom and with a corneal scale (about 10 mm according to MRD1, MRD2) photos were evaluated. All the areas are in square millimeters and according to the evaluation criteria of the cornea. For this purpose, photos before and after the operation (at intervals of 1, 3 months) were taken.

Ethical considerations

The study was approved by the Medical Ethical Committee of Ahvaz Jundishapur University of Medical Sciences (Ethics code IR.AJUMS.REC.1401.200), and this trial was registered in the Iranian clinical trial system with the patented number of IRCT20220903055866N1. The written informed consent was obtained from each participant.

Statistical analysis

Statistical analysis was performed by SPSS software Version 22 (IBM, Chicago, USA). The quantitative and qualitative variables were indicated as mean±SD and number (percentage), respectively. Kolmogorov–Smirnov and, Shapiro–Wilk tests were used to test for the distribution. Differences were compared by using the independent t-test and ANOVA. *P*-value less than 0.05 was considered statistically significant.

RESULTS

Eighty patients including 62 females (77.5%) with a mean age of 25.27±6.20 years, and an age range of 18 to 39 years were enrolled. Patients were evaluated in terms of lateral limbus, medial limbus and medial canthus variables in two groups (percutaneous and internal) and at three times before treatment, 1 and 3 months after treatment. There was no significant difference between the two percutaneous and internal groups in terms of age (*P*=0.065). Also, the number of women in the percutaneous and internal group was 30 (75%) and 32 (80%), respectively. Gender in the two studied groups did not differ significantly from each other (*P*=0.592).

Based on **Table 1**, in the both group, the lateral limbus was not significantly different between the groups at any time (*P*>0.05 for each). In both groups, there was a notable difference for limbus between the three measurement times (*P*<0.001 for each) (**Table 1).**

Regarding comparison between the groups, the medial limbus in the percutaneous group was about 0.38 higher than the internal group, but this difference was not significant (*P*=0.322). However, there was a significant difference for changes between the 3 measured times (*P*<0.001) (Tale 2).

The mean changes of the lateral limbus before and one month after the treatment in the percutaneous group were significantly higher than in the internal group (*P*=0.006). The mean changes of the lateral limbus before and three months after the treatment were lower in the percutaneous group than in the internal group, but the difference was not significant (*P*=0.389). The mean changes of lateral limbus one and three months after treatment in the percutaneous group compared to the internal group did not differ remarkably (*P*=0.051).

The mean changes of the medial limbus before and after one month of treatment between the two groups were not statistically significant (*P*=0.240). The mean changes before and three months after treatment in the percutaneous group were higher than in the internal group, but the difference was not significant (*P*=0.108). The mean changes one and three months after treatment in the percutaneous

Table 1: The mean of the lateral limbus and its comparison in the studied times and groups

Group	Before the treatment	One month after treatment	Three months after treatment	The result of ANOVA with repeated measures
Percutaneous (n=40)	6.89±1.35[a]	7.22±1.31[b]	7.02±1.28[c]	*P*<0.001
Internal (n=40)	6.20±1.86[a]	6.76±1.82[b]	6.43±1.91[c]	*P*<0.001
The result of independent t test	T=1.88 *P*=0.064	T=1.31 *P*=0.196	T=1.61 *P*=0.113	*P*=0.015

*Dissimilar lowercase English letters indicate significant differences between times in each of the groups.

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group were lower than the internal group, but the difference was not significant (*P*=0.063). Moreover, the mean changes one and three months after treatment in the medial canthus group were notably lower in the percutaneous group than in the internal group (*P*=0.032). The mean changes in the level of scleral show in one and three months after treatment in the percutaneous group were higher than in the

Table 2: The mean of medial limbus and medial canthus in the studied times and groups

Variable	Before the treatment	One month after treatment	Three months after treatment	Total	The result of ANOVA with repeated measures
Medial Limbus					
Percutaneous (n=40)	7.17±1.31	7.44±1.36	7.26±1.33	7.29±1.33	
Internal (n=40)	6.77±2.00	7.13±1.99	6.84±2.03	6.91±1.99	F=53.29 *P*<0.001
Total	6.97±1.69[a]	7.28±1.70[b]	7.05±1.72[c]	7.10±1.70	
The result of ANOVA with repeated measures	F=0.99 *P*=0.322				F=1.50 *P*=0.226
Medial Canthus					
Percutaneous (n=40)	7.78±1.44	8.00±1.50	7.83±1.46	7.87±1.46	
Internal (n=40)	7.25±2.01	7.48±1.97	7.23±1.98	7.32±1.98	F=26.53 *P*<0.001
Total	7.52±1.76[a]	7.74±1.76[b]	7.53±1.76[a]	7.60±1.75	
The result of ANOVA with repeated measures	F=1.98 *P*=0.163				F=0.78 *P*=0.441

*Dissimilar lowercase English letters indicate significant differences between times in each of the groups.

Table 3: Comparison of lateral limbus, Medial Limbus, Medial Canthus and Scleral show changes between percutaneous and internal groups

	Variable	*Group*	*Mean±SD*	*P-value*
Lateral limbus	Changes before and one month after treatment	Percutaneous (n=40) Internal (n=40)	0.33±0.25 0.55±0.44	0.006
	Changes before and three month after treatment	Percutaneous (n=40) Internal (n=40)	0.13±0.20 0.23±0.43	0.389
	Changes one to three months after treatment	Percutaneous (n=40) Internal (n=40)	-0.20±0.18 -0.32±0.39	0.051
Medial Limbus	Changes before and one month after treatment	Percutaneous (n=40) Internal (n=40)	0.28±0.23 0.36±0.34	0.240
	Changes before and three month after treatment	Percutaneous (n=40) Internal (n=40)	0.10±0.16 0.07±0.35	0.108
	Changes one to three months after treatment	Percutaneous (n=40) Internal (n=40)	-0.18±0.18 -0.28±0.36	0.063
Medial Canthus	Changes before and one month after treatment	Percutaneous (n=40) Internal (n=40)	0.21±0.17 0.23±0.45	0.651
	Changes before and three month after treatment	Percutaneous (n=40) Internal (n=40)	0.05±0.09 -0.01±0.32	0.086
	Changes one to three months after treatment	Percutaneous (n=40) Internal (n=40)	-0.17±0.12 -0.25±0.45	0.032
Scleral show	Changes before and one month after treatment	Percutaneous (n=19) Internal (n=18)	4.61±8.99 0.16±6.78	0.099
	Changes before and three month after treatment	Percutaneous (n=19) Internal (n=18)	2.27±6.93 0.23±4.15	0.290
	Changes one to three months after treatment	Percutaneous (n=19) Internal (n=18)	-2.35±5.01 0.08±3.98	0.113

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internal group, but it was not statistically significant (P=0.113) (**Table 3**).

DISCUSSION

Rearrangement and shaping of the nasal bones is an exception to most rhinoplasty surgeries. Choosing the lateral osteotomy method among different surgeons depends more on the experience and comfort with that method. In any case, the selection method should have accurate, ideal and reliable results and minimize post-operative problems. Ecchymosis and edema are the most common complaint of patients after surgery, although it does not cause pain to the patient, but due to the change in shape and the consequences of appearing in society, it is uncomfortable and disturbing for patients[14]. Various factors are involved in postoperative periorbital ecchymosis, the most important of which is the type of osteotomy. Therefore, various types of osteotomy methods and treatments have been recommended to reduce it[15]. Recently, various studies have investigated the role of different nasal osteotomy techniques in reducing postoperative complications, especially periorbital edema and ecchymosis[16, 17].

In a study the degree of ecchymosis around the eyes was higher in the internal osteotomy method than in the external method, and the difference between the two methods was significant in this regard on days 1 and 7 after surgery [18]. On the third day after surgery, there was no significant difference in the degree of ecchymosis between the two osteotomy methods. Despite the absence of significant differences in the degree of edema on the first day after surgery in the two methods, the degree of edema was reported to be lower in the external osteotomy method than in the internal method. Their study showed that maybe the choice of external osteotomy method, along with other considerations, can be effective in preventing the complications of edema and ecchymosis around the eyes after rhinoplasty surgery[18]. In another study, Caglar et al. tried to reduce complications after rhinoplasty by comparing two groups that underwent rhinoplasty. Lateral osteotomy after tip plasty, at the end of surgery, or lateral osteotomy before tip plasty, at the beginning of surgery. Their results showed that lateral osteotomy in the final stages of surgery, using nasal plaster and splint as soon as possible, significantly reduced postoperative complications[19].

Kilic et al. conducted a clinical study to compare four different rhinoplasty techniques: septorhinoplasty with open technique and internal lateral osteotomy and continuous, endonasal rhinoplasty and internal lateral osteotomy and continuous, septorhinoplasty with open technique and external perforating lateral osteotomy, and endonasal rhinoplasty and external perforating lateral osteotomy. They found that different types of rhinoplasty caused different amounts of periorbital edema and ecchymosis. However, the osteotomy itself did not make a significant difference[20].

One of the limitations of the present study was the non-cooperation of the patients and the limitation in the follow-up of the patients due to the COVID-19 pandemic. In future studies, more studies with higher sample size and follow-up period should be conducted in order to compare the effect of low to high osteotomy by two percutaneous and internal methods on tear trough and scleral show in rhinoplasty patients. In addition, the relationship between scleral show and tear trough should be investigated and it should be determined whether using piezosurgery for osteotomy instead of conventional osteotomy has an effect on the outcome of the operation.

CONCLUSION

Both rhinoplasty methods are similar in terms of peri-ocular aesthetic units and do not have significant permanent effects. Moreover, both techniques are almost similar in terms of periorbital effect after surgery in the early stages and 3 months after surgery.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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