



The effect of alar release on interalar changes in Le Fort I osteotomy

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ARTICLE INFO	ABSTRACT
<p><i>Article Type:</i> Original Article</p> <p><i>Received:</i> 23 Feb 2015 <i>Revised:</i> 10 Apr 2015 <i>Accepted:</i> 31 May 2015</p> <p><i>*Corresponding author:</i> Mahsa Shariati Craniomaxillofacial Research Center, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran.</p> <p><i>Tel:</i> +98-2184902473 <i>Fax:</i> +98-2184902473 <i>Email:</i> mahsa.shariati@gmail.com</p>	<p>Introduction: Due to the increase in Le Fort surgeries and its effect on nose widening, it seems necessary to use an alternative method without this effect. The present research examined the effect of alar release on interalar changes in Le Fort I osteotomy.</p> <p>Materials and Methods: The study population included patients admitted to Bou-Ali Hospital in 2012-2013 undergoing Le Fort I osteotomy. The samples were 26, selected using simple random sampling method. Fourteen patients who underwent osteotomy with alar release were considered as experimental group and 12 who underwent conventional orthognathic surgery considered as control group. Then, the width of interalar was measured with actual size in photography.</p> <p>Results: The initial interalar width in experimental group was 4.1 mm; 12% wider than control group ($p<0.000$). After surgery, the interalar width in control and experimental groups were 36.2 and 39.6mm respectively that revealed a significant difference ($p<0.01$). The interalar width in control group increased 1.45 ± 2.25 which showed a significant difference ($p<0.05$). In experimental group the increase was 0.28 ± 2.48 reporting a significant difference ($p<0.4$). The change of interalar width in control group was 0.62 mm; 74.7% more than experimental group and Man-Whitney U test reported this difference as significant. Nine patients (75%) in control and 7 patients (50%) in experimental group experienced improvement. The relative risk for patients received alar release, was 1.5 higher (RR-1.5) and attributable risk of not using alar release for interalar width increase 25% (A.R-25%). Chi-square test showed that this difference was not significant ($p<0.3$).</p> <p>Conclusion: Basically, using alar release would probably prevent increase of interalar width in Le Fort I osteotomy.</p> <p>Keywords: Alar release, Interalar, Osteotomy, Le Fort I.</p>

Introduction

One of the main concerns in Le Fort I surgeries is increasing in nasal base width which means that interalar distance exceeds intercanthal width. Due to importance of retaining ligaments in beauty and function of face, investigation on pyriform ligament is essential. Le Fort I osteotomy rate is increasing due to people's desire for face attractiveness [1]. Epker for the first time in 1981 mentioned nasal base widening as a

complication regarding upper jaw surgeries [2]. Epker and other surgeons used cinch method for reducing that rise [2-4]. Different techniques have been used for solving this problem such as Rauso technique, Motamedi technique, Muradin technique, Millard technique and Epker technique [3-5]. Alar release with medialization method was proposed by Rohrich for the first time in 2008 and afterwards this method was performed on cadavers or used in rhinoplasty

surgery [6-8]. Although this method has had successful results surgeons have shown little interest to use and included it in surgery textbooks yet.

Le Fort I osteotomy is a type of surgery which involves repositioning upper jaw to the intended position. This movement can occur in forward, backward or upward and downward directions to correct jaw abnormalities. For the first time, von Langenbeck in 1859 performed upper jaw osteotomy on the fracture line which was described later in 1901 by Le Fort. Nowadays, a wide variety of techniques derived from Le Fort I osteotomy is performed by surgeons but the basis of this method has remained unchanged and still focused on maxilla's vascularity [9].

Rhinoplasty is nose plastic surgery for correction of nasal form and function. For the first time, Gunter in 1987 proposed an effective method for open nose surgery. Cosmetic surgeries follow this trend increasingly and now rhinoplasty is ranked 4th among most common surgeries. Rhinoplasty is one of the most challenging cosmetic surgeries because the site of surgery is face which makes covering the probable deformities and asymmetries almost impossible [9].

Nasal base width is the distance between the most prominent alar points in both sides, which according to Guyuron should ideally be at most just 1 millimeter wider than inter medial canthal distance. Decision about alar base alteration is made before surgery but its change is performed at the end of surgery. This procedure can be done in clinic with local anesthesia. Nasal nostrils size and nasal flare is changed with Weir surgery [9].

Gruber et al in 2009 recruited 12 patients for evaluating nasal base reduction by alar release with medialization. An incision was made in ala-sill junction and release was made by Joseph periosteal elevator in soft tissues of anterior maxilla, 2-3 centimeters around pyriform rim. Then soft tissue of vertical edge of pyriform rim in anterior and posterior of maxilla was

released. Finally cinch polydioxanone 3-0 suture was performed. After 11 months to 3 (3/4) years follow-up, two cases of recurrence and one airway obstruction were detected [7]. Another study assessed role of releasing pyriform ligament in achieving alar medialization without tension and recurrence. Sixteen hemifacial cadavers were investigated for ala-supporting tissues including: soft tissues and pyriform ligament of anterior maxilla, posterior of pyriform rim and soft tissues along the horizontal pyriform rim. After releasing each one, ala-pyriform distance was measured. After releasing vertical pyriform rim, ala-pyriform distance was released to 1.9mm and after releasing periosteum posterior to pyriform rim, it was reduced to 1.7mm. After releasing horizontal pyriform rim, this distance was decreased to 1mm. All of these decreases make up for 4.6 mm reduction in ala-pyriform distance [8].

Materials and Methods

The study population included patients admitted to Bou-Ali Hospital in 2001-2002 undergoing Le Fort I osteotomy. The samples were 26 patients selected by simple random sampling method. Fourteen patients underwent osteotomy with alar release and 12 conventional orthognathic surgery. Then, the interalar width was measured with actual size photography.

Results

This study was conducted on 26 qualified patients undergoing Le Fort I osteotomy. Twelve patients were in control group (without alar release) and 14 in experimental group (with alar release). All patients were identical in socio-economic and timing aspects and all were admitted in the same hospital (Bou-Ali Hospital). Personal characteristics, type of surgery and follow-up duration in two groups are presented in Table 1 that shows similarity of patients to age, sex, type of surgery and follow-up duration. There was no significant difference detected in these properties.

Table 1. Characteristics, Surgery type and follow-up duration of patients according to using alar release.

Follow-up duration	Type of surgery		Age	Gender	
	Two-jaw osteotomy	One-jaw osteotomy		female	male
6.84 ± 5.4	10	2	25 ± 4.8	10	2
5 ± 2.14	13	1	21.8 ± 3.4	9	5

Table 2. Interalar width in patients grouped according to having alar release.

Qualitative		Within-group test	Changes	Quantitative	
Increased	Not changed or decreased			Post-surgery	Pre-surgery
9(75)	3(25)		1.45 ± 2.25	36.2 ± 3	34.7 ± 2.6
7 (50)	7 (50)		0.83 ± 2.48	39.6 ± 2	38.8 ± 2.2
P< 0.3		P< 0.4		P< 0.01	P< 0.000

Initial interalar width and interalar width after surgery with alar release are presented in Table 2. The table shows that initial interalar width in experimental group is 4.1 mm which is 12% wider than that of control group ($p < 0.000$). Post-surgery interalar width in control and experimental groups were 36.2 and 39.6 respectively. T-test showed that this difference is statistically significant ($p < 0.01$). Interalar width in control group was increased 1.45 ± 2.25 mm which was significant according to Wilcoxon test ($p < 0.05$). In experimental group increasing changes for 0.82 ± 2.48 mm were recorded which is not statistically significant based on Wilcoxon test ($p > 0.4$).

Interalar width change in control group was 0.62 mm which is 74.7% more than experimental group; though Mann Whitney U test showed that this difference is not statistically significant.

Nine patients (75%) in control group and 7 (50%) in experimental group reached increases in width, thus if patients in Le Fort I osteotomy undergo alar release, their relative risk is increased by 1.5 times ($RR = 1.5$) and attributable risk of not using alar release for increasing interalar width is 25% ($AR = 25\%$). Chi-square test showed that this difference is not statistically significant ($p < 0.3$).

Discussion

Our investigation revealed that using alar release leads to interalar width decrease in Le Fort I osteotomy surgery so that patients who did not receive alar release experienced 75% interalar width increase while in experimental group this rate was 50%. It should be noted that this difference was not statistically significant. Also, interalar width change in control group was significant but in experimental group, this change could not reach significant level. In literature we found no research similar to our study for comparing possible similarities and disagreements on this issue. However, alar release has been used in rhinoplasty which in almost all cases has led to successful outcomes especially in interalar width which was similar

to our research in preventing interalar width increase [7]. We had some limitations in this research including small sample size which generally was low for comparing qualitative changes (increasing interalar width or not).

Notable relative risk of using alar release is 1.5 times and attributable risk of not using alar release is 25%. Significant differences between interalar widths of the two groups before surgery might have great impact on final results. Due to this problem, we used non-parametrical test of Mann Whitney U test. Matching patients based on primary interalar width is preferred. Another problem was that Le Fort I osteotomy was performed by different surgeons and residents and it affects the outcomes of research and reduces the study internal validity. Nonetheless, if just one surgeon performs surgery on all patients, internal validity increases but external validity or generalizability of research decreases. Another issue that likely affects the results is the amount of changes and amount of impaction and advancement in Le Fort I osteotomy surgery. It has been suggested for future studies, authors may consider the amount of changes to reach more delicate results. We tried to make some arrangements for upgrading this study by including 26 patients in the study which seemed to be appropriate comparing with previous studies' 12 to 16 samples. In this study we used two criteria as control factors; the first was primary interalar width of patients and the second was the group without using alar release. We used parametrical and non-parametrical tests and matched patients' characteristics and tried to select all patients from one medical center. But the question is that why and how alar release can probably prevent from interalar width increase. Soft tissue position is defined by a combination of static and dynamic anatomy. Static support is maintained by suspensory ligaments and compact fasciae. Dynamic support is also maintained by muscular tone which is absent in Bell's palsy. Interestingly, despite full cutting of the nerve, lateral canthus and alar base's position are preserved. This

emphasizes the importance of suspensory ligaments in supporting these two regions. Canthal position is fixed by anteroposterior canthal ligaments and compact suspensory ligament of orbicularis muscle. Anatomical cause of alar base stability is assessed by Rohrich et al [10]. Ala is connected to maxilla and is mobile in all directions. To achieve successful medialization, understanding of structures holding that laterally is important [7]. Alar base is a completely mobile region and is controlled by numerous muscles (respiratory and face expression muscles) [6].

Laboratory anatomy dissection shows muscular nature of alar base. Fasciae support of alar region is not well-noted in previous studies. Clinical observations revealed that a fascia system exists in alar region. Nasal bones have different shapes and are dependent on different factors. It is logical that shape and position of nasal structures are transferred to nasal cartilages by a ligamentous system. A fascia membrane surrounds pyriform aperture. This membrane is limited by nasal bones at top and by anterior nasal spine inferiorly. Lateral border of this membrane reaches aperture pyriform edge where connects to maxillary periosteum. This is a circumferential or peripyriform fascia network. This fascia merges with sesamoid complex. This compact fascia expands to lower lateral cartilages and upper lateral cartilages and surrounds ligament in between. This fibrous membrane is not connected to any muscular, subfacial or superficial system. Due to these characteristics, this structure is named "peripyriform ligament" [6].

A facial system surrounds aperture pyriform and makes a connection from maxilla bone to lower lateral cartilages, alar base and nasal vault. Bones affect the shape of nose by this fasciae network and more clinical investigation is needed to figure out how manipulation of this ligament affects the shape of nose [6].

Role of pyriform ligament stabilization is emphasized in previous studies on necessity of releasing for tension-free medialization. A common method for medialization of alae is bunching or cinching sutures. The most disappointing problem in alae mobilization and suturing techniques is recurrence. Alae is under tension and sutures may not be able to withstand alae during the time. Knowing which tissues or structures hold alae in their place and how much each structure has a role in ala stabilization and how much medialization is achieved with

release of these structures, is helpful [8].

Alar release through buccal sulcus is easier than alar incision. Alar release allows interalar width to decrease markedly, thus tension on sutures will decline. In case that nasal base width is high, alar release is necessary. Alae release is so important that allows alae to fit medial to pyriform and tension on sutures drops. With proposing the technique of alar release, medialization without tension is feasible which lowers risk of recurrence greatly [7]. This method is frequently used in rhinoplasty and its effectiveness and success in rhinoplasty surgery can justify its use in orthognathic surgery. As seen in research limitations, it seems that we approve the hypothesis of "using alar release prevents interalar width increase" and prescribe using alar releasing method. A 75% alar width increase seen in conventional technique without alar release shows that we need alternative techniques for preventing this widening because the nose is one of the most important components of people's beauty [9]. There are many patients which need another rhinoplasty after orthognathic surgery because their basal nose has become wider [9].

Conclusion

It seems that using alar release probably can prevent interalar width increase in Le Fort I osteotomy. Due to increasing application of Le Fort I osteotomy further investigation is needed, especially for known complications of interalar width increase in these surgeries.

Conflict of interests: The authors declared none.

References

- [1] Schendel SA, Carlotti AE. Nasal considerations in orthognathic surgery. *Am J Orthod Dentofacial Orthop.* 1991 Sep;100(3):197-208.
- [2] Collins PC, Epker BN. The alar base cinch: a technique for prevention of alar base flaring secondary to maxillary surgery. *Oral Surg Oral Med Oral Pathol.* 1982 Jun;53(6):549-53.
- [3] Gunter JP. Tip Rhinoplasty: A Personal Approach. *Facial Plast Surg.* 2008;4(04):263-75.
- [4] Muradin MS, Rosenberg A, van der Bilt A, Stoelinga PJW, Stoelinga PJ, Koole R. The effect of alar cinch sutures and V-Y closure on soft tissue dynamics after Le Fort I intrusion osteotomies. 20090811 DCOM-20091026(1878-4119 (Electronic)).
- [5] Rauso R, Gherardini GF, Santillo V, Santillo V, Biondi P, Santagata M, et al. Comparison of two

- techniques of cinch suturing to avoid widening of the base of the nose after Le Fort I osteotomy. 20100614 DCOM- 20100922(1532-1940 (Electronic)).
- [6] Rohrich RJ, Hoxworth RE, Thornton JF, Pessa JE. The pyriform ligament. *Plast Reconstr Surg*. 2008 Jan;121(1):277-81.
- [7] Gruber RP, Freeman MB, Hsu C, Elyassnia D, Reddy V. Nasal base reduction: a treatment algorithm including alar release with medialization. *Plast Reconstr Surg*. 2009 Feb;123(2):716-25.
- [8] Gruber RP, Freeman MB, Hsu C, Elyassnia D, Reddy V. Nasal base reduction by alar release: a laboratory evaluation. *Plast Reconstr Surg*. 2009 Feb;123(2):709-15.
- [9] Raymond J. Fonseca D, Timothy A. Turvey, DDS and Robert D. Marciani, DMD Oral and Maxillofacial Surgery. 2 ed: Elsevier; 2009.
- [10] Rohrich RI, Ranieri I Jr, Ha RY. The alar contour graft: correction and prevention of alar rim deformities in rhinoplasty. *Plast Reconstr Surg*. 2002;109: 2495-2505.

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