ISSN 2515-8260 Volume 07, Issue 07, 2020

Evaluation Of Alar Base Changes After Orthognathic Surgery: An Original Research

Dr. Nafeesa Tabassum[1], Dr. Eklavya Sharma[2], Dr. Tanya Anand[3], Dr Shilpa Sunil Khanna M.D.S[4], Dr Suhael Ahmed[5], Dr. Gowri Swaminatham Pendyala[6], Dr. Heena Tiwari[7]

[1]Department of Oral and maxillofacial surgery, Dar al Uloom university, Riyadh, Kingdom of Saudi Arabia.
[2]MDS, Cosultant Oral & Maxillofacial Surgeon,Tonk ENT Dental & General Hospital, B-61, Sahkar Marg near ICICI Bank, Jaipur.
[3]Consultant Orthodontist & Dentofacial Orthopedics, Sector-16, Chandigarh, India.
[4]Department of Oral and Maxillofacial Surgery, Senior Lecturer, Sri Ramakrishna Dental College and Hospital, Coimbatore , Tamil Nadu

[5]Assistant Professor, Department of Oral and Maxillofacial Surgery, Riyadh elm university, Saudi Arabia.
[6]Reader, Department Of Periodontics, Rural Dental College, Pravara Institute Of Medical Sciences, Loni, Ahmednagar, Maharashtra
[7]BDS, PGDHHM, MPH Student, Parul Univeristy, Limda, Waghodia, Vadodara, Gujrat, India.

Corresponding Author: Dr. Nafeesa Tabassum, Department of Oral and maxillofacial surgery, Dar al Uloom university, Riyadh, Kingdom of Saudi Arabia.nafeesa.t@dau.edu.sa

ABSTRACT: Aim: Purpose of our research was to assess any soft tissue changes, especially related to alar base after orthognathic surgical procedure.
Methodology: 20 patients were selected for this study who were suffering from maxillary hypoplasia, maxillary or mandibular prognathism. They underwent orthognathic surgeries like LeFort I osteotomy of maxilla and/or bilateral sagittal split osteotomy (BSSO) of mandible, or combinations with Genioplasty,Anterior Maxillary Osteotomy and/or Sub-Apical Osteotomy.
Superimposition of 3D photographic images before and after treatment was performed for comparisons using 3D stereophotogrammetric camera setup and software. Paired t-test was performed to compare between pre- as well as post-operative measurements of alar base.
Results: The average width of the alar base and subalare were almost same after surgery. Alar width was amplified by 0.74 mm. Nasal height and length persisted. Nasolabial angle enlarged significantly. Nostril's total area also increased. Nasal tip projection decreased significantly by 1.99 mm.
Conclusion: The nasal changes in patients demonstrated an increase of the nasolabial angle, a delicate increase of the alar width, together with no change on the alar base width, nasal height, and nasal length.

Keywords Nasal changes, Orthognathic surgery, Retrognathia, Prognathism, Three-dimensional analysis

1. INTRODUCTION

Orthognathic surgery is an efficient treatment method and popular in plastic and maxillofacial surgeries, which provides both functional and esthetic benefits. Orthognathic surgery for correction of patients with Class III malocclusion and prognathism is one amongst the common procedures performed especially in Asian people. during this treatment, the maxilla is moved forward and also the mandible is ready back. The treatment planning must acknowledge the facial soft tissue response following the underlying skeletal reposition. The nose plays a crucial role in facial attractiveness. LeFort I osteotomy and movement of the maxilla does affect the placement of nostril in a specific way. Widening of the alar base was constantly reported within the literature.[1-4] However, mixed nasal changes were reported for nasal tip projection and nasolabial angle. The previous studies had disparities in clinical diagnosis, operative design, surgical technique, measurement method, and ethnic population, except those factors, most previous studies were supported two-dimensional (2D) X-ray or scans.[5,6] Recently, a brand new imaging technique has been developed, permitting accuracy in three-dimensional (3D) assessment of craniofacial morphology. Three-dimensional photogrammetry has been accepted within the evaluation of orthognathic patients. Three-dimensional photographic devices are designed to capture surface anatomy quickly and noninvasively, and supply an excellent potential to expand quantitative assessment of the face.[7]The effect of maxillofacial surgery on the facial soft tissue has been investigated in many studies within the past.[8,9] However, there's a scarcity of research on the link between the advancement distance and therefore the amount of alteration measured, [10-13] a large kind of analyses have been used for the verifying the purpose of orthognathic surgery. The methods most frequently utilized in the past have included photography and two-dimensional lateral cephalography.[14-18] Recently, various optical procedures like laser projection, glancing-light projection, and stereophotogrammetry have made it possible to capture spatial, three dimensional parameters. In radiography, CT scan and cone-beam computed tomography (CBCT) is used.[19] In contrast to optical procedures, radiographic methods don't seem to be limited to depicting only the surface of the body; deeper bone structures may be captured. Three dimensional changes within the osseous structures and therefore the resulting changes within the soft tissues is analysed using CBCT.In this study, we quantified the nasal changes using proper technique of 3D photograph superimposition between images taken before and after orthognathic surgery, and evaluated if the nasal widening may be prevented.

2. AIM OF THE STUDY

Purpose of our research was to assess any soft tissue changes, especially associated with alar base after orthognathic surgery.

3. METHODOLOGY

A retrospective study was conducted in our institution. Three dimensional photographs were taken employing a 3D stereophotogrammetric camera setup and therefore the software. All patients had maxillary hypoplasia, maxillary or mandibular prognathism and underwent orthognathic surgeries like LeFort I osteotomy of maxilla and/or bilateral sagittal split osteotomy (BSSO) of mandible, or combinations with Genioplasty,Anterior Maxillary Osteotomy and/or Sub-Apical Osteotomy. Exclusion criteria were patients with severe congenital craniofacial deformity and a history of facial trauma, and people who didn't have adequate image data. 20 patients were included during this study. Three-dimensional photography before the operation and a minimum of 12 months after the operation were taken. Facial landmarks in each 3D image were defined, located, and measured by one investigator. Measurements of the changes in shape and size were analysed.While taking photographs, the patients were asked to bite in intercuspidation, relax their lips, and keep their eyes open. The program was used for manipulation of the 3D photographic data, landmark identification, and superimposition. Horizontal line was drawn connecting both exocanthia. The patient's image was rotated during this plane to the Camper's plane. truth horizontal plane was automatically calculated 7.5° above this Camper's plane, together with the horizontal direction of the quality head position and thru the nasion point. The postoperative 3D image was superimposed on the preoperative image, and therefore the same coordinate system was used. As there have been nasal changes after orthognathic surgery, and one amongst the nasal landmarks was wont to determine the reference plane, superimposition of 3D photographic images before and after treatment was performed for comparisons. The forehead, glabella, and both the inner and also the outer canthi of the eyes were used for registration, because these areas weren't tormented by the surgery. Data from pre- and postoperative images were compared and analyzed for nasal changes. Statistical analysis of the differences between pre- and postoperative measurements was distributed with a paired t test using the SPSS software program. The results were illustrated as mean ± SD. A p value <0.05 was considered statistically significant.

4. RESULTS

In 20 patients, we observed that maximum cases were suffering from maxillary hypoplasia and were subsequently treated with Le Fort I osteotomy procedure where alar base measurement varied from 31-34 cms. One case of maxillary hypoplasia was treated with Anterior Maxillary Osteotomy with Genioplasty and post-operative measurement of alar base was 32cms. Another case was treated with a combination surgery (Le Fort I and Genioplasty) with resultant measurement of alar base was 33cms. Bilateral Sagittal Split Osteotomy procedure was carried out on cases of mandibular prognathism with resultant alar base measurement 33cms. (Table 1)We observed that alar width was significantly altered statistically (41.49 ± 3.75, p=<0.001). Nasolabial angle is also changed dramatically (102.04 ± 16.06, p=<0.001). There was meagre increase in the measurement nasal height as well as length. However, subalare width had evidently decreased. (Table 2) Alar width was increased by 0.74 mm. The area of nostril show revealed a significant increase and was correlated with a decrease of columella inclination. Nasal tip projection decreased significantly, by 1.99 mm.

ISSN 2515-8260 Volume 07, Issue 07, 2020

5. DISCUSSION

Three-dimensional photogrammetric method and its managing software have evolved greatly within the past number of years. This modality is often accustomed assess the changes within the soft tissue and skin surface after orthognathic surgery, and through this study, it had been accustomed assess the postoperative morphological changes of the nose. This 3D method is more accurate and reliable for facial measurements than other methods, like direct anthropometry, cephalometric Xray, or 2D photography.[20,21] For 3D photogrammetric analysis, reference planes should be constructed and thus the identical system should be used for accurate comparisons. The soft tissue reference plane is different from the skeletal tissue reference plane. Several studies developed a 3D photograph-based organisation.[22,23] during this study, the horizontal plane rotating by 7.5° from the Camper's plane was selected. This plane provided a high correlation with the standard Frankfurt horizontal plane.[24,25]The orbitale and porion landmarks for the Frankfurt plane are hard to define in 3D photographs, while the tragus and nasal alare points are frequently positioned precisely. Using the alike organisation is very significant when definition and measurement of facial landmarks and nasal morphology, like columella inclination and nostril show, depend on upon constant 3D image placement. Most of the inter-rater errors were acceptable within the landmark locating test, and also the intra-observer errors were much lower. The mean differences, measurement errors, and standard errors were significantly lower within the intra-observer tests. As a consequence, one investigator was chosen so on extend the tactic accuracy during this study. Prognathism and class III malocclusion are common problems and concerns during this region.[26,27] The foremost frequent complaint after the LeFort I operation is nasal widening. [28,29,30] LeFort I procedure includes detachment of the soft tissue, and muscle insertion from the maxilla and piriform margin. After bone movement and soft tissue re-draping, nasal alae drift laterally and also the nose widens. it's well reported that nasal suture prevents nasal widening after LeFort I osteotomy. Classic alar base stitch for alteration of flat flare nose was seen by Millard.[31] Alar cinching suture has been practiced commonly after LeFort I osteotomy. The cinch techniques varied. within the mostly performed method, an intraoral suture caught the soft tissue and muscle under the alar base on either side of piriform rim. The extraoral technique of nasal cinching suture was applied in our study. during this system, the suture was skilled a subcutaneous tunnel, which offered a more robust anchorage of the soft tissue and enhanced greater stability. it absolutely was anticipated to have less relapse. In our study, the nasolabial angle increased after surgery. Hence, nasal tip (pronasale) was moved relatively upward as compared with the subnasale and labiale superius points, increasing the nostril show.

6. CONCLUSION

The nasal changes in patients demonstrated an increase of the nasolabial angle and nostril show, a delicate increase of the alar width, and a decrease of columella inclination, together with no alteration on the alar base width, nasal height, and nasal length. Three-dimensional photogrammetry is also a strong tool for evaluation of nasal changes after orthognathic surgery.

ISSN 2515-8260 Volume 07, Issue 07, 2020

ACKNOWLEGMENT

We would like to thank Dar al uloom university, Riyadh, Saudi Arabia for their support.

7. REFERENCES

[1] Altman JI, Oeltjen JC. Nasal deformities associated with orthognathic surgery: analysis, prevention, and correction. J Craniofac Surg 2007;18:734e9.

[2] Honrado CP, Lee S, Bloomquist DS, Larrabee Jr WF. Quantitative assessment of nasal changes after maxillomandibular surgery using a 3-dimensional digital imaging system. Arch Facial Plast Surg 2006;8:26e35.

[3] Schendal SA, Carlotti Jr AE. Nasal considerations in orthognathic surgery. Am J Orthod Dentofacial Orthop 1991;100:197e208.

[4] Ubaya T, Sherriff A, Ayoub A, Khambay B. Soft tissue morphology of the naso-maxillary complex following surgical correction of maxillary hypoplasia. Int J Oral Maxillofac Surg 2012;41:727e32.

[5] Betts NJ, Vig KW, Vig P, Spalding P, Fonseca RJ. Changes in the nasal and labial soft tissues after surgical repositioning of the maxilla. Int J Adult Orthodon Orthognath Surg 1993;8:7e23.

[6] Misir AF, Manisali M, Egrioglu E, Naini FB. Retrospective analysis of nasal soft tissue profile changes with maxillary surgery. J Oral Maxillofac Surg 2011;69:e190e4.

[7] Caloss R, Atkins K, Stella JP. Three-dimensional imaging for virtual assessment and treatment simulation in orthognathic surgery. Oral Maxillofac Surg Clin North Am 2007;19:287e309.

[8] Baik HS, Kim SY. Facial soft-tissue changes in skeletal Class III orthognathic surgery patients analyzed with 3-dimensional laser scanning. Am J Orthod Dentofacial Orthop. 2010;138(2):167–78. doi:10.1016/j.ajodo.2010.02.022.

[9] Choi JW, Lee JY, Oh TS, Kwon SM, Yang SJ, Koh KS. Frontal soft tissue analysis using a 3 dimensional camera following two-jaw rotational orthognathic surgery in skeletal class III patients. J Craniomaxillofac Surg. 2013. doi:10.1016/j.jcms.2013.05.004.

[10] Radney LJ, Jacobs JD. Soft-tissue changes associated with surgical total maxillary intrusion. Am J Orthod. 1981;80(2):191–212.

[11] 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;53(6):549–53.

[12] Westermark AH, Bystedt H, Von Konow L, Sallstrom KO. Nasolabial morphology after Le Fort I osteotomies. Effect of alar base suture. Int J Oral Maxillofac Surg. 1991;20(1):25–30.

[13] Rustemeyer J, Martin A. Soft tissue response in orthognathic surgery patients treated by bimaxillary osteotomy: cephalometry compared with 2-D photogrammetry. Oral Maxillofac Surg. 2013;17(1):33–41. doi:10.1007/s10006-012-0330-0.

[14] Kajikawa Y. Changes in soft tissue profile after surgical correction of skeletal class III malocclusion. J Oral Surg. 1979;37(3):167–74.

[15] Lin SS, Kerr WJ. Soft and hard tissue changes in Class III patients treated by bimaxillary surgery. Eur J Orthod. 1998;20(1):25–33.

ISSN 2515-8260 Volume 07, Issue 07, 2020

[16] Kinzinger G, Frye L, Diedrich P. Class II treatment in adults: comparing camouflage orthodontics, dentofacial orthopedics and orthognathic surgery–a cephalometric study to evaluate various therapeutic effects. J Orofac Orthop. 2009;70(1):63–91. doi:10.1007/s00056-009-0821-2.

[17] Verze L, Bianchi FA, Schellino E, Ramieri G. Soft tissue changes after orthodontic surgical correction of jaws asymmetry evaluated by three dimensional surface laser scanner. J Craniofac Surg. 2012;23(5):1448–52. doi:10.1097/SCS.0b013e31824e25fc.

[18] Holberg C, Heine AK, Geis P, Schwenzer K, Rudzki-Janson I. Three-dimensional soft tissue prediction using finite elements. Part II: Clinical application. J Orofac Orthop. 2005;66(2):122–34. doi:10.1007/s00056-005-0422-7.

[19] Holberg C, Schwenzer K, Rudzki-Janson I. Three-dimensional soft tissue prediction using finite elements. Part I: Implementation of a new procedure. J Orofac Orthop. 2005;66(2):110–21. doi:10.1007/s00056-005-0421-8.

[20] Plooij JM, Swennen GR, Rangel FA, Maal TJ, Schutyser FA, Bronkhorst EM, et al. Evaluation of reproducibility and reliability of 3D soft tissue analysis using 3D stereophotogrammetry. Int J Oral Maxillofac Surg 2009;38:267e73.

[21] Lu¨bbers HT, Medinger L, Kruse A, Gra¨tz KW, Matthews F. Precision and accuracy of the 3dMD photogrammetric system in craniomaxillofacial application. J Craniofac Surg 2010;21:763e7.

[22] Maal TJ, van Loon B, Plooij JM, Rangel F, Ettema AM, Borstlap WA, et al. Registration of facial 3-dimensional facial photographs for clinical use. J Oral Maxillofac Surg 2010;68: 2391e401.

[23] Huang CS, Liu XQ, Chen YR. Facial asymmetry index in normal young adults. Orthod Craniofac Res 2013;16:97e104.

[24] Ferrario VF, Sforza C, Tartaglia G, Barbini E, Michielon G. New television technique for natural head and body posture analysis. J Craniomandib Pract 1995;13:247e55.

[25] Ferrario VF, Sforza C, Schmitz JH, Serrao G, Miani Jr A. A three dimensional computerized mesh diagram analysis and its application in soft tissue facial morphometry. Am J Orthod Dentofacial Orthop 1998;114:404e13.

[26] Chang ZC, Chen YJ, Chang HF, Yao CC, Lan WH, Liu PH, et al. Morphometric analysis of mandibular growth in skeletal class III malocclusion. J Formos Med Assoc 2006;105:318e28.

[27] Lin HC, Chang HP, Chang HF. Treatment effects of occipitomental anchorage appliance of maxillary protraction combined with chin cup traction in children with class III malocclusion. J Formos Med Assoc 2007;106:380e91.

[28] Yamada T, Mishima K, Moritani N, Janune D, Matsunura T, Ikeya Y, et al. Nasolabial morphologic changes after a Le Fort I osteotomy: a three-dimensional anthropometric study. J Craniofac Surg 2010;21:1089e95.

[29] O'Ryan F, Schendel Jr SA. Nasolabial esthetics and maxillary surgery. In: Bell WH, editor. Modern practice in orthognathic and reconstructive surgery. St Louis, MO: WB Saunders; 1992. p. 285e317.

[30] Mitchell C, Oeltien J, Panthaki Z, Thaller SR. Nasolabial aesthetics. J Craniofac Surg 2007;18:756e65.

[31] Millard Jr DR. The alar base cinch in the fat flaring nose. Plast Reconstr Surg 1980;65:669e72.

TABLES

TABLE 1- ALAR BASE MEASUREMENTS

S. No.	**DIAGNOSIS**	**OTHOGNATHIC SURGERY PERFORMED**	**ALAR BASE MEASUREMENT (in cm)**
1	Max. Hypo.	Le Fort I	31
2	Max. Hypo.	Le Fort I	34
3	Max. Hypo.	Le Fort I	32
4	Max. Hypo.	Le Fort I	34
5	Max. Hypo.	Le Fort I	33
6	Max. Hypo.	Le Fort I	31
7	Max Hypo.	Amo & Genio	32
8	Mand Progn.	Bsso	35
9	Max. Hypo.	Le Fort I	34
10	Mand Progn.	Bsso	33
11	Max. Hypo.	Le Fort I	34
12	Max. Hypo.	Le Fort I	32
13	Max. Hypo.	Le Fort I	31
14	Max. Progn.	Le Fort I, Amo & Genio	34
15	Bimax Prog.	Le Fort I, Amo & Sao	32
16	Max. Hypo.	Le Fort I & Genio	33
17	Max. Hypo.	Le Fort I	32
18	Bimax Prog.	Le Fort I, Amo & Genio	34
19	Max Ret. Mand. Prog.	Le Fort I & Bssro	32
20	Max Hypo	Le Fort I	33

**Max.- Maxillary, Mand.- Mandibular, Hypo.- Hypoplasia, Progn.- Prognathism, Ret.- Retraction, Bimax.- Bimaxillary, Amo.- Anterior Maxillary Osteotomy, Genio.-Genioplasty, Bsso- Bilateral Sagittal Split Osteotomy, Bssro-Bilateral Sagittal Split Ramus Osteotomy, Sao- Sub-Apical Osteotomy.*

ISSN 2515-8260 Volume 07, Issue 07, 2020

TABLE 2- NASAL CHANGES AFTER SURGERY, COMPARING THE PRE- AND POSTOPERATIVE MEASUREMENTS

Variable	**Pre-operative measurement *(Mean ±SD)***	**Post-operative measurement *(Mean ±SD)***	**Paired t-test value *(p value<0.05-significant)***
Nasal height	51.60 ± 4.27	51.63 ± 3.76	0.91
Nasal length	45.66 ± 5.05	45.99 ± 4.87	0.27
Alar width	40.74 ± 3.70	41.49 ± 3.75	<0.001
Alar base width	36.52 ± 3.87	36.55± 3.81	0.93
Nasolabial angle	92.80 19.49	102.04 ± 16.06	<0.001
Subalare width	21.60 ± 3.02	21.55 ± 3.08	0.82

**SD- Standard Deviation*