



Bimaxillary surgery in Class III malocclusion: Soft and hard tissue changes

Barış Aydil^a, Nedim Özer^b, Gülnaz Marşan^{c,*}

^a Istanbul University, Faculty of Dentistry, Department of Maxillofacial Surgery, Çapa 34093, Istanbul, Turkey

^b Okmeydanı Dental Hospital, Department of Maxillofacial Surgery, Turkey

^c Istanbul University, Faculty of Dentistry, Department of Orthodontics, Turkey

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ABSTRACT

The aim of this study was to quantify anteroposterior facial soft tissue changes with respect to underlying skeletal movements after Le Fort I maxillary advancement and mandibular setback surgery with sagittal split osteotomy in Class III skeletal deformity by using lateral cephalograms taken before and after the operation.

The material consisted of 31 patient (15 female, 16 male cases, mean age was 26.7 ± 2.5 years) with Class III skeletal deformity. All patients were treated by Le Fort I maxillary advancement and mandibular setback surgery with sagittal split osteotomy. Lateral cephalograms were taken before and 1.4 $\pm$ 0.3 years after surgery. Wilcoxon test was used to compare the pre- and post-surgical measurements. Pearson correlation test was used to compare the relationships between the skeletal, dental and facial soft tissue changes.

In the maxilla, the APOINTAP (the anteroposterior position of A point) and ITIPAP (the anteroposterior position of upper incisor) showed significant protractions (-3.19 ± 3.63 , and -3.19 ± 4.52 , $p < 0.01$). In the mandible, the L1TIPAP (the anteroposterior position of lower incisor, -3.20 ± 5.83 , $p < 0.01$), L1TIPSI (the superoinferior position of lower incisor, -2.43 ± 10.31 , $p < 0.05$), BPOINTSP (the superoinferior position of B point, -2.28 ± 12.51 , $p < 0.05$) and BPOINTAP (the anteroposterior position of B point, -3.19 ± 9.31 , $p < 0.01$) showed significant retractions and upper positions after bimaxillary surgery. The insignificant decrease in soft tissue Pog–Vert distance was correlated the significant upper position of B point and lower incisor ($r: 0.851$, $p < 0.001$ and $r: 0.842$, $p < 0.001$).

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1. Introduction

Well balanced and harmonious soft tissue facial profile is a very important goal in orthognathic surgery (Abeltins and Jakobsone, 2011; Anic-Milosevic et al., 2010; Altman and Oeltjen, 2007; Altuğ-Ataç et al., 2008; Arad et al., 2011; Bailey et al., 1996, 2001, 2007).

Skeletal Class III malocclusion is reported to be the most frequent anomaly corrected by combined orthognathic surgery and orthodontic treatment (Chew et al., 2008; Chunmaneechok, 1999; Costa et al., 2001; Day and Lee, 2006; Espeland et al., 2008; Guest et al., 2001; Hajeer et al., 2002; Hernández-Alfaro et al., 2011; Honrado et al., 2006; Jakobsone et al., 2011; Moldez et al., 2005; Moure et al., 2012; Rustemeyer and Gregersen, 2011). Although the use of bimaxillary procedures is wide spread, relatively few reports

based on substantial and homogenous samples are available only a few studies address nasal and midfacial changes (Mitchell et al., 2007; Misir et al., 2011; Park et al., 2012; Seah et al., 2012; Yamada et al., 2010). Therefore, the aim of this study was to quantify anteroposterior facial soft tissue changes with respect to underlying skeletal movements after Le Fort I maxillary advancement and mandibular setback surgery with sagittal split osteotomy in Class III skeletal deformity.

2. Patients and methods

The material consisted of 31 patients (15 female, 16 male cases, mean age was 26.7 ± 2.5 years) with Class III skeletal deformity.

Patients who had trauma, congenital defects or syndromes, or soft tissue surgeries (e.g. rhinoplasty) were excluded. The study involved a retrospective analysis of anonymized records-as such, it was judged that ethical approval was not required.

All patients were received pre-surgical and post-surgical orthodontics at the Istanbul University, Department of Orthodontics,

* Corresponding author. Tel.: +90 2124142020; fax: +90 2125312230.
E-mail address: gulnaz.marsan@yahoo.com (G. Marşan).

Faculty of Dentistry and operated by Le Fort I maxillary advancement and mandibular setback surgery with sagittal split osteotomy by the same surgeons at the Okmeydanı Dental Hospital, Department of Maxillofacial Surgery.

A Le Fort I osteotomy was performed with a horizontal incision above the reflection of the sulcus, subperiosteal degloving of the nasal spine, and separation of the septum with a guarded osteotome. The anterior nasal spine was left intact in all patients. No maxillary impaction was performed.

2.1. Cephalometric analysis

Lateral cephalograms were taken before and 1.4 ± 0.3 years after surgery and evaluated by the same operator on the same machine. All postoperative films were taken after orthodontic band removal. Transient soft tissue changes resulting from the different stages of healing and recovery were virtually eliminated by requiring that the postoperative radiograph be taken 1.4 ± 0.3 years postoperatively.

The pre- and post-surgical (T1–T2) lateral cephalograms were selected and traced manually by the same clinician. The cephalometric reference points were determined by use of acetate tracing paper. All radiographs were taken with teeth together in centric occlusion and lips in repose (Fig. 1).

The horizontal reference line was constructed by raising a line 7° from sella–nasion, and a perpendicular to this line at nasion was used as the vertical reference line as seen in Fig. 1. This reference line was transferred to the post-surgical lateral cephalograms. The hard and soft tissue landmarks were measured in millimeters to both the horizontal and vertical reference lines in both the pre-surgical and post-surgical cephalograms, and any differences in the distance were recorded as the surgical change.

The Sella–Nasion length (S–N) was measured on both cephalograms, and the cases were included in the study only if there had been no change in S–N length. Nasion horizontal and vertical were chosen as reference planes. A vertical line to the S–N, which passes through the nasal tip, was selected to evaluate the nasal tip vertical and horizontal movement. The T2 cephalogram was superimposed on the T1 cephalogram using the cranial base as a stable reference.

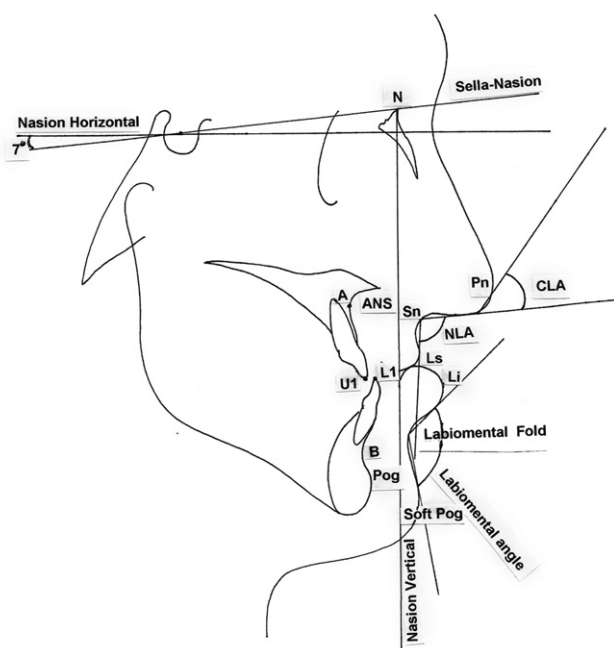


Fig. 1. Skeletal and soft tissue landmarks and measurements.

Movements in the anterior and superior directions were assigned positive values; those in the posterior and inferior directions were assigned negative values. Two angles were drawn to measure the soft tissue profile of the nose; nasolabial angle (NLA), the angle formed by the intersection of the columella point to subnasale line and subnasale to labrale superius line and columella-lobular angle (CLA), the angle formed at the junction of the columella with the infratip lobule.

The tracing of cephalograms were repeated by the same investigator after 1 month to assess intraexaminer reliability.

2.2. Statistical analysis

Statistical analysis was performed with the NCSS (Number Cruncher Statistical System, Utah, USA, 2007) statistical software programme. Wilcoxon test was used to compare the pre- and post-surgical measurements. Pearson correlation test was used to evaluate the relationships between the skeletal, dental and facial soft tissue changes.

2.3. Error of the method

The values for the re-traced films were analyzed by use of the Dahlberg Formula: Error of the method² = $\Sigma d^2/2n$, where d is the difference between 2 measurements and n is the number of double determinations (Bland and Altman, 2010). The error of the method was no greater than 0.5° and millimeter.

3. Results

Table 1 shows the means and standard deviations of skeletal and facial soft tissue changes after Le Fort I maxillary advancement and mandibular setback surgery with sagittal split osteotomy in Class III skeletal deformity.

As seen in Table 1, The APOINTAP (the anteroposterior position of A point) and ITIPAP (the anteroposterior position of upper incisor)

Table 1

The means and standard deviations of pre- and post-surgical measurements by using Wilcoxon test.

	Pre-surgical (T1)		Post-surgical (T2)		Difference (T1 – T2)		p
	Mean	SD	Mean	SD	Mean	SD	
APOINTAP (mm)	–6.00	4.18	–1.38	3.18	–3.19	3.63	0.001**
ITIPAP (mm)	–2.31	4.80	1.62	4.35	–3.19	4.52	0.001**
NASALAP (mm)	30.46	6.88	30.92	7.25	–0.53	7.60	0.596
APOINTSI (mm)	55.23	7.55	54.85	9.57	–0.48	8.51	0.635
ITIPSI (mm)	78.23	10.58	77.77	12.04	–0.83	11.31	0.406
NASALSI (mm)	41.38	7.16	42.23	12.34	–1.62	9.75	0.104
NLA (ϕ)	92.15	13.61	91.85	8.44	–0.04	11.52	0.972
CLA (ϕ)	27.08	5.33	28.31	5.50	–0.64	5.21	0.523
L1TIPAP (mm)	4.46	6.37	–1.85	5.40	–3.20	5.83	0.001**
L1TIPSI (mm)	79.00	11.59	74.08	10.13	–2.43	10.31	0.015*
Mentolabial angle	134.77	13.72	131.69	14.48	–0.88	14.10	0.381
BPOINTSP (mm)	100.23	12.42	95.00	12.60	–2.28	12.51	0.023*
BPOINTAP (mm)	1.62	10.18	–4.77	8.45	–3.19	9.31	0.001**
Soft Pog Vert (mm)	107.85	12.33	105.38	14.64	–0.74	13.43	0.436

* $p < 0.05$ and ** $p < 0.01$.

Table 2

Correlations between skeletal and soft tissues by using Pearson correlation test.

	BPOINTSP	LTIPSI
	$r: 0.851$	$r: 0.842$
Soft Pog Vert (mm)	$p: 0.0001^{***}$	$p: 0.0001^{***}$

*** $p < 0.001$.

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