

## Role of Le fort I Osteotomy in orthosurgical management of maxillary deformities in north Indian population

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### ABSTRACT

**Background:** Le Fort I osteotomy is one of the most commonly performed procedure, either alone or in conjunction with other orthognathic procedures for maxillary deformities.

**Objective:** The present prospective study pertains to definite diagnosis, orthosurgical planning with cephalometric predictions of dento-osseous deformities of maxilla and their correction by LeFort I osteotomy.

**Material and Methods:** Fourteen patients with skeletal deformity along with malocclusion which was too severe to be corrected orthodontically alone were selected. Parameters were selected on the basis of clinical findings, cephalometrically hard and soft tissue landmarks [COGS (Burstone and Legan) and Steiners analysis]. Parameters were observed and compared preoperatively prediction values, postoperatively and on follow-up.

**Results:** There were obvious improvement in various linear and angular readings of hard and soft tissues. In linear measurements, N-ANS  $\perp$  HP decreased from  $57.62 \pm 3.3$  to  $52.4 \pm 2.9$ ; ANS-Gn  $\perp$  HP decreased from  $75.8 \pm 8.1$  to  $69.3 \pm 6.1$ ; NA  $\parallel$  HP reduced by approximately 5mm; N-Pg  $\parallel$  HP decreased from  $-12.07 \pm 9.6$  to  $-3.78 \pm 8.8$  and PNS-N  $\perp$  HP decreased from  $55.28 \pm 5.08$  to  $58.07 \pm 4.4$ . On analysis of angular hard tissue measurements, N-A-Pg angle decreased from  $5.14 \pm 5.75$  to  $4.17 \pm 2.73$  (superior repositioning of maxilla) and increased from  $3.0 \pm 1.4$  to  $4.5 \pm 0.7$  (inferior repositioning of maxilla); MP-HP angle, Ar-Go-Gn angle decreased following superior repositioning and increased following inferior repositioning of maxilla and SNA angle decreased from mean 80.8 to 79.5.

**Conclusion:** LeFort I osteotomy is really a workhouse of orthognathic surgery in which maxilla can be mobilized in vertical and saggital planes to correct various dento-osseous deformities.

**Key Words:** LeFort I osteotomy, orthosurgical planning, cephalometric analysis, the dento-osseous deformity

### Introduction

Versatility of Le Fort I osteotomy can be utilized in correcting maxillary deformities in vertical as well as saggital plane. It is imperative that any surgical procedure of the jaws has to be considered with the possibility of relapse which has made it compulsory to achieve normal occlusion anteriorly and posteriorly along with definite

overjet and overbite. Le Fort I osteotomy is one of the most commonly performed procedure, either alone or in conjunction with other orthognathic procedures for maxillary deformities.

The present study pertains to definite diagnosis, orthosurgical planning with cephalometric predictions of dento osseous deformities of maxilla and their correction by Le Fort I osteotomy.

### Historical Background

Von-Lengenbeck,<sup>[1]</sup> was the first person to perform maxillary osteotomy in Europe but according to Moloney et al, Cheever was first to perform LeFort I osteotomy to remove nasopharyngeal tumor.<sup>[2]</sup> To correct the anterior open bite, Cohn – Stock,<sup>[3]</sup> described the first anterior maxillary osteotomy, however, Le Fort I osteotomy was presented by Wassmund,<sup>[4]</sup> who corrected the anterior open bite with the help of elastic traction but pterygomaxillary junction was left intact.

The displaced Le Fort I fractures of the maxilla was corrected by Axhausen by advancing the maxilla anteriorly with the elastics which proved that in Le Fort I fractures, the pterygotuberosities should also be fractured, which facilitated the advancement of maxilla by elastics.<sup>[5]</sup> Schuchardt presented the Le Fort I osteotomy in stages which ended by pterygo maxillary separation which he described as complete down fracture of the maxilla.<sup>[6]</sup> Dingman & Harding described the importance of Le Fort I in correction of post traumatic deformities.<sup>[7]</sup> Obwegeser who described a single step full maxillary osteotomy to bring the maxilla into predicted position.<sup>[8]</sup>

### Biological Consideration

Prior to 1969, there was extensive controversy over utilizing the soft tissue pedicle for the osteotomised maxilla; it was Bell, who performed landmark study on rhesus monkeys regarding the revascularization after maxillary osteotomy.<sup>[9]</sup> He confirmed that revascularization is achieved if either labial or palatal flap with its circulation

is maintained intact during maxillary osteotomy.

The same basic research protocol was used by Bell et al,<sup>[10]</sup> and Bell W H,<sup>[11]</sup> to establish a biological basis for a variety of different osteotomy techniques that induce less morbidity and ischemic sequelae. The Le Fort I osteotomy, introduced by Obwegeser,<sup>[12]</sup> and first evaluated by Willmer,<sup>[13]</sup> is a commonly used procedure in the management of midfacial deformities. Wolford stressed that a V-Y closure improves upper lip esthetics.<sup>[14]</sup> According to Al-Waheidi et al upper lip length increased while lower lip thickness decreased following maxillary advancement.<sup>[15]</sup>

### Materials and Methods

LeFort I osteotomy have proved to be most acceptable procedure in dento-osseous deformities in maxilla. The patients who attended the Outdoor Patient Department of Dental Surgery with maxillary dento-osseous deformities were included in the study. Finally, 14 Patients were selected, out of which, 10 were females and 4 were males. The age of these patients ranged from 17 to 26 years. The average age at which the surgical correction was carried out was 20 years. Patients with skeletal deformity along with mal-occlusion which was too severe to be corrected orthodontically alone were selected.

Out of 14 patients, 7 patients with long face syndrome having vertical maxillary excess; 2 patients with short face syndrome; 2 patients of cleft-palate with hypoplastic maxilla; 1 patient with severe mid-face deficiency and severe

class III skeletal deformities were selected for combination surgery. 2 patients were selected for correction of canting of occlusion. All the patients had completed their growth spurts. (Fig. 1-4)



Fig. 1 Long face syndrome (superior repositioning) [pre-operative]

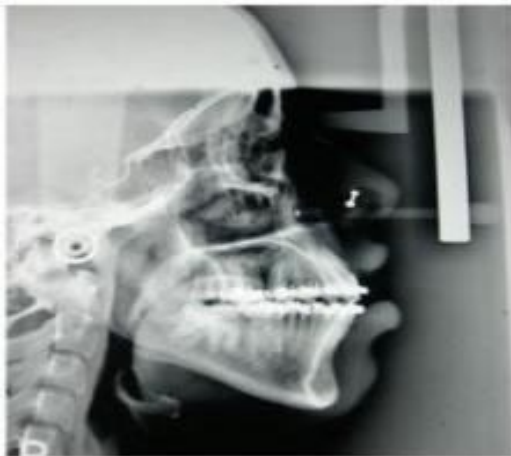


Fig. 2 Long face syndrome - Cephalogram in natural head position [pre-operative]



Fig. 3 Short face syndrome (inferior repositioning) [pre-operative]



Fig. 4 Short face syndrome - Cephalogram in natural head position [pre-operative]

Parameters were selected on the basis of clinical findings, cephalometrically hard and soft tissue landmarks. Parameters were observed and compared pre-operatively, prediction values, post-operatively and on follow ups. (Immediate post-operatively, at 3 months and 6 months follow ups)

### Results

The present study comprised of 14 cases. In 7 out of 14 cases, superior repositioning of maxilla and in 2 cases inferior repositioning was done. In 2

cases, canting of occlusion was corrected and in 3 cases advancement of maxilla was done with iliac bone grafting. (Fig. 5-8)

In 7 cases out of 14 cases, dento-osseous deformities were managed by LeFort I osteotomy alone and in 7 cases LeFort I surgeries were combined with additional mandibular surgical procedures. The group under study

included 10 females & 4 males with average age of 20 years (range 17 to 26 years). Table: 1

We studied changes utilizing (Legan and Burstone's) <sup>[16]</sup> soft tissue and hard tissue analysis in patients who underwent correction of dento-osseous deformities by LeFort I osteotomy. (Graph. 1-2)

**Table: 1 Summary of Data from 14 cases of Dento-osseous Deformities Treated with LeFort I Osteotomy or Combination Surgeries**

	Patient's	Age	Sex	Diagnosis	Surgery
1	Case-1	23	F	I	1
2	Case-2	18	F	I,IV	1,6
3	Case-3	19	F	I,IV	1,6
4	Case-4	20	F	I	1
5	Case-5	18	M	I,IV,III	1,3,6
6	Case-6	25	F	I,V	1
7	Case-7	24	F	I	1
8	Case-8	19	F	II	2
9	Case-9	24	F	II	2
10	Case-10	19	M	III,IV	3,5,6
11	Case-11	18	M	III,V	2,3
12	Case-12	16	F	III	3
13	Case-13	17	F	II,VI	4
14	Case-14	26	M	VI	4

**Keys:**

**(Diagnosis in the cases)**

- I. Vertical Maxillary Excess
- II. Vertical Maxillary Deficiency
- III. Midface Deficiency (Cleft cases, Congenital defect)
- IV. Mandibular Prognathism (Excess)
- V. Mandibular Deficiency
- VI. Maxillary asymmetry due to operated cases of the ankylosis

**(Surgery performed in cases)**

- 1. LeFort I Osteotomy with Superior Repositioning
- 2. LeFort I Osteotomy with inferior refusing
- 3. LeFort I Osteotomy with advancement
- 4. LeFort I Osteotomy with for correlation of canting
- 5. Vertical ranal osteotomy to setback mandible
- 6. Genioplasty



Fig. 5 Long face syndrome (Superior repositioning) [Post-operative]

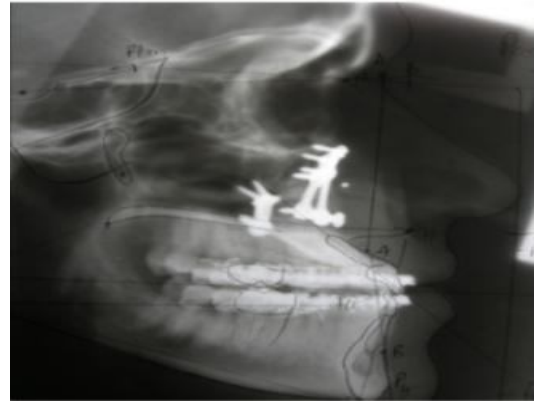


Fig. 8 Short face syndrome - Cephalogram in natural head position [post-operative]

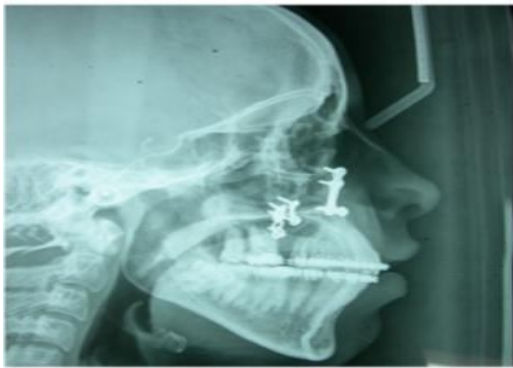
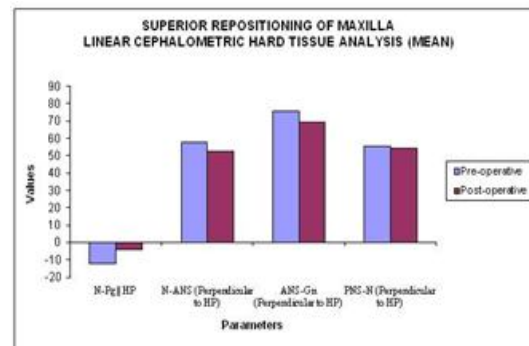


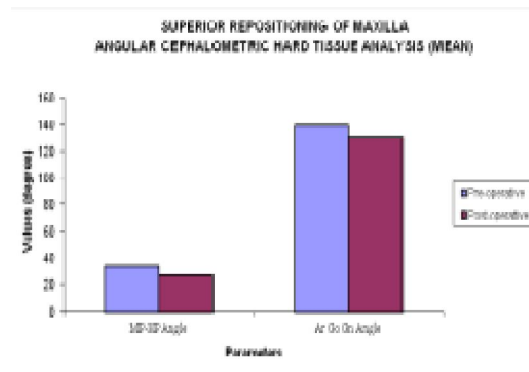
Fig. 6 Long face syndrome - Cephalogram in natural head position [post-operative]



Graph 1: Superior repositioning of maxilla-Linear cephalometric hard tissue analysis (mean)



Fig. 7 Short face syndrome (inferior repositioning) [post-operative]



Graph 2: Superior repositioning of maxilla-Angular cephalometric hard tissue analysis (mean)

**Table 2: Comparison of Pre-operative and Post-operative Values (Group I)**

	Pre-operative	Post-operative
Linear Measurements (in mm)	Mean ± SD	Mean ± SD
N-A    HP	0.71 ± 4.88	1.2 ± 5.12
N-B    HP	-9.57 ± 7.93	-4.28 ± 8.83
N-Pg    HP	-12.07 ± 9.64	-3.78 ± 8.83
N-ANS (⊥ HP)	57.57 ± 3.30	52.35 ± 2.92
ANS-Gn (⊥ HP)	75.85 ± 8.19	69.28 ± 6.14
PNS-N (⊥ HP)	55.28 ± 5.08	54.07 ± 4.41
Angular Measurements (in degree)		
N-A-Pg ∠	5.14 ± 5.75	4.14 ± 2.73
MP-HP ∠	34.14 ± 3.43	28.07 ± 2.71
Ar Go Gn ∠	139.28 ± 5.99	131.14 ± 5.52
SNA ∠	80.85 ± 5.84	79.57 ± 3.73
SNB ∠	79 ± 5.91	78.57 ± 3.64

**Table 3: Comparison of Pre-operative and Post-operative Values (Group I)**

	Pre-operative	Post-operative
Clinical Findings (in mm)	Mean ± SD	Mean ± SD
Upper lip length	21.68 ± 1.44	22.28 ± 1.38
Na to tip of incisor (upper)	81.78 ± 2.78	77.07 ± 2.37
Interlabial gap	9.21 ± 1.07	4.42 ± 0.88
Upper incisor show	12.78 ± 1.79	5.92 ± 0.83
Alar base width	29.5 ± 1.32	31.5 ± 1.47
Middle 3 <sup>rd</sup> Facial Height	59 ± 2.30	54.21 ± 1.38
Lower 3 <sup>rd</sup> Facial Height	77.5 ± 7.68	69.42 ± 6.45
SOFT TISSUE ANALYSIS		
Facial Convexity Angle (G-Sn-Pg) (in degree)	11.28 ± 1.28	7.28 ± 1.34
Middle 3 <sup>rd</sup> Facial Height (G-Sn') (in mm)	62.28 ± 3.35	56.78 ± 2.98
Lower 3 <sup>rd</sup> Facial Height (Sn-Pg') (in mm)	78.92 ± 10.13	71.64 ± 6.70
Nasolabial Angle (in degree)	102.35 ± 1.74	99.28 ± 1.25
Mentolabial Sulcus (in mm)	0.21 ± 0.99	2.28 ± 0.75

**Table 4: Comparison of Post-operative Values of Group I with Acceptable Norms (Cog's Analysis)**

	Post-operative	Acceptable Norms
Linear Measurements (in mm)	Mean ± SD	Mean ± SD
N-A    HP	1.2 ± 5.12	-2 ± 3.7
N-B    HP	-4.28 ± 8.83	-6.9 ± 4.3
NPg    HP	-3.78 ± 8.83	-6.5 ± 5.1
N-ANS (⊥ HP)	52.35 ± 2.92	50.0 ± 2.4
ANS-Gn (⊥ HP)	69.28 ± 6.14	61.3 ± 3.3
PNS-N (⊥ HP)	54.07 ± 4.41	50.6 ± 2.2
Angular Measurements (in degree)		
N-A-Pg ∠	4.14 ± 2.73	2.6 ± 5.1
MP-HP ∠	28.07 ± 2.71	24.2 ± 5.0
Ar Go Gn ∠	131.14 ± 5.52	122 ± 8.3
SNA ∠	79.57 ± 3.73	82 ± 2
SNB ∠	78.57 ± 3.64	80 ± 2

**Table 5: Comparison of Post-operative Values of Group I with Acceptable Norms**

	Post-operative	Acceptable Norms
Clinical Findings (in mm)	Mean ± SD	Mean ± SD
Upper lip length	22.28 ± 1.38	20 ± 2
Na to tip of incisor (upper)	77.07 ± 2.37	78 ± 3
Interlabial gap	4.42 ± 0.88	2 ± 2
Upper incisor show	5.92 ± 0.83	2 ± 2
Alar base width	31.5 ± 1.47	32 ± 3
Middle 3 <sup>rd</sup> Facial Height	54.21 ± 1.38	55 ± 3
Lower 3 <sup>rd</sup> Facial Height	69.42 ± 6.45	65 ± 4
SOFT TISSUE ANALYSIS		
Facial Convexity Angle (G-Sn-Pg) (in degree)	7.28 ± 1.34	12 ± 4
Middle 3 <sup>rd</sup> Facial Height (G-Sn') (in mm)	56.78 ± 2.98	57 ± 2
Lower 3 <sup>rd</sup> Facial Height (Sn-Pg') (in mm)	71.64 ± 6.70	68 ± 2
Nasolabial Angle (in degree)	99.28 ± 1.25	102 ± 8
Mentolabial Sulcus (in mm)	2.28 ± 0.75	4 ± 2

### **HARD TISSUE ANALYSIS**

#### **Linear Measurement: (Table- 2 & 4)**

#### **N-ANS $\perp$ HP: (Height of the Middle 3<sup>rd</sup> of the Face)**

This value indicates supero-inferior position of maxilla in relation to horizontal reference plane. This value has decreased from  $57.62 \pm 3.3$  to  $52.4 \pm 2.9$  (mean  $\pm$  standard deviation in mm), indicating superior repositioning of maxilla in correction of long face syndrome faces by LeFort I osteotomy. This value has significantly changed with p value less than 0.001.

This value is increased from  $47.0 \pm 1.4$  to  $50.5 \pm 0.7$  (mean  $\pm$  standard deviation in mm) in inferior repositioning of maxilla in correction of short face syndrome.

#### **ANS-Gn $\perp$ to HP: (Height of the Lower 3<sup>rd</sup> of the Face)**

This value describes superoinferior positioning of maxilla in relation to mandible. This value is decreased from  $75.8 \pm 8.1$  to  $69.3 \pm 6.1$  indicating the autorotation of mandible due to superior repositioning of maxilla by LeFort I osteotomy.

This value was statistically significant with p value = 0.004. This decrease in value was due to decrease in the height maxilla, reduction in anterior nasal spine and crest which is done during superior repositioning of maxilla.

#### **NA $\parallel$ HP: (Degree of horizontal dysplasia of maxilla)**

This measurement describes the apical base of maxilla in relation to Nasion in anteroposterior direction. This enables anteroposterior position of maxilla. On analysis of mean values, this has changed from  $0.71 \pm 4.9$  to  $1.2 \pm 5.1$  (mean  $\pm$  standard deviation in mm)

following superior repositioning of maxilla. Statistically insignificant result was observed. In advanced group, this value has increased from  $3.3 \pm 7.1$  to  $3.00 \pm 4.8$  (mean  $\pm$  standard deviation in mm)

#### **NB $\parallel$ HP: (Horizontal Position of Mandible in Relation to Cranial Base)**

It helps in assessment of anteroposterior position of mandible in relation to cranial base. When mean values of this measurement were analyzed for superior repositioning of maxilla, there was reduction of approximately 5 mm post-operatively this value was insignificant.

#### **N-Pg $\parallel$ HP: (Prominence of Chin)**

This value indicates position of chin in relation to cranial base. Change of value from  $-12.07 \pm 9.6$  to  $-3.78 \pm 8.8$  (mean  $\pm$  standard deviation in mm). This value was significant with p value = 0.004.

#### **PNS-N $\perp$ HP: (Posterior Height of Maxilla)**

This value has decreased from  $55.28 \pm 5.08$  to  $58.07 \pm 4.4$  by superior repositioning of maxilla. Significant changes have been found with p value = 0.035 following superior repositioning.

### **ANGULAR HARD TISSUE MEASUREMENT**

#### **N-A-Pg Angle: (Facial Convexity)**

This angle gives an indication of the overall facial convexity. This value was decreased from  $5.14 \pm 5.75$  to  $4.17 \pm 2.73$  indicating the straightening of profile by superior repositioning maxilla. This value was increased from  $3.0 \pm 1.4$  to  $4.5 \pm 0.7$  following inferior repositioning of maxilla indicating that profile became more convex in inferior repositioning.

#### **MP-HP Angle**



This is the angle formed between a line from Go and Gn and horizontal plane (HP) as it intersects Gn. This angle tells the posterior facial divergence with respect to anterior facial height. So, the divergence of the mandible posteriorly, is shown by MP-HP angle. This value has decreased by superior repositioning of maxilla and reverse was true for inferior repositioning. This value was highly significant with p value < 0.001 following superior repositioning.

**Ar Go Gn Angle:** (Gonion angle that represents the relationship between the ramal plane and mandibular plane) This angle was with higher value in the long face syndrome and obviously this angle was decreased following superior repositioning of maxilla by LeFort I osteotomy which leads to antorotation of mandible. The change was statistically significant with p value = 0.0002. This Gonion angle was increased when inferior repositioning of maxilla was done to correct short face syndrome cases.

**SNA Angle:** (Position of Maxilla in Anteroposterior Plane)

This angle determines if maxilla is positioned forward or backward in relation to cranial base. As in 7 out of 14 cases superior positioning of maxilla was done. Simultaneously there was reduction of mean value from 80.8 to 79.5 and this change was insignificant.

#### **SOFT TISSUE ANALYSIS (Table: 3&5)**

##### **G-Sn-Pg': (Facial Convexity Angle)**

This is the angle between the line joining the glabella to subnasale (G-Sn) and subnasal to soft tissue pogonion (Sn-Pg). This value describes the overall horizontal soft tissue profile of the patient. This angle has decreased on

superior repositioning of maxilla from 11.2 to 7.3 indicating that straightening of profile has taken place following superior repositioning. The result is statistically significant with p value < 0.001. But this value was increased on inferior repositioning and advancement of maxilla.

##### **G-Sn: (Middle Facial height)**

This value describes the upper facial height by measuring the distance between glabella and Sn. This length was decreased on superior repositioning of maxilla from 62.28 to 56.8 mm (mean). This value was statistically significant with p value < 0.001. G-Sn value is increased when inferior repositioning of maxilla.

##### **Sn-Pg': (Lower Facial height)**

This value tells about the lower facial height. This value was decreased on superior repositioning of maxilla with mean value change from 78.9 to 71.6. This value is statistically significant with p value < 0.001.

##### **Cm-Sn-Ls: (Naso Labial Angle)**

This angle is formed by columella point (cm), subnasale and (Sn) nad Labrale superius (Ls). This angle assesses the anteroposterior position of maxilla. This angle has decrease i.e. become more acute on superior repositioning of maxilla, mean value change from 102.4 degree to 99 degree. This is statistically significant as p value < 0.001.

This angle has also decreased by advancement of maxilla. It takes into consideration the inclination of the columella as well as the position of upper lip.

##### **Mentolabial Sulcus Depth**

The sulcus depths is measured from depth of sulcus perpendicular to Li-Pg' line. The value has increased with

superior repositing of maxilla. On the analysis of mean value, this has changed from 0.21 mm to 2.3 mm and it is statistically significant with p value <0.001.

### Discussion

Facial harmony and a well balanced profile is an essential goal of orthognathic surgery. The present study showed significant hard tissue and soft tissue improvement in facial appearance by LeFort I osteotomy.

This study was carried out to assess and analyze the utility of LeFort-I osteotomies in dentofacial deformities of jaw. The patients were selected from Haryana and other adjoining places of India. There were a number of patients with most obvious dentofacial deformities which required utility of LeFort-I osteotomy. However, only 14 patients accepted the surgical treatment and rest were satisfied with compromised results by orthodontics.

Out of 14 patients, 10 were females and 4 were males. A higher proportion of female indicates that they are more concerned about their aesthetic appearance. Moreover, in our society, bad looks are a social stigma for girls, marring her matrimonial prospects. These could be the reasons behind greater proportion of female patients. Parula K, Oli Krenin K, after studying 655 patients of orthodontic surgery found that females were more concerned about their cosmetics than men.<sup>[18]</sup>

In the north Indian population, especially in Haryana, the problem of maxillary dysplasia is very common. Most of the patients with these problems undergo orthodontic

treatment for their management. Wolford suggested leveling of arches, correction of incisal inclination and correction of rotations as a must, before undertaking surgical procedure.<sup>[19]</sup> Actually, assessment of complete deformity can be made only after adjustment of incisors on basal bone.

We found cephalometrics of great value in analyzing the case preoperatively and to study the changes produced by surgery and relapse thereafter. The importance of cephalometry in diagnosis and treatment planning before orthognathic procedures has been repeatedly stressed by Nordenram et al<sup>[20]</sup>, McNeil et al<sup>[21]</sup> and Burstone & Legan.<sup>[22]</sup> In many instances, clinical evaluation and study model relationship will provide all the information a surgeon needs, regardless of the cephalometric picture. Kent and Hinds also stressed the importance of clinical evaluation and study model relationship over cephalometrics.<sup>[23]</sup>

The difference in position of maxilla and mandible in antero posterior plane as well as difference in their relative relationship was measured and statistical analysis suggested that changes observed during the period of follow-up of 6 months were highly significant. It was noted that surgical treatment allows placement of osteotomised maxilla along with teeth and corresponding soft tissue structures in desired relationships. Post-operatively, osseous soft tissue changes were determined by super-imposition of tracings at recall time. All osseous mandibular structures related on an arc with their origin at the condylar summit. Stability was examined in all patients

with complete records over an average follow up of six months. Ewing and Ross<sup>[24]</sup> reported that following LeFort I osteotomy, the overall soft tissue changes were minute after the first year. This is an agreement with previous studies dealing with skeletal relapse. Advancement of small cleft maxilla improves upper lip support. Ewing and Ross<sup>[24]</sup> have shown that upper lip thinned with maxillary advancement. According to Al-Waheidi<sup>[15]</sup> the upper incisor position was the most common predictor of significant soft tissue change.

An addition of V-Y closure also improves the upper lip esthetics. Wolford<sup>[14]</sup> V-Y closure was done in all the patients where LeFort-I osteotomy was performed to overcome the problems of short upper lip. This problem was corrected to some extent by excision of anterior nasal spine as well.

In our experience simultaneous V-Y plasty can be used to compensate for unfavourable changes in the lip that may result from LeFort I osteotomy. Soft tissue changes of the naso-maxillary region invariably accompany LeFort I osteotomies. Typically, there is widening of nasal base and associated flattening and thinning of upper lip (Schendel and Carlotti).<sup>[25]</sup> In the frontal view, an increase in inter alar width was always observed to accompany anterior and superior repositioning of the maxilla. These findings are consistent with our study.

In the present study the nasolabial angle was found to decreasing in advancement and superior repositioning and was increasing in inferior repositioning of

cases. Value lies within the norms as suggested by Legan and Burstone<sup>[22]</sup> and Moshiri et al.<sup>[26]</sup>

The facial convexity angle was found to be significantly improve surgery. The post operative value when compared with the standard esthetically acceptable norms, lie well within limits thereby indicating a significant change.

After going through the details of the findings in the present study, it is possible to say that desirable degree of facial esthetic, improvement was achieved after surgery. However, when the post-operative findings were compared with the norms described by Legan and Burstone<sup>[16]</sup> several measurements were found to be dissimilar. The simple reason for this may be the fact that these norms are applicable to the caucasian and more over the sample size considered in present study was small. These norms have been used here because no satisfactory norms for Indian population are available at hand.

Though sample size was small. We got results quite close to the acceptable norms of Legan and Burstone,<sup>[16]</sup> Hinds and Kent<sup>[27]</sup> and Henderson.<sup>[28]</sup> Long and extensive studies with large sample size are required to determine the acceptable norms hard and soft tissue correlation in the north Indian population.

We utilized elastic traction postoperatively in all of our patients who required minor corrections in the alignment of osteotomized segments. Post-operative elastic traction to achieve the final positioning of segments is recommended by Kole<sup>[29]</sup> in certain cases.

Orthognathic surgery is one of the highly specialized parts of oral and maxillofacial surgery. It gives right and opportunity to every individual to live with well proportionate and contoured profile. Orthognathic procedures require tremendous amount of planning on the part of orthodontist and maxillofacial surgeon. This is more true in case of LeFort I osteotomy. Our study has confirmed LeFort I ostotomy is really a workhouse of orthognathic surgery in which maxilla can be mobilized in vertical and saggital planes to correct various dento-osseous deformities. LeFort I osteotomy when used for superior repositioning of maxilla (approximately 5 to 6 mm) leads to expected results. Particularly in cases in which maxilla has to be pushed up for the correction of long face deformities, the cartilaginous part of nasal septum should be cut to prevent buckling of nasal septum. Alar clinching is must to prevent widening of alar base. Hard and soft tissue changes which have occurred after surgery are predictable. Cases should be planned carefully after discussion with an orthodontist. Diagnostic tools like cephalometry, model surgery and clinical interpretation are of utmost importance. Also, pre and post operative orthodontic treatment is must for desired results. There is a need to standardize the norms for changes in facial profile after versatile procedure LeFort I osteotomy in various ethnic groups of Indian population.

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