

# TREATMENT OF CLASS III MALOCCLUSION WITH COMBINATION OF DISTRACTION OSTEOGENESIS AND ORTHOGNATHIC SURGERY

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## ABSTRACT

Dentofacial deformities and occlusal discrepancies in adults usually call for the treatment that combines orthodontics and orthognathic surgery to acquire optimal, stable, functional, and esthetic outcome. The basic aim of orthodontics and orthognathic surgery is to address patient's main concern and to establish optimal functional occlusion as well as to achieve good esthetic outcome. To accomplish this, the orthodontist and the surgeon must work in collaboration to diagnose and address the dentofacial deformity. Newer techniques such Distraction osteogenesis (DO) has emerged in the field of maxillofacial surgery.

**Keywords:** Dentofacial Deformity, Distraction Osteogenesis, Class III malocclusion, Mandibular Prognathism, Cephalometric analysis

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## INTRODUCTION

Dentofacial deformities and occlusal discrepancies in adults usually call for the treatment that combines orthodontics and orthognathic surgery to acquire optimal, stable, functional, and esthetic outcome. The basic aim of orthodontics and orthognathic surgery is to address patient's main concern and to establish optimal functional occlusion as well as to achieve good esthetic outcome. To accomplish this, the orthodontist and the surgeon must work in collaboration to diagnose and address the dentofacial deformity<sup>1</sup>.

Skeletal class III malocclusion can be the result of maxillary retrognathism or mandibular prognathism or the combination of both conditions<sup>2,3</sup>. Role of inheritance in the etiology of class III malocclusion is well known<sup>4</sup>. Due to the complexity of skeletal class III malocclusion cases orthognathic surgery in such cases is essential to provide acceptable facial and occlusal outcomes.

Concepts in craniofacial and maxillofacial surgery have grown rapidly during recent decades. Newer techniques such Distraction osteogenesis (DO) has emerged in the field of

maxillofacial surgery because of its utility, simple design, and an advantage of avoiding bone grafts, infection, blood transfusion and intermaxillary fixation for long periods of time<sup>5</sup>. Perks of using distraction osteogenesis is the augmentation of soft tissue along with the bone, this augmented soft tissue reduces the likelihood of relapse thus increasing stability of the results achieved<sup>6</sup>.

The initial applications of DO were done with extraoral distractors according to Ilizarov's principles, but these applications carried significant complications such as external scarring, facial nerve damage, inferior alveolar nerve damage, and social problems, to counter these problems intraoral distractors were made available<sup>7-8</sup>.

## CASE REPORT

A 22-year-old male came to a private clinic in Lahore with the chief complaint of prominent mandible. On clinical examination he had a concave profile with minimal incisal show on smile, acute nasolabial angle, maxillary dental and



**Figure 1: Cephalogram (Pre-treatment).**

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**Table 1: Pre-treatment Cephalometric Analysis.**

Pre-treatment Cephalometric Analysis		
	Norm <sup>9</sup>	Pretreatment values
SNA	82± 2	77°
SNB	80± 2	95°
ANB	2± 2	-16°
Witts	2± 2mm	22mm
FMA	25±5	18°
Face height ratio LFH/TAFH	55±5%	69%
UI-SN	108±5	124°
IMPA	95±4	73°
Interincisal angle	128 ±5	139°
Nasolabial	95± 5	54°
E-line		
Upperlip	2± 2mm	-11mm
Lower lip	0±2	-2mm

skeletal midline coincide with facial midlines, mandibular dental midline was 3 mm off towards left. Skeletal mandibular midline was coincident with the chin.

On Intraoral examination he had missing lower left 1st molar and grossly carious upper left lateral incisor. Incisors were in class III relationship with a negative overjet of 8mm and overbite of around 50%. Arch length discrepancy was -1 in upper arch. We were not able to detect any centric relation and centric occlusion discrepancy.

OPG findings were, missing lower left 1st permanent molar, root canal treated lower right 1st permanent molar, and grossly carious upper left lateral incisor. There were 31 permanent teeth with good crown root ratio and bone level. No sign of Temporomandibular joint disorder was found.

Cephalometric analysis revealed skeletal class III relationship with prognathic mandible and retrognathic maxilla. He was a low angle case with well-established class III compensations of dentition, that is, retroclined lower incisors and proclined upper incisors. Figure: 1 shows Cephalometric radiograph (pre-treatment), Table: 1 mentions the pre-treatment cephalometric analysis.

### TREATMENT GOALS

The goals of the treatment consisted of, treating the grossly carious upper left lateral incisor, correcting the mandibular prognathism, improving the profile and the nasolabial angle, increasing incisal show on smile, achieve stable molar relationship and class 1 canine and incisors, correct upper incisor proclination and lower incisor retroclination, improve overjet and overbite and achieve skeletal class 1 relationship. Replace the missing tooth with dental implant.

### SUGGESTED TREATMENT PLANS

Extent of discrepancy wouldn't allow sole orthodontic treatment thus surgical orthodontic treatment was suggested. The amount of maxillomandibular differential call for bimax surgery. Extraction of upper premolars to correct the proclined upper incisors simultaneously correction of lower incisor retroclination followed by maxillary advancement and mandibular setback. Lower left 1st molar will have prosthetic replacement with a dental implant.

Another plan suggested was distraction of maxillary segment to have stable results, space gained via distraction will be used

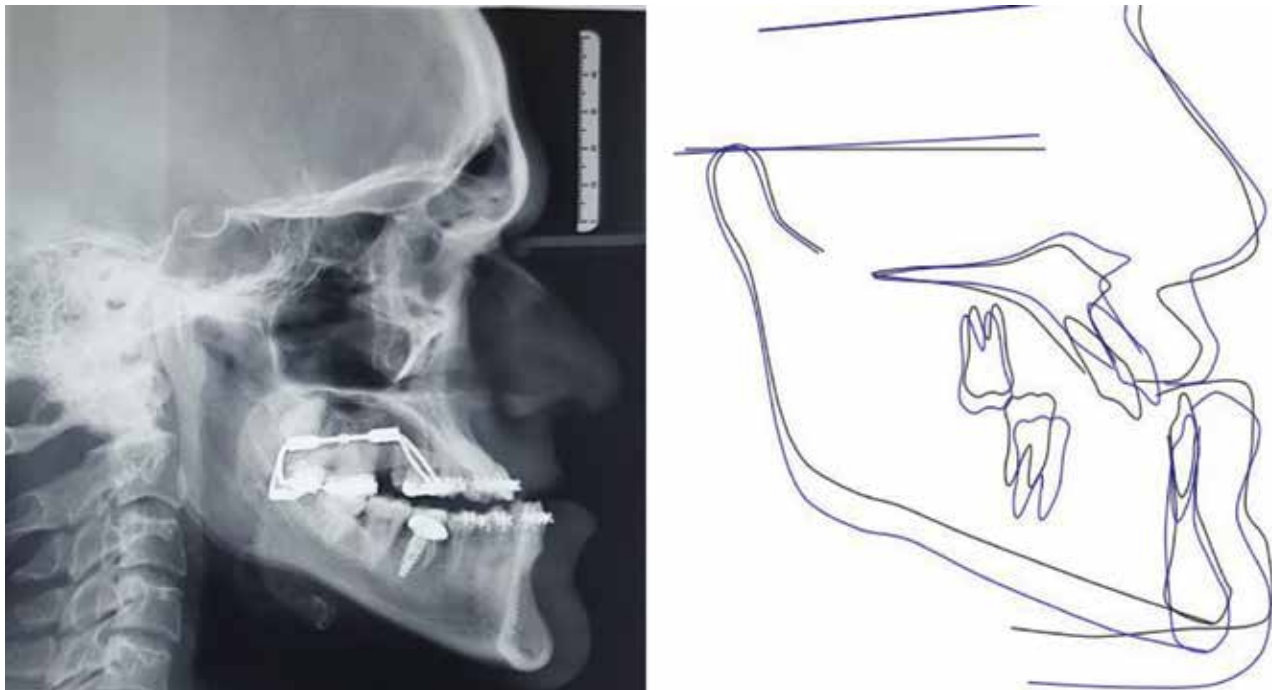


Figure 2: (a) Post distraction Cephalometric Radiograph (b) Superimpositions: pre-treatment (black) post-distraction (blue).

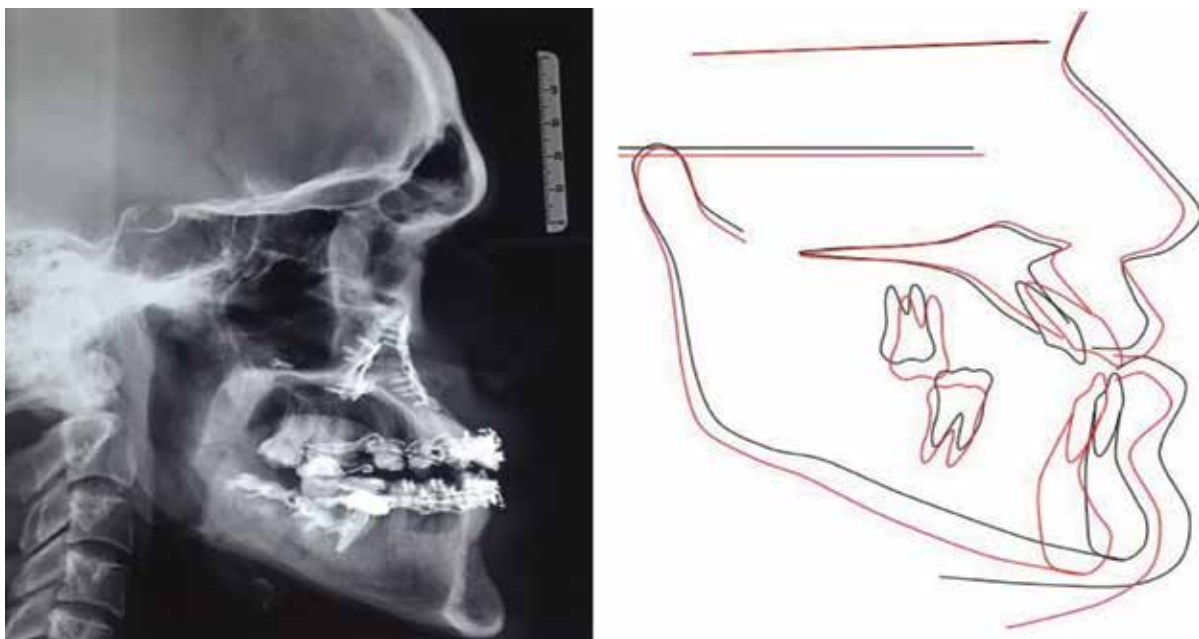


Figure 3: (a) Post-Surgical Cephalometric Radiograph (b) Superimpositions: post distraction (black) and post-surgery (red).

for the correction of inclination of upper incisors followed by mandibular setback. Although maxillary values are not very far from a norm, this plan was suggested because the amount of movement required ideally was 22 mm which cannot be done in single jaw so a major maxillary and mandibular movement was required to achieve acceptable esthetics. Patient opted for this plan.

### TREATMENT PROGRESS

Placement of Roth slot 0.022" x 0.025" to begin phase I, starting with 0.014" NiTi arch wires in both arches to begin with the alignment and leveling. Patient was concerned for the missing

tooth, lower 1st molar was prosthetically replaced. Treatment continued with the first phase, aligning and leveling, using 0.016" NiTi round arch wires, and subsequently torsion movements were begun to express with 0.016" x 0.022" NiTi, 0.017" x 0.025" NiTi and 0.019" x 0.025" NiTi rectangular ones. 2 month after, 0.019" x 0.025" stainless steel arch wires were used to make space for the cuts in the maxilla for distraction. After leveling and alignment and creation of space surgery to place cuts between upper 1st molars and upper second premolars was performed. Tooth borne distracter i.e. Hyrax appliance placed anteroposteriorly was used as a distracter. Distraction was started 5 days after the surgery and distracter was activated with the rhythm of 0.5mm activation in the morning and 0.5

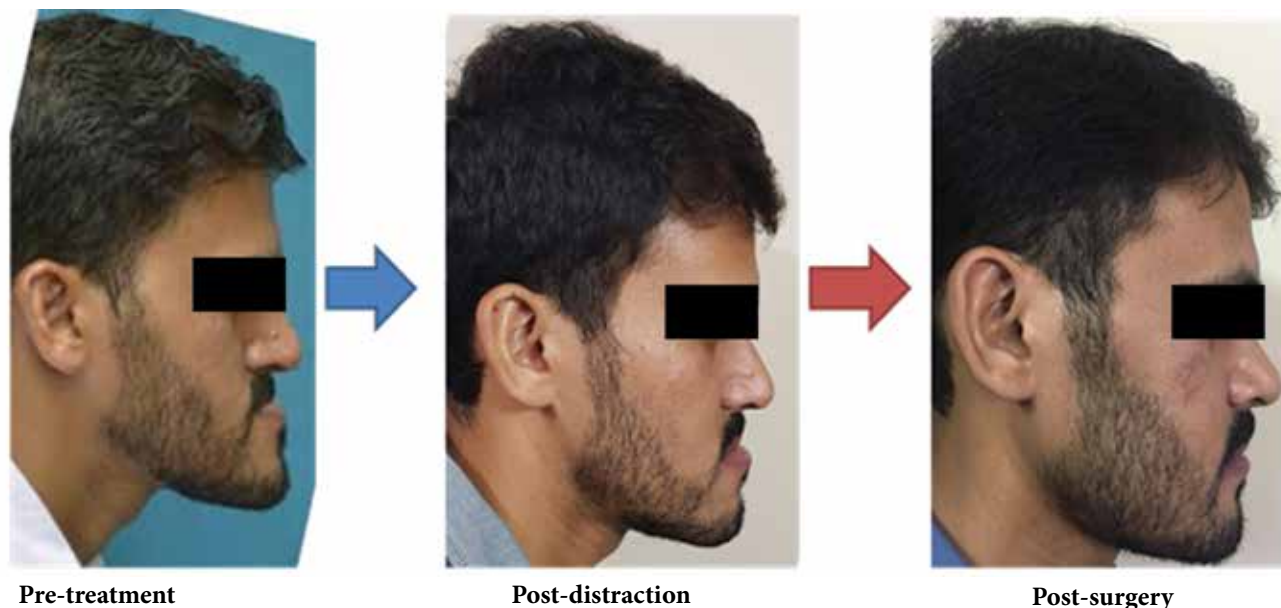


Figure 4: Face Profile (Pre-treatment, Post-distraction & Post-surgery).

Table 2: Cephalometric Comparison: Pre-treatment, Post-distraction & Post-surgery.

Cephalometric Values				
	Norm <sup>9</sup>	Pre-treatment values	Post-distraction	Post-surgery
SNA	82±2	77°	81°	84°
SNB	80±2	95°	95°	85°
ANB	2±2	-16°	-14°	-1°
Witts	2±2mm	-22mm	-15mm	-1mm
FMA	25±5	18°	20°	22°
Face height ratio PFH/LFH	55±5%	69%	72%	70%
UI-SN	108±5	124°	122°	120°
IMPA	95±4	73°	79°	84°
Interincisal angle	128 ±5	139°	135°	120°
Nasolabial	95±5	54°	86°	85°
E-line				
Upperlip	2±2mm	-11mm	-8mm	-2mm
Lower lip	0±2	-2mm	-2mm	-1mm

mm in the evening for 10 days. After distraction period a consolidation phase was given for 3 months. Post distraction records were obtained (Figure 2), 10 mm of maxillary forward movement was achieved with distraction. Cephalometric comparison of pre and post distraction can be seen in table # 2. SNA improved, distraction was achieved without disturbing upper incisor inclination instead the incisors retroclined due to creation of space. Point A and ANS moved forward without proclination of upper incisors resulting in the improvement of nasolabial angle.

Space created between upper second premolar and upper 1st molars was used to improve inclinations of upper incisors

Before the completion of presurgical orthodontics, patient requested for the surgery as he was moving out of the country. He was informed about the consequences of premature surgery. So surgical phase II was performed 6 months after distraction. Mandible was moved back asymmetrically, on average 9mm by the help of sagittal split osteotomy and maxilla was advanced 3mm. post-surgical records were obtained, superimpositions

post distraction and post-surgery shown in (Figure 3)

As shown in figure 4, improvement in profile is obvious. Due to the severity of deformity ideal result were very difficult to achieve because of limitations of surgical movements. Patient was de-bonded 2 months after surgery, orthodontic treatment couldn't be completed because he had to leave and insisted on de-bonding.

### DISCUSSION

Distraction osteogenesis is a versatile technique that is used in craniofacial anomalies may or may not in conjunction with orthognathic surgery. Distraction Osteogenesis helps in achieving skeletal movements that may otherwise be difficult with conventional techniques, it eliminates the need for bone grafts, and provides predictable healing. Distraction can be combined with conventional orthognathic surgery to achieve optimal results<sup>10,11</sup>.

### CONCLUSION

Combined approach of Distraction Osteogenesis followed by Orthognathic Surgery in severe skeletal discrepancy is a conducive approach with minimum chances of replace.

### AUTHORS' CONTRIBUTION

Muhammad Mudassar Saleem: Write up & Conception.  
 Ammar Saeed: Data Collection.  
 Huma Ijaz: Literature Review.  
 Bushra Naeem Khan: Proof Reading & Critical Analysis.

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