

CLINICAL STUDY**INTRAORAL DISTRACTION
OSTEOGENESIS OF MANDIBLE
IN MANDIBULAR HYPOPLASIA**KUMAR SUDESH¹ PRABHAKAR VIKRAM²
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Faridkot (Punjab)**ABSTRACT****INTRODUCTION**

The ability to induce a callus in bone (by an osteotomy or sectioning) and then distracting the proximal and distal ends is known as callotaxis or distraction osteogenesis. Intraoral distraction devices used in mandibular hypoplasia would avoid significant skin scars, provide cosmetic and functional advantages with better patient compliance.

MATERIAL METHOD

Five patient of mandibular hypoplasia are selected and intraoral distraction devices were placed after osteotomy. Distraction was carried out after 7 days latency period at a rate of 1mm/day (0.5 twice). Devices were removed after 8 week of consolidation period.

RESULTS AND OBSERVATION

All patients suffered from hypoplastic mandible. The distraction carried out varies from 10-17mm. In two patient distraction devices applied bilaterally and in three patient unilaterally. Anterior open bite developed in two cases and appliance failure occur in one case.

DISCUSSION

Mandibular lengthening with distraction osteogenesis in mandibular hypoplasia is a significant alternative to traditional surgical technique

KEYWORDS

Distraction osteogenesis , intra oral distraction device , mandibular hypoplasia

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Faridkot (Punjab)**INTRODUCTION**

Distraction osteogenesis is a process initiated by application of traction within physiologic limits across the corticotomy / osteotomy site. The concept was introduced by Ilizarov in 1951 who designed the first scientific protocol on human bone lengthening^{1,2}. McCarthy and associates in 1991 popularised a technique using an external bone lengthening device to obtain a gradual distraction of the mandible and later in 1955 developed and demonstrated the feasibility of miniaturized mandibular lengthener that is suitable for intraoral lengthening.^{3,4}

Mandibular lengthening with distraction offers many advantages over conventional orthognathic surgical techniques . It will achieve superior results with favourable soft tissue adaptation, stable distraction bone stock and less acute loading of TMJ. Relapse chances are minimal. There is also no donor site morbidity associated with using the grafts.

The techniques of mandibular distraction osteogenesis has quickly evolved from the use of extra oral device to that of hybrid appliances and

intraoral devices. The use of transcutaneous pins in external fixator results in scarring and difficulty with compliance in children. Intraoral approach would avoid the significant skin scar from external approach but also provide cosmetic and functional advantages with better patient compliance.

MATERIAL & METHOD:**1. Patient Selection :-**

- Five patient of mandibular hypoplasia were selected. Out of these two patient had hypoplasia secondary to Bilateral TMJ ankylosis due to trauma and two secondary to unilateral TMJ ankylosis (one due to trauma, other due to exanthematous fever). One patient was a case of cogenital mandibular hypoplasia on unilateral side.

- None of the patients had other systemic disease or medical ailments.

- Four patients with mandibular hypoplasia had been operated earlier for release of TMJ ankylosis & were having adequate mouth opening.

- All the patients selected were between age group of 10-18.

2. PATIENT EVALUATION

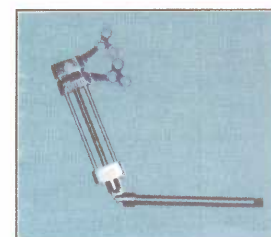
- Patient evaluation was done by facial evaluation from frontal side and from lateral side.

- Oral examination, TMJ evaluation done.

- Radiographic examination included the cephalometric analysis designed by Burstone et al.⁵

- Frontal asymmetry analysis given by Grummon's and Kappeyne⁶ was done for unilateral case.

- Dental models were made and clinical photographs were taken.

3. DISTRACTION DEVICE:

Distraction Appliance

Intraoral custom – made miniature distraction osteogenesis device was used for mandible which has following features.

- Completely internalized miniature designs.
- Separate units for right & left side.
- Made up of stainless steel.
- Monocortical screw of 2mm diameter of 8mm length are used.

- Available in various sizes.
- Have adequate strength to withstand lateral forces.

● It comprised of fixed block, movable block, threaded central rod – (thread of rod has a pitch of 0.5mm. One complete turn brought about 0.5mm distraction) and two guiding supporting rod.

4. DISTRACTION PROTOCOL:

- Osteotomy of mandible with preservation of neurovascular bundle.
- Latency period of 7 days before the active distraction began.
- Distraction started on 8th day.
- Rate & Rhythm : 1 mm distraction per day 0.5mm twice daily.
- Consolidation period: 2 month consolidation period after active distraction.
- Removal of device (after radiological check up).

5. SURGICAL PROCEDURE :

All patient were planned to be operated under GA. Surgical procedure for elongation of mandible comprised of two stages:

Stage-I Osteotomy and fixation of device. Stage-II Removal of device.

Stage-I: Gingival, crevicular and releasing incision given to expose the osteotomy site. For mandibular body lengthening, osteotomy was performed between second premolar and first molar and for simultaneously increasing the vertical ramus height osteotomy was done in mandibular angle region.

- Fixation of device with 2mm monocortical screw of 8mm length either intraorally or with help of trocar and canula.

Stage-II: Removal of device

After 6-8 week the distraction site is evaluated clinically and radiographically and surgery to remove the device is done.

6. Post operative care was given and follow up was done regularly for 3 month. Regular OPG were taken.

RESULTS AND OBSERVATION:

This study was conducted in Dept. of Oral and Maxillofacial Surgery, DIRDS Faridkot. Five patients were treated by means of distraction (4 in mandibular body & one in mandibular angle) after doing osteotomy under general anesthesia. Distraction was started after latency period of 7 days.

There was no bar for age & sex

from 10-18 years 3 were male and 2 were female. All 5 patients suffered from hypoplastic mandible.

TABLE –I
Causes of Mandibular Deficiencies

S.No	Description	No
1	Hypoplasia Secondary to TMJ ankylosis (trauma)	3
2	Hypoplasia Secondary to TMJ ankylosis (exanthematous fever)	1
3	Congenital Hypoplasia	1

In 2 patients we applied distraction devices bilaterally and 3 unilaterally. (In 2 at mandibular body region between 2nd premolar and first molar and in one at mandibular angle region).

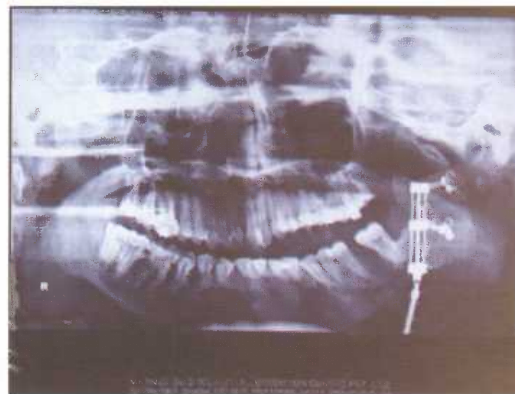


Before Distraction

After Distraction

TABLE –II
Amount of Distraction

S.No.	Amount of Distraction (in mm)
1.	R – 18mm
2.	R – 13mm
	L – 13 mm
3.	R – 12mm
4.	R – 10mm
.	L – 12mm
5.	R – 16mm



Post operative OPG

The distraction which was carried varied from 10mm to 18mm. In one case where osteotomy was performed at angle region, significant increase in ramus height noted.

No local complications such as wound infection was noted. There was development of slight open bite in two cases which was managed by intermaxillary elastics. There was exposure & breakage of appliance due to lateral bending. So distraction was stopped prematurely.

**TABLE-III
Complications**

S.No.	Complications	No.
1	Infection	0
2	Paresthesia / Anaesthesia	0
3	TMJ dysfunction / Decreased mouth opening	0
4	Appliance failure	1
5	Open bite	2

None of the patient suffered from anesthesia or paresthesia during and after active distraction. No complain of TMJ pain or decreased mouth opening was reported. Patients were regularly followed up for 3 months and no case of relapse was reported.

DISCUSSION:

Facial deformity requires early treatment and optimum time is related to severity of malformation. One of the most important objectives is to avoid secondary malformation of midface resulting from growth restriction by small mandible (Kaban et al, 1988).⁷

The potential benefits of intraoral device include :^{8,9,10,11,12}

- 1) Elimination of skin scarring caused by fixation of transcutaneous pins.
- 2) Improved patient compliance during fixation and consolidation.
- 3) Improved stability of the attachment of the device to the bone.
- 4) Minimal risk of Injury to inferior neurovascular bundle and branches of facial nerve.

In the present study, the most frequent cause of Hypoplasia was TMJ ankylosis secondary to trauma ,. ne case of congenital hypoplasia and one case of hypoplasia secondary to TMJ ankylosis due to exanthematous fever was reported. Two patients underwent bilateral distraction and three unilateral distraction. A total of seven distractions were used for five patients. Horizontal lengthening of mandibular body ranges fears 10-18mm. In one case where distractor is placed at angle region, increase in ranius height is also noticed.

The lateral aspect of mandibular body between second premolar first molar was selected as osteotomy site after reflection of mucoperiosteal flap in 4 cases^{13,14,15}

In one case osteotomy was done at mandibular angle region.

Distraction in all cases began after latency period of 7 days. When comparing the PA cephalograms taken before and after treatment there was marked improvement in chin position and in lower dental midline. In bilateral cases there was significant increase in

mandibular body (Go-Pg) length. The neck assumed a normal contour with a well defined angle. The chin also assumed a prominent position. The soft tissue associated with distraction zone stretched but did not tear which was consistent with the findings of Molina et al.¹⁶

Various problems encountered during procedures are:

- 1) Difficulty in orientation of device was experienced. Device was oriented parallel to mandibular occlusal plane in 4 cases.¹⁷ however exact positioning of device using an intraoral approach is not possible.
- 2) The development of anterior open bite occurred in 2 patients. It was the most common problem during mandibular lengthening.¹⁸ Intraoral elastics have been used to overcome the problem as observed in other series also.¹²
- 3) Breakage of appliance occurred in one patient. It might be due to higher distraction forces or due to metal failure. Same problem has also been encountered by van strijen et al.¹² Careful surgical technique during osteotomy and distraction device placement is important to avoid injury to inferior alveolar nerve. With the development of intraoral devices permanent injury to facial nerve has been eliminated. In present study no complain of anaesthesia or paresthesia was reported.

According to patients and their parents the distraction period was not an uncomfortable experience. No major discomfort either at distraction site or at TMJ was observed. Both the patient and parental cooperation is necessary. Although distraction achieved the desired results, the ideal design and placement of osteotomy cut has yet to be determined. The occlusal discrepancies which occurred after

distraction needs to be corrected.

CONCLUSION

In the present study mandibular body deficiency was corrected in 5 cases and in one case increased ramus height is also achieved. Further study and investigation are required in regard to multiplaner distraction in all three dimensions to correct complex deformities. Long term stability, the effect on growth and TMJ behavior, await further evaluation.

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