Case Report

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Management of Bilateral Condylar agenesis with Electromyography assessment and orthognathic treatment approach: A Case Report

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ABSTRACT

Abstract : Condylar agenesis is a rare case involving developmental disturbances related to growth of mandible, facial aesthetics, dentition development, muscle deformation and occlusal problems. As such this is a rare condition and there is no internationally accepted protocol for the same. This article is a description of bilateral condylar agenesis with orthognathic protocol involving presurgical orthodontics and genioplasty. This case report also evaluates pre and post treatment muscle functions with electromyography and gives an overall treatment approach related to functional efficiency, structural balance and esthetic harmony.

Keywords: Condylar agenesis, Electromyography, Genioplasty, Mandible, Orthodontics.

INTRODUCTION

The temporomandibular joint (TMJ) is a ginglymus diarthrodial joint, one of the most complex joints of the human body which is capable of both rotational and translatory movements. It consists of the mandibular condyle and the articular eminence of the temporal bone. The condyle is very important because it controls the expression of mandibular growth. The TMJ first appears in the 8th week of gestation, when two separate areas of mesenchymal blastemas appear near the eventual location of the mandibular condyle and glenoid fossa.[1,2] Agenesis of the ramus of the mandible (agnathia) is a rare disease that can be part of more than 100 genetic syndromes . From an embryological point of view, agenesis of the mandible is linked to defects in migration of neural crest cells that determine a developmental anomaly of the first arch or mandibular arch, during the 4th week of embryogenesis .[3] Growth disturbances such as aplasia, hypoplasia or agenesis of the mandibular condyle in the development of mandibular condyle may occur in uterus late in the first trimester . Underdevelopment or defective formation of condyle may be congenital or acquired. Condylar agenesis is congenital non formation of condyle while hypoplasia is poor development.Although both are distinct entity yet wrongly but very often these terms are used interchangeably . Atypical mandibular condyles can also be seen in connection with different syndromes of the head and neck.[4] In these cases there will, as a rule, also be soft tissue manifestations. In the present case, there were no anomalies either of the ear or the eyelids. Agenesis of the mandibular condyle without affection of the soft tissues has been reported earlier .[5] It is difficult to ascertain whether non formation of condyle is congenital or due to condylar maldevelopment in adult age group. This report details the diagnosis , treatment planning and accomplishment of orthodontic and surgical treatment modalities of skeletal class 2 malocclusion with bilateral congenital agenesis with pre and post treatment electromyography analysis.

DIAGNOSIS

A 22 year old female patient reported with chief complaint of facial disharmony and irregularly placed teeth both in maxillary and mandibular arches. On clinical examination, extra oral features showed convex profile, retrognathic mandible, facial asymmetry towards the right side.

Intra oral features showed crowding in both maxillary and mandibular arches, grossly decayed right and left maxillary first permanent molars, anterior open bite, curve of spee of 5mm and interlabial gap of 7 mm and bilateral condylar agenesis. (Fig 1, 2) .

PRE-TREATMENT RADIOGRAPHIC ANALYSIS:

On radiographic examination, pretreatment lateral cephalogram values are given in Table.1 The panoramic radiograph showed normal root anatomy, grossly decayed maxillary right and left

first permanent molar and bilateral condylar agenesis. P.A.View showed gross facial asymmetry towards right side. (Fig 3)

Fig 1 : Pretreatment extra oral photographs.
Fig 2 : Pretreatment intra oral photographs.

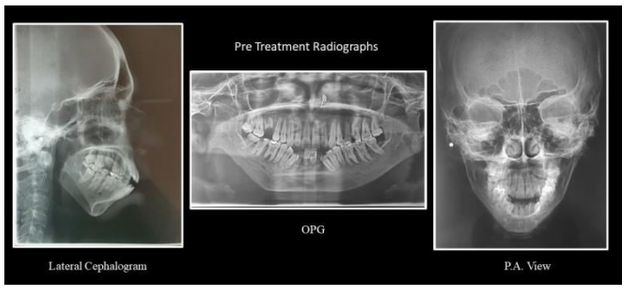

Fig.3: Pre – treatment radiographs

Problem list:

1) Skeletal Class 2 jaw base relation
2) Convex profile
3) Anterior open bite
4) Facial asymmetry
5) Crowding present both in the maxillary and mandibular arches.

TREATMENT PLANNING

The treatment plan was orthodontics along with orthognathic surgery. Depending on the clinical and other related examination it was decided with extraction of first premolars in the mandibular arch for leveling and alignment and non-extraction in the maxillary arch with advancement genioplasty to improve the facial esthetics.

ELECTROMYOGRAPHIC ANALYSIS

Percentage overlapping coefficient measures the symmetry of the muscles on right and left side of the same muscle group and is measured in percentage.0-50% shows poor symmetry,50-75% shows borderline symmetry and 75-100% shows good symmetry between right and left sides.

Taking the functional muscle activity as 200 µV/sec. Pretreatment electromyographic report shows: (Fig 4).

1) Right temporalis anterior activity of 67.7 µV/sec and left temporalis anterior activity of 98.7 µV/sec showing the percentage overlapping coefficient of 68.5%.
2) Masseter muscles which represent the clenching group of muscles showed 43.2 µV/sec and 66 µV/sec on right and left side respectively with a percentage overlapping coefficient of 65.4%.
3) Sternocleidomastoid muscle which represents the whole group of infra hyoid group of muscles and postural muscles showed a reduced activity of 5 µV/sec and 4.8 µV/sec on right and left side respectively with a percentage overlapping coefficient of 96%.
4) Anterior belly of digastric which represents the whole group of swallowing and suprahyoid group of muscles showed a reduced activity of 6.2 and 10.2 µV/sec on right and left side respectively with a percentage overlapping coefficient of 60.7%.

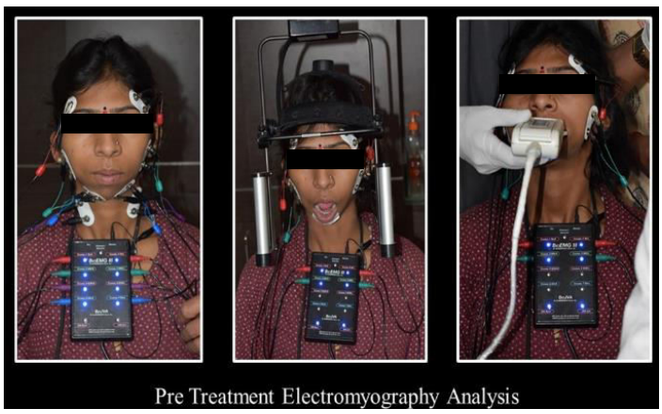

Fig.4: Pretreatment electromyography analysis

Fig.5: Posttreatment electromyography analysis

Post treatment electromyographic report showed: (Fig 5)

1) Marked improvement in right and left temporalis anterior activity with an activity of 61.8 and 168.2 µV/sec respectively with a percentage overlapping coefficient of 36.7%.

2) Masseter muscles showed an activity of 80.5 and 34 µV/sec on right and left side respectively With a percentage overlapping coefficient of 42.2%.

3) Sternocleidomastoid muscle showed an activity of 5.2 and 8.10 µV/sec on right and left side respectively with a percentage overlapping coefficient of 64.1%.

4) Anterior belly of digastric showed an activity of 11.7 and 11.3 µV/sec on right and left side respectively with a percentage overlapping coefficient of 96.5%.

SUMMARY OF ELECTROMYOGRAPHY REPORT:

Summarizing the results, there was a significant improvement in left temporalis anterior, right masseter, right and left sternocleidomastoid and anterior belly of digastric muscles post treatment. Percentage overlapping coefficient signifying the symmetry between the muscles showed significant improvement in sternocleidomastoid and anterior belly of digastric muscles.

TREATMENT PROGRESS

The case was bonded with 0.022" slot MBT appliance. Wire sequencing was 0.014, 0.018, 17 x 25, and 19 x 25 niti wires followed with 17 x 25 SS and 19 x 25 SS was used both in the maxillary and mandibular arches during pre-surgical phase. Presurgical extra and intra oral photos were taken once leveling and alignment stage was completed with extraction space closed in the mandibular arch. Later advancement genioplasty was done as planned. (Fig 6,7)

Fig 6 : Advancement Genioplasty

Vertical settling elastics were given after sectioning the arch wire to allow occlusal settling which is the important phase of post-surgery. Post-surgical radiographs were repeated. Post treatment values are tabulated in Table.1

VARIABLE	PRE-TREATMENT	PRE-SURGICAL	POST-TREATMENT
SAGITTAL SKELETAL RELATION			
SNA	87	87	85
SNB	74	73	75
ANB	13	14	10
WITS APPRAISAL	BO is behind AO by 7 mm	BO behind AO by 10 mm	BO behind AO by 5 mm
DENTAL RELATIONSHIP			
U1-NA(mm/deg)	3 mm;19	1 mm;13	3 mm;15
L1-NB(mm/deg)	19mm;50	8 mm; 25	8 mm; 25
U1-SN PLANE	107	101	100
IMPA	106	88	100
INTER-INCISAL ANGLE	97	114	115
L1-Apog line	10 mm	12 mm	6 mm
VERTICAL RELATIONSHIP(SKELETAL)	**PRE TREATMENT**	**PRE SURGICAL**	**POST TREATMENT**
MAXILLARY-MANDIBULAR PLANE ANGLE	40	41	38
FMA	54	51	34
Y Axis	77	87	70.5
JARABAK RATIO	56%	52%	54%
SOFT TISSUES			
UPPER LIP-RICKETT'S E PLANE	5 mm ahead E plane	4 mm ahead E plane	1 mm behind E plane
LOWER LIP-RICKETT'S E PLANE	15 mm ahead E plane	12 mm ahead E plane	3 mm ahead E plane
NASO LABIAL ANGLE	102	95	135

Table 1: Lateral cephalometric Values Pre and Post treatment

There was great improvement in patient's profile and overall soft tissue balance post-surgery. (Fig 8) Patient had ideal overjet and overbite at the end of the treatment. The case was finished in Class 1 canine relation and incisor relation. (Fig 9)

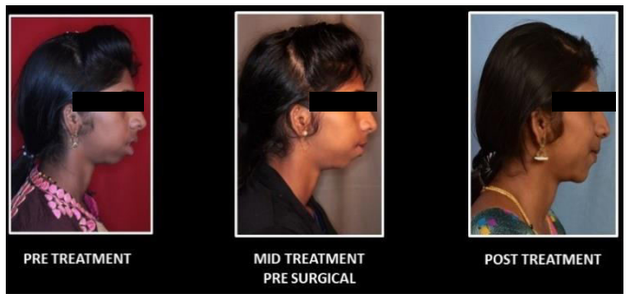

Fig.7: Profile View

Fig.8: Post treatment extra oral photographs

Fig.9: Posttreatment intra oral photographs

CONCLUSION

Severe malocclusion requires interdisciplinary approach which involves surgical and orthodontics to correct the skeletal and dental discrepancies. This article also reveals the importance of supplementary diagnostic aids such as electromyography which played a vital role in the treatment planning. With the combined effort bilateral condylar agenesis was treated with extractions of first premolars in the mandibular arch and genioplasty to achieve superior function, stability, facial esthetics with good occlusion and postoperative stability.

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