

MANAGEMENT OF AN ASYMMETRIC CLASS II MALOCCLUSION IN ASSOCIATION WITH MANDIBULAR DEFORMITY. A CASE REPORT Y

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ABSTRACT

Diagnosis and management of skeletal and dental asymmetries associated with malocclusions of varying severity are in most instances a challenging prospect for an orthodontist. A detailed history followed by proper diagnosis and an efficient treatment plan is always necessary in management of such cases. Diagnosis and management of Class II malocclusion with skeletal and dental components compounded with mandibular deformity is presented.

Keywords : Diagnosis, asymmetry, coronoidectomy, orthomorphics

INTRODUCTION

Facial asymmetry is defined as the presence of a clinically significant variation between the two halves of the face which is often the patient's concern and can be quantified by the clinician. Many parts of the human body develop from bilateral structures which give uniformity to the transverse dimension, which means that development of some part leads to equal right and left sides. The midface and lower face develop from the intrinsic co-ordination of bilateral processes (lateral and medial) as well as the processes associated with maxillary and mandibular development. Any developmental abnormality or failure of maturation in these embryonic processes can result in unequal right and left sides which are perceived as an asymmetry. Minor amount of asymmetry is present sub clinically in a normal population and often does not demand clinical intervention.^[1] However, moderate to severe facial symmetry forms the epicentre of treatment need as it results in aesthetic and functional imbalance. The asymmetry can be skeletal, dental or of the soft tissue, each demanding different treatment approaches. Changes in the anteroposterior and posterior directions have been discussed extensively in literature. Changes in the transverse dimension have not been studied in great detail.^[2]

One of the important goals of orthodontic therapy is aesthetic harmony which aims at coincident dental and facial midlines. Diagnosis of asymmetry is relatively simple in the presence of gross midline offset or when there is asymmetric dental crowding or spacing.^[3] However, in some cases where dental compensations have masked an underlying asymmetry, it might manifest as the orthodontic treatment progresses which in turn leads to unwanted delay in treatment duration and may even lead to a compromised final result. Thus, it is important to diagnose and classify the asymmetry in order to form an accurate treatment protocol.

Farkas and Cheung^[4] in 1981 used direct anthropometry for asymmetry assessment and concluded that there existed mild differences between right and left side of 3mm in absolute measurements and 3% relative values. Severt and Proffit^[5] in 1997 in another extensive study reported that facial asymmetry was present in 34% of the population. The most common feature was associated with chin deviation. The mid and upper face did not show as much variation as that observed in the lower face according to the study.

Etiology and Classification

Asymmetry has been associated with multiple etiologies. A classification of types of asymmetries was given by Chia and associates.^[6] Etiologic factors of pre and post natal origin related to asymmetry were described by Haraguchi et al.^[7] Mercier^[8] divided mandibular hyperplasia and hypoplasia depending upon origin as muscular or bony defects. Plint and Ellisdon^[9]

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further classified facial asymmetries into apparent facial asymmetry or true asymmetry. Cohen^[10] discussed anomalies associated with asymmetry development and separated them into classes as abnormal processes of development, mechanical force deformations or deformations caused by breakdown of normal processes during development.

Pirttinieni^[11] based his classification of mandibulofacial asymmetries on the time of onset: fetal, embryonal and predominantly post natal expression. Cheong and Lo^[12] grouped facial symmetry in three main categories: congenital, acquired and developmental.

Lundstrom^[13] discussed asymmetries as being either of genetic or non genetic origin with a possibility of mixed origins in some cases. Bishara et al^[14] classified asymmetry into 4 different types. Obwegeser and Makek^[15] classified asymmetry on the basis of mandibular changes such hemimandibular elongation or hemimandibular hyperplasia. Based on morphological features Hwang et al^[16] classified 4 types of facial asymmetry depending upon the features of the mandible and chin. Idiopathic asymmetries as described by Kawamoto^[17] include cases in which aetiology of facial asymmetry remains unknown. They are also termed as asymmetry of development. Such idiopathic asymmetries generally do not manifest early but appear with increasing development. The factors stated have been shown to be responsible for development of asymmetry; however, due to lack of well controlled long term studies, they remain controversial and are yet to be scientifically validated.

Diagnosis and treatment planning

Diagnosis and evaluation of patients with asymmetries can be divided into two parts: a) essential patient evaluation and b) additional or adjunctive evaluation. Essential patient evaluation includes a complete medical history, social-psychologic evaluation, frontal and profile photographic analysis, radiographic evaluation (lateral and postero anterior cephalometric evaluation, panoramic evaluation), occlusal evaluation (functional and static), masticatory muscle and temporomandibular joint evaluation. Adjunctive evaluation is often indicated

either as a result of unusual findings or because of special patient problems. These are also helpful in differentiating asymmetry which is of dental and/or skeletal nature and include computed tomographic scans, 3D computed tomographic reconstruction and radionucleotide scans (especially in condylar hyperplasia and deviant prognathism). Cone beam computed tomography(CBCT) has enabled the clinician to make an efficient diagnosis of asymmetry easily.^[18-20]

Management of asymmetry should be decided after understanding the limits of treatment modalities. Treatment of facial asymmetry is dependent on both age of the patient and severity of the asymmetry. The goal of treatment is to treat the underlying problem.

Children of pre pubertal age are extremely challenging to treat with results sometimes being difficult to predict.^[21] Waite et al^[22] found that growing patients with mild asymmetry and a functional condyle should receive early orthodontic treatment and be allowed to finish growth before surgery is undertaken. In situations of asymmetry involving only the dentition, treatment strategies could include use of asymmetric extractions in conjunction with similar asymmetric mechanics.^[23,24] Mild functional deviations can be managed by undertaking equilibration of the occlusion. Problems which are severe in nature in most instances would require alignment of the dentition as a pre surgical goal. Severe skeletal and dental asymmetries in almost all instances would require comprehensive orthodontic and surgical management.^[25] Bimaxillary surgery involving Le Fort I osteotomy and bilateral sagittal split osteotomy can be carried out in surgical management of facial asymmetry. A modified surgical procedure involving mandibular osteotomy in the midline to correct transverse discrepancy problems was presented by Anghinoni et al.^[26] Recent studies also advocate the use of multiplanar distraction osteogenesis in correction of facial asymmetry especially caused by mandibular hypoplasia.^[27-29]

In cases of hemifacial microsomia, it has been proved to improve facial asymmetry by lengthening of the mandibular ramus and concomitant increased volume



Fig. 1 Pretreatment extraoral views



Fig.2 Pretreatment intraoral views

of the soft tissues by adjusting the volume of the medial pterygoid.^[30] Thus, proper diagnosis and subsequent treatment of the facial and dental asymmetry ensures appropriate and stable treatment.

Condylar hypoplasia is one of the rare causes of facial asymmetry in all 3 dimensions. It is a congenital or acquired developmental disorder that affects condylar cartilage growth and results in progressive facial asymmetry, mandibular deviation and dental malocclusion³¹. The majority of them are associated with syndromes, especially Goldenhar syndrome or

hemifacial microsomia with very little emphasis on the “nonsyndromic” category.

This case report focuses on the diagnosis and treatment planning of an asymmetric Class II dentofacial deformity with unilateral condylar hypoplasia and coronoid hyperplasia of unknown etiology.

Case Report

A 17 year old post pubertal female presented with a chief complaint of a lower deviated jaw with irregularly placed upper front teeth. No significant medical or dental history was reported. She added that the lower jaw was shifted to the right since birth and the need

for treatment was first perceived by her teacher. She presented with vertical maxillary deficiency, maxillary transverse deficiency, a retrognathic and retrusive mandible, negative lip step and mandibular asymmetry with deviation to the right side associated with inferior border discrepancy.[Fig.1]

In addition, the patient had crowding in the upper anterior region and a deep bite with canting of the maxillary occlusal plane. The overjet was 7mm with a bilateral Class II canine relation. The patient had a discrepancy in the mandibular midline with differential molar relation as a Class I on the left and a Class II on the right.[Fig.2].



Fig.3 Pretreatment orthopantomogram

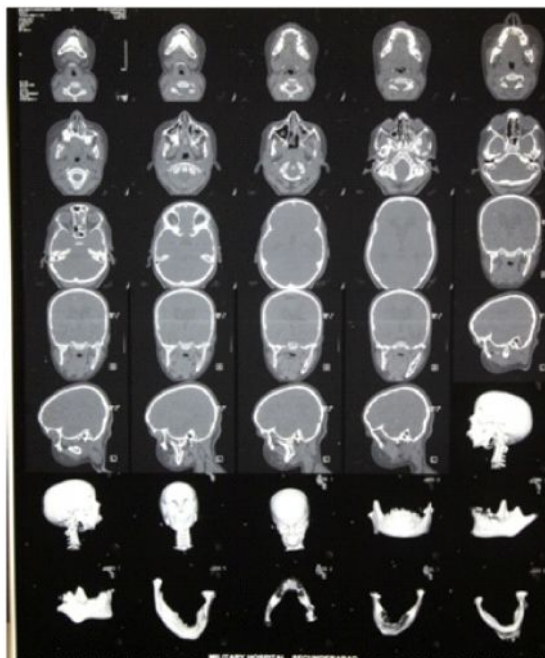


Fig. 4 Pretreatment CT scan

The panoramic radiographic exam revealed hypoplasia of the right condyle with decreased ramal height,

hyperplasia of the right coronoid process with an accentuated antegonial notch[Fig.3].Computed tomography scans and a PA radiograph confirmed the findings of the panoramic radiograph revealing a severely hypoplastic condyle on the right side. There was associated hypoplasia of the right mandibular body and ramus[Figs.4, 5]. Analysis of the lateral cephalogram revealed a severe skeletal Class II malocclusion with reduced mandibular length and decreased lower anterior facial height.[Fig.6]



Fig. 5 Pretreatment PA radiograph



Fig. 6 Pretreatment Lateral Cephalogram

A diagnosis of unilateral right condylar hypoplasia with hyperplasia of the right coronoid process(non



Fig.7 Post surgical extraoral views



Fig.8 Post surgical intraoral views

syndromic) in association with a Class II division 1 subdivision malocclusion was made after evaluation. Treatment plan

A combined surgical orthodontic treatment plan was recommended and accepted by the patient to achieve facial aesthetic and occlusal goals. The first surgical procedure planned was coronoidectomy of the right coronoid process to improve mouth opening as the coronoid process was impinging on the zygomatic arch. This would be followed by placement of an 0.022" MBT prescription fixed appliance for levelling, aligning and decrowding both arches. Orthomorphics (shape preservation of small areas) surgery for correction of mandibular retrusion and facial asymmetry was the next procedure^[32]. In most instances, facial deformities require varying amounts of surgical correction for ideal management. Degala et al^[33] postulated that deformities involving shape alterations in jaws were generally not amenable to correction by surgical methods alone.

Treatment Progress

The patient underwent a coronoidectomy of the right side initially. This enabled wider mouth opening. Intermittent physiotherapy sessions were advised for a six month period after this initial procedure. Both arches were bonded with an 0.022" MBT appliance. After levelling and aligning, an orthomorphics surgical correction for the mandibular deformity was planned. The mandible was advanced differentially after a bilateral sagittal split with an advancement genioplasty to correct the severe retrognathism and asymmetry.

Significant facial profile improvement, increase in the lower anterior facial height and improved mouth opening were observed [Fig.7]. Differential mechanics will be utilized for correction of the molar relation which was Class I and II. [Fig.8] Final orthodontic finishing procedures to achieve the desired occlusal goals are required. The post surgical orthopantomogram, lateral cephalogram and PA cephalogram show some of the positive changes brought about by the surgical procedures. [Figs.9,10,11].



Fig.9 Post surgical orthopantomogram



Fig.10 Post surgical lateral cephalogram

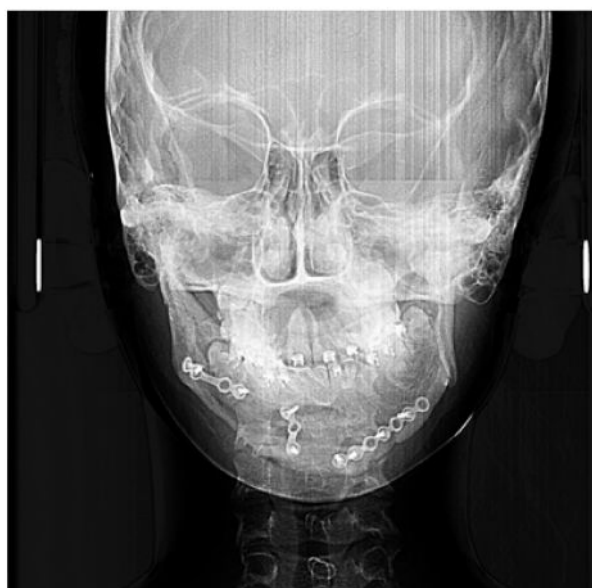


Fig.11 Post surgical PA cephalogram

DISCUSSION

Treatment modalities for mandibular condylar hypoplasia vary depending on age and severity of the facial asymmetry. There is no specific protocol to treat patients with mandibular hypoplasia with unknown etiology. In this case, both hypoplasia of right condyle and hyperplasia of the right coronoid process presented as gross facial asymmetry with limited mouth opening due to impingement of the coronoid process on the zygomatic arch on mouth opening. Orthodontic treatment had to be deferred till mouth opening improved. Mulder et al^[34] conducted a systematic review on coronoid hyperplasia and concluded that coronoidectomy effectively improved mouth opening. Al Saadi et al^[35] reviewed 37 cases of pseudoankylosis and hyperplasia. Their findings included significant improvement in mandibular mobility, however in one case, significant iatrogenic postoperative deranged occlusion resulted and another case had re-pseudoankylosis 6 months postoperatively despite initial improvement. Distraction osteogenesis in this case was considered as a possible modality of management in the planning phase but was rejected as according to a study by Carlotti and Shendell^[36], the ramus must be well developed, even if short, for distraction osteogenesis. In this patient, the mandible was both small and abnormally shaped along with poor bone quality making distraction osteogenesis difficult if not impossible. If carried out, there was a risk of condylar sag, postoperative TMJ symptoms and relapse. The CT scans obtained were used to fabricate 3D printed models of the mandible to enable direct visualisation and surgical treatment planning. The mandibular asymmetry was managed with rotational advancement of the mandible and advancement genioplasty coupled with autogenous bone grafting. The patient had reached skeletal maturity and no further growth was anticipated. Bertin et al^[37] investigated the surgical correction of 39 cases of mandibular hypoplasia and found that surgical procedures with bone grafting was suitable and a safe procedure with good outcomes that allowed single-stage correction of occlusion with preservation of mandibular growth. Degala et al^[33] studied orthomorphologic correction of mandibular dysmorphology and found that good asymmetry correction was noted in 60% of cases with the remainder showing a 40% change. The Degala procedure was followed in this case. The osteotomy was designed as an eccentric genioplasty extended along the corpus to an osteotomy of the lateral cortex of the ramus. The osteotomy was

extended to involve the the ramus laterally close to the external oblique ridge similar to Dal Pont modification^[37] of an Obwegeser sagittal split osteotomy with the difference being the medial cut being placed on the ramus laterally. Care was taken to ensure that the inferior alveolar neurovascular bundle was not compromised at the junction between the corpus and the ramus as the osteotomy cut is changed from full thickness to an outer cortical osteotomy. The anterior segment was positioned to correct the midline and restore vertical and anteroposterior relationships as planned. The chin position was improved by undertaking a genioplasty procedure simultaneously to reduce facial convexity. The determination of the final position was subjective. Fixation was performed with mini bone plates and autogenous corticocancellous bone graft harvested from the iliac crest was sandwiched between osteotomized segments and used to bridge overlapping edges.

The soft tissue incisions were sutured using 3-0 vicryl with additional extraoral pressure dressings for control of bleeding. Lindquist et al^[39] reported that 28.5% of patients had altered sensation of lower lip and chin after combined genioplasty and bilateral sagittal split osteotomy. 10% of patients had mental nerve paresthesia after genioplasty alone. The major limitation of this technique was not being able to establish perfect symmetry. This was because the procedure relocates the deformed mandibular segment but does not correct the straightened contour of the body of mandible. This would be evident as a flattening of the mandibular contour, which requires additional augmentation.

Post surgically, the patient was satisfied with her appearance and gained confidence with improved self esteem. The maxillary cant of occlusal plane will be corrected in the final stage using TAD's prior to final finishing procedures.

CONCLUSION

Advancements in diagnosis and treatment protocols have made management of asymmetry more predictable to some extent. Availability of adjuncts like temporary anchorage devices allowing use of asymmetric mechanics without concomitant anchorage loss have also reduced stress on treating clinicians. Facial asymmetry remains a challenging aspect of the orthodontic and surgical field as there are number of factors governing successful outcome: severity of asymmetry, age of the patient, dental, skeletal and soft

tissue compensations associated with asymmetry. Therefore, it requires not only planning and skill but time and patience in diagnosis, treatment planning and execution. Patient compliance and motivation also play a great role in the successful treatment of facial asymmetries as they require both orthodontic and surgical intervention. It is also of paramount importance that the limitations of surgery and orthodontic treatment are understood by both the clinician and patient.

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