

Dentofacial Asymmetries: Challenging Diagnosis and Treatment Planning

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Abstract:

Dentofacial asymmetry is quite common and when sufficiently severe can require surgical orthodontic intervention. Asymmetries can be classified according to the structures involved into skeletal, dental and functional. In diagnosing asymmetries, a thorough clinical examination and radiographic survey are essential to determine the extent of soft tissue, skeletal, dental and functional involvement. Dental asymmetries, as well as a variety of functional deviations, can be managed orthodontically, whereas significant structural facial asymmetries require a comprehensive orthodontic and orthognathic management. With less severe dental, skeletal and soft tissue deviations the advisability of treatment should be carefully considered. The following article also contains a case report highlighting the importance of proper diagnosis in treatment plan for management of dentofacial asymmetry.

Key Words: Dentofacial asymmetry, diagnosis, functional shift, midline shift

Introduction

Perfect bilateral symmetry seldom exists in living organisms. Always right and left side differences are present in nature. These slight facial asymmetries are acceptable esthetically. However, significant asymmetry may cause functional as well as esthetic problems. The etiology of facial asymmetry can be divided into three components: congenital, developmental and acquired.^{1,2} However etiology for certain cases remains unknown. Facial asymmetry may be present along with Class I or Class II malocclusions, but it most commonly occurs in cases with Class III malocclusions.^{3,4}

Depending on the craniofacial structures involved, facial asymmetry can be classified into - skeletal, dental and functional. Dental factors mainly include early loss of deciduous tooth, congenital missing tooth or teeth, and certain habits. Skeletal asymmetry may involve either one or more number of bones.

Functional asymmetry may result because of deviation of the mandible due to tooth interferences.

However, many times a combination of factors is present. Proper examination of the dentofacial structures is required to arrive at the correct diagnosis. Patients having facial asymmetry are evaluated through clinical assessment, cephalography and more recently with the use of three-dimensional imaging techniques.

Clinical assessment starts with ascertaining patient's chief complaint and evaluating the medical history. Clinical examination includes a visual inspection of the entire face, palpation to differentiate between soft tissue and bony defects and comparison of dental midline with a facial midline. In addition to the frontal aspect, viewing mandible from an inferior or submental vertex view sometimes helps to determine the extent of mandibular asymmetry in relation to the rest of the face.

The dental midline needs to be evaluated in different positions such as in centric relation, open mouth, at initial contact and in centric occlusion. True skeletal and dental asymmetry will not show any change in the midline discrepancies in centric relation and in centric occlusion. Whereas, asymmetry due to occlusal interference may result in functional shift of the mandible on initial tooth contact.

In most of the cases, clinical examination needs to be supplemented by other diagnostic aids such as - study models, face bow transfer and various imaging techniques to accurately localize the asymmetric structures.

Interpretation of lateral cephalogram in diagnosing asymmetries is of limited value.^{5,6} Panoramic view provides information regarding gross anomalies, supernumerary or missing teeth. Any variations in the shape and height of mandibular ramus and condyles on both sides can be assessed and compared.⁷ However, the cephalometric postero-anterior projection provides valuable information and helps in proper diagnosis. It can be obtained at centric occlusion and open mouth positions to determine the extent of functional mandibular deviation.

More recently the newer imaging techniques like three-dimensional computed tomography and three-dimensional photography are being used to accurately localize the discrepancy. A detailed study of various diagnostic records obtained on the patient is necessary to determine the cause,

extent and location of asymmetry. This will enable the clinician to formulate proper treatment plan.

Case Report

A 17-year-old female patient reported for orthodontic treatment with a chief complaint of irregular teeth and an unesthetic smile.

Patient had a leptoprosopic facial type with mandibular asymmetry. Facial profile was convex with retrusive chin position and high clinical FMA. Intraoral findings showed Class II subdivision right malocclusion with severe crowding of upper and lower anteriors, anterior cross bite in relation to upper laterals and lower canines and a lower midline deviation of 3 mm to right (Figure 1).

All the routine essential diagnostic records, which include extraoral radiographs (Figure 2) lateral cephalogram (Figure 2a), orthopantomogram (Figure 2b), photographs and study models were advised. Face bow transfer (Figure 3) was recorded on the patient (Figure 3a) and transferred on to the articulator (Figure 3b), to evaluate the midline shift. In addition to these, two cephalographs with postero-anterior (PA) view (Figure 4) in centric occlusion (Figure 4a) and open mouth

position (Figure 4b) were advised to differentiate between skeletal and dental asymmetry.

Findings

Photographic analysis revealed non coinciding midlines with deviation of chin towards right. Panoramic radiograph showed that condyle of the left side was slightly larger than the right side, suggesting mild hyperplasia of the left condyle. The lateral cephalometric tracing showed a good anteroposterior skeletal relationship with a vertical growth pattern. Face bow transfer indicated presence of skeletal midline shift, which was confirmed with the radiographic analysis of PA view cephalograms (Figure 5) in occlusion (Figure 5a) and in open mouth position (Figure 5b).



Figure 1: Pre-treatment photographs.

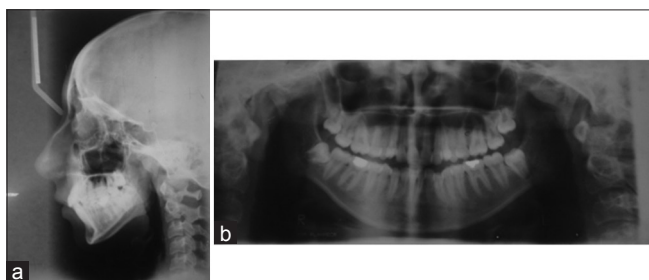


Figure 2: Pre-treatment radiographs. (a) Lateral cephalograph (b) Orthopantomogram.

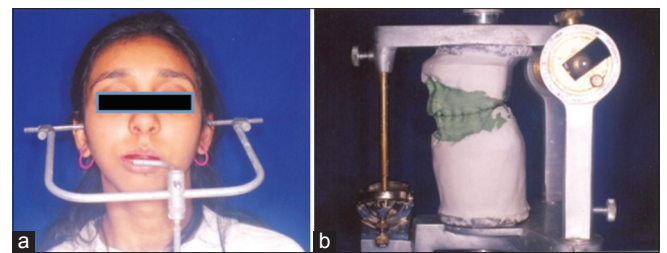


Figure 3: Facebow transfer. (a) In patient (b) On articulator.

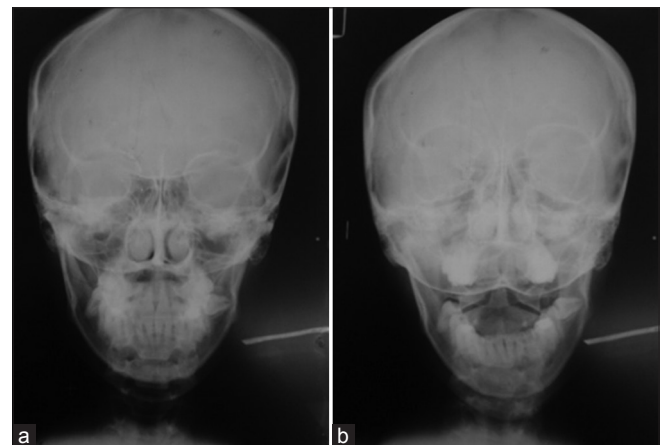


Figure 4: Postero-anterior view cephalographs. (a) In centric occlusion (b) Open mouth position.

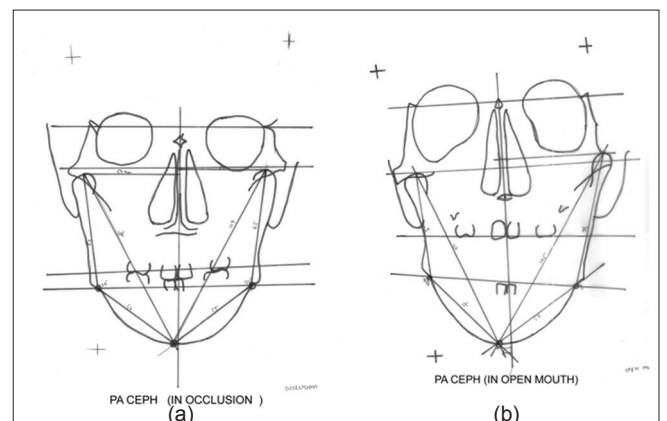


Figure 5: Radiographic analysis of pa view cephalographs. (a) In occlusion (b) Open mouth position.

After assessing patients perception of her facial asymmetry and expectations of treatment results, advisability of surgical correction was not considered.

Alignment and leveling of teeth were carried out using pre-adjusted edgewise appliance following extraction of maxillary first premolars and mandibular second premolars.

Significant improvement was observed in the patient's dental esthetics including alignment of upper and lower anteriors, achievement of ideal overjet and over bite and Angle's Class I molar relation (Figure 6). The cephalometric evaluation of skeletal and dental changes pre- and post-orthodontic treatment are summarized in Table 1.



Figure 6: Post-treatment photographs.

Table 1: Cephalometric analysis.

	Mean values	Pre-treatment	Post-treatment
Steiner's analysis			
SNA	82	75	76
SNB	80	72	72
ANB	2	3	4
1-NA	22	22	25
1-NA	4 mm	6 mm	6 mm
1-NB	25	25	25
1-NB	4 mm	7 mm	7 mm
Interincisal	131	128	125
1-SN	102	99	101
Go-Gn to SN	32	42	41
Tweed's analysis			
FMA	25	44	43
IMPA	90	89	90
FMIA	65	47	46
Jarabak ratio		55%	55%
Wits appraisal		0	0

Discussion

When patients complain of facial asymmetry and seek treatment, it is first essential to determine the underlying causes. This entails a thorough case history, radiographic analysis, facebow transfer and imaging studies.^{8,9} True dental asymmetry can be managed by orthodontic treatment alone using asymmetric extraction mechanics and by use of combination of intraoral elastics. For pronounced tooth irregularities, composite buildups or prosthodontic restorations may be indicated.

Mild functional deviation can be treated by minor occlusal adjustments. More severe discrepancies may need orthodontic alignment of teeth to achieve proper occlusion and function. Occlusal splints help in evaluating the presence and extent of functional shift by eliminating habitual posturing and deprogramming of musculature. In cases with contracted maxillary arches leading to shifting of mandible, rapid maxillary expansion may be indicated to achieve proper intercuspation of posterior teeth in centric relation.¹⁰

Severe skeletal asymmetries require a combination of orthodontic and surgical management. Surgical treatment planning may include orthognathic facial bone contouring surgery, genioplasty and contouring of soft tissues such as the masseter muscle and buccal fat pads.^{11,12} The extent of soft tissue changes as a result of related skeletal structure mobilization may be difficult to predict accurately.¹³ If later a second operation is required for adjustment of symmetry, alloplastic implants and fat injections for volume augmentation, as well as bone contouring and liposuction for volume reduction, can be carried out.¹⁴

More recent advances in three-dimensional photography have provided a valuable tool in diagnosis and treatment planning of dentofacial asymmetries with their proven accuracy and precision.^{15,16} However, decisions regarding intervention of dentofacial deformities depend upon the patient's awareness of the esthetic problem, the extent of occlusal deformity and concomitant sagittal or vertical jaw imbalance.¹⁷

Conclusion

A systematic and comprehensive examination, diagnosis and treatment plan is requirements for successful management of dentofacial asymmetries. Contributions from soft tissue, dental and skeletal elements leading to facial asymmetry should be evaluated in detail for arriving at an accurate diagnosis. Patient complaints and desires should be addressed carefully before finalizing the treatment plan since they may vary from unrealistic expectations to a total lack of concern even in the presence of severe discrepancies. In the presence of less severe skeletal, dental and soft tissue deviations, intervention with treatment procedures should be carefully considered.

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