PLANNING OF ORTHOGNATHIC SURGERY – 'A NEW ERA'

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Abstract:
Dentofacial deformities sometimes do demand for orthognathic surgeries & the success of these surgeries depends on proper evaluation & treatment planning. Thera are various phases of treating an orthognathic case. Here we focus on the advanced technologies like Dolphin analysis to predict the outcome of surgery & for preparing the manual surgical splints accordingly.

Keywords: Orthognathic Surgery, Dolphin Analysis, 2- Dimensional Cephalometry, Dentofacial deformities

INTRODUCTION

Orthognathic surgery is the ***art and science of diagnosis, treatment planning and execution of treatment by combining orthodontic and OMFS to correct musculoskeletal, dento-osseous and soft tissue deformities of the jaws and associated structures.***

Dentofacial deformities constitutes approx. **20%** of population[1]. The word "handicapping malocclusion" was also used to describe dentofacial deformity in the 1975 report by the National Research Council of the United States of America, which focused attention on these problems[2]. Success of orthognathic surgery depends on recognizing patient concerns, patient expectation, evaluation and assessment of problem & most importantly planning the treatment. This article focuses on the case series where we have used the advanced technologies like Dolphin analysis to predict the outcome of surgery & for preparing the manual surgical splints accordingly.

Presurgical orthodontics involves selection of appliance & alignment of teeth as the first step followed by vertical positioning of teeth, anteroposterior incisor position, arch compatibility & preparation for osteotomy sites if required.[3,4] Final Surgical Planning includes

1) Presurgery records which further includes general patient evaluation, sociopsychologic evaluation, esthetic facial analysis radiographic evaluation & occlusion & study cast evaluation.
2) Computerized Cephalometry & Orthognathic Surgical treatment planning
3) Model surgery
4) Stabilizing arch wires & splints[5]

PATIENT EVALUATION

An accurate diagnosis will lead to good surgical planning, thus favourable results. The orthodontist and the surgeon should take part and be responsible throughout the evaluation process, and there should be always a joint discussion between the surgeon, the orthodontist and the patient, before a definitive treatment plan is made. Full history such as medical and dental history should be obtained before going into examination. Articulated dental models should be prepared for later evaluation. Understanding of the patient's socio-psychological profile will greatly reduce misunderstandings by knowing the patient's motives for surgery and expectations.[6]

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CEPHALOMETRIC ANALYSIS

Cephalometric radiographs are used to not only to define what is wrong with the patient, but what effect treatment has, because it now can be quantified. The outcome of treatment such as skeletal stability can be objectively measured.[7,8] Moreover, the final facial form in profile as a sum of skeletal and soft tissue components can then be correlated with the surgical skeletal movements. Cephalometric tracing has evolved from tracing overlay methods to computer methods recently.[9]

Today, cephalometric films are rarely traced and analyzed by hand. Instead, the films are replaced by digital images, and there are a multitude of software packages that are now available to rapidly perform the analysis once the landmarks are indicated. The programs are designed to allow orthodontic and surgical manipulation with soft tissue responses that are preprogrammed.

2-DIMENSIONAL COMPUTERIZED CEPHALOMETRY & ORTHOGNATHIC SURGICAL TREATMENT PLANNING USING "DOLPHIN IMAGING"

Recently, cephalometric analysis and surgical prediction are done by robust cephalometric imaging software that can rapidly analyze the radiograph, and retrace and recalculate the analysis for a variety of possible surgical outcomes.[10]

In Dolphin Imaging, cephalometric norms based on population group, age, and gender as well as soft tissue response to the hard tissue changes can be adjusted accordingly. The programs dynamically recalculate the analysis and indicate the surgical moves that can be easily translated to model surgery. The speed and accuracy of the analysis and manipulation give the operator the option of simulating a variety of surgical procedures, and the ability to choose the outcome based on morphologic criteria. The soft tissue predictions remain less than ideal, but will continue to improve in time with better algorithms. Nevertheless, when appropriately used, these programs can be useful guides to the clinician. Finally an added benefit of digital cephalometric records is the ease with which the data can be archived and retrieved for outcomes analysis.

STEPS IN COMPUTER IMAGE PREDICTION

- First, Profile Image & Lateral Cephalogram of the patient should be taken in *Natural Head Position.*
- An image of lateral cephalogram is scanned into pt's file or direct digital cephalogram is entered.
- An "electronic tracing" is then produced by using digitization pad to enter points.
- Pt's Profile Image is then entered into file.
- Digital tracing is then "sized" to fit & coordinate with the facial image, using profile as the overlay reference.
- The small boxes on teeth & jaws seen at this point respresent treatment "handles" by which teeth & osseous segments can be moved with computer mouse in simulation of treatment changes.

- Once it has been done, Treatment algorithms are then displayed in table form which the clinician may change accordingly.

CONCLUSION

No doubt, conventional 2D cephalometric soft tissue and skeletal analysis attempts to quantify the dento-facial skeletal deformity in angular-linear measurements, but it still fails to take into account the complexity of the relationship between multidimensional surface contours of the soft tissue in relation to the underlying skeletal framework. The final decision must be based on 3D assessment of the deformity, and not on normalizing the facial skeleton and soft tissue envelope to 2D static normative data.

Fig 1 (a,b,c) - PHOTOGRAPHS

Fig 1 (d) - ESTHETIC FACIAL ANALYSIS

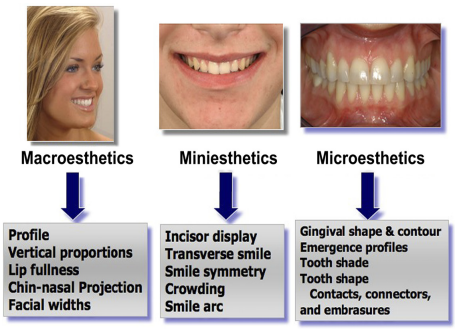

Fig 1 (e,f,g) - RADIOGRAPHIC EVALUATION

Fig 1 (h,i) - STUDY CAST EVALUATION & FACE BOW TRANSFER

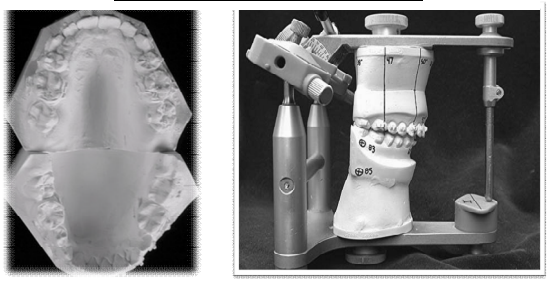

Fig 1 (j,k) - 2-D COMPUTERIZED CEPHALOMETRY & ORTHOGNATHIC SURGICAL TREATMENT PLANNING

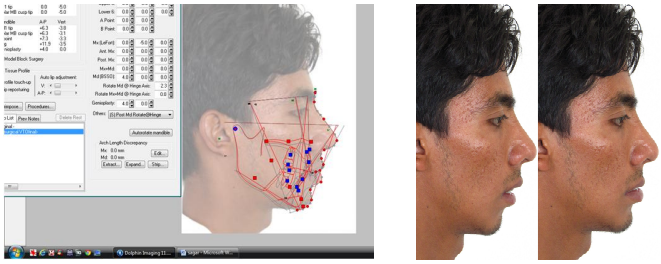

Fig 1 (l,m) - MODEL SURGERY & MANUAL SURGICAL SPLINT

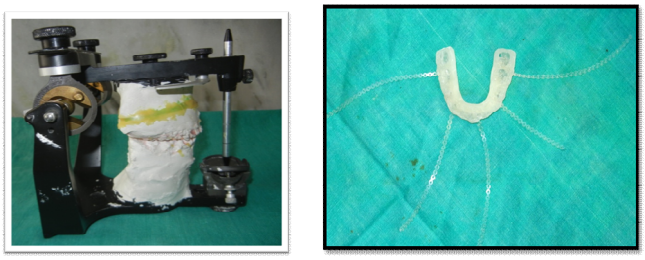

Fig 2 - ORTHOGNATHIC SURGERIES & RESULTS

Fig 2 a,b - Le Fort I Maxillary Advancement

Fig 2 c,d - Superior Elevation of Maxilla with AMO

Fig 2 e,f - TWIN JAW SURGERY: Le Fort I for superior elevation & advancement BSSO

Fig 2 i,j - TWIN JAW SURGERY
AMO & Asymmetrical BSSO for setback

Fig 2 g,h - Advancement BSSO

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