EVALUATION OF THE ROLE OF DISTRACTION OSTEOGENESIS IN CORRECTION OF MANDIBULAR POST-ANKYLOTIC DEFORMITY PRIOR TO RELEASE OF ANKYLOSIS

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By

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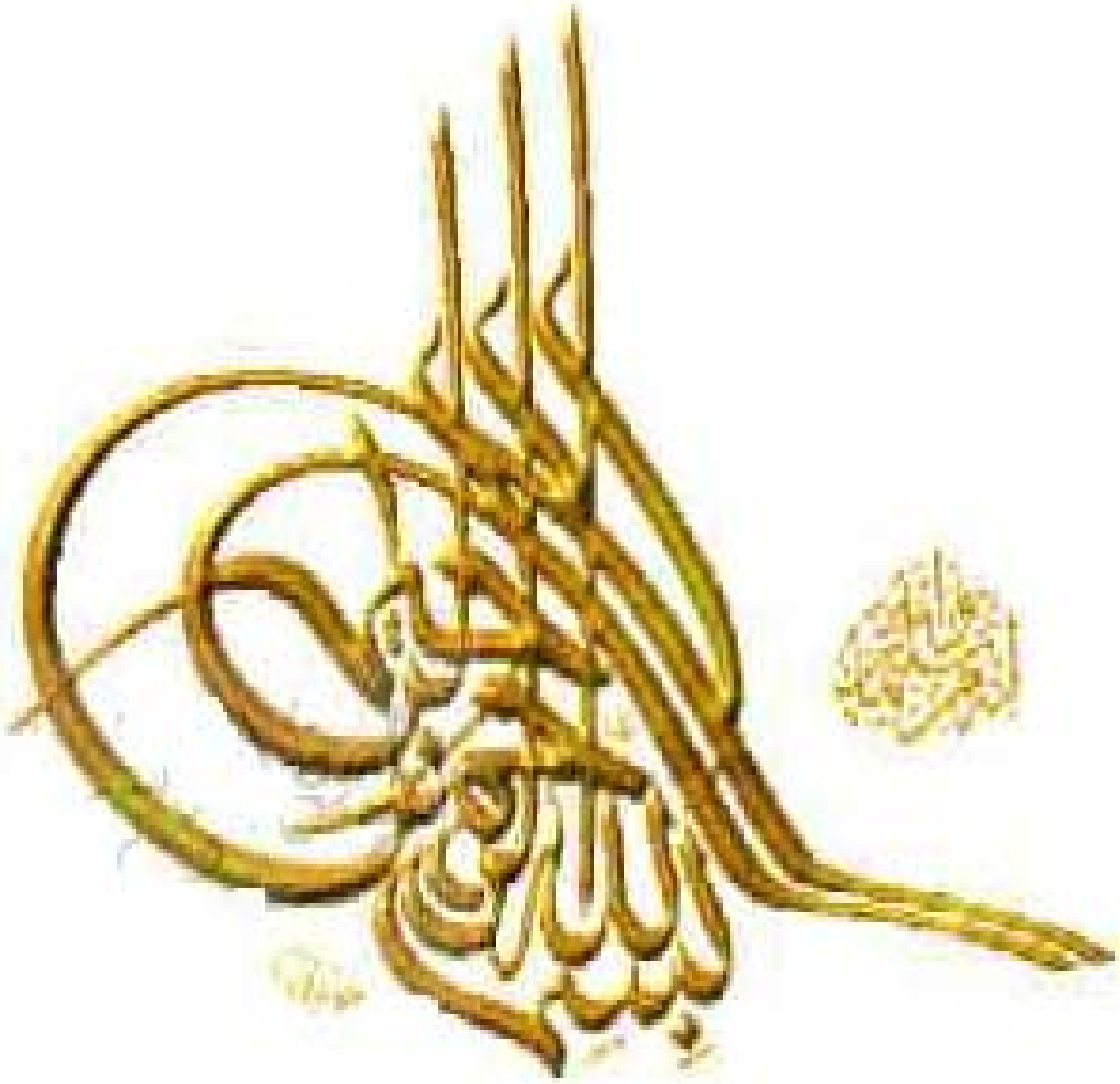

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Dedication

To my parents, sister and my wife for their support

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Abstract*: The aim of this study was to evaluate the role of mandibular Distraction Osteogenesis (DO) in the correction of post-ankylotic deformity prior to ankylosis release using extraoral mandibular distractors. Six patients with true bilateral mandibular ankylosis were included. A cephalometric analysis has been used to determine the extent and plane of deficiency and gives the exact amount and vector of distraction to be achieved. Planning of the osteotomy site and vector of distraction using Losken's formula was applied for every case in this study. The distractors were activated, after a latency period of 1–3 days, 2 times daily by 0.5 mm, followed by consolidation period of 8–12 weeks. Good results were achieved with minimal complications.*

Key words: Temporomandibular joint, Ankylosis; Micrognathia; Distraction osteogenesis; Cephalometric analysis.

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Introduction

TMJ ankylosis is a disorder of the joint which occurs secondary to trauma, local or systemic infection, or systemic disease. This condition involves the fusion of the mandible and the temporal bone which gives rise to a sequence of deformities of the facial skeleton.

It is a serious and disabling condition that may cause problems in mastication, digestion, speech, appearance, and hygiene. It also causes disturbances of facial and mandibular growth, and acute compromise of the airway resulting in physical and psychological disability.

The treatment of TMJ ankylosis poses a significant challenge because of technical difficulties and a high incidence of recurrence. A variety of surgical options have been advocated, with the goal of to both release the joint ankylosis and lengthen the mandible, with hope of restoring and maintaining normal TMJ movement and mandibular function.

Mandibular distraction in the last decade has been accepted as a good modality in managing the hypoplastic mandible, without the necessity for bone grafts or complex osteotomies. One of the main advantages of DO involves distraction of soft tissue along with lengthening of the bone. Because of the gradual and controlled movement of the bone, the surrounding soft tissues are ‘‘recruited’’ or ‘‘stretched’’ simultaneously.

Mandibular distraction has been used successfully to manage the facial deformities associated with TMJ ankylosis. However the simultaneous use of mandibular distraction with ankylosis release has significant disadvantages: (1) improper outcome of distraction due to unpredictable vector management and (2) physical interference of the distraction process, to active post-operative physiotherapy after ankylosis release.

In this study, we will evaluate the role of mandibular DO in the correction of post ankylotic deformity prior to ankylosis release.

Review of literature

The temporomandibular joint (TMJ) is composed of the temporal bone and the mandible, as well as a specialized dense fibrous structure, the articular disk, several ligaments, and numerous associated muscles. The TMJ is a compound joint that can be classified by anatomic type as well as by function.

Anatomically the TMJ is a diarthrodial joint, which is a discontinuous articulation of two bones permitting freedom of movement that is dictated by associated muscles and limited by ligaments. its fibrous connective tissue capsule is well innervated and well vascularised and tightly attached to the bones at the edges of their articulating surfaces. It is also a synovial joint, lined on its inner aspect by a synovial membrane, which secretes synovial fluid. The fluid acts as a joint lubricant and supplies the metabolic and nutritional needs of the nonvascularized internal joint structures.

Functionally the TMJ is a compound joint, composed of four articulating surfaces: the articular facets of the temporal bone and that of the mandibular condyle and the superior and inferior surfaces of the articular disk. The articular disk divides the joint into two compartments. The lower compartment permits hinge motion or rotation and hence is termed ginglymoid. The superior compartment permits sliding (or translatory) movements and is therefore called arthrodial. Hence the temporomandibular joint as a whole can be termed ginglymoarthrodial.

Temporomandibular joint (TMJ) ankylosis is a disorder characterized by hypomobility of the TMJ; ranging from partial reduction to complete immobility of the jaw. The term ankylosis in Greek terminology means “stiff joint”.

Various types of TMJ ankylosis have been classified; the first was by Kazanjian who classified TMJ ankylosis into two categories: True ankylosis (intra-articular) and Pseudonkylosis (extra-articular). [(1)] Furthermore, true ankylosis has been further classified according to type of tissue involved into (bony, fibrous, or fibro-osseous) and the extent of fusion into complete and incomplete form, with the complete form having less than 5 mm of interincisor opening.[(2)]

Sawhney listed four types of ankylosis: type I, decreased joint space with dense fibrous adhesions; type II, decreased joint space with dense fibrous adhesions, which also exhibits lateral “lipping” and bony bridges; type III, broad areas of bony bridging from lateral ramus to zygomatic arch; type IV, complete bony fusion. [(3)]

Furthermore, Topazian proposed a three-stage sub-classification to grade bony ankylosis as follows: stage I, ankylotic bone limited to the condylar process; stage II, ankylotic bone extending to the sigmoid notch; and stage III, ankylotic bone extending to the coronoid process. [(4)]

Pseudoankylosis results from pathologic conditions outside the joint causing limitations in opening the mouth. The etiology of extra-articular TMJ ankylosis includes fibrosis of the masticatory muscle, coronoid impingement, Fracture dislocation of the condyle, depressed zygomatic arch fracture, Scar contracture following thermal injury and Tumor of the condyle or coronoid process. [5] Limitations in opening the mouth caused by cancrum oris and osseous union between the coronoid process and the skull base or zygomatic arch after trauma have been reported. [6]

True ankylosis is produced by fibrous or bony adhesions between the articular surfaces of the mandibular condyle and glenoid fossa.[1] The most common etiology of intra-articular TMJ ankylosis is trauma, especially fracture of the mandibular condyles which resulted in TMJ ankylosis in 29 to 98% of the cases. [7, 8] The second most common cause (10~49% of the cases) is local or systemic infection; such as otitis media, mastoiditis, severe dental infection and hematogenous spread of tuberculosis, gonorrhea, and scarlet fever.[7] Some systemic inflammatory and rheumatologic diseases such as ankylosing spondylitis, rheumatoid arthritis, and psoriasis were reported as possible etiologic factors in less than 10% of the cases.[9]

Trauma to TMJ area may lead to intra-capsular hematoma; injury to disc, articular capsule, or articular surface; with subsequent mandibular hypomobility. Moreover, the presence of condylar neck fracture intra-articular bone fragment can increase the extent of ankylosis.[10] Histologically, at one month distance from the traumatic event, full hematoma organization and filling of

the articulation with fibrous connective tissue is observed, although residual joint place is still visible. After three months, joint space is fully obliterated, the entire capsule hosts fibrous ankylosis, and it is possible to detect the presence of bone tissue as well as areas of endochondral ossification in proximity of articular surfaces. [10]

On the other hand, septic arthritis of TMJ represents a rare cause of ankylosis. It is essentially due to the reactive formation of fibrous or bone tissue within intra-articular abscess. Pathologic microorganisms, chiefly Staphylococcus aureus, can reach the articular capsule from remote nidi via blood, to the middle ear or neighbouring structures, through direct inoculation from traumatic or surgical injury, or blunt trauma. When the septic process is not diagnosed and/or not treated with specific antibiotic therapy, drainage and functional rest complications may arise as propagation of the septic process, articular surface erosion and consequent dysfunction, and finally fibrous or bone TMJ ankylosis.[11]

The clinical findings in patients with TMJ ankylosis are related with the age, duration and whether the ankylosis is unilateral or bilateral. Since the growth of the mandible occurs by two related processes: translational growth driven by endochondral bone formation at the condyles and resorptive/depository (remodelling) growth causing mandibular enlargement. Disruption of any of these processes can affect the growth in this region and secondary hypoplasia of the pterygomasseteric sling. [12,13]