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Opinion

Pediatric and Children Facial Deformity with Special Reference to Ankyloses of the Temporomandibular Joint

Raja Kummoona*

Emeritus Professor of Maxillofacial Surgery, Iraqi Board for Medical Specializations, Medical City, Baghdad, Iraq

***Corresponding Author**: Raja Kummoona, Emeritus Professor of Maxillofacial Surgery, Iraqi Board for Medical Specializations, Medical City, Baghdad, Iraq.

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Ankyloses of the temporomandibular joint (TMJ) means stiff joint with loss of function in swallowing, speech and mastication. The etiology of ankyloses of the TMJ is due to internal intrauterine trauma or due to external trauma to the mandible transmitted through the long axis of the ascending ramus to the condyle. The condyle in children is spongy vascular wide with short neck. The severity of the object causing fragmentation of the disc and comminution of the condyle with damage to cartilaginous structures of the joint leading to bleeding in the joint associated with pain and swelling and inability to open the mouth, the bleeding of the joint causing heamoarthrosis leading to fibrosis of the joint, sometime the impact sever enough to fracture the glenoid fossa and might fracture the petrous bone of base of skull and tearing the meninges with leakage of CSF from the ear as CSF otorrhea in this state the case should be treated as head injuries.

Morphological changes of the facial skeleton resulting from ankylose of TMJ

The sequences of traumatic injuries to the TMJ and base of skull were, an extensive callus involving the damaged condyle, the disc and glenoid fossa. This callus extended up to the skull base, affecting the sagittal suture, the petrous bone and the spheno-occipital synchondrosis. These changes lead to deformity of skull base, the mid face and the mandible in the affected side.

These changes occurred as a result of growth disturbance of the normal growth pattern of the facial skeleton featuring shortens of the long and transverse axis of the skull base with medially positioned ankylosed TMJ and ascending ramus with an underdeveloped mandible and floor of the mouth and midface in comparison with the normal side; and the chin twisted to the affected side.

Other deformities including changes of the pharyngeal-laryngeal inlet with hyperplasia of epiglottis and the tongue posteriorly located. These sever insult to primary growth center of the condyle and facial matrix occurred as result of ankyloses.

A compensatory mechanism developed by excessive growth of the masticatory muscle attachments process on the mandible was observed in the angle of the mandible for masseter muscle attachments and on genial tubercle for attachments of suprahyoid and genioglossus muscles; the excessive pull of these muscles lead to formation of antigonial notch in presence of stiff TMJ featuring as concavity of the lower border of the mandible with hyperplasia of coronoid process as result of excessive pull of temporalis muscle.

These signs considered an important diagnostic clinical signs of this disease, the problem might rise during intubation of anesthesia because the large epiglottis with deviation of the larynx causing deflecting the tube from the inlet required expert anesthetic. In the past and early years we use to do tracheostomy as life saving and for intubation but nowadays we use guided endoscopy for intubation.

Managements of head injuries

Research done on CNS, by taking few samples of CSF collected from the patients with head injury and also their blood serum underwent analysis by using high specific isoelectric focusing electrophoresis set on polyacrylamide gel for direct immunofixation of transferrin

by aplex electrophoresis set and by spectrophoto meter for serum samples, by this method we can detect CSF leakage due to traumatic injuries and to differentiate it from serum exudate, in this technique we were detected the concentration of the B2-transferrin enzyme in CSF was 90.26 ppm which approximately 35 times greater than in the serum.

The priority of managements by Kummoona 4 golden C for life saving steps was applied, Control breathing and maintain patent airway, Control circulation and manage shock, Control bleeding by cauterization of small vessel and ligation of large vessels, and Control soft tissue laceration and bony fragments.

The managements of CSF leakage usually carried out by conservative technique after reduction and fixation of craniofacial fractures by applying the following steps:

1- Reduction of intra cranial pressure (ICP) by elevation of the head 45 degree.

2- Reduction of CSF leakage by using carbonic anhydrase inhibitors (Acetazolamide {Diamox 3-Kcl} 250 mg twice daily) to correct hyperkalemia as a complication of Diamox and 4 triple antibiotic to prevent meningitis.

3- The CSF leakage usually stop within 4 - 5 days, once does not stopped Lumber puncture is required to reduce the ICP by aspiration of CSF.

4- Once the leakage continue with the previous measures Craniotomy indicated for Dural repair by either by piece of Gale aponeurosis or a piece of temporalis muscle and sutured as water tight.

The managements of head injuries is the responsibilities of neurosurgeons and with collaboration with craniofacial surgeon.

Sagittal CT scans required to assess the pharyngeal-laryngeal inlet and epiglottis also X-ray of the chest required to show shifting of the Larynx further CT scans with 3D to demonstrate the facial deformity and ankyloses of the TMJ.

The Surgical managements of ankyloses

We don't operate on kids till age of 5 - 6 years before going to school, the managements is quiet complicated and a long surgical procedure by using Kummoona Preauricular-Temporal flap similar to? Design as full thickness fasciocutanous flap, dissection started from the posterior fibers of Temporalis muscle down to the capsule of the TMJ with careful attention to facial nerve and auditory meatus, capsule incised by L shape to expose the ankylosed joint, excision of the mass of ankyloses done with coroniodactomy and re attachments of both medial pterygoid and masseter muscle through another incision in the submandibular region also used as an access for path of Kummoona [1,2], Chondro-Ossous graft of 4 - 5 cm length and 1 cm width, the cap is covered by piece of muscle work as future meniscus, muscle and graft harvested from iliac crest, the graft should be inserted to fit the glenoid fossa, the graft and the ascending ramus was decorticated before fixation of the graft by 3 holes and fix it with stainless steel soft wire of 0.5 cm. The patient advised to resume mastication after few days to restore functional activity of the TMJ and growth potential of the Chondro-Ossous graft.

There are two techniques widely used for reconstruction of the damaged TMJ, for restoration of function and growth of the mandible and midface and they are:

1- Costo-Chondral graft of Poswillo 1974.

2- Kummoona Chondro-Ossous graft 1986.

There are a lot of controversy about the usage of graft for reconstruction of the TMJ, many researchers tried in the past different technique to be applied in TMJ for restoration of growth and all failed and some of these may be used for one trial without success. Costa-Chondral graft been studied clinically by Kennett 1973 [3] and experimentally on Meccaca Iris Monkeys 1974 by Poswillo [4,5] to assess the viability of the graft, his work was a breakthrough in research and reconstruction with restoration of growth of TMJ and this graft had been widely used for few decades.

The Kummoona Chondro-Ossous graft [6,7] is the most valuable graft been advocated since 1986 [3] for reconstruction of the TMJ. The graft applied in 3 disease of TMJ, Ankyloses, mild hemi facial microsomia and hypoplasia of the condyle and the aim was to restore growth of the condyle, mandible and mid face. The graft has the ability to grow in multi directional fashion instead of iliac crest growth in columnar type due to changes of environment of graft from weight bearing in iliac crest to masticatory process in the TMJ.

The objection about costa chondral graft, the cartilaginous cap of the easily displaced from the rib due to lake of strong connection between the osseous elements and the cap, perforation of pleura might happened and an over growth of the graft might occur [8] and the procedure required 6 weeks inter maxillary fixation (IMF), after six weeks the child faces difficulty in opening and closing the mouth due to spasm of masticatory muscles. While in application of Kummoona Chondro-Ossous graft we do advice the child to eat and chew within few days to enhance the graft for growth and there is no IMF or long time fixation but active mobilization of the jaw required.

Experimental research was done by us on Rabbits for demonstration of viability of Chondro-Ossous graft and to demonstrate the condyle as a growth center, the histological examination of the graft showed 4 zones in the first layer a thick articular layer of dense fibrocartilage due to demand of hard masticatory process of Rabbit food, the second layer showed several zones of active round cells of mesenchymal stem cells which represent the proliferative layer and the third layer showed series of hypertrophic chondrocyte passed through series of changes with osteoid tissue, the third layer represent the differentiation of mesenchymal stem cells to chondrocyte and osteoblast, these cellular changes represent the growth potential of the graft, the fourth layer was showing an osteoid tissue with bony trabeculae and bone marrow spaces in between.

Previous studies and research on bone, they found a G-protein coupled receptor (CXCR4) predominantly expressed in hypertrophic chondrocyte while its ligand Chemokine stromal cells derived factor (SDF-1) is expressed in the bone marrow adjacent to hypertrophic chondrocyte. This finding explained the endogenous growth potential of the graft to continue to grow as a condyle and to maintain growth of the mandible and mid face and the graft has the ability to restore growth, repair and remodeling of the condyle [9].

The growth of the face and mandible controlled and directed by two theories as we believed, the first theory of primary growth in the condyle, nasal cartilage and sphenoid occipital synchondrosis as mentioned by John Hunter 1772-1773, the greet British scientist in his book the teeth [10], the second theory by Moss 1962, he stated the growth of the face is a functional demand of the periosteal matrix of the facial skeleton [8], the author [11], his own theory based on there is no single theory controlling the jaw and face growth but both theories exist and required in growth of the face and our theory based on experimental research and studies carried previously on animals models Rabbit and Monkeys.

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