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TEMPOROMANDIBULAR DISORDERS: A REVIEW ON DIAGNOSIS AND MANAGEMENT.

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INTRODUCTION

Temporomandibular disorder (TMD) is one of the most common disorders in the maxillofacial region which usually presents with pain, unusual sounds, discomfort in chewing and locking of the jaw. TMD patients comprise a considerable proportion of patients seeking treatment; early diagnosis is important because it is proven that acute TMD responds well to treatment in contrast to chronic TMD. True diagnosis and treatment of TMD can be difficult, as these patients often suffer from some other disorder at the same time. In these cases, a successful treatment is due to true diagnosis of all initiating factors, predisposing and perpetuating factors and treatment of other established disorders. An important point is the close relation of intrajoint disorders to disorders of masticatory muscles. Today, it has been proven that disorder of masticatory muscles can lead to TMD. The opposite of this, is also true. Correct diagnosis is essential. The diagnostic steps and differential diagnosis of TMD and the treatment protocols from supportive treatment, splint therapy and physiotherapy to temporomandibular joint (TMJ) surgeries are explained herein. We hope this chapter can help better understand TMJ disorders, diagnosis and recognition of the signs and symptoms of disorders of the temporomandibular and masticatory system.

TMD which includes problems related to masticatory muscles, TMJ and adjacent structures, is the most common non-dental pain in the maxillofacial region. The most common sign of TMD is pain in masticatory muscles, or preauricular region and on the TMJ which becomes severe when chewing or upon other mandibular movements. TMD patients have limitation and asymmetry in mandibular movements. They often have clicking, popping, grating and crepitus. Patients may complain from headache, earache and pain in the mandibulofacial region. Masticatory muscle hypertrophy and an unusual facet of occlusal surfaces of the dentition due to excessive mandibular movements such as bruxism or grinding may be present. Management of TMJ disorders usually includes finding the cause or etiology. Parafunction and trauma are common causes of TMD. Stress and mental problems are secondary aggravating factors.[1,2]

DISCUSSION

TMJ anatomy

Temporomandibular joint is the junction site of the mandibular condyle to skull base or glenoid fossa of the temporal bone. A disc separates the two bones. The part of the disc which is in contact with mandibular condyle bone consists of fibrous connective tissue without any nerve or vessel. This joint is a compound one. The disc is divided into three parts, in sagittal view: anterior, posterior and middle. The middle zone is the thinnest part. The disc becomes thicker in the anterior and posterior parts. In coronal view, the medial part of the disc is thicker than the lateral part (Fig. 1).[3]

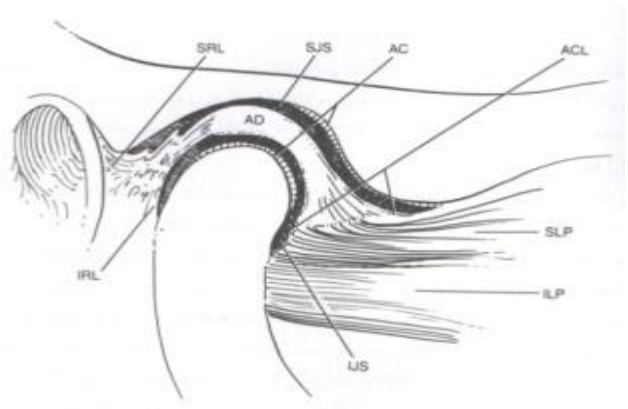

Figure 1: TMJ in sagittal and coronal views.

Disc shape is determined by condyle morphology and mandibular fossa. The disc may become displaced or destroyed via degenerative forces. In the posterior part,

the disc is attached to a loose connective tissue of nerve and vessels named retrodiscal tissue. In the superior posterior part, it is attached to a connective tissue full of elastic bands named superior retrodiscal layer or bilaminary zone. This tissue connects the disc to the tympanic bone posteriorly. Below this, there is the inferior retrodiscal layer which connects the inferior border of the posterior edge of the disc to the posterior part of condyle joint surface. Inferior disc layer and superior retrodiscal tissue are made of collagen and elastic fibers, respectively. Anteriorly to the disc, superior and inferior adhesions of it connect to the capsular ligament. Both of these adhesions are made of collagen fibers. Between the capsular ligaments, the disc is adherent to fibers of the superior lateral pterygoid muscle. The disc adheres to the capsular ligament, not only anteroposteriorly, but also mediolaterally. The joint is divided into two separate and distinct spaces. The superior space is located between the glenoid fossa and superior part of the disc; the inferior disc space lies between the disc and condyle. Internal surfaces of superior and inferior spaces are lined with special endothelial cells which secrete synovial fluid. This fluid has two functions: 1-Molecular transport and metabolism and 2-Lubrication of joint surfaces; the fluid is secreted on the joint surfaces under pressure and results in friction reduction. During function, forces entering to the joint surfaces lead to movement of this fluid into intrajoint tissues. In coronal view, the condyle has a medial and lateral pole; the medial pole is thicker than the lateral one. The TMJ is supported by three major and two minor ligaments.[1,4] Major ligaments are: Collateral ligaments, Capsular ligament, Temporomandibular ligament while minor ligaments are: Spheno-mandibular ligament, Stylomandibular ligament.

TMD etiology

TMD is considered as a multifactorial disorder and there is no special or individual cause for it. There are factors which can damage the balance in TMJ and the masticatory system. Bone deformations, soft tissue metaplasia of TMJ and muscle activity reduction are often adaptive responses to changes. Hyperactivity of masticatory muscles resulting from parafunctional habits can lead to adaptive responses in dynamic balance because of hyperactivity and high load in the long term. Excessive changes in any of the above functions can lead to disability to adapt leading to TMJ disorders. For example, external trauma to any part results in injuries and disorders in normal joint function. Moreover, anatomic, systemic, pathophysiological and emotional causes can make the disorder more severe.[4, 5]

Nowadays, trauma is believed to be the initial cause of TMD. In fact, excessive trauma because of parafunctional forces can damage the masticatory system. These damages may result in joint injuries and pain in eating, smiling, yawing or excessive opening of the mouth. External trauma such as a punch, sport activities and injuries because of dental practice can lead to TMD. An important type of trauma is parafunctional trauma. Postural habits such as head forwarding or holding the phone handset place pressure on joints and muscles which result in musculoskeletal pains such as headaches in TMD patients. Additional habits and movements such as clenching, bruxism, attrition, lip biting and abnormal posture of the jaws common in society may lead to TMD. Although in some patients, it is known as an initial factor, parafunctional habits can be aggravated by stress, anxiety, sleeping and eating disorder.[2]

Anatomical factors

Anatomical factors affecting the TMJ can be hereditary, developmental or acquired. Some skeletal disorders such as small mandibular arch, class II occlusion etc. can affect the TMJ. However, millimetric changes in face vertical dimension, overbite, over jet or cross bite alone, are not the only cause of TMD. Today it is believed that dental occlusion disorders are second in importance.

Pathophysiological factors

These include: degenerative disorders, endocrine disorders, infections and blood disorders. It is revealed that viscosity of synovial liquid and its lack of lubricant property may be the initial cause of internal derangement and clicking.

Temporomandibular disorders classification

Classifying TMDs, makes diagnosis easier. As there are numerous similar disorders and pains in the head and neck region, differential diagnosis is paramount (Table 1).

Table 1: Classifying temporomandibular disorders.

Temporomandibular disorders classification
1. Deviation in form
2. Disc displacement with reduction
3. Disc displacement without reduction
4. Dislocation
5. Inflammatory conditions: Synovitis, Capsulitis
6. Arthritides: Osteoarthrosis, Osteoarthritides, Polyarthritides
7. Ankylosis: Fibrosis, Bony

In differential diagnosis of TMJ disorders and pains, problems such as neoplasms, migraine, neuralgia and mental disorders should be considered. Moreover, it is noticeable that, growth-developmental disorders include

aplasia, hypoplasia, hyperplasia and dysplasia can lead to TMJ problems.

Aplasia is defective growth of skull or mandible bones. These belong to one group of mandibular anomalies named hemifacial microsomia or first and second brachial arch syndrome. These are the most common developmental defects which have no articular fossa or eminence and the patient suffers from hearing problems.

Hypoplasia is low or incomplete growth of bones which is congenital or acquired. This is milder than aplasia. Many craniofacial anomalies include incomplete growth of cranial and mandibular bones, for example Treacher-Collins syndrome.
Hyperplasia is extensive growth of bones in congenital or acquired form which is unilateral in mandibular body, coronoid or condyle and leads to asymmetry.[3, 6]

Dysplasia or fibrosis dysplasia is a benign disorder with defective mandible or maxilla growth which demonstrates itself as fibrotic connective growth. On radiography, it varies from lucent to ground glass.

Neoplasia may be benign or malignant. From the benign ones, osteoma, chondroma, osteoblastoma, chondroblastoma, ameloblastoma and synovial chondromatosis (which is common in TMJ) can be named. Malignant tumors such as osteosarcoma, Ewing sarcoma, chondrosarcoma, fibrosarcoma and adenocarcinoma are usually rare. About 1% of malignant tumors metastasize to jaws.

Fractures can result in displacement, damage of joint surfaces, ligaments and disc in combination with bleeding, then adhesion, or joint derangement can be expected.[6, 7]

General Therapeutic Goals for Temporomandibular Joint Surgery

Table 2: Goals for Temporomandibular Joint Surgery.

Improve function and form
Limited period of disability
Improved range of jaw motion and/or function
Appropriate understanding by patient (family) of treatment options and acceptance of treatment plan
Appropriate understanding and acceptance by patient (family) of favourable outcomes and known risks and complications
Reduction in pain
Improved Quality of Life

General Criteria, Parameters, And Considerations for Temporomandibular Joint Surgery

Dealing with neurologic deficits

Injuries to the terminal branches of the trigeminal nerve (eg, lingual, inferior alveolar, long buccal nerves), as well as the facial nerve, are known risks of oral and maxillofacial surgery.[8] It should be noted that the presence of a pathologic craniomaxillofacial condition, dentoskeletal or craniofacial abnormality, or traumatic craniomaxillofacial injury may result in nerve injury prior to surgical management. In addition, the use of local anesthesia (eg, mandibular block) may increase the risk of nerve injury. Most nerve injuries resolve spontaneously, but some do not, and these may require consideration for non-surgical and/or surgical intervention. Micro-neurosurgical repair should be considered when the disability is of concern to the patient, and there is clinical evidence of moderate, severe, or complete neurosensory impairment of various areas of the orofacial region (eg, lips, chin, tongue); paresis or paralysis of facial muscles; loss, decreased, or abnormal taste sensation; or neuropathic pain of peripheral origin. Surgical repair should incorporate specialized microsurgical techniques (eg, operating magnification, nerve grafting), when indicated.[9,10]

Use of imaging modalities

Imaging modalities may include panoramic radiograph, periapical and/or occlusal radiographs, maxillary and/or mandibular radiographs, computed tomography, cone beam computed tomography, positron emission tomography, positron emission tomography/computed tomography, radionucleotide imaging, and magnetic resonance imaging. In determining studies to be performed for imaging purposes, principles of ALARA (as low as reasonably achievable) should be followed.[11-13]

General Factors Affecting Relative Risk During Temporomandibular Joint Surgery[14-16]

Table 3: Factors Affecting During Temporomandibular Joint Surgery.

Degree of patient and/or family understanding of the origin and natural course of the condition or disorder and therapeutic goals and acceptance of proposed treatment.
Presence of coexisting major systemic disease (eg, disease that increases a patient's American Society of Anesthesiologists classification to II, III, or IV as detailed in the Patient Assessment chapter)
Age of patient
Presence of concomitant facial pain (eg, dental pain, earache, headache)
Presence of parafunctional habit
Existing drug or alcohol dependence
Issues of secondary gain (eg, pending litigation)
Chronic pain disorders (eg, pain in excess of 3 months duration)
Presence of malocclusion
Presence of deformity or pathology of the TMJ
Presence of concomitant skeletal deformity
History of previous orthodontics, orthognathic surgery, or TMJ surgery
History of sensory or motor nerve abnormality (eg, temporary or permanent)
History of infection of surgical site
Presence of local or systemic conditions that may interfere with the normal healing process and subsequent tissue homeostasis (eg, previously irradiated tissue, diabetes mellitus, chronic renal disease, liver disease, blood disorder, pregnancy, steroid therapy, contraceptive medication, immunosuppression, malnutrition, Ehlers-Danlos syndrome, fibromyalgia)
Prolonged period of TMJ disuse (e.g, ankylosis)
History of maxillofacial trauma

General Known Risks and Complications of Temporomandibular Joint Surgery[17-22]

Table 4: Complications of Temporomandibular Joint Surgery.

Unplanned admission to intensive care unit after elective surgery
Unplanned intubation for longer than 12 hours after surgery
Reintubation or tracheostomy after surgery
Emergency tracheostomy (eg, ankylosis, trismus, unable to maintain airway)
Use of parenteral drugs and/or fluids for longer than 72 hours after elective surgery
Failure to ambulate within 48 hours of elective surgery
Facial and/or trigeminal nerve dysfunction after surgery (eg, temporary or permanent facial muscle weakness resulting from surgery) resulting as inability to wrinkle the brow, raise the eyebrow, or gain tight closure of the eyelids and numbness.
Facial fracture during or after surgery
Unplanned exploratory procedures associated with surgery
Dental injury during surgery
Ocular injury during surgery and postoperative sequelae (eg, corneal abrasion, keratoconjunctivitis, blindness)
Repeat oral and/or maxillofacial surgery
Core temperature of greater than 101°F 72 hours after elective surgery
Postsurgical radiograph indicating presence of foreign body
Unplanned transfusion(s) of blood or blood components during or after surgery.
Readmission for complications or incomplete management of problems on previous hospitalization
Development of chronic pain disorder
Increased and/or persistent pain
Postoperative development of adhesions, heterotopic bone (reactive bone), or ankylosis within the joint space.
Development of TMJ internal derangement
New or worsened malocclusion
adhesions (scar tissue), joint arthritis (contralateral joint in unilateral cases), or osteomyelitis of the jaw (bone infection)
Significant joint noise with or without increased pain and/or dysfunction.
Ear pain and/or dysfunction
Development or worsening of a parafunctional habit
Abnormal mandibular growth (eg, excessive, restricted)
Prolonged period of disability

Infection
Development of complex regional pain syndrome
Foreign body reaction or allergic reaction and rejection of the implant, wear, displacement, breakage, or loosening of alloplastic device components
Ear problems, including inflammation of the canal, middle or inner ear infections, perforation of the ear drum, temporary or permanent hearing loss, ringing in the ears, or equilibrium problems
Respiratory and/or cardiac arrest
Death

Special Considerations for Pediatric Temporomandibular Joint Surgery

Orofacial pains due to TMJ conditions are less common in young children compared with teenagers and adults. Internal derangements are uncommon.[23-24] TMJ conditions other than congenital deformities (eg, hemifacial microsomia) or acquired anatomical abnormalities (eg, fractures, bony ankylosis, idiopathic condylar resorption) are very uncommon in children. When painful TMJ conditions do occur, underlying psychopathologic factors are more frequent. Informed consent issues specific to children as discussed in the Patient Assessment chapter are applicable for TMJ surgery. Imaging is frequently required to assess and treat pediatric patients. Every effort to minimize the frequency and complexity of imaging studies should be employed to reduce radiation exposure in this patient population. Whenever possible contrast should be avoided unless clinically indicated to further reduce the radiation dose and risks associated with the use of contrast.[25] Masticatory muscle hyperactivity in children may present as night time grinding or bruxism, and this is common in the deciduous or mixed dentition stages of dental development. Children may complain of headaches, earaches, or jaw stiffness in the morning on awakening.[24,25] Usually this can be managed with a night guard or biofeedback and appropriate medications, when indicated. Symptomatic clicking generally can be eliminated or diminished with midline hinge axis opening exercises to overcome an abnormal opening pattern. The origin of headache in the pediatric patient is primarily related to the sinus, eye, vascular system or cervicalgia. Any operative procedure on the TMJ of a growing child must consider the ultimate effect of the treatment on growth and development of the mandible and face. Management of ankylosis, juvenile idiopathic arthritis, degenerative joint disease (very rare in children), infectious arthritis, mandibular dislocation, and condylar resorption is similar in children and adults. Juvenile idiopathic arthritis involvement of the TMJs is not uncommon. These children require frequent monitoring and occasional imaging (MRI with gadolinium contrast) to manage their disease. Medical management can include systemics such as NSAIDs, disease-modifying anti- rheumatoid drugs (eg, methotrexate), and biologics (eg, adalimumab [Humira®]).[26] Steroid injections may be required as a primary treatment, or for periodic management of exacerbations of disease activity to augment their medical management. Occasionally surgery is required to debride or reconstruct joints destroyed by this disease. The goal of reconstructing the TMJ and ramus-condyle unit in children includes the restoration of normal functioning anatomy. This is true regardless of the underlying condition (eg, tumor, traumatic defect, developmental defect). Therefore, autogenous donor sites with growth potential (eg, costochondral grafts) are recommended although alloplastic reconstruction may be considered in some children where the benefit of improving hypomobility outweighs the risk of asymmetric growth with the knowledge that additional surgical procedures may be necessary.

CONCLUSION

A multidisciplinary team approach is required for the fundamental care of patients with TMD disorder. Dental practitioners who work in isolation run the risk of overlooking serious issues that may adversely impact on long term care of such patients. Therefore, this is advisable that all the members of specialist TMD team should have their perspective in general to be considered seriously so that a tailored treatment plan is framed for each patient with TMD disorder.

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