Over the last seven weeks, I have been reviewing the vast library of literature that can be discussed in relation to the implications of temporomandibular joint dysfunction (TMJD) on athletic performance.

The articles have considered the the effects of increased glial cell activation & increased substance P secretion, related to the hyper-sensitisation of the trigeminal nerve, that can occur as a result of TMJD.

During the last post, I discussed what components need to be included in a thorough TMJ assessment by the various members of the multi-disciplinary team that should be involved in the condition's management. So, all that is left to discuss now, is what we actually need to do to resolve TMJD.

I will predominantly focus on the physical therapy approach in this article, as I that is where my strengths lie. However, as I mentioned in a couple of the posts that make up this series, effective treatment of TMJD is a multi-disciplinary sport, incorporating dentists, psychologists, dieticians & physical therapists (both physiotherapists & osteopaths).

From a dental perspective, their examination will focus on bite alignment as impacted by the teeth. So in some instances they may look to file down dental surfaces, whilst in others, the aim may be to encourage eruption of the molars. This may be achieved in conjunction with braces or splints, which may be worn all the time or only during certain times of day or night.

The psychologists will look to identify the factors causing anxiety or stress in an attempt to put strategies in place to deal with the underlying causes of bruxism or clenching. This may be related to specific situations or a more generalised state that is impacting the TMJ during sleep.

Dieticians will want to introduce strategies to deal with eating habits, dietary preferences & managing the symptoms that have arisen as a result of symptom progression.

The physical therapy approach considers the functional relationships between the TMJ, cervical spine & cranium, addressing altered kinematics by treating myofascial (muscle & connective tissue), joint & neural structures. This can be done using both manual & exercise therapy.

When we consider the normal arthrokinematics that may arise at the TMJ, they may be categorised into depressions or elevations, lateral excursions or protrusions.

In mandibular depression, the initial roll-gliding of the condyle in the inferior joint space transitions to a translatory gliding motion in the upper joint space at around 25 mm of opening, the posterior & collateral ligaments are pulled taut at around 35mm of opening, with any further opening achieved by increased translation & over-rotation, further stretching of these ligaments.

This end range opening requires the lateral pterygoid (inferior head) to provide a protecting force on the condyles & discs, whist the geniohyoid & digastic muscles must affect a depressive & retractive force on the chin. Combined with the downward pull on the mandibular body by the mylohyoid muscle, the jaw is rotated & translated to achieve mandibular depression.

When the mandible is elevated, the temporalis, masseter & medial pterygoid muscles contract to provide the force of the elevation, whilst the lateral pterygoid (superior head) pulls the condyle

forward in the joint to provide room for the rotation. The temporalis muscles provide a postero-superior pull to achieve congruency in the joint at the end of range.

The grinding motion of the jaw is achieved by the alternating action of the medial pterygoid muscles.

The lateral excursion of the TMJ requires the condyle and the disc on the contralateral side to be pulled forwards, downwards & medially along the articular eminence. Meanwhile the condyle on the ipsilateral side performs a small rotation around the vertical axis combined with a slight lateral shift.

The muscles responsible for this movement are the lateral pterygoids on the contralateral side of the movement direction, in combination with the temporalis muscles on the ipsilateral side, which must contract to hold the condyle in position, thus preventing anterior deviation of the mandible.

Finally, the condyle & disc complexes must achieve symmetrical anterior translation on theatrical eminence to achieve mandibular protrusion. This is performed by a collaboration between the lateral pterygoid (pulls the condyle & disc forward & down), masseter & medial pterygoid muscles (maintain the mandibular position).

Mandibular retrusion is achieved by the temporalis muscles whilst the mouth is retained in a slightly open position by the muscles responsible for depression & elevation.

So what happens when any of these muscles develop an imbalance? Well, any restrictions of the myofascial anatomy can cause a change in the normal kinematics & a variation in the stresses placed upon the TMJs. Over time, these altered kinematics will result in modifications to the joint capsular tension, the ligament tension & the wear on the condyles.

An altered resting position of the joint caused by muscular imbalance will affect dental alignment & the ability of the molars to achieve congruency, thus preventing healthy occlusion & a normal resting posture for the mandible, disc & condyle in the TMJ.

This abnormal inter molar relationship can also be brought about by changes in the dental anatomy, brought about by wear, trauma or surgical/non-surgical corrective intervention. The margins for error are tiny, with micrometers making the difference between a healthy occlusion & a pathological occlusion.

Altered occlusion can cause the mandible to be pulled forward, which increases anterior stress on the disc, in addition to increased resting tone of the muscles that originate or attach to the mandible. These changes can cause neural sensitisation of the tri-geminal nerve & increases in substance P secretion.

Whilst malocclusion can be caused by dental factors, extra-dental factors can also exacerbate or precipitate the dental factors that result in malocclusion. For example, a change in the resting position of the mandible can change the posture of the head & neck (Daly, 1982) but also a forward head posture caused by myofascial restrictions of the neck extensors, will place the mandible in a more retruded position (Darling et al, 1984), causing an altered mandibular trajectory, which pulls the mouth open at rest. As a result, the muscles involved in mastication have to work to maintain jaw closure at rest (Goldstein et al, 1984).

Daly, P. Postural response of the head to bite opening in adult males. Am J Orthodontics, 1982; 82: pp 157-160

Darling, D.W. et al. Relationship of head posture & the rest position of the mandible. J Prosth Dent, 1984; 52(1): pp 111-115

Goldstein, D.F. et al. Influence of cervical posture on mandibular movement. J Prosth Dent, 1984; 52(3): pp 421-426

So what are the types of TMJD that can occur as the result of extra- or intra-dental factors & how can they be treated?

Treatment will vary according to presentation, however, the aims of intervention will be to restore normal joint movement of both TMJ & the cervical spine, whilst improving postural awareness; restore functional capabilities (e.g. eating, talking); reduce occurrence of joint pain & associated headaches & educate patients on strategies to prevent recurrence of symptoms.

Capsulitis or Synovitis

The lateral joint condyle or posterior compartment will be painful on palpation, as well as by applying overpressure to retrusion & on accessory joint mobilisation.

Actively, biting will cause pain on the contra lateral side.

Capsular Fibrosis

Whilst there will be no history of trauma or surgery reported, the will be deviation towards the symptomatic side on opening & protrusion, accompanied by limited lateral excursion to the opposite side. This will contribute to both limited active & accessory ranges of movement at the joint, although there will not be any abnormal sounds in the joint.

Masticatory Muscle Dysfunction

The masticatory muscles will be painful on palpation & whilst there will be no abnormal joint sounds, there will be changes to the joint function & control of the mandible.

Actively, biting will cause pain on the ipsilateral side.

Joint Hypermobility

Whilst these presentations may not necessarily be painful, there will be a joint sound at the end range of opening, often a click, which accompanies a deviation away of the symptomatic side. This excessive range of more than 40mm opening & hypermobile accessory testing, may lead to disc displacement.

Articular Disc Displacement (with Reduction)

Whilst the range of motion at the TMJ will not be reduced, unless it occurs in combination with a capsulitis or muscle dysfunction, the action of opening will occur with an “S” curve, with the deviation towards the pathological side early & late in the range. In addition, there will be a reciprocal joint sound with both closing (as the disc displaces anteriorly, staying in this position whilst the teeth are together) & opening (as the disc relocates).

Articular Disc Displacement (without Reduction)

If the disc displacement is not reduced & the disc remains in an anteriorly displaced position, the range of motion can be markedly restricted (limited to 25mm in acute presentations).

When the jaw is opened, the mandible deviates towards the pathological side & this will be accompanied by joint sounds that may have a longstanding history.

Post-surgical TMJD

This can present as a capsulitis or synovitis & may occur in combination with an underlying TMJD.

Majwer & Swider reported significant improvements of post-surgical joint pain following dexamethason or xylocaine infiltration using iontophoresis.

Majwer, K. & Swider, M. Results of treatment with iontophoresis of post traumatic changes of temporomandibular joints with an apparatus of own design. Prochet Stomatol, 1989; 39: pp 172-176

Osteoarthritis

The TMJ will be painful on palpation & crepitus will be audible on auscultation. On imaging investigation, there will be evidence of osteoarthritis on radiograph.