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Research Paper
TMJ Disorders

A new surgical classification for temporomandibular joint disorders

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Abstract. The role of temporomandibular joint (TMJ) surgery is ill-defined, so a universal classification is needed to collate the evidence required to justify the surgical interventions undertaken to treat TMJ disorders. The aim of this article is to introduce a new classification that divides TMJ disorders into 5 categories of escalating degrees of joint disease that can be applied to TMJ surgery. Using a category scale from 1 to 5, with category 1 being normal, and category 5 referring to catastrophic changes to the joint, the new classification will provide the basis for enhanced quantitative and descriptive data collection that can be used in the field of TMJ surgery research and clinical practice. It is hoped that this new classification will form the basis of what will eventually become the universal standard surgical classification of TMJ disorders that will be adopted by both researchers and clinicians so that ultimately, the role of TMJ surgery will be based on evidence rather than conjecture.

Keywords: temporomandibular joint; surgery; classification; disorders.

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The role of temporomandibular joint (TMJ) surgery is not well defined.[1] Part of the reason is that hard evidence is lacking since, unlike orthopaedic surgery, there is no universal classification that allows the collection of standard data that can be used to compare the various techniques published in the literature. Temporomandibular disorder (TMD) specialists have been proactive in establishing the Research Diagnostic Criteria (RDC) for TMD and have used this as the basis for assessing various non-surgical strategies.[2] The field of TMJ surgery has only managed to come up with what constitutes successful TMJ surgery outcomes.[3]

Evidence is needed to define the role of TMJ surgery, and evidence needs data which can only be derived from universal medical codes. Universal medical codes are collected from classifications and what the field of TMJ surgery needs is a universal classification in order to collate the evidence required to justify the surgical interventions undertaken to treat TMJ disorders. The aim of this article is to introduce a new surgical classification that includes all TMJ specific disorders that can be applied to future studies related to TMJ surgery.

Reasons for classification

Medical classification is the process of transforming descriptions of diagnoses and procedures into universal medical code. It is from these codes that data can be collected and analysed for the purpose of providing the hard evidence needed to determine whether TMJ surgery is effective in providing material benefit to patients.[1] In other words, the hard evidence for TMJ surgery can only be secured with a universally recognized surgical classification of TMJ disorders.

Presently, there are 3 main classifications related to TMD; the Research Diagnostic Criteria (RDC) for TMD,[2] the Wilkes Classification[4] for TMJ internal derangement, and the most recent American Academy of Orofacial Pain (AAOFP) Classification of TMD.[5] The RDC-TMD classification[2] is the most widely used by TMD researchers who stress the

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importance of psychosocial dysfunction (Axis II) as opposed to physical disorders (Axis I) and come up with a wide variety of complex calculations that often have little bearing on clinical practice. The RDC-TMD has remained firmly embedded in the research world with little use in clinical practice.

The Wilkes classification[4] is the most widely used classification that has been adopted by surgeons who treat TMJ disorders. Its widespread adoption is linked to its simplicity in describing escalating joint pathology in 5 stages, but it concentrates on only 2 disorders (internal derangement and osteoarthritis) and fails to include other TMJ disorders such as ankylosis and tumours which are covered by a host of other sub-classifications[6,7] that will not be elaborated here.

The AAOFP classification of TMD[5] has refocused its attention on articular disorders with a more widespread appreciation of joint disease, not confined to internal derangement, but also ankylosis, trauma and even developmental conditions of the TMJ are listed. The masticatory muscle disorders are listed simply as local, general and centrally mediated which reflects the poor understanding of extra-articular disorders related to TMD. While the AAOFP classification[5] of TMD is a vast improvement on the cumbersome RDC-TMD,[2] there is still a problem when it comes to data collection as the AAOFP classification does not allow for degree of disability which is quantifiable like the Wilkes Classification.[4]

In 1994, Dolwick and Dimitroulis[8] published a table which divided indications for TMJ surgery into relative and absolute. Relative indications were stipulated for common TMJ disorders such as internal derangement and osteoarthrosis, while absolute indications were reserved for less common TMJ disorders such as ankylosis and neoplasia of the TMJ. Surgical indications such as this only indicate when TMJ surgery should be considered, but does not stipulate what kind of surgery is required and for which disease.

New classification

In the development of a new classification, it is essential to purge the weaknesses and build on the strengths of previous classifications. Dozens of new medical classifications are introduced to the literature every year, but history has shown that only the simplest, such as the classic Le Fort classification for midface injuries,[9] that are easy to remember and simple to understand are universally adopted. The criteria for the new classification are given in Table 1. The purpose of this new classification (Table 2) is to specify the role of TMJ surgery in all TMJ disorders in a graded fashion across a spectrum of 5 categories of escalating degrees of joint disease.

Table 1. Criteria for new TMJ surgical classification.

Simple – easy to understand and remember
Clear – unambiguous description of each category
Focused – on the TMJ
Inclusive – of all TMJ disorders and diseases
Specific – so that patient populations can be easily defined and compared
Universal – adopted by all TMD clinicians and researchers

Table 2. Surgical classification of TMJ disorders.

Category 1
TMJ normal
No surgery required or indicated
Category 2
TMJ minor changes (all joint components are salvageable)
TMJ arthrocentesis/arthroscopic lavage
Category 3
TMJ moderate changes (most joint components are salvageable)
TMJ operative arthroscopy/TMJ arthroplasty
Category 4
TMJ severe changes (few joint components are salvageable)
TMJ discectomy ± condylar surgery
Category 5
TMJ catastrophic changes (nothing in the joint is salvageable)
TMJ resection ± total joint replacement

Table 3. Category 1: Normal TMJ.

Clinical presentation
TMJ pain
No joint noises
No history of locking or dislocation
Full range of jaw movement
Normal chewing
Radiological features
OPG – normal condyles
MRI – normal TMJ
Diagnosis
Joint contusion – acute trauma
Myofascial pain
Ear pathology – otalgia
Neuropathic
Psychogenic
Treatment
Medication ± splint
Surgery has no role

Category 1: TMJ normal joint

No surgery is required. In this category (Table 3), a patient may present with pain specifically centred around the TMJ but report no history of locking, dislocation or difficulty chewing. There are no audible or palpable joint noises and the patient exhibits a full range of jaw movement with symmetrical opening. Plain films, magnetic resonance imaging (MRI) and computed tomography (CT) scans show normal joint with no radiological abnormalities (Fig. 1). The patient may have sustained recent acute trauma following whiplash, fall or assault or experienced an ear infection. In long standing cases the TMJ arthralgia may be secondary to myofascial pain, fibromyalgia or part of a neuralgia or psychosomatic disorder. TMJ surgery has no role in these situations and patients must be carefully assessed for other ailments that may be contributing to or exacerbating the TMJ arthralgia.

Category 2: TMJ minor changes

All joint components are salvageable. In this category (Table 4) a patient may present with intermittent TMJ pain, joint clicking and occasional locking. Plain films demonstrate normal condyles but MRI may show mild disc displacement with reduction or excess fluid in the joint indicative of inflammation (Fig. 2). TMJ arthrocentesis may be appropriate for cases of acute onset closed lock and TMJ arthroscopy may demonstrate mild inflammation with occasional adhesions. Both procedures may help unlock a stuck joint, but the primary treatment modality remains conservative (i.e. anti-inflammatory medication, jaw rest, soft diet).

Category 3: TMJ moderate changes

Most joint components are salvageable. In this category (Table 5), patients report painful long-standing closed lock (>2 months), joint swelling or painful recurrent dislocation of the TMJ. The patient may report difficulty chewing with moderate to severe pain levels exacerbated by jaw function. Mandibular opening is restricted either because of fear of dislocation or actual joint pain which often results in deviation of the mandible to the affected side. Because of the restricted mouth opening joint noises are often absent. While plain films may show normal condylar morphology, MRI shows non-reducing disc displacement. The disc may exhibit mild contour deformity and there may be a prominent articular eminence that obstructs the backward path of the translated condyle (Fig. 3). Diagnostically, the patient may have suffered

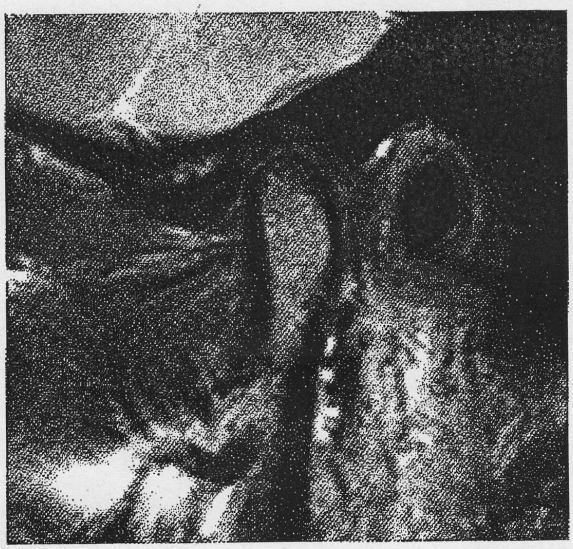

Fig. 1. Normal TMJ. Category 1 joint which demonstrates a normal TMJ on MRI. The main presentation is TMJ arthralgia but TMJ surgery is not indicated if there are no functional disturbances. Category 1 patients offer researchers the ideal control group with which to compare surgical outcomes in other categories.

an acute event such as a fracture dislocation of the condylar head or simply dislocation of the condyle. In long standing cases, the patient may be suffering from moderate TMJ internal derangement or synovial chondromatosis. In category 3 cases, the patient would benefit from operative TMJ arthroscopy, modified condylotomy, TMJ arthroplasty consisting of disc repositioning with or without eminectomy, or open reduction and internal fixation of displaced condylar fractures.

Category 4: TMJ severe changes

Few joint components are salvageable. In this category (Table 6), patients report constant joint pain with painful crepitus and mildly limited mouth opening. Chewing is very painful and yawning is almost impossible without provoking severe pain. Plain films show radiological signs of early changes in condylar morphology such as flattening and beak type deformities of the condylar head which are better seen on cone-beam CT scans. MRIs demonstrate severely degenerate, displaced and deformed articular discs (Fig. 4) which may sometimes demonstrate perforations. Early condylar changes such as osteophytes and small subcondral cysts with loss or thinning of cartilage layer may be seen on cone-beam CT scans. The clinical picture is that of severe TMJ internal derangement with early osteoarthritis. This category may also include rare metabolic, inflammatory or developmental disorders of the TMJ. TMJ discectomy with or without debridement, shaving or surgical reduction of the condylar head, articular eminence and glenoid fossa is the mainstay of treatment.

Table 4. Category 2: Minor TMJ changes.

Clinical presentation
Intermittent joint pain
Joint clicking
Occasional locking
Radiological features
OPG – normal condyles
MRI – disc displacement with reduction
Disc and condyle normal contour
Diagnosis
Early TMJ internal derangement
Joint inflammation/adhesions
Treatment
TMJ arthrocentesis
TMJ arthroscopic lavage

Table 5. Category 3: Moderate TMJ changes.

Clinical presentation
Painful chronic closed lock
Recurrent joint swelling
Painful recurrent dislocation
Radiological features
OPG – normal condyles
MRI – disc displacement without reduction
Disc normal or mildly deformed contour
Prominent eminence
Diagnosis
Moderate TMJ internal derangement
Recurrent TMJ dislocation
TMJ synovial chondromatosis
Dislocated condylar fracture
Treatment
TMJ arthroscopy (operative)
TMJ arthroplasty – disc plication/ repositioning ± eminectomy
Modified condylotomy
ORIF fractured condyle

Category 5: TMJ catastrophic changes

No joint components are salvageable. Patients in this category (Table 7) report intolerable low grade joint pain and joint crepitus with constant locking and inability to chew anything solid. Plain films show obvious degenerative changes to the condyle which is better depicted on cone-beam CT scans which show irregular articular surface and large subchondral cysts. MRI shows severely degenerated disc which is often difficult to visualize with low signal from the condyle that appears irregular and deformed. Diagnostically, these patients suffer from TMJ osteoarthritis or degenerative joint disease that may be the result of multiple previous operations. Where the joint pain is absent or tolerable, the patient may have TMJ osteoarthrosis or in rare cases, TMJ anky-

Fig. 2. Minor TMJ changes. Category 2 joint showing disc displacement on MRI that has resulted in locking and pain on function. TMJ arthrocentesis or TMJ arthroscopic lavage may be useful in these cases, although non-surgical measures are still important. Future studies may look at whether TMJ arthrocentesis/arthroscopy significantly reduce the treatment time span compared to conservative measures alone in category 2 patients.

Fig. 3. Moderate TMJ changes. Category 3 joint showing dislocation of TMJ with condyle stuck beyond the articular eminence. In cases of recurrent TMJ dislocation, operative TMJ arthroscopy, modified condylotomy or TMJ eminectomy with disc plication may be appropriate. Whichever technique is the most effective can only be determined by randomized clinical studies involving category 3 patients.

losis (Fig. 5), condylysis or tumour. Patients in this category would benefit from condylectomy, discectomy and total joint replacement where feasible.

Discussion

For many years, the Wilkes classification[4] has served as the unofficial standard classification for TMJ surgeons worldwide. The simplicity of the stages described and escalating disease level with each stage made it universally applicable to the most common TMJ disorders treated by oral and maxillofacial surgeons (internal derangement and osteoarthrosis). The new classification embodies the simplicity of the Wilkes classification[4] by keeping the 5 stages of disease but broadening the definition of each category to include other less common TMJ disorders such as dislocations and tumours as well as ankylosis.

In the development of a new surgical classification for TMJ disorders it was necessary to include all disorders that are amenable to surgical intervention.

Fig. 4. Severe TMJ changes. Category 4 joint showing severely displace, deformed and degenerate disc on MRI with degenerate bony changes in the condyle. The disc is unsalvageable so TMJ discectomy is most appropriate with perhaps a high condylar shave. Future studies may look at whether disc repair is possible in category 4 patients.

Table 6. Category 4: Severe TMJ changes.

Clinical presentation
Constant joint pain
Painful crepitus
Mildly limited mouth opening
Painful chewing
Radiological features
OPG – early condylar changes
CT scans – mild to moderate condylar degeneration
MRI – severely degenerated, displaced and deformed disc
Early condylar changes – osteophytes, flattening
Diagnosis
Advanced TMJ internal derangement
Rare TMJ disorder – metabolic, inflammatory or developmental joint disease
Treatment
TMJ discectomy ± condyloplasty/shave
Debridement of glenoid fossa
Reduction of eminence

The classification not only describes the clinical and radiological features of each category, but also suggests the degree of surgical intervention. Thus when a study presents results on the treatment outcomes of category 3 patients, for example, readers will immediately understand the criteria for category 3 patients that were involved in the study and future meta-analyses of treatment options for category 3 patients will be easier to assess and analyse because of the standardized classification.

The major theme behind each category is whether any of the joint components are salvageable by surgery, regardless of the diagnosis. A scale of 1–5 with progressive increased severity of joint disease allows numerical quantification to aid data collection, with category 1 being normal and category 5 referring to catastrophic

Table 7. Category 5: Catastrophic TMJ changes.

Clinical presentation
Intolerable low grade pain
Constant crepitus
Locking
Malocclusion
Unable to chew anything solid
Radiological features
OPG – obvious degenerative changes to condyle
MRI – disc destroyed/difficult to see
CT scan – condyle severely degenerate
Diagnosis
TMJ osteoarthritis
TMJ condylysis
TMJ ankylosis
TMJ tumour
Treatment
TMJ resection
TMJ total joint replacement

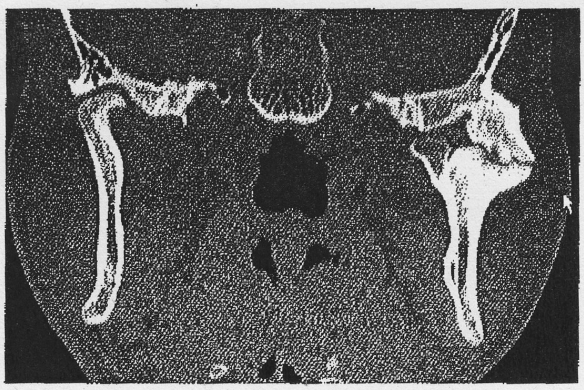

Fig. 5. Catastrophic TMJ changes. Category 5 joint on coronal CT scan showing catastrophic changes to the TMJ resulting in extensive bony ankylosis. TMJ surgical resection with total joint replacement is normally indicated although some may argue the medially displaced condyle may be salvageable in some cases.

changes to the joint. The role of the new classification should not only be confined to research data collection but also allow clear communication between clinicians. So if a clinician refers a patient with a category 1 TMJ, the recipient clinician will immediately understand that while the TMJ is painful, there are no clinical or radiological signs of joint disease that would require surgical intervention. Whereas, if the TMJ is described as category 5, the recipient clinician will immediately appreciate that there are catastrophic changes in the joint so that none of the joint components are salvageable. This classification not only helps codify the diagnosis but also underscores the salvageable potential of various joint components that may aid surgical treatment planning. The lack of a definitive method of collecting data to prove the efficacy of the numerous TMJ surgical procedures described in the literature is glaringly obvious.[1] With the help of this classification, the TMJ patient populations will be better defined and easily compared, particularly when it comes to multicentre clinical trials.[1]

Having presented this new classification as a means of research data collection and communication between clinicians, it must be emphasized that this is only a preliminary attempt at trying to standardize understanding of TMJ disorders. As it is a new classification, there will be plenty of discussion and debate about the essential requirements for clear and unambiguous interpretations of each category. A consensus conference may help to resolve many of the issues raised by this new classification, including the need for such a classification. Independent research is essential to validate the reliability and applicability of this classification to TMJ disorders that surgeons would find useful and practical in their everyday clinical practice.

Progress in TMJ surgery can only be achieved on the back of a simple and straightforward classification that is universally accepted and adopted by both researchers and clinicians. It is hoped that this new surgical classification will form the basis of what will eventually become the universal standard surgical classification of TMJ disorders that will be adopted by all oral and maxillofacial surgeons.

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Competing interests

None declared.

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