

Surgical Considerations in the Management of Temporomandibular Joint and Masticatory Muscle Disorders

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The patient who presents to the oral and maxillofacial surgeon with a temporomandibular disorder (TMD) can be a challenge even for the most experienced and confident practitioner. The surgeon will conduct a thorough assessment, make a diagnosis, then suggest a management strategy that will address concerns in a predictable manner. The surgical assessment should include:

- Prior receipt of a referral letter, including documentation of previous treatment and/or interventions
- A comprehensive history that includes psychosocial aspects
- A comprehensive physical examination, which should include documentation of range of mandibular motion, signs specific to temporomandibular function, masticatory muscle pain, and occlusal features
- Referral to medical colleagues for additional assessment as indicated
- Ordering of additional/adjunctive tests as indicated
- The formulation of a diagnosis and treatment strategy to address the specific documented abnormalities
- A thorough discussion with the patient, to include an explanation of the diagnosis and treatment management options, including the implications of no treatment
- Informing the patient of his or her critical role in postoperative management procedures

This process must take place within the context of an often diverse and multifactorial etiology. The surgeon is not excused from understanding the interactions of pathologic, anatomic, psychologic, behavioral, and neuromuscular etiologies. Furthermore, the surgeon must apply these issues to the predisposing, precipitating, and perpetuating factors as they affect the patient. Advances in our understanding of TMD also lead us to the requirement that these assessments occur under the umbrella of a multidisciplinary and comprehensive diagnostic process following a biopsychosocial protocol, rather than a simple mechanical and reparative approach. It is only then that a reasonable management strategy, avoidance of overtreatment, and a predictable outcome can be formulated. In this regard, it must also be understood that it does not necessarily follow that, because nonsurgical efforts have failed, then surgery is the next logical option. Given the aforementioned tenets, surgical management may be considered only after all

Key words: temporomandibular joint surgery, internal derangement

J OROFAC PAIN 1999;13:307-312.

Table 1 Disorders of the Temporomandibular Apparatus Amenable to Surgical Intervention

Classification	Disorders
Non-inflammatory disorders	Congenital and developmental/acquired disorders, including aplasia, hypoplasia, hyperplasia, and neoplasia; mechanical disorders, including trauma, osteoarthritis (degenerative disease, dislocation, and disc-displacement disorders)
Inflammatory disorders	Arthritides; connective tissue disorders, including infection; miscellaneous
Muscular disorders	Muscle fibrosis/contracture

reasonable nonsurgical efforts directed at symptom relief have failed—and then only if it is believed that these symptoms are severe and disabling and therefore the source of a significantly diminished quality of life.¹⁻⁵

A classification of temporomandibular joint (TMJ) pathology for which surgical procedures, as part of a comprehensive strategy, are appropriate will embrace noninflammatory and inflammatory disorders^{6,7} (Table 1). As well, masticatory muscle dysfunction must be considered.⁸ Within these entities, the surgeon must be guided not only by failures in nonsurgical treatment, but also by the degree of dysfunction, evidence that the pathology is in the TMJ itself, and that pain relief is not the sole criterion for surgery. Unfortunately, there are few prospective, randomized studies with long-term results to assist the surgeon in choosing a particular surgical option, and therefore the personal experience of the surgeon may be the determining factor.¹ The surgeon must be convinced that the outcome of the chosen procedure will be predictable and that the potential benefits will outweigh the risks.^{1,9,10}

The procedures that the surgeon may consider include chairside arthrocentesis, mandibular manipulation under anesthesia with arthrocentesis (including the use of corticosteroids or sodium hyaluronate), arthroscopy, condylectomy, arthrotomy, and orthognathic surgery (Table 2). In general terms, the indications for and surgical procedures available in the management of overt pathology, such as severe, debilitating osteoarthritis, condylar neoplasia, or recurrent dislocation, are unequivocal. While the choice of surgical technique may vary, therapeutic goals and surgical outcomes are clear and predictable.² It is in the arena of internal derangement that most controversy exists. Diagnostic or clinical evidence of an abnormal disc/condyle assembly does not imply

inevitability of significant joint dysfunction.^{2,11} In choosing to offer a surgical solution, both the surgeon and the patient must appreciate that, in general, there is little if any predictability as to the progression of TMD, including internal derangements, which may be self-limiting or even self-correcting with or without active treatment. Furthermore, the limitations in the reliability (including interpretation) of various diagnostic modalities and the predictability of surgical results in specific cases continue to frustrate surgeons.^{6,12,13}

Surgical Procedures

Arthrocentesis

There are a number of clinical reports of the effectiveness of this procedure.^{1,14-16} It is simple to perform and virtually risk-free. It is indicated both as a diagnostic and therapeutic tool. The intent is to create hydraulic pressure within the superior joint space with about 2 mL of physiologic solution such as Ringer's lactate, following which the space is lavaged with about 100 mL of the same solution. This may be followed by the instillation of a corticosteroid or sodium hyaluronate. Short-term results for use in the treatment of sudden onset of disc displacement with limited opening are encouraging. In the author's experience, this is also a valuable tool in the assessment process for patients with early forms of internal derangement and may be an excellent treatment modality. The clinical results can be quite dramatic; however, like all interventions, patient selection is important, and outcomes, especially long-term, are difficult to predict.

Table 2 Surgical Procedures

Procedure	Description/benefits
Arthrocentesis	Placement of 2 needles in the superior joint space for lavage and instillation of corticosteroid or sodium hyaluronate to treat internal derangement, including disc displacement disorders
Arthroscopy	Placement of an arthroscope with an attached external camera into the superior joint space for examination, lavage, lysis of adhesions, arthroplasty, and disc stabilization and for instillation of corticosteroid or sodium hyaluronate
Condylotomy	Transection of the posterior border of the vertical ramus from the sigmoid notch toward the mandibular angle, including the condyle, to alter condylar/disc/glenoid fossa relationship
Arthrotomy	Open incision into the TMJ for direct visualization, then disc repair, discectomy, condylar reshaping, condylectomy, or joint reconstruction with autologous or alloplastic materials
Orthognathic surgery	Surgical correction of skeletal and occlusal disharmonies, usually in conjunction with orthodontic procedures, to repair or adjust skeletal/occlusal relationships altered by condylar disease, and to alter grossly abnormal skeletal/occlusal relationships that may be a precipitating and/or perpetuating factor in susceptible patients with a symptomatic TMD
Muscle/ligament transection	Release of fibrotic muscle or thick ligament attachment, to treat chronic lack of mandibular movement, coronoidectomy

Arthroscopy

Arthroscopy of the TMJ gained popularity in the late 1980s.¹⁷⁻²⁰ While generally considered a comparatively less invasive procedure, it requires a greater skill level than most other interventions. As well, the learning curve to competency is quite steep. In skilled hands, the risks and complications are uncommon, although the list of potential problems is impressive. With the insertion of an endoscope (arthroscope), introduced into the superior joint space through a thin cannula, and with a camera attached to the external eyepiece, a direct examination of the anatomy of all aspects of this space is undertaken. It has been suggested that the main benefits are gained from arthrocentesis and lavage. However, it is possible to release and lyse adhesions, and when a second operating portal is achieved, abrasion arthroplasty, synovectomy, debridement of degenerating fibrocartilage, disc release, and disc stabilization can be done. The use of lasers is a relatively recent addition to the arthroscopy armamentarium. Its main indication is in definitive diagnosis of internal derangement and in the treatment of symptomatic disc displacement with reduction. Good results may be expected when arthroscopy is used to debride damaged fibrocartilage. The author has also found that patients are more understanding of a possible need for arthrotomy (see section on arthrotomy) if they

have not responded to arthroscopic procedures, a very useful tool in overall treatment planning for select patient populations.

Condylotomy

This procedure was first introduced in the late 1950s for treatment of the painful (with or without clicking) TMJ.²¹⁻²³ In the author's experience, it was a surprisingly easy procedure to perform with good initial results. It did not gain wide acceptance by virtue of the potential, albeit uncommon, serious complications. A modification of the technique has fostered renewed interest, and the procedure is again in use. The primary indication for intraoral unilateral condylotomy is chronic, painful, TMJ disc displacement with reduction. It is postulated that a slight self-repositioning of the transected condylar segment, or "sag," fosters a modified disc/condylar arrangement, thereby reducing symptoms. It is reported that up to 90% of patients believe the results are excellent. The potential complications are few but include possible mandibular nerve disruption and malocclusion. The procedure, with a need for short-term maxillomandibular fixation, requires a general anesthetic and is done in a hospital setting.

Arthrotoomy

Open joint surgery may be indicated for any abnormality requiring direct intervention.² It requires a general anesthetic in a hospital setting. The incision is either preauricular, endaural, or postauricular. There are many potential complications and postsurgical problems that must be considered when this surgery is offered. The common procedures using this approach are disc repositioning or discectomy for internal derangements, condylar reshaping with or without glenoid fossa/articular eminence arthroplasty or condylectomy in degenerative disease, and total joint reconstruction, usually requiring a concomitant sub-mandibular incision.

1. Disc Repositioning. Because of advances in radiographic imaging, specifically arthrography, supporting the concept of a displaced disc, it was postulated in the late 1970s that an abnormally positioned disc could be surgically repositioned and thereby reduce painful, locking TMJs. The results, while initially gratifying, were quite unpredictable—that is, in which patients would this procedure provide long-term symptom relief? It has been this author's experience that some patients have responded exceedingly well for more than 15 years, whereas many failed within months. Nevertheless, the anterior or medially displaced disc that can be manually reduced, after release of adhesions, to a more "normal" position, or that may have a perforation in the retrodisical (bilaminar) zone, may lend itself to repositioning and/or repair. Favorable outcomes have been reported.⁹

2. Discectomy. Once the disc is chronically and severely damaged (perforated or fibrosed), it will interfere with condylar movement, resulting in persistent pain and limited movement. Discectomy is an appropriate procedure and is also undertaken through an arthrotoomy approach in a hospital setting.^{1,2,9,24} The short- and long-term results can be favorable. There is no consensus as to the type of interpositional material that might be used once the disc is removed—or, indeed, whether it is necessary to use any. Auricular cartilage, cadaver cartilage, dermis, and temporalis myofascial flaps are reportedly in current use, although there are no compelling long-term studies favoring any specific procedure. Alloplastic interpositional implants following discectomy are no longer indicated. While the potential list of complications and postsurgical problems are impressive, the reported incidence is low.

3. Condylectomy. In situations of severe condylar degeneration, it may be appropriate to com-

pletely remove the articular surface.^{1,2,9,25,26} It may not be necessary to replace lost vertical height, especially if a unilateral procedure has been performed. Restoration of vertical dimension must be considered for large excisions or for bilateral condylectomy. Various acceptable techniques may include costochondral or tibial grafts, posterior border osteotomy of the vertical ramus with superior repositioning of the segment, or alloplastic (artificial) joint replacement.

Orthognathic Surgery

Many TMD and non-TMD patients demonstrate significant occlusal and skeletal abnormalities, for which there are a number of excellent combined orthodontic and surgical solutions.^{7,12,27-29} However, there is little evidence to support the notion that surgical (or orthodontic) correction of a preexisting malocclusion is either a useful or predictable strategy for the management of TMD. While controversial, it is nevertheless difficult to reconcile initiation of treatment of a persistent TMD where the primary pathology is within the TMJ itself in patients with unquestionable, severe occlusal disharmonies. For example, patients with a retrognathic mandible and Class II malocclusion must "artificially" reposition the mandible in order to make anterior contact. It is suggested that these are "excessive and exaggerated" condylar movements and, in susceptible individuals, such movements may create forces that exceed the adaptive capacity of joint tissues. These presumed abnormal forces then become a precipitating or perpetuating factor in TMJ dysfunction. This may also apply to the severe open bite deformity with molar contact only. This has occasionally been the result of excessive use of an occlusal "bite plate." The concept, therefore, is to establish a reasonable and stable occlusal table with more "acceptable" condylar movement, and presumably decreased joint loading, *as part of an overall, comprehensive management strategy.* Subsequent to a reasonable healing period, the nature of any persistent TMD is then reassessed for further management.

Treatment of Muscle Disorders

The surgeon must also appreciate that muscle dysfunction can possibly present as restricted TMJ movement.⁸ Therapy and surgery may need to be directed at the dysfunctional muscle group rather than the TMJ. In the author's experience, the patient presenting with an acute inability to open the mouth following a dental procedure, in

particular following a mandibular block anesthetic, most likely has myositis involving the medial or perhaps the lateral pterygoid muscle. Surgery is not indicated. Chronic lack of mandibular movement, with various noninflammatory etiologies, may be the result of muscle fibrosis and contracture. For these situations, if surgery is ultimately required, coronoidectomy with release of the attachment of the temporalis muscle may be an initial consideration.

Postoperative Care

The success of any surgical procedure is dependent on a multitude of factors, including the establishment of a strong therapeutic doctor-patient relationship, the choice of an appropriate surgical procedure specific to the problem, an experienced and skilled surgeon, a caring and sympathetic treatment team, and an aggressive program of postsurgical management.^{30,31} The latter will include a carefully monitored, comprehensive physiotherapy program and frequent postsurgical office visits.

Conclusions

While there are a number of elegant surgical procedures available to resolve diseases of the temporomandibular apparatus, in an identifiable population requiring this intervention, the jury may still be deliberating on the long-term efficacy or outcome of such surgeries. This is particularly evident in surgical management of internal derangements. It is clear that there is an absolute requirement for a thorough patient assessment, a meticulously derived diagnosis, a carefully selected procedure, and aggressive postsurgical management. It is also clear that the therapeutic partnership between surgeon and patient is a long-term commitment.

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