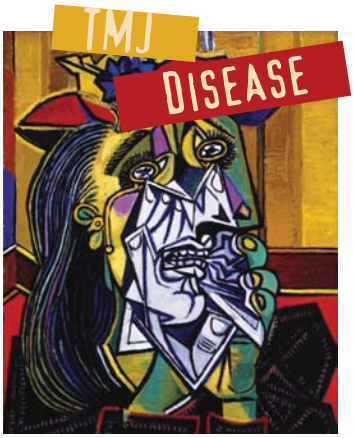

Temporomandibular Joint Disease: An Update of Surgical Treatment

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ABSTRACT

The temporomandibular joint is one of the most complicated joints in the human body. Because signs and symptoms of TMJ problems often disrupt mastication, the general dentist may be the first health care provider the patient sees. Cases that are refractory to nonsurgical treatment are frequently referred to an oral and maxillofacial surgeon. This paper provides an overview of the surgical procedures used to manage internal derangement of the TMJ.

Temporomandibular disorders is a set of symptoms (that may or may not have pathology) that can be treated surgically. Surgical treatment is typically employed only when the established diagnoses are amenable to surgical treatment. Unfortunately, many times "failure of conservative treatment" has become a reason for surgery. This exclusionary diagnosis is fraught with failure. Pain is not a diagnosis that can be treated with surgery. The goal of surgical intervention is to correct demonstrable pathology.

Many pathologic conditions have surgical solutions. These include internal derangement, degenerative arthritis, inflammatory arthritis, and iatrogenic joint destruction. Other conditions that may contribute to TMD can be treated with techniques performed by oral and maxillofacial surgeons. These include dentofacial deformities, myalgia, and myositis.

Botox Injections

While not a surgical procedure, Botox can be very helpful for refractory pain due to muscle problems in surgical and nonsurgical cases. Patients with muscle pain from primary myositis respond to injection of Botox into the masseter, and temporalis muscles. Injection of the drug decreases the muscle activity in discreet areas. The agent must be injected using an electromyographically directed needle. A tuberculin syringe attached to the EMG needle is used to inject 10 to 70 units of Botox per side, usually 40 to 50 units in five divided doses in the masseter and 20 to 30 units in the temporalis.

This treatment causes a decrease in the contractility in certain areas of the muscle, which decreases the hyperactivity and allows for rest and repair. Patients do not notice a decrease in chewing strength. One would expect the results to last about six weeks (the duration of Botox), but the effects seem to last much longer, possibly because the cycle of muscle parafunction is broken. The patient may remain asymptomatic if no inciting event resumes. Botox has been used on very refractory patients with very good success, lasting

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Table 1

Wilkes Staging of Internal Derangement[7]

STAGE	CLINICAL	IMAGING	SURGICAL
I. EARLY	Painless clicking No restricted motion	Slightly forward disc, reducing Normal osseous contours	Normal disc form Slight anterior displacement Passive incoordination (clicking)
II EARLY/ INTERMEDIATE	Occasional painful clicking Intermittent locking Headaches	Slightly forward disc, reducing Early disc deformity Normal osseous contours	Anterior disc displacement Thickened disc
III. INTERMEDIATE	Frequent pain Joint tenderness, headaches Locking Restricted motion Painful chewing	Anterior disc displacement, reducing early progressing to non-reducing late Moderate to marked disc thickening Normal osseous contours	Disc deformed and displaced Variable adhesions No bone changes
IV. INTERMEDIATE/LATE	Chronic pain, headache Restricted motion	Anterior disc displacement, non-reducing marked disc thickening abnormal bone contours	Degenerative remodeling of bony surfaces Osteophytes Adhesions, deformed disc without perforation
V. LATE	Variable pain Joint crepitus Painful function	Anterior disc displacement, non-reducing with perforation and gross disc deformity Degenerative osseous changes	Gross degenerative changes of disc and hard tissues; Perforation Multiple adhesion

as long as one year, with repeated success on subsequent injections.[1,2]

Arthrocentesis

The introduction of a needle into the superior joint space is an outgrowth of arthroscopy. Experience with arthroscopic lysis and lavage showed the benefits of irrigation. Therefore, since there seemed to be no reason to actually look inside the joint in many situations, arthrocentesis was derived.[3,4] The technique has become the first line treatment for newly diagnosed patients with internal derangement and has been used for all stages of ID and DJD. However, the literature best supports its use for locking joints. Irrigation is deemed useful to remove "breakdown" products like kinins which have been shown to cause pain.[5,6] The technique can be used as a means of placing medications in the joint which may prove to be the best reason for performing it in the future. Various forms of steroids have been used to reduce inflammation. Hyaluronic acid has been used to increase joint lubrication. NSAIDS have been tried to give long-acting pain relief as well as reduced inflammation. Narcotics have been used to break the pain cycle, and sclerosing agents have been used to stabilize loose joint ligaments (**Figure 1**).

Figure 1. Arthrocentesis of right TMJ.

Arthroscopy

Arthroscopy is a very useful technique with a wealth of supportive literature.[11] An arthroscope is passed into the inferior joint space allowing the surgeon to visualize the joint. Arthroscopy can be diagnostic or therapeutic. It was first used to treat closed lock and is presently used for all stages of ID and DJD. Those who developed the technique refined it so that full arthroscopic arthroplasty could be performed. Unfortunately, triangulation and complicated maneuvers like laser

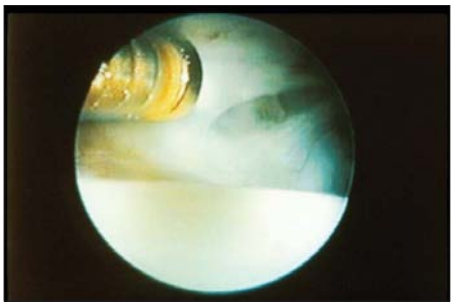

Figure 2. Arthroscopic anterior release performed with YAG laser.

Figure 5. CAD Cam construction model of custom TMJ replacement.

usage are technically difficult, causing arthrocentesis to be used more frequently. The value of arthroscopy is that an arthroplasty can be performed without surgically opening the joint, thereby reducing the potential for scarring and limitation of motion. Those who can perform arthroscopic arthroplasty do so quickly with minimal trauma, but this takes extraordinary skill and must be performed frequently to keep up the skills of the surgeon (**Figure 2**).

Open Arthroplasty

Open arthroplasty is a technique widely used in the 1970s to repair various stages of internal derangement. The intention of this operation is to repair and reposition a damaged and displaced articular disk. However, studies using postoperative MRIs have shown that this repaired position does not hold over time (**Figure 3**).

Figure 3. Open arthroplasty showing the superior joint space with hypervascular disc prior to wedge resection.

Discectomy

The most written about and most successful surgical technique related to TMJ surgery since the early part of the 20th century, discectomy (surgical removal of the articular disk) has been used in the United States and in Europe to deal with advanced degenerative joint disease.[8] Silver has a follow up greater than 50 years on these patients.[9] Removing the disk in its entirety, the surgery gets patients out of pain and improves function. Eventually the patient exhibits radiographic changes in the bone and joint crepitance. These signs were accepted in Europe and explained as accelerating the "natural history of the disease" or taking a Wilkes Stage 2 or 3 and advancing it to a Stage 4. This was deemed acceptable as the patient returned to a state of pain free mobility.

In this country, these changes were not deemed acceptable and consequently, spurred a number of attempts at disc replacement, which included using dermis, ear cartilage, femoral head cartilage, temporalis muscle and a variety of alloplastic materials as substitutes for the missing disk (**Figure 4**).

Condylotomy

This technique stemmed from the reports that patients who underwent vertical ramus osteotomies for orthognathic correction improved their TMJ symptoms. First used in Britain by Ward-Booth, it has been championed by Hall.[10] The theory is that instead of placing the disc over the condyle, one allows the condyle to find

Figure 4. Discectomy without replacement.

itself under the displaced disc. Outcomes are similar to other surgical treatments, but acceptance has been limited.

Total Joint Replacement

Replacement of bone substance for severely degenerated joints has been available for many years. Autogenous grafting with hip or rib has been used along with a number of more unusual donor sites. Most autogenous grafting has the problem of previous scarring and limited blood supply. Rib grafting is often used for growing children since growth can be continued at the costochondral interface.

Replacement using allogeneic systems has increased since Mercuri published outcome studies over 20 years showing excellent retention and correction of severe DJD[12] (**Figure 5**).

Distraction Osteogenesis

Developed for orthognathic procedures, it recently has been used for the replacement of condyles that have been severely degenerated as well as for failed allogeneic total joints. The theory is appealing since slow distraction causes bone deposition and soft tissue growth, including new vascularity. While a small number of surgeons have reported success, long-term results have yet to be reported.

Conclusion

A wide variety of surgical procedures are available to correct pathologic temporomandibular joints. Over the years, the authors have performed all of the

listed procedures. Generally speaking, the authors' experiences have paralleled the literature.

Following conservative treatment, arthrocentesis is an effective first intervention for internal derangement. If an arthroplasty is needed, arthroscopy with Ho:YAG laser, is preferential because it causes less scarring than open procedures. In cases where the disk cannot be repaired/repositioned, discectomy without placement of interpositional material has withstood the test of time.

For adults with severe DJD or multiply operated degenerated joint allogeneic total joint replacement is indicated. In growing children, costochondral grafting is preferential due to increased blood supply and potential for growth. CDA

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