

## **Chapter 79: Temporomandibular Joint Disorders**

**Daniel M. Laskin**

It has been estimated that as many as 10 million people in the USA suffer from disorders of the temporomandibular joint and such disorders constitute a major health problem. Because many of these patients complain about facial pain, earache, and headache, they are frequently seen by the otolaryngologist. Therefore it is important for the otolaryngologist to be familiar with the diagnosis and treatment of these various conditions.

The term *temporomandibular disorders (TMD)* is an umbrella term that actually encompasses two groups of patients: those with true pathology of the temporomandibular joint (TMJ problems) and those with primary involvement of the masticatory muscles (myofascial pain-dysfunction (MPD) syndrome). Much of the difficulty encountered in the treatment of temporomandibular disorders relates to the physician's failure to distinguish between these two groups because of the similarity of the signs and symptoms with which they present. Adding further to the confusion is the fact that there is also a variety of other conditions that are unrelated to the temporomandibular joint but occur in the same region that can also produce similar signs and symptoms; these also must be considered in the differential diagnosis. Therefore the emphasis in this chapter is on the diagnosis of temporomandibular disorders, which, with a subsequent discussion of what is known about the etiology of the various conditions, will form the basis for a rational approach to therapy.

### **Anatomy of the Temporomandibular Joint**

To understand some of the clinical problems that can arise in the temporomandibular joint it is first necessary to understand something about the anatomy of this unique structure. The TMJ consists of the movable condyloid process and its articulating counterpart, the articular eminence, which forms the anterior aspect of the glenoid fossa. The articulating surfaces are lined with fibrous connective tissue beneath which, on the condyle, is a layer of hyaline cartilage. This relatively unprotected cartilage layer is an important growth site for the mandible and damage to it can have significant effects, not only on mandibular growth and morphology, but also ultimately on growth of the maxilla and midface. Thus, whenever there is any pathology involving the TMJ in a growing child, there is need for concern about both the primary condition and its possible secondary effects on facial growth.

The TMJ also differs from most other joints in the body in that it has a disk interposed between the articulating components. This disk adds stability to the joint by compensating for the incongruity between the articulating surfaces. It also serves as a shock absorber and contributes to the ability of the condyle to undergo both rotational and translatory movements. However, certain conditions can lead to displacement of the intraarticular disk (internal derangement), and this can give rise to abnormal sounds as well as altered function.

Another difference between the TMJ and other joints in the body is the influence of the teeth on the relationship of the articulating components. When the teeth are not in occlusion, this relationship is determined by the morphology of the bones, and by the muscles and ligaments that cross the joint (just as in any other joint). However, when the teeth do come into contact, they determine the final position of the condyle. This factor has clinical

implications that have to be considered in the treatment of many conditions involving the TMJ.

The final difference between the TMJ and other joints in the body relates to the functional relationship between the two joints. The mandible is the only bone in the body hinged on both ends that is not capable of independent movement at one end. This also has clinical implications because any dysfunctional movement on one side will result in altered movement on the contralateral side. Thus, a unilateral condition can ultimately lead to pain and dysfunction in the opposite joint even though the underlying problem does not primarily affect the opposite joint. This phenomenon has to be taken into consideration whenever a patient presents with bilateral TMJ symptoms.

### **Diseases and Disorders of the Temporomandibular Joint**

The TMJ is susceptible to the same conditions that affect other joints in the body such as congenital and developmental anomalies, traumatic injuries, dislocations, ankylosis, various forms of arthritis, and occasional neoplastic diseases (Table 79-1). There may also be internal derangements of the intraarticular disk. Although many of these conditions are treated in the same manner as when they occur in other joints, the previously described anatomic and functional differences of the TMJ often require some variations in therapy.

#### **Congenital and developmental anomalies**

Because the condyle has an important role in mandibular growth, congenital absence of the condyle (condylar agenesis, otomandibular dysostosis, hemifacial microsomia), condylar hypoplasia, or condylar hyperplasia, can produce severe facial deformity. It is important to distinguish between these conditions because of the variations in treatment.

##### ***Condylar agenesis***

With condylar agenesis, the coronoid process, the ramus, and parts of the mandibular body may also be absent, and there can be associated abnormalities of the internal and external ear, the temporal bone, the parotid gland, the muscles of mastication, and the facial nerve. Radiographs of the mandible and TMJ show the degree of bony involvement and help distinguish this condition from others that produce similar facial deformities, but which are not associated with such severe structural loss.

Early treatment of condylar agenesis is indicated to limit the degree of deformity. The objectives are to reestablish normal ramal height and restore the missing growth site so that further mandibular deformation is prevented. This is best accomplished by reconstruction of the TMJ with a costochondral graft (Poswillo, 1987). Orthodontic therapy, orthognathic surgery, otoplasty, and soft- and hard-tissue grafts for facial augmentation are often necessary to complete the reconstructive process.

### ***Condylar hypoplasia***

Hypoplasia of the mandibular condyle may be congenital in origin, but usually it results from trauma, infection, or irradiation during the postnatal growth period. The diminished condylar growth produces a facial deformity characterized by shortness of the mandibular body, unilateral fullness of the face, and deviation of the chin to the affected side. On the contralateral side, the body of the mandible is elongated and the face appears flattened. The degree of mandibular and facial deformity relates to the severity of the hypoplasia and the age at which it occurred. The diagnosis is based on the history of progressive facial deformity during the growth period, radiographic evidence of condylar deformity and antegonial notching, and a frequent history of trauma.

If the condition is recognized during the growth period, replacement of the condyle with a costochondral graft may be indicated (Lindqvist et al, 1988; Obeid et al, 1988). In the adult, either shortening of the normal side or lengthening of the abnormal side by orthognathic surgery is aesthetically and functionally corrective. Prior orthodontic therapy is often necessary to establish a normal occlusion.

### ***Condylar hyperplasia***

This is a disturbance of unknown etiology characterized by a slowly progressing, unilateral overgrowth of the mandible resulting in facial asymmetry, malocclusion, and deviation of the chin to the unaffected side. In contrast to condylar hypoplasia, which produces changes in facial symmetry during the period of normal mandibular growth, this condition usually first becomes apparent in the second decade of life when one condyle continues to grow while the other side is no longer active. On radiographic examination, the condyle may have a normal shape, but the mandibular neck is elongated, or the entire condyloid process may be symmetrically enlarged. This is in contradistinction to osteoma or osteochondroma of the condyle, which can sometimes produce a similar facial deformity, but which produces condylar asymmetry.

Treatment of condylar hyperplasia depends on whether the condyle is still growing (Hampf et al, 1985), which can be determined by the use of scintigraphy. If growth is still occurring, condylectomy is the treatment of choice. If growth has ceased, the condition is corrected by orthognathic surgery, usually preceded by orthodontic alignment of the teeth.

### **Traumatic injuries**

The condyloid process is one of the most frequent sites of fracture following trauma to the mandible. The diagnosis is generally based on the physical and radiographic findings. Usually there is preauricular pain and tenderness as well as difficulty in opening the mouth. When there is a unilateral fracture, the jaw will deviate to the affected side on attempted opening. With bilateral fractures there is no deviation, but there is frequently an anterior open bite.

Intracapsular condylar fractures are treated by short periods of maxillomandibular fixation. In the adult, fractures of the condyloid process are also treated by maxillomandibular fixation unless the malposed segment interferes with jaw function, there are no occluding

teeth on the involved side, or the condyloid processes are fractured bilaterally and grossly displaced. In the latter instances, open reduction should be done (Zide and Kent, 1983). Other conditions that may necessitate open reduction are a lack of adequate teeth for maxillomandibular fixation and the presence of associated fractures in the mandible and/or the maxilla and midface. In children, closed reduction and fixation is also the method of choice, except that a fractured, severely displaced condyloid process may require surgical repositioning to prevent a possible growth deformity occurring subsequently (Laskin, 1976).

### **Dislocation**

When the jaw is dislocated, the mandible is fixed in an open position with only the most posterior teeth contracting. Three forms of dislocation can be distinguished based on frequency and duration of the condition: the single, acute episode; chronic recurrent dislocation; and chronic persistent dislocation. Only the last two conditions may require surgical treatment; the acute dislocation is treated by manual reduction supplemented by the use of local anesthesia, IV sedation, or general anesthesia.

Chronic recurrent dislocation can be treated by injecting a sclerosing agent into the TMJ capsule and ligament to produce scarring of the stretched tissues (Schulz, 1956) or the same effect can be accomplished by capsulorrhaphy. However, if the factors leading to the capsular laxity, such as frequent epileptic seizures or dyskinetic jaw movements, are uncontrollable, the patient may require lateral pterygoid myotomy (Laskin, 1972).

Although some cases of chronic persistent dislocation can be reduced manually with the aid of traction wires placed through the bone at the angles of the mandible, when this fails, temporal myotomy performed through a vertical incision over the anterior border of the coronoid process generally is effectual (Laskin, 1972). As a last resort, direct manipulation of the condyles through preauricular incisions or condylectomy can be done.

### **Ankylosis**

The most common causes of TMJ ankylosis are traumatic injuries and rheumatoid arthritis, although it may also result from congenital abnormalities, infection, or neoplasia. It is important to distinguish between true ankylosis, which involves the joint, and false ankylosis, which involves extraarticular conditions such as enlargement of the coronoid process, depressed fractures of the zygomatic arch, or scarring from surgery or irradiation. Radiographic examination of the joints and a careful clinical history generally are sufficient to establish the diagnosis of true ankylosis. The radiographs usually show condylar deformity, and either a narrowing or irregularity of the joint space or obliteration of the normal bony morphology.

There are three basic principles involved in the surgical treatment of ankylosis (Laskin, 1976). First, the new joint should be established at the highest possible point on the ramus so as to maintain maximum ramal height and minimize postoperative shift of the mandible; second, an interpositional material must be placed to avoid fusion of the parts; and third, it is important to initiate long-term physical therapy postsurgically. In the growing child, consideration should not only be given to maintenance of ramal height, but also to replacement of the condylar growth site. A costochondral graft serves this purpose, as well

as provides an excellent interpositional material (Politis et al, 1987).

## **Arthritis**

Arthritis is the most frequent pathologic condition affecting the TMJ. All of the various types that occur in other joints can occur in this region, but infections, traumatic, rheumatoid, and degenerative arthritis are the most common.

### ***Infectious arthritis***

This condition is rare in the TMJ. It may be associated with a systemic disease such as gonorrhoea, syphilis, or tuberculosis; develop as an extension of a local infection; or, occasionally, be due to blood-borne organisms. Clinically, there are local signs of inflammation and limited jaw movement. There may also be signs and symptoms of the associated systemic disease. The radiographs are negative initially, but later may show extensive bone destruction. Treatment includes antibiotics, proper hydration, control of pain, and restriction of jaw movement. Suppurative infections may require aspiration, incision and drainage, or sequestrectomy.

### ***Rheumatoid arthritis***

Although the earliest symptoms of rheumatoid arthritis occasionally may occur in the TMJ, usually other joints are involved first. When the TMJ is involved, there is usually bilateral pain, tenderness and swelling, and limitation of jaw motion. In the early stages, there may be no radiographic changes, but with progression of the disease the articular surface of the condyle is destroyed and the joint space is obliterated; as a result of this destruction an anterior open bite can occur. In children, such destruction also can cause mandibular growth retardation and facial deformity. In all patients there is a possibility of ankylosis.

The treatment of rheumatoid arthritis in the TMJ is similar to that in other joints (Zide et al, 1986). Antiinflammatory drugs are used during the acute phases, and mild jaw exercises are used to prevent excessive loss of motion when the acute symptoms subside. In severe cases, drugs such as hydrochloroquine, gold, and penicillamine are also used to control the pain and inflammation. Surgery may be necessary if ankylosis develops.

### ***Degenerative arthritis***

Primary degenerative arthritis is seen in older persons and is associated with the normal wear and tear of aging. Its onset is insidious, the symptoms are generally mild, and patients rarely complain about the condition. Secondary degenerative arthritis, which usually is caused by trauma or the chronic clenching associated with myofascial pain dysfunction (MPD) syndrome, occurs in younger individuals and produces more severe symptoms of pain, joint tenderness, clicking or crepitation, and limitation of jaw movement. Usually the condition is unilateral. The radiograph will frequently show flattening, lipping, osteophyte formation, or erosion of the articular surface of the condyle.

Treatment of degenerative joint disease includes nonsteroidal antiinflammatory drugs, a soft diet, limited jaw movement, and use of a bite appliance if the patient has a chronic clenching or grinding habit. When nonsurgical management for 3 to 6 months fail to relieve the symptoms, and there is radiographic evidence of bony change on the articular surface of the condyle, surgical intervention may be indicated. This should involve removal only of the minimal amount of bone necessary to produce a smooth articular surface. Unnecessary removal of the entire cortical plate, as occurs with the so-called condylar shave or condylotomy, can lead to continued resorptive changes in some instances, and should be avoided, if possible.

### **Neoplasms**

Primary neoplasms arising in the TMJ are uncommon. Chondroma, osteochondroma, and osteoma are the most common benign tumors. There have also been isolated cases of myxoma, fibrous dysplasia, giant cell reparative granuloma, synovialoma, chondroblastoma, osteoblastoma, and synovial hemangioma reported. Malignant tumors are even more uncommon, with infrequent reports of fibrosarcoma, chondrosarcoma and multiple myeloma. The TMJ can also be invaded by neoplasms from the cheek or parotid gland, and metastasis to the condyle from distant neoplasm has also been noted on occasion.

Tumors of the TMJ cause pain, limited jaw movement, and difficulty in occluding the teeth. Depending on the nature of the condition, the radiographs may show bony deformation, apposition, or resorption. Biopsy is necessary to establish a definitive diagnosis.

Surgery is the treatment of choice for the primary neoplasms, whether they are benign or malignant. Most of the malignant neoplasms are not radiosensitive, and therefore radiation therapy is seldom used.

### **Internal derangements**

Internal derangements of the TMJ take two forms: anterior disk displacement with reduction on opening the mouth, which is characterized by clicking or popping sounds, and anterior disk displacement without reduction on attempted mouth opening, which is characterized by locking. As a result of an internal derangement, the patient also may develop a perforation in the disk or, more commonly, at the junction between the disk and the retrodiskal tissue.

Internal derangements may be caused by trauma, the lateral pterygoid spasm that frequently accompanies MPD syndrome, or the alterations in the frictional properties of the joint and the resultant degenerative changes that are produced by chronic clenching. In addition to the sounds produced and the difficulties with jaw movement, the most common symptom caused by an internal derangement is pain. The diagnosis is generally made on the basis of the history and physical examination, and confirmed by visualization of disk position by magnetic resonance imaging (MRI).

A patient with a painless click and no jaw dysfunction requires no treatment. For those who have associated pain, treatment consists of a nonsteroidal antiinflammatory drug, a jaw-repositioning appliance, and a muscle relaxant when there is lateral pterygoid spasm. For

patients with persistent pain and clicking unresponsive to such modalities, the disk can be repositioned surgically (diskoplasty).

In patients with anterior disk displacement without reduction (locking), surgical correction is urgent because, if untreated for a long period, the disk becomes extremely deformed and subsequently cannot be repositioned. At the time of surgery, repositioning of the disk should be attempted but, if not possible, it should be removed (discectomy) and replaced with an auricular cartilage or dermal graft. Alloplastic substitutes for the disk have not been shown to be effective in most instances.

Arthroscopic lysis and lavage also has been used to treat anterior disk displacement without reduction. Although this procedure does not restore the disk to its normal position (Gabler et al, 1989), it does increase disk mobility and this seems to reduce or eliminate the pain in some patients (Indresano, 1989).

### **Myofascial Pain-Dysfunction Syndrome**

Myofascial pain dysfunction (MPD) syndrome is a psychophysiologic disease that primarily involves the muscles of mastication (Laskin, 1969). The condition is characterized by poorly localized, dull, aching, radiating pain that may become acute during use of the jaw, and mandibular dysfunction that usually involves a limitation of opening. Generally the condition involves only one side of the face and, upon examination, tenderness can usually be elicited in one or more of the muscles of mastication or their tendinous attachments. Although headache is frequently mentioned as a symptom, the only type of headache that may be directly or indirectly part of the syndrome is muscle spasm or tension-type headache, with other types being coincidental findings. The same is true for such complaints as diminished hearing, tinnitus, burning tongue, and neuralgic pains. However, when there is lateral pterygoid spasm, the patient may complain of earache and deep pain behind the eye. Although MPD syndrome starts as a functional disorder, it can ultimately lead to organic changes in the temporomandibular joint and the masticatory muscles, and even cause alterations in the dentition.

MPD syndrome is believed to be a stress-related disorder. It is hypothesized that centrally induced increases in muscle tension, frequently combined with the presence of parafunctional habits such as clenching or grinding of the teeth, result in the muscle fatigue and spasm that produce the pain and dysfunction. However, similar symptoms occasionally can result from muscular overextension, muscle overcontraction, or trauma (Fig. 79-1).

Women are affected by MPD syndrome more frequently than men, with the ratio in various reports ranging from 3:1 to 5:1. Although the condition can occur in children, the greatest incidence appears to be in the 20- to 40-year age group.

### **Differential diagnosis**

Because the cardinal signs and symptoms of MPD syndrome are similar to those produced by organic problems involving the TMJ such as degenerative joint disease and internal disk derangement, as well as by a variety of non-articular conditions (Tables 79-2 and 79-3), the diagnosis of this syndrome can be difficult, requiring a careful history and a

thorough clinical evaluation to rule out other conditions. Radiographs may be helpful. These include periapical views of the teeth and screening views (transcranial, transpharyngeal, or panoramic) of the TMJs. If the screening views of the TMJs show some abnormality, tomographic views are usually advisable. MRI can also be useful in determining the position of the disk when an internal derangement of the TMJ is being considered. Depending on the suspected condition, other radiographic views of the head and neck, CT scans, and scintigraphy may be needed to establish a final diagnosis. In addition, certain laboratory tests may be helpful in some instances. These include a complete blood cell count if an infection is suspected; serum calcium, phosphorus, and alkaline phosphatase measurements for possible bone disease; serum uric acid determination for gout; serum creatinine and creatine phosphokinase levels as indicators of muscle disease; and erythrocyte sedimentation rate, rheumatoid factor, and latex fixation tests for suspected rheumatoid arthritis. Electromyography can be used to evaluate muscle function. Psychologic evaluation and psychometric testing are good research tools, but have little diagnostic value other than for determining the presence of any associated abnormal behavior characteristics.

### **Treatment**

The treatment of MPD syndrome is divided into four phases (Laskin and Block, 1986). Once a definitive diagnosis is made, phase I therapy is started. This initially involves providing the patient with some understanding of the problem. Because patients often have difficulty accepting a psychophysiologic explanation for their condition, the discussion should deal with the issue of muscle fatigue and spasm as the cause of the pain and dysfunction, delaying consideration of the role of stress and psychologic factors until the symptoms have improved and the patient's confidence has been gained. Relating the symptoms to specific masticatory muscles helps the patient understand the reason or the type and location of the pain; for example, headache from the temporalis muscle, jaw ache from the masseter muscle, discomfort when swallowing and stuffiness in the ear from the medial pterygoid muscle, and earache and pain behind the eye from the lateral pterygoid muscle.

In addition to the initial explanation, the patient is counseled regarding home therapy. This includes recommendations about avoidance of clenching and grinding of the teeth; eating a soft, nonchewy diet; use of moist heat on, and massage of, the masticatory muscles; and limitation of jaw motion. Because the patient has muscle spasm and pain, a muscle relaxant and a nonsteroidal antiinflammatory drug are prescribed. Diazepam and ibuprofen are commonly used.

About 50% of the patients will have a resolution of their symptoms within 2 to 4 weeks with phase I therapy. For those whose symptoms persist, however, phase II therapy is initiated. Home therapy and medications are continued but, at this point, a bite appliance is made for the patient. Although numerous types have been used, the Hawley-type maxillary appliance is probably most effective because it prevents occlusion of the posterior teeth and thereby also prevents most forms of parafunctional activity. Generally the appliance is worn at night, but can be worn for 5 to 6 hours during the day, if necessary. However, it should not be worn continuously because the posterior teeth may supra-erupt in some patients.



With phase II therapy, another 20% to 25% of the patients will become free of symptoms in 2 to 4 weeks. The medications are then stopped first, and next the wearing of the bite appliance is discontinued. If the patient has a return of symptoms when the appliance is not worn at night, its use can be continued indefinitely.

Patients who do not respond to the use of a bite appliance are entered into phase III of treatment for 4 to 6 weeks. In this phase either physical therapy (ultrasound, electrogalvanic stimulation) or relaxation therapy (EMG biofeedback, conditioned relaxation) are added to the regimen. There is no evidence to show that one form of treatment is better than the other, and either can be used first. If one is not successful, the other can then be tried. Phase III therapy usually helps another 10% to 15% of the patients.

If all these approaches fail and there is no question about the correctness of the diagnosis, psychologic counseling is recommended. This involves helping patients to identify possible stresses in their life and to learn to cope with such situations. If there is doubt about the diagnosis, the patient should first be referred for appropriate consultation and re-evaluation. Another alternative is to refer patients with recalcitrant MPD syndrome to a TMJ center or pain clinic because such patients generally require a multidisciplinary approach for successful treatment.

### **Summary**

The successful management of patients with temporomandibular disorders is dependent on establishing an accurate diagnosis and using proper therapy based on an understanding of the etiology of the condition being treated. Of particular importance is separating patients with MPD syndrome, who constitute the major group encountered and who are not surgical candidates, from those with TMJ pathology, who frequently require surgical treatment. Even in the latter group, however, many of the commonly encountered conditions such as arthritis and internal disk derangements often respond to nonsurgical therapy, which should be given a fair trial before more aggressive management is considered.