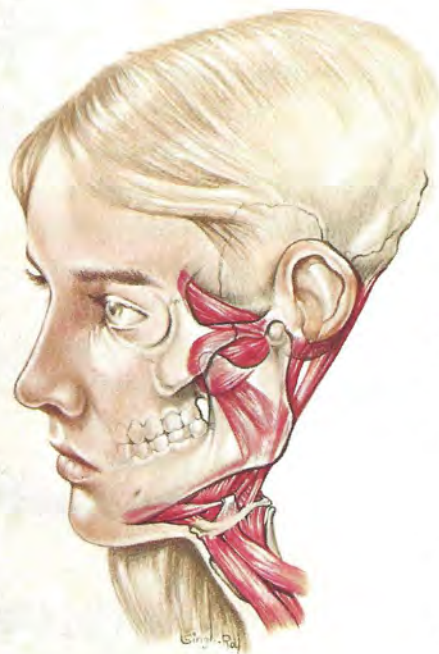


THE  
PRACTICAL  
JOURNAL  
FOR  
PRIMARY CARE  
PHYSICIANS

# patient care



Temporomandibular disorders

## “Doctor, my jaw hurts.”

BASED ON INDIVIDUAL INTERVIEWS WITH DONALD C. CHASE, DDS; M. FRANKLIN DOLWICK, DMD, PHD; BARRY H. HENDLER, MD, DDS;  
STEVEN L. KRAUS, RPT

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The Drug Spotlight  
Program of the  
American Society  
of Clinical  
Pharmacology and  
Therapeutics



## TEMPOROMANDIBULAR DISORDERS

# “Doctor, my jaw hurts.”

BASED ON INDIVIDUAL INTERVIEWS WITH DONALD C. CHASE, DDS; M. FRANKLIN DOLWICK, DMD, PHD; BARRY H. HENDLER, MD, DDS; STEVEN L. KRAUS, RPT (SEE PAGE 119)

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### EXPRESS STOP

**Focusing the history:** When you suspect a temporomandibular disorder, get a detailed description of the pain, including its character, location, onset, severity, and duration. Pain commonly consists of achy jaw muscles, usually the masseter or temporalis. It can begin over several days or progress over weeks or months; it is often associated with emotional stress or, less frequently, with physical trauma to the jaw. Pain is common with motion of the jaw, and sometimes with movement of the head.

A few key questions can help you determine the likelihood of a temporomandibular disorder and the need for a more searching evaluation (see “Temporomandibular disorders: Paring the differential in the history,” page 127).

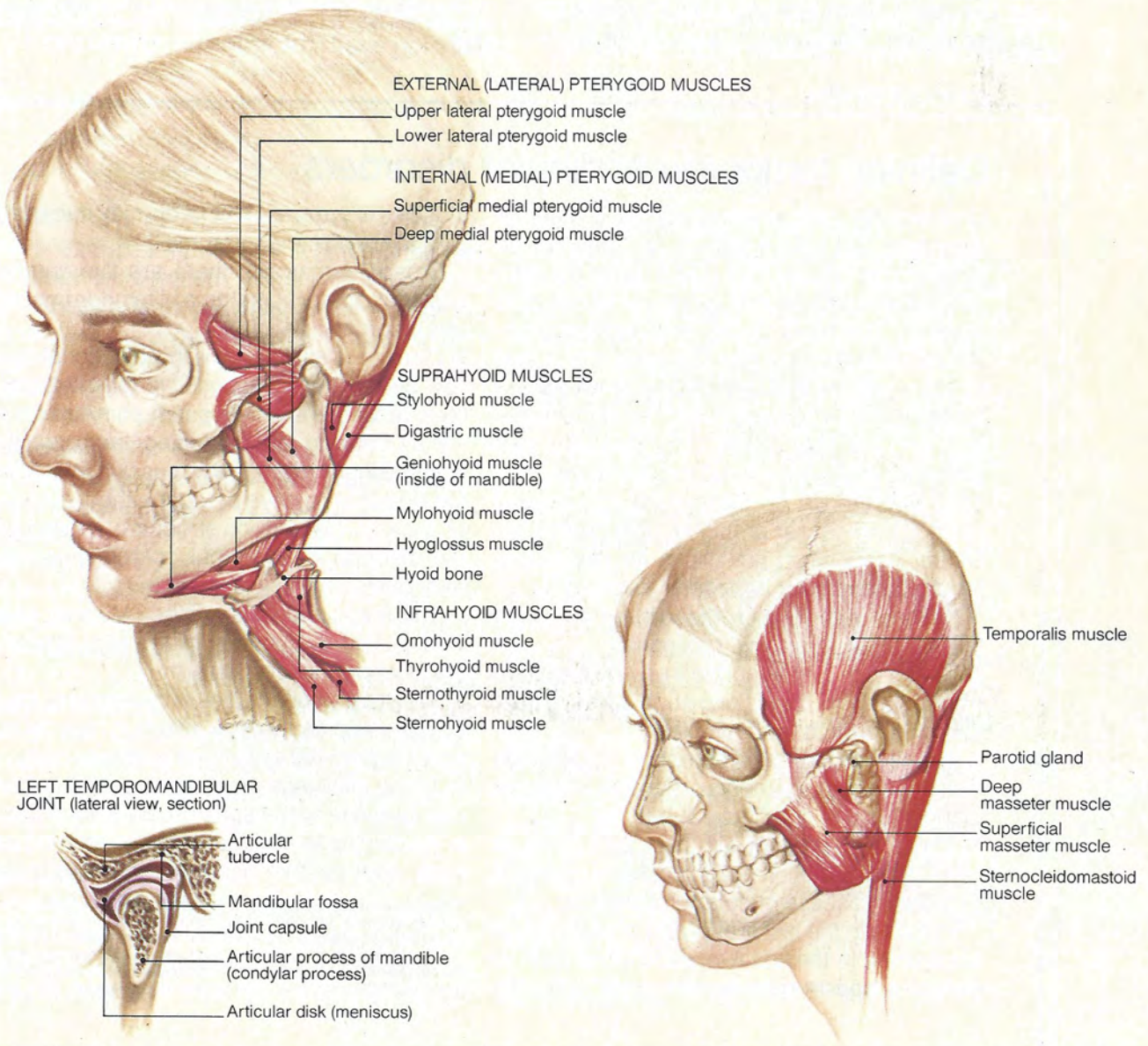
» *What kind of pain do you have?* Most patients will have a dull, muscular ache that worsens with use of the jaw; jaw muscles can be exquisitely sensitive to palpation. Referred pain is usually a dull ache or burning sensation that does not change on palpation of the painful area or of the origin.

» *Where is your pain?* Have the patient outline the area of pain, using one finger. Often, a patient indicates the masseter, the temporalis, the base of the skull, or the temporomandibular joint (TMJ). Referred pain is often dispersed and affects the ear canal, outer ear, neck, supraorbital area, temporal areas, occiput, sinuses, or teeth.

» *How did the pain begin?* Pain associated with a temporomandibular disorder can begin over several days, or progress over weeks or months. Typically, the patient will gradually have become aware first of discomfort in the jaw, then of pain, and will not recall exactly when it began. Its occurrence is usually associated with insidious onset of emotional stress or trauma, and, less frequently, with direct physical trauma from a variety of sources: a lengthy dental procedure, a wide yawn, or an activity such as playing a wind instrument or snorkeling. Automobile accidents resulting in whiplash or a direct blow to the mandible are a common cause of injury to the TMJ, the cervical spine, and the muscles of mastication. Sports injuries often involve direct trauma to the mandible.

When the signs and symptoms suggest muscular pain, also consider the patient's occupation. Some musicians (for example, clarinetists and violinists) and people who regularly cradle a phone against their shoulder can traumatize the TMJ and the muscles of mastication and of the cervical spine. Also consider, as a precipitating factor, a change in work habits that demands a change in posture—for example, from sitting all day to moving about.

## Anatomy of the temporomandibular joint and associated structures



» *When is your pain most severe?* Most patients will complain of pain or difficulty when chewing, yawning, or opening the mouth wide (wide enough to insert two knuckles); some will have pain when turning the head from side to side or nodding up and down. The pain is also often asso-

ciated with a sound or sensation of clicking, popping, or grinding in the TMJ during opening or closing of the mouth.

Ask the patient if she\* has discomfort in the jaw or TMJ, headaches, or a sensation

\*Since temporomandibular disorders are reported 3-4 times as often in women as in men, patients in this article are presumed to be female unless otherwise noted.

#### CAPSULE REVIEW

## Defining temporomandibular disorders

Until recently, clinicians tended to lump together disorders that cause pain in and around the temporomandibular joint (TMJ) under the term *temporomandibular joint syndrome* or one of its variants. The more global term *temporomandibular disorders* has recently been introduced to acknowledge that dysfunction is not always limited to the joint proper (see "The chicken, the egg, and the TMJ," page 115). This term was preferred by the American Dental Association's 1982 conference on diagnosing and treating temporomandibular problems (see "American Dental Association guidelines for diagnosing temporomandibular disorders," page 131).

Patients with temporomandibular disorders fall into three diagnostic categories:

- » Those with joint abnormalities resulting from trauma or from conditions such as ankylosis, synovitis, arthritis, and neoplasm
- » Those with structural defects of the articular disk (meniscus), ligaments of the disk, condyles, glenoid fossae, or articular tubercles
- » Those who present with pain, joint noise, or restricted jaw motion but do not have evidence of organic disease or structural defects

Patients in the last group, and presumably at least some in the first two, experience pain as part of a spasm-pain-spasm cycle\* affecting

muscles in the area. This cycle may subject the TMJ to chronic microtrauma.

Broadly construed, there are five common explanations for symptoms of temporomandibular disorders:

- » One prevalent opinion is that emotional stress can be ultimately responsible for masticatory muscle fatigue and the spasm-pain-spasm cycle by causing jaw clenching, teeth grinding, and tensing of masticatory muscles. When dysfunction and pain are present without evidence of organic disease or structural abnormality, the disorder is commonly called *myofascial pain-dysfunction syndrome*.
- » Trauma to or disease of the TMJ may cause pain in and dysfunction of the joint proper or masticatory muscles or both.
- » Structural abnormalities of the joint may cause symptoms directly or by affecting muscle tone and initiating the spasm-pain-spasm cycle.
- » Some clinicians maintain that malocclusion can give rise to the spasm-pain-spasm cycle.
- » According to some orthopedic physiotherapists, poor posture can influence mobility and

\*"Spasm" is used here to mean a sudden, involuntary contraction of a muscle or group of muscles attended by pain and interference with function. Contraction is sustained even when the muscle is at rest (in contrast to muscle splinting), and is induced by efferent impulses from the central nervous system. Bell WE: *Orofacial Pains: Differential Diagnosis*, ed 2. Chicago, Year Book Medical Publishers Inc, 1979, p 66.

of loose or painful teeth in the morning. This generally indicates nocturnal teeth grinding or clenching or poor sleeping posture. More rarely, painful mastication on arising can indicate rheumatoid arthritis (see "Joint inflammation," page 128).

Frequently, patients will have pain after

meals and at the end of the day without showing signs of joint inflammation. For these patients, suspect involvement primarily of the masticatory muscles.

» *How long have you had this pain?* Most patients will seek help after having pain for more than a month. Some will have ex-

positioning of the mandible, which can result in the spasm-pain-spasm cycle (see "Is the cervical spine implicated?" page 123). Proponents of this view—which is controversial—prefer the term *craniomandibular-cervical dysfunction syndrome*, since they include derangement of the cervical spine in the etiology.

### Symptoms

Typical symptoms include, in order of decreasing prevalence, pain in and around the TMJ or masticatory muscles, followed by joint noise—clicking, popping, or crepitus—and limited range of jaw motion. Referred pain may be felt in the occiput, ears, eyes, sinuses, and the angle of the mandible. Clinical evidence suggests that pain in the neck, shoulders, arms, and fingers may be related to disorders in the cervical spine which may be associated with temporomandibular disorders. Muscular pain often affects the temporalis, the masseter, and muscles of the occipital area and the neck.

### Epidemiology

» Temporomandibular disorders are reported in women about 3-4 times as often as in men. Recent data suggest that women are more apt to seek treatment than men, and that the dis-

orders occur equally in both sexes.

» While older studies reported that most patients were women in their 40s and 50s, newer studies report an increasing proportion of men and women under age 20. Some 10-46 million Americans may have symptoms.

» Some 70-90 percent of the patients present with pain on jaw movement as the primary symptom. Forty to 60 percent also have unilateral joint noise, and 15-25 percent will have a limited range of jaw motion. Pain on palpation of the masseter is present in about half the patients. Pain is almost always unilateral.

» Nearly 60 percent of the patients habitually grind or clench their teeth, most without knowing it. About 20 percent have other suspect oral habits such as excessive gum chewing, biting on hard objects, or biting their fingernails, cheeks, lips, or tongue.

» Of patients with temporomandibular disorders, some 70-80 percent suffer from masticatory muscle spasm.\* The spasm is usually attributed to overuse from clenching or grinding of the teeth or tensing of masticatory muscles, either as a long-standing habit or as a habit induced by acute emotional stress.

\*Laskin DM: Etiology of the pain-dysfunction syndrome. *J Am Dent Assoc* 1969;79:147-53.

perienced pain for a year or more.

Occasionally, you will find little in the history to guide your diagnosis. If the patient's pain is obscure in character and location, check for signs and symptoms of atypical facial neuralgia, keeping in mind that:

» Pain from atypical facial neuralgia is constant; it does not change with jaw function, time of day, or palpation.

» Atypical facial neuralgia is usually diffuse and follows neuroanatomy; pain from

temporomandibular disorders generally involves specific muscles.

» Like temporomandibular disorders, atypical facial neuralgia commonly affects emotionally depressed women under age 40.

» Atypical facial neuralgia does not present with trigger points, as does a true tic douloureux.

Also inquire about any family history of cardiovascular disease. Angina and cardiac infarction can refer dull, aching, or throbbing pain to the angle and base of the

## The chicken, the egg, and the TMJ

Since the 1950s, when the "TMJ syndrome" became generally recognized, general dentists, oral and maxillofacial surgeons, orthodontists, anatomists, physiatrists, physical therapists, and orthopedists have debated which comes first: masticatory muscle spasm or joint derangement? Or does malocclusion play a role in causing either or both of these problems? And what role do posture and derangement of the cervical spine play?

Laszlo Schwartz, DDS, and his co-workers at Columbia University first proposed in 1959 that psychological stress and anxiety resulted in masticatory muscle spasm.\* Since then, several other workers have modified Schwartz's ideas. Among them, Daniel Laskin, DDS, has become a leading spokesman and has taken Schwartz a step further. He proposes that occlusal abnormalities in most patients are *not* the cause of muscle spasm.

Meanwhile, the idea that occlusal disharmony is the primary cause of temporomandibular disorders has fallen into disfavor; much of

the evidence in support of the theory has been interpreted as anecdotal. Many maintain that the relief that occlusal therapy frequently affords is evidence for an occlusal component in the disorder, but a causal role for such a component has not been confirmed.

Another theory of the etiology of temporomandibular disorders—based on clinical data—proposes that children who have so-called dual bites may be more susceptible to temporomandibular disorders than adults. These children can chew with their jaws in protruded, middle, or retruded positions.

Continuing work by John Rugh, PhD, a psychologist, suggests that about 10 percent of patients with masticatory muscle disorders suffer from a sleep disorder that appears unrelated to anxiety. His work indicates that some people sleep well and grind their teeth; they remember neither dreaming nor bruxism. If they are sedated, they sleep more deeply and grind their teeth more. In contrast, people whose teeth grinding is stress related usually recall dreaming, and they grind their teeth less when sedated.

\*Schwartz L: *Disorders of the Temporomandibular Joint: Diagnosis, Management, Relation to Occlusion of Teeth*. Philadelphia, WB Saunders Co, 1959, p 39.

mandible. Temporal arteritis, most common in men over age 50, results in tenderness to palpation over blood vessels in the neck and face; patients describe the pain as throbbing or aching.

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EXPRESS STOP

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**Pacing the physical exam: Begin your examination of the patient with temporomandibular complaints by palpating the masticatory muscles. Vapocoolants can aid diagnosis of muscular involvement. Investigate the condition of the temporomandibular joint proper by palpating both over the joint and through the auditory canal. Listen to the joint with a stethoscope as the patient's jaw moves. Also note any asymmetry in jaw motion and in the face.**

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Physical examination for temporomandibular disorders begins with palpation of masticatory muscles over their bony origins. Tenderness, which is quite common, signals muscular involvement but does not reveal information about etiology.

You can reach the masseter, the deep masseter, the temporalis, the internal (or medial) pterygoid, and the infrahyoid and suprahyoid muscles. Palpating the internal pterygoids can elicit exquisite pain. The external (or lateral) pterygoids are more difficult to reach; some studies, furthermore, have found them tender in asymptomatic patients.

Refrigerant sprays, or vapocoolants, such as Fluori-Methane, can also help diagnose muscular involvement. When a patient with a limited range of jaw motion can suddenly open her mouth wider following a treatment with a vapocoolant, you can usually safely suspect muscle tension as a major

component of her disorder.

To evaluate the temporomandibular joint (TMJ) itself, begin by palpating over the outside of the joint. You are likely to elicit pain if there is synovitis, arthritis, or a structural defect, such as damaged ligament of the articular disk (meniscus).

Next, with the patient's mouth open, stand behind her and, with your palms turned forward, gently insert your little fingers into both ear canals. Ask her to close and open her mouth slowly. With your fingertips pressed gently forward you can feel the condyles translate on opening and pivot in the fossae. Tenderness at the head of the condyle suggests an organic disorder, displacement of the disk, inflammation of the disk ligaments associated with joint laxity, or inflammation of the joint capsule.

With a stethoscope, listen to the joint as the patient opens and closes her mouth. Joint noise, when present with pain, can indicate derangement of the disk, condyle, or both. Crepitus commonly indicates an organic disorder, such as osteoarthritis or rheumatoid arthritis. Keep in mind, however, that about 40 percent of patients who are asymptomatic will have some TMJ noise.

Stand in front of the patient and ask her to open and close her mouth slowly, and note any gross asymmetry in jaw motion. Deviation can be of an S-curve or C-curve shape; if you find either, increase your suspicion of involvement of the TMJ proper, including the possibility of congenital anomalies. Also check for facial asymmetry. Pronounced asymmetry can indicate bony tumors, fractures, abscessed or impacted teeth, and disease of the parotid gland.

Hypertrophy of the masseter or temporalis may result from teeth grinding or jaw clenching, but it may also be congenital.

Given the large proportion of patients whose temporomandibular disorders are caused entirely by muscle spasm and fatigue, it's reasonable to assume provision-

ally that the patient with evident TMJ dysfunction and no signs or symptoms of organic or structural problems has a disorder of the masticatory muscles. If the patient does not respond to treatment\* of

\*A forthcoming *Patient Care* article will discuss the treatment of temporomandibular disorders.

### Meet the consultants on temporomandibular disorders



**Donald C. Chase, DDS**  
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**M. Franklin Dolwick, DMD, PhD**  
associate professor, department of oral and maxillofacial surgery, University of Texas Health Science Center at San Antonio Dental School; chairman, American Association of Oral and Maxillofacial Surgeons ad hoc study group on TMJ disk surgery



**Barry H. Hendler, MD, DDS**  
acting chairman, department of oral and maxillofacial surgery; clinical associate professor of oral surgery and anesthesiology, University of Pennsylvania School of Dental Medicine; director, department of oral and maxillofacial surgery, and associate director, division of dental medicine, Medical College of Pennsylvania, Philadelphia



**Steven L. Kraus, RPT**  
consultant, Emory University School of Dentistry; clinical faculty, department of community health, division of physical therapy, Emory University School of Medicine, Atlanta

In addition to his teaching, clinical, and administrative duties, Dr. Chase recently completed a radiographic study defining temporomandibular joint (TMJ) relationships in normal subjects. Dr. Dolwick, a pioneer in the development of TMJ arthrography and surgical management of TMJ disk derangement, participated in the American Dental Association's 1982 conference on temporomandibular disorders. As a physician and a dentist, Dr. Hendler has long been interested in temporomandibular joint disorders "because it is an area that truly crosses interdisciplinary lines." Mr. Kraus spends about half his time treating patients suffering from temporomandibular disorders.

Please address all correspondence concerning this article to: The Editor, *Patient Care*, 16 Thorndal Circle, Darien, CT 06820. Reprints are not immediately available, but a limited supply of tear sheets is available on a first-come, first-served basis.



# SINEQUAN® (doxepin HCl)

Reference: 1. Barranco SF, Thrash ML, Hackett E, Frey J, et al (Pfizer Pharmaceuticals, Pfizer Inc., New York, N.Y.): Early onset of response to doxepin treatment. *J Clin Psychiatry* 40:265-269, 1979.

## BRIEF SUMMARY

### SINEQUAN® (doxepin HCl) Capsules/Oral Concentrate

**Contraindications.** SINEQUAN is contraindicated in individuals who have shown hypersensitivity to the drug. Possibility of cross sensitivity with other dibenzoxepines should be kept in mind.

SINEQUAN is contraindicated in patients with glaucoma or a tendency to urinary retention. These disorders should be ruled out, particularly in older patients.

**Warnings.** The once-a-day dosage regimen of SINEQUAN in patients with intercurrent illness or patients taking other medications should be carefully adjusted. This is especially important in patients receiving other medications with anticholinergic effects.

**Usage in Geriatrics:** The use of SINEQUAN on a once-a-day dosage regimen in geriatric patients should be adjusted carefully based on the patient's condition.

**Usage in Pregnancy:** Reproduction studies have been performed in rats, rabbits, monkeys and dogs and there was no evidence of harm to the animal fetus. The relevance to humans is not known. Since there is no experience in pregnant women who have received this drug, safety in pregnancy has not been established. There are no data with respect to the secretion of the drug in human milk and its effect on the nursing infant.

**Usage in Children:** The use of SINEQUAN in children under 12 years of age is not recommended because safe conditions for its use have not been established.

**MAO Inhibitors:** Serious side effects and even death have been reported following the concomitant use of certain drugs with MAO inhibitors. Therefore, MAO inhibitors should be discontinued at least two weeks prior to the cautious initiation of therapy with SINEQUAN. The exact length of time may vary and is dependent upon the particular MAO inhibitor being used, the length of time it has been administered, and the dosage involved.

**Usage with Alcohol:** It should be borne in mind that alcohol ingestion may increase the danger inherent in any intentional or unintentional SINEQUAN overdosage. This is especially important in patients who may use alcohol excessively.

**Precautions.** Since drowsiness may occur with the use of this drug, patients should be warned of the possibility and cautioned against driving a car or operating dangerous machinery while taking the drug. Patients should also be cautioned that their response to alcohol may be potentiated.

Since suicide is an inherent risk in any depressed patient and may remain so until significant improvement has occurred, patients should be closely supervised during the early course of therapy. Prescriptions should be written for the smallest feasible amount.

Should increased symptoms of psychosis or shift to manic symptomatology occur, it may be necessary to reduce dosage or add a major tranquilizer to the dosage regimen.

**Adverse Reactions. NOTE:** Some of the adverse reactions noted below have not been specifically reported with SINEQUAN use. However, due to the close pharmacological similarities among the tricyclics, the reactions should be considered when prescribing SINEQUAN.

**Anticholinergic Effects:** Dry mouth, blurred vision, constipation, and urinary retention have been reported. If they do not subside with continued therapy, or become severe, it may be necessary to reduce the dosage.

**Central Nervous System Effects:** Drowsiness is the most commonly noticed side effect. This tends to disappear as therapy is continued. Other infrequently reported CNS side effects are confusion, disorientation, hallucinations, numbness, paresthesias, ataxia, and extrapyramidal symptoms and seizures.

**Cardiovascular:** Cardiovascular effects including hypotension and tachycardia have been reported occasionally.

**Allergic:** Skin rash, edema, photosensitization, and pruritus have occasionally occurred.

**Hematologic:** Eosinophilia has been reported in a few patients. There have been occasional reports of bone marrow depression manifesting as agranulocytosis, leukopenia, thrombocytopenia, and purpura.

**Gastrointestinal:** Nausea, vomiting, indigestion, taste disturbances, diarrhea, anorexia, and aphthous stomatitis have been reported. (See anticholinergic effects.)

**Endocrine:** Raised or lowered libido, testicular swelling, gynecomastia in males, enlargement of breasts and galactorrhea in the female, raising or lowering of blood sugar levels have been reported with tricyclic administration.

**Other:** Dizziness, tinnitus, weight gain, sweating, chills, fatigue, weakness, flushing, jaundice, alopecia, and headache have been occasionally observed as adverse effects.

**Dosage and Administration.** For most patients with illness of mild to moderate severity, a starting daily dose of 75 mg is recommended. Dosage may subsequently be increased or decreased at appropriate intervals and according to individual response. The usual optimum dose range is 75 mg/day to 150 mg/day.

In more severely ill patients higher doses may be required with subsequent gradual increase to 300 mg/day if necessary. Additional therapeutic effect is rarely to be obtained by exceeding a dose of 300 mg/day.

In patients with very mild symptomatology or emotional symptoms accompanying organic disease, lower doses may suffice. Some of these patients have been controlled on doses as low as 25-50 mg/day.

The total daily dosage of SINEQUAN may be given on a divided or once-a-day dosage schedule. If the once-a-day schedule is employed the maximum recommended dose is 150 mg/day. This dose may be given at bedtime. **The 150 mg capsule strength is intended for maintenance therapy only and is not recommended for initiation of treatment.**

Anti-anxiety effect is apparent before the antidepressant effect. Optimal antidepressant effect may not be evident for two to three weeks.

## Overdosage.

### A. Signs and Symptoms

1. Mild: Drowsiness, stupor, blurred vision, excessive dryness of mouth.
2. Severe: Respiratory depression, hypotension, coma, convulsions, cardiac arrhythmias and tachycardias.

Also: urinary retention (bladder atony), decreased gastrointestinal motility (paralytic ileus), hyperthermia (or hypothermia), hypertension, dilated pupils, hyperactive reflexes.

### B. Management and Treatment

1. Mild: Observation and supportive therapy is all that is usually necessary.
2. Severe: Medical management of severe SINEQUAN overdosage consists of aggressive supportive therapy. If the patient is conscious, gastric lavage, with appropriate precautions to prevent pulmonary aspiration, should be performed even though SINEQUAN is rapidly absorbed. The use of activated charcoal has been recommended, as has been continuous gastric lavage with saline for 24 hours or more. An adequate airway should be established in comatose patients and assisted ventilation used if necessary. EKG monitoring may be required for several days, since relapse after apparent recovery has been reported. Arrhythmias should be treated with the appropriate antiarrhythmic agent. It has been reported that many of the cardiovascular and CNS symptoms of tricyclic antidepressant poisoning in adults may be reversed by the slow intravenous administration of 1 mg to 3 mg of physostigmine salicylate. Because physostigmine is rapidly metabolized, the dosage should be repeated as required. Convulsions may respond to standard anticonvulsant therapy, however, barbiturates may potentiate any respiratory depression. Dialysis and forced diuresis generally are not of value in the management of overdosage due to high tissue and protein binding of SINEQUAN.

More detailed professional information available on request.

muscle spasm and fatigue, you can go on to explore the possibilities of joint disease and structural problems—diagnoses that are more difficult to establish.

## EXPRESS STOP

**Referred pain: Your diagnosis can be complicated by referred pain, which can make other disorders present like temporomandibular disorders, and vice versa. Check for tooth decay, pulpitis, cementitis, periapical abscess, impaction, and occlusal trauma by percussing teeth, applying heat and cold, or both. Sinusitis, masticatory muscle spasm, an ear disorder, migraine, temporal arteritis, or glaucoma (rarely) may be responsible for pain in the jaw or cheek.**

You'll want to rule out disorders that can mimic temporomandibular pain—and detect temporomandibular pain that presents like other disorders—before either narrowing your diagnosis by means of a more thorough examination or consulting with a general dentist. Examine teeth, paranasal sinuses, eyes, ears, and head and neck muscles and vasculature. Keep in mind that sites of referred pain are typically marked by hyperesthesia and diffuse tenderness. Referred pain from a tooth usually occurs first in tissue innervated by the same division of the trigeminal (fifth cranial) nerve that connects to the tooth—the maxillary or mandibular division—but pain can spread to tissue innervated by other divisions. For example, referred pain from a disorder in a lower molar is likely to be felt first along the mandibular division and second along the maxillary or ophthalmic divisions.

In determining whether the source of referred pain is from a nontemporoman-

dibular disorder, start by examining the teeth for abnormalities. If you find or suspect any of the following, refer the patient to a dentist:

» *Tooth decay* Direct and referred pain from dental caries is detectable by probing and percussing all surfaces of teeth you suspect are afflicted. The decaying tooth may be sensitive to pressure, heat, cold, or sweetened foods and drinks.

» *Pulpitis* In early stages of pulpitis, heat and cold applied to an afflicted tooth will elicit pain. When you can produce pain by applying heat and relieve it by applying

cold, the pulp is usually moribund. Rarely, these stimuli will cause discomfort at the referred pain site.

» *Cementitis* When an infection of the dental pulp spreads through the apical foramen, it may infect the cementum. The tooth will cease being sensitive to thermal change but will be tender to percussion. Often, however, you will find both types of tenderness present.

» *Periapical abscess* Cementitis can develop into periapical abscess. The patient may present with a constant aching or throbbing pain, gingival swelling, and, some-

## Is the cervical spine implicated?

A relatively new branch of physiotherapy—orthopedic physiotherapy—has advanced the controversial view that the position of the head on the spine and the curvature of the cervical spine can affect mandibular mobility and positioning, indirectly influencing the temporomandibular joint (TMJ), and occlusal contacts. This view, currently supported by clinical experience but not by objective evidence, maintains that when a patient's posture is out of balance, as in the head-forward posture, masticatory muscle spasm, trauma to the TMJ, and malocclusion can result.

To illustrate the effects of posture on jaw position, try this test:

1. Sit upright with your head level and shoulders square. Relax your neck and jaw muscles and lightly tap your teeth together. Notice where they meet.
2. Keep tapping and tilt your head back. Notice that your jaw retrudes and your lower teeth make contact farther back on the upper teeth.
3. Now tip your head forward. Your jaw will

protrude and the contact of your teeth will move forward.

4. Keep your head level and thrust it forward. Your jaw will retrude and your teeth will meet as in step 2.

Patients with postures like that of the fourth position—head forward, shoulders rounded—are primary candidates for fatigue of the muscles of mastication as well as of the cervical spine.

When a patient's stance suggests this kind of imbalance, you can assess involvement of the cervical spine by palpation. If the spine is involved, according to proponents of the theory, you will elicit moderate tenderness by palpating the anterior chest along the inferior border of the clavicle and the costosternal joints. You will also find tenderness in the neck (the suprahyoid and infrahyoid muscles), and in the cervical and upper thoracic spine area (the trapezius, rhomboids, splenius, and suboccipital muscles), and where the middle and anterior scalene muscles attach to the first rib.

## Lasix® (furosemide)

A brief summary of the Prescribing Information for Lasix (furosemide) Tablets 20, 40 and 80 mg.

**WARNING:** Lasix (furosemide) is a potent diuretic which, if given in excessive amounts, can lead to a profound diuresis with water and electrolyte depletion. Therefore, careful medical supervision is required, and dose and dose schedule have to be adjusted to the individual patient's needs.

**INDICATIONS:** Edema associated with congestive heart failure, cirrhosis of the liver, and renal disease, including the nephrotic syndrome. Hypertension when used alone or in combination with other antihypertensive drugs; patients not adequately controlled with thiazides also probably will not be adequately controlled with furosemide alone.

**CONTRAINDICATIONS:** Anuria. History of hypersensitivity to the compound.

**WARNINGS:** Excessive diuresis may result in dehydration and reduction in blood volume, with circulatory collapse and with the possibility of vascular thrombosis and embolism, particularly in elderly patients. Excessive loss of potassium in patients receiving digitalis glycosides may precipitate digitalis toxicity. Exercise care in patients receiving potassium-depleting steroids. Perform frequent serum electrolyte, CO<sub>2</sub>, and BUN determinations during first few months of therapy and periodically thereafter, and correct abnormalities or temporarily withdraw the drug. Initial therapy of patients with hepatic cirrhosis and ascites is best carried out in the hospital. Closely observe cirrhotic patients for sudden fluid and electrolyte imbalances that may precipitate hepatic coma. Supplemental potassium chloride and, if required, an aldosterone antagonist are helpful in preventing hypokalemia and metabolic alkalosis. Discontinue furosemide if increasing azotemia and oliguria occur during treatment of severe, progressive renal disease. Observe patients regularly for possible blood dyscrasias, liver damage, or other idiosyncratic reactions.

Patients with known sulfonamide sensitivity may show allergic reactions. Furosemide may potentiate the therapeutic effect of other antihypertensive agents. Potentiation occurs with ganglionic or peripheral adrenergic blocking drugs. Exacerbation or activation of systemic lupus erythematosus may occur. Furosemide appears in breast milk. If use of the drug is essential, the patient should stop nursing. Cases of tinnitus and reversible hearing impairment have been reported.

There have also been some reports of cases in which irreversible hearing impairment occurred. Usually ototoxicity has been reported when furosemide was injected rapidly in patients with severe impairment of renal function at doses exceeding several times the usual recommended dose and in whom other drugs known to be ototoxic were given. If the physician elects to use high-dose parenteral therapy in patients with severely impaired renal function, controlled intravenous infusion is advisable. (For adults, an infusion rate not exceeding 4 mg furosemide per minute has been used.)

**PRECAUTIONS:** As with any effective diuretic, electrolyte depletion may occur, especially in patients receiving higher doses and a restricted salt intake. Patients receiving furosemide should be observed for clinical signs of fluid or electrolyte imbalance, namely, hyponatremia, hypochloremic alkalosis, and hypokalemia. Serum and urine electrolyte determinations are particularly important when the patient is vomiting excessively or receiving parenteral fluids. Medication such as digitalis may also influence serum electrolytes. Hypokalemia may develop with furosemide as with any other potent diuretic, especially with brisk diuresis, when cirrhosis is present, or during concomitant use of corticosteroids or ACTH. Interference with adequate oral electrolyte intake will also contribute to hypokalemia. Digitalis may exaggerate metabolic effects of hypokalemia, especially with reference to myocardial activity. Asymptomatic hyperuricemia can occur and gout may rarely be precipitated. Increases in blood glucose and alterations in glucose tolerance tests with abnormalities of the fasting and two-hour postprandial sugar have been observed, and rare cases of precipitation of diabetes mellitus have been reported. Furosemide may lower serum calcium levels, and rare cases of tetany have been reported. Periodic serum calcium levels should be obtained. Reversible elevations of BUN may be seen. These have been observed in association with dehydration, which should be avoided, particularly in patients with renal insufficiency. Patients receiving high doses of salicylates in conjunction with furosemide may experience salicylate toxicity at lower doses because of competitive renal excretory sites. Furosemide has a tendency to antagonize the effects of tubocurarine and may potentiate the action of succinylcholine. Lithium generally should not be given with diuretics because they reduce its renal clearance and add a high risk of lithium toxicity. Diuretics such as furosemide may enhance the nephrotoxicity of cephaloridine. Therefore, furosemide and cephaloridine should not be administered simultaneously. Furosemide may decrease arterial responsiveness to norepinephrine. This diminution is not sufficient to preclude effectiveness of the pressor agent for therapeutic use. It has been reported in the literature that coadministration of indomethacin may reduce the natriuretic and antihypertensive effects of Lasix (furosemide) in some patients. This effect has been attributed to inhibition of prostaglandin synthesis by indomethacin. Indomethacin may also affect plasma renin levels and aldosterone excretion; this should be borne in mind when a renin profile is evaluated in hypertensive patients. Patients receiving both indomethacin and Lasix (furosemide) should be observed closely to determine if the desired diuretic and/or antihypertensive effect of Lasix (furosemide) is achieved.

**PREGNANCY:** Pregnancy Category C. Furosemide has been shown to cause unexplained maternal deaths and abortions in rabbits at 2, 4 and 8 times the human dose. There are no adequate and well-controlled studies in pregnant women. Furosemide should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

**ADVERSE REACTIONS:** Anorexia, oral and gastric irritation, nausea, vomiting, cramping, diarrhea, constipation, jaundice (intrahepatic jaundice), pancreatitis, dizziness, vertigo, paresis, headache, xanthopsia, blurred vision, tinnitus and hearing loss, anemia, leukopenia, agranulocytosis (rare), thrombocytopenia, aplastic anemia (rare), purpura, photosensitivity, rash, urticaria, necrotizing angitis (vasculitis, cutaneous vasculitis), exfoliative dermatitis, erythema multiforme, pruritus. Orthostatic hypotension may occur and may be exaggerated by alcohol, barbiturates, or narcotics. Other adverse reactions include hyperglycemia, glycosuria, hyperuricemia, muscle spasm, weakness, restlessness, urinary bladder spasm, thrombophlebitis.

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times, with fever. The tooth and its gingiva may be exquisitely sensitive to pressure.

➤ *Impaction of a tooth* Like abscess, infection of an unerupted or impacted tooth can produce a constant pain and a sensation of pressure in a well-defined area. Look for osseous and soft tissue swelling on the afflicted side; in the mandible, swelling produces restricted or painful jaw motion. If you suspect impaction with infection—or abscess—refer to a dentist for X-ray, the best technique for differentiating the two conditions. Most often pain and tenderness in and around the molars signal impaction; abscess can affect any tooth. A tooth that is impacted and not infected will produce a more diffuse, radiating pain, usually with less swelling.

➤ *Occlusal trauma* A tooth that is continually traumatized at one point on its occlusal surface will traumatize the socket at a single, corresponding point. To find the traumatized tooth and the point of occlusion on the tooth, look for obvious signs of load bearing: wear facets and areas flattened by overload; gingival recession and inflammation; jagged or fractured cusps; and molar cusps without wear, which indicate that other teeth are bearing the load. To elicit pain, percuss the traumatized tooth at the point of occlusion and at precisely the angle at which the tooth is normally stressed.

Several types of head pain can also cloud the diagnosis. Keep in mind that patients with sinus pain, headache, ear discomfort, or pain in the jaw or cheek may have (more or less in decreasing order of frequency):

➤ *Sinusitis* Check for acute frontal sinus-

itis when you find a history of postnasal drip or respiratory allergies. Pain from sinusitis can be referred to the jaw, cheek, or frontal areas. Unlike pain from temporomandibular disorders, the pain of sinusitis usually increases when the baromet-

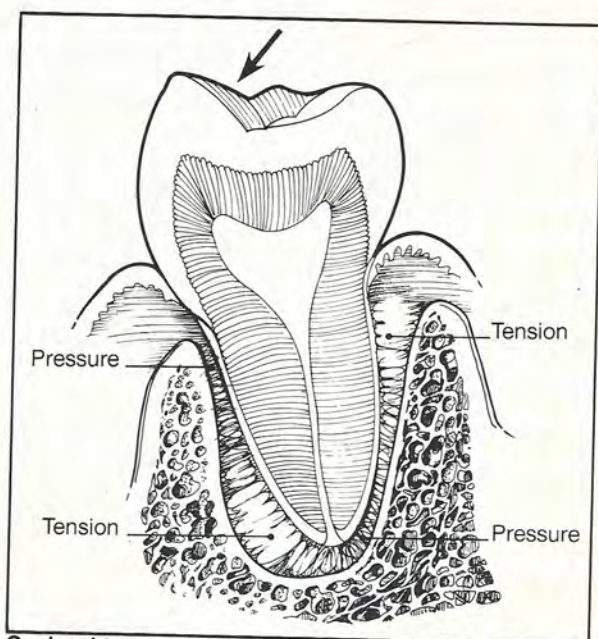
ric pressure falls, when the patient bends over, or when you press on the interior and lateral walls of the sinuses.

» *Muscle spasm* Just as pain may be referred to the temporomandibular area, the reverse may be true: Recent evidence sug-

Temporomandibular disorders: Paring the differential in the history	
If the patient reports . . .	Increase your suspicion of . . .
jaw pain that is: <ul style="list-style-type: none"> <li>● limited to the masseter, the temporalis, the base of the skull, or the temporomandibular joint (TMJ) <i>or</i></li> <li>● associated with insidious onset of emotional stress or trauma or with direct physical trauma <i>or</i></li> <li>● brought on by nodding the head or turning it from side to side <i>or</i></li> <li>● worse after meals and at the end of the day</li> </ul> jaw pain or difficulty in chewing, yawning, or opening the mouth wide occupational activities that may stress the TMJ, the muscles of mastication, or the cervical spine	masticatory muscle fatigue.*
any of the following symptoms, when the patient experiences them in association with arising: discomfort in the jaw or TMJ, headaches, or a sensation of loose or painful teeth	nocturnal teeth grinding or clenching or poor sleeping posture.
a dull, aching, or throbbing pain in the angle and base of the mandible, with a family history of cardiovascular disease	referred pain from angina or cardiac infarction.
facial pain that is obscure in character or location	atypical facial neuralgia.
morning jaw stiffness that subsides with less than half an hour of jaw use, with evidence of rheumatoid arthritis in joints other than the TMJ	rheumatoid arthritis of the TMJ.
*If more benign causes have been ruled out, consider osteoarthritis as an explanation for pain or stiffness that increases with jaw use.	

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## Temporomandibular disorders



**Occlusal trauma** (arrow) can subject a tooth to damaging tension and pressure, with consequent tenderness in the periodontium.

gests that masticatory muscle spasm can refer pain to specific sites.\* Statistically significant relationships have been found between headaches and external pterygoid muscle tenderness; between aching, stiffness, or tingling in the ear and internal pterygoid muscle tenderness; and between sinus pain and tenderness in temporal and internal pterygoid muscles.

» *An ear disorder* Pain in the jaw, the back of the neck, or the temples may stem from an ear disorder. Check the ear canals and tympanic membranes for inflammation or infection.

» *Migraine* Classic migraine and cluster headaches can cause pain in the jaw and cheek, although it is usually felt in the or-

\*Campbell CD, Loft GH, Davis H, et al: TMJ symptoms and referred pain patterns. *J Prosthet Dent* 1982;47:430-3.

bital, parietal, and temporal regions. Expect a description of either throbbing pain or steady ache that lasts from a few hours to a day or two.

» *Temporal arteritis* This disorder affects men over age 50 almost exclusively; it is marked by a distinct onset of lateral head pain and by tenderness or a burning sensation over the lateral neck muscles and blood vessels. The pain is constant and becomes progressively more severe. It occasionally refers pain to the jaw and posterior neck.

» *Glaucoma* More rarely, glaucoma and other eye disorders may produce pain in the jaw, cheek, or teeth.

### EXPRESS STOP

**Joint inflammation: Synovitis, rheumatoid arthritis (RA), and osteoarthritis (OA) are the most common inflammatory disorders affecting the temporomandibular joint (TMJ). Synovitis is associated with tenderness over the joint, and—when accompanying RA—joint stiffness that abates with jaw movement. It responds to corticosteroid injections. Discomfort from OA will not lessen with movement. Imaging procedures will usually reveal erosion of the TMJ structures with arthritis.**

Of the common inflammatory disorders of the temporomandibular joint (TMJ), synovitis tends to produce the mildest symptoms; it is often associated with chronic trauma to the joint and with certain systemic diseases. Most commonly, you'll find it as a complication of osteoarthritis (OA) or of adult rheumatoid arthritis (RA). Occasionally it accompanies juvenile RA. Mumps, measles, and infectious mononucleosis can also result in TMJ synovitis.

Although it is difficult to diagnose, sus-

pect synovitis when you find tenderness on palpation of the TMJ posteriorly, from the ear canal (see "Pacing the physical exam," page 118), but there is no evidence of arthritis. You will also find tenderness on palpation of the lateral joint, just anterior to the tragus, where you feel a slight depression.

When you suspect an arthritic inflammation, keep in mind that the time of day when jaw dysfunction is worst can help you narrow the diagnosis. If, in the morning on arising, the patient's jaw stiffness abates in less than a half hour of jaw use, and you find evidence elsewhere for RA, suspect RA, usually accompanied by synovitis. Keep in mind that RA usually affects the TMJ *after* involvement of the fingers, wrists, and weight-bearing joints. Expect

this involvement in about half your patients with RA.\*

If the patient has no TMJ stiffness on arising, but increasing stiffness with use, suspect OA in the absence of evidence for more benign sources of pain. In the early stages of OA, stiffness disappears with rest but reappears with fatigue, and often at the end of the day. When present, joint noise will usually be a grinding rather than a clicking.

If, in the absence of arthritis, you consider that the patient has synovitis, first try conservative therapies for several weeks—application of moist heat to the TMJ, a soft diet, use of a bite plate or

\*Ericson S, Lundberg M: Alterations in the temporomandibular joint at various stages of rheumatoid arthritis. *Acta Rheum Scand* 1967;13:257-74.

## American Dental Association guidelines for diagnosing temporomandibular disorders

At a June, 1982, conference on temporomandibular disorders, the American Dental Association, the country's largest dental group, assembled the following diagnostic guidelines:\*

➤ The use of radiographs to assess joint spaces has not been shown to be a reliable diagnostic procedure. Radiographs should be reserved for patients with suspected pathologic conditions.

➤ Arthrography of the temporomandibular joint is not recommended as a routine diagnostic procedure to assess internal joint derangement. Reserve it for patients who have not profited from nonsurgical therapy of an adequate duration and who contemplate surgery.

\*Report of the President's Conference on the Examination, Diagnosis, and Management of Temporomandibular Disorders, Association reports. *J Am Dent Assoc* 1983;106:75-9.

➤ Although psychological factors are suspected to be involved in some temporomandibular disorders, there is no evidence to support the use of psychological testing (Minnesota Multiphasic Personality Inventory, anxiety scales, and life event scales) in diagnosing temporomandibular disorders.

➤ The scientific literature has not shown that malocclusion causes temporomandibular disorders. Clinical data show that the two conditions often coexist, although the nature of the relationship is unclear.

➤ Scientific studies have not supported applied kinesiology as a reliable indicator of jaw dysfunction, for establishing proper jaw position, or for providing useful information on the patient's systemic health.

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Before prescribing, please consult complete product information, a summary of which follows:

**Indications:** Effective in all types of insomnia characterized by difficulty in falling asleep, frequent nocturnal awakenings and/or early morning awakening; in patients with recurring insomnia or poor sleeping habits; in acute or chronic medical situations requiring restful sleep. Objective sleep laboratory data have shown effectiveness for at least 28 consecutive nights of administration. Since insomnia is often transient and intermittent, prolonged administration is generally not necessary or recommended. Repeated therapy should only be undertaken with appropriate patient evaluation.

**Contraindications:** Known hypersensitivity to flurazepam HCl; pregnancy. Benzodiazepines may cause fetal damage when administered during pregnancy. Several studies suggest an increased risk of congenital malformations associated with benzodiazepine use during the first trimester. Warn patients of the potential risks to the fetus should the possibility of becoming pregnant exist while receiving flurazepam. Instruct patient to discontinue drug prior to becoming pregnant. Consider the possibility of pregnancy prior to instituting therapy.

**Warnings:** Caution patients about possible combined effects with alcohol and other CNS depressants. An additive effect may occur if alcohol is consumed the day following use for nighttime sedation. This potential may exist for several days following discontinuation. Caution against hazardous occupations requiring complete mental alertness (e.g., operating machinery, driving). Potential impairment of performance of such activities may occur the day following ingestion. Not recommended for use in persons under 15 years of age. Though physical and psychological dependence have not been reported on recommended doses, abrupt discontinuation should be avoided with gradual tapering of dosage for those patients on medication for a prolonged period of time. Use caution in administering to addiction-prone individuals or those who might increase dosage.

**Precautions:** In elderly and debilitated patients, it is recommended that the dosage be limited to 15 mg to reduce risk of oversedation, dizziness, confusion and/or ataxia. Consider potential additive effects with other hypnotics or CNS depressants. Employ usual precautions in severely depressed patients, or in those with latent depression or suicidal tendencies, or in those with impaired renal or hepatic function.

**Adverse Reactions:** Dizziness, drowsiness, lightheadedness, staggering, ataxia and falling have occurred, particularly in elderly or debilitated patients. Severe sedation, lethargy, disorientation and coma, probably indicative of drug intolerance or overdosage, have been reported. Also reported: headache, heartburn, upset stomach, nausea, vomiting, diarrhea, constipation, GI pain, nervousness, talkativeness, apprehension, irritability, weakness, palpitations, chest pains, body and joint pains and GU complaints. There have also been rare occurrences of leukopenia, granulocytopenia, sweating, flushes, difficulty in focusing, blurred vision, burning eyes, faintness, hypotension, shortness of breath, pruritus, skin rash, dry mouth, bitter taste, excessive salivation, anorexia, euphoria, depression, slurred speech, confusion, restlessness, hallucinations, and elevated SGOT, SGPT, total and direct bilirubins, and alkaline phosphatase; and paradoxical reactions, e.g., excitement, stimulation and hyperactivity.

**Dosage:** Individualize for maximum beneficial effect.

**Adults:** 30 mg usual dosage; 15 mg may suffice in some patients. **Elderly or debilitated patients:** 15 mg recommended initially until response is determined.

**Supplied:** Capsules containing 15 mg or 30 mg flurazepam HCl.



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night guard, and, when masticatory muscle spasm is present, isotonic exercise to break the spasm. These therapies should bring relief if the trouble is synovitis. If these therapies are unsuccessful, consider injecting the joint with corticosteroids.\*

In making the diagnosis, several imaging procedures may be helpful, including panoramic X-rays, transcranial X-rays, and CT scans. Reserve the last for patients who are most difficult to treat or who are in poor health.

In severe synovitis or arthritis, X-rays and scans will reveal some erosion of the temporal bone, the articular tubercle, and the condyle. In milder cases of synovitis, imaging procedures are not always diagnostic. A CT scan will show a narrowing of the joint space, increased radio-opacity, osteophytes, and condensation of the subchondral bone.

X-rays show the same kind of structural erosion in OA as in RA, but only after about 30 percent of the bone has been destroyed. In more advanced RA cases, look for an open anterior bite and overbite as evidence of condylar and temporal bone recession.

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EXPRESS STOP

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**Structural joint disorders:** If you've ruled out an organic temporomandibular joint (TMJ) disorder, suspect a displacement of the articular disk (meniscus), the most common structural disorder; it's nearly always associated with an opening and closing click and tenderness over the TMJ. Coordinate the radiographic workup with a dentist. The use of arthrography remains controversial, but it can be helpful in determining the need for surgery.

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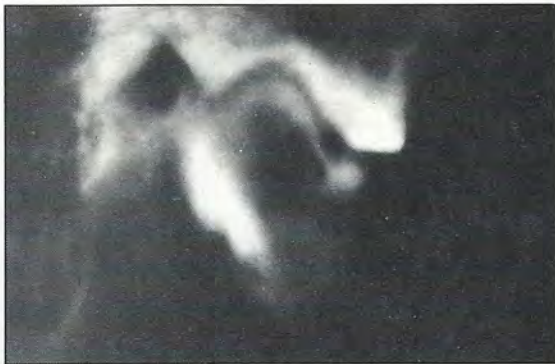
If failure of noninvasive therapy for arthritis or synovitis has ruled out organic disorders of the temporomandibular joint (TMJ) but the patient still has pain, joint noise, limited range of jaw motion or a locking jaw, suspect a derangement of the articular disk (meniscus).

Anterior displacement of the disk on jaw opening is the most common structural dis-

order; the second is subluxation of the TMJ, which you can sometimes feel by palpating over the joint on opening of the mouth.

Displacement of the disk is nearly always associated with tenderness over the TMJ and clicking, crepitus, or locking of the joint. It is thought that the disk can become displaced by one or a combination of factors that stretch its medial and lateral collateral ligaments: chronic microtrauma from masticatory muscle spasms, acute

\*A forthcoming *Patient Care* article will discuss these and other aspects of the treatment of temporomandibular disorders.

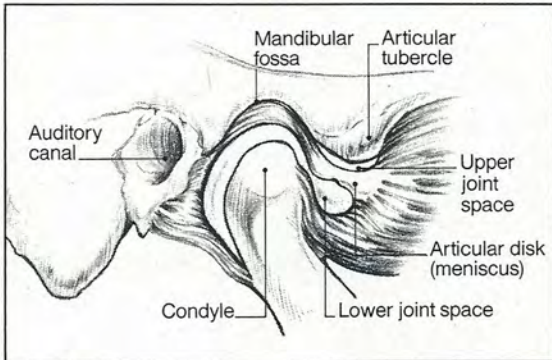


1a

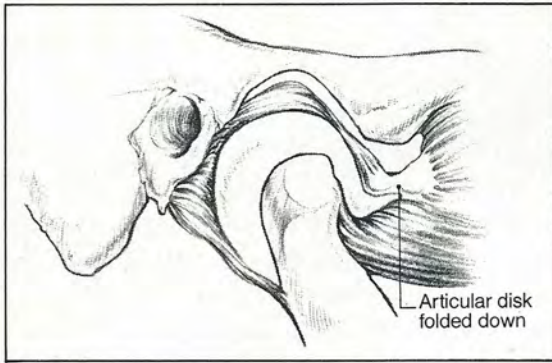


2a

Temporomandibular joint arthrograms can reveal the condition and position of the joint's soft tissue. Here, arthrograms show anterior displacement of the articular disk (meniscus) with the mouth closed (1a) and partially



1b



2b

open (2a). As the artist's renderings make clear (1b, 2b), the action of the condyle on opening folds the articular disk downward and causes it to be displaced even further anteriorly.



## Temporomandibular disorders

trauma (such as a blow to the jaw), malocclusion that stresses the joint, stressful oral habits, or congenital abnormality of joint structures.

To help confirm your suspicion of a structural disorder, look to radiographic studies. While they will not help in identifying disk problems, they can show the condition of the bony surfaces. You can coordinate the radiographic workup with—or delegate it to—a dentist. The American Dental Association guidelines suggest transcranial, transpharyngeal, or panoramic views for the initial studies and CT scans for patients in whom the first procedures indicate TMJ abnormality. CT scanning costs about 40 percent more than a conventional X-ray series, but it exposes the patient to about half the radiation.

Since the mid-1970s, the use of arthrography to diagnose the condition and reveal the position of the disk has grown as much in popularity as in controversy. Conservative oral surgeons believe its use should be restricted to preoperative diagnostics. Others regard it as the best tool for imaging the relationship of the joint's hard and soft tissues, and consider it essential in determining the need for surgery. Still others, invoking the uncertainty principle, claim that injection of an anesthetic and an arthrographic fluid alters the relationship of the fossa, disk, and condyle.

The procedure takes about a half hour and involves an injection of local anesthetic followed by injection of water-soluble, iodinated radiographic contrast material. In all, up to 1.3 ml of fluid is injected into the joint space.

Inform the patient who will undergo the procedure that it may alter her bite for a day or two and cause mild-to-moderate discomfort for a few days and tenderness for up to two weeks.

For some patients, such as the elderly, the frail, or those who have suffered recent myocardial infarctions, oral and maxillofacial surgeons will often choose CT scans rather than TMJ arthrography. Generally, CT scans cost about the same as arthrography. □

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### Coming up in *Patient Care*

Watch for a companion piece to the accompanying article, which will present a plan for treating temporomandibular disorders, covering the spectrum of therapy from hot packs and exercises through articular disk surgery.