

Diagnosis of TMD and Associated Head Pain

A Peer-Reviewed Publication
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Educational Objectives

1. Understand the path of nociception and the role of the central nervous system
2. Understand macrotrauma and microtrauma and the mechanism of destruction
3. Understand how to differentiate between headaches of TMD and non-TMD origin, and know when to refer patients
4. Understand how to diagnose intra-capsular pathology

Introduction

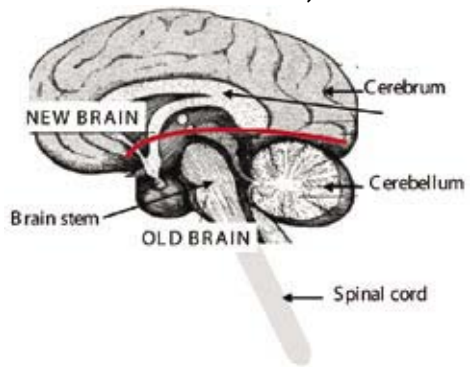
A good diagnosis requires an understanding of the symptoms of TM dysfunction and associated head pain, and a thorough clinical examination. In order to understand the symptoms and their severity, as well as the factors that must be included in a differential diagnosis, it is necessary to understand how the TMJ and the central nervous system (CNS) interact in response to noxious stimuli of the TMJ. Headaches are one of the more common symptoms of TMD but are also common occurrences for other reasons. Differential diagnosis of headaches of TMJ and non-TMJ origin is critical for correct treatment and referral of patients for treatment if the headaches are not related to TMD.

The inter-relationship between the TMJ and CNS

The TMJ is a small joint that can produce dramatic symptoms that in some cases result in a complete disruption of quality of life. To understand why, it is necessary to understand the inter-relationship of the CNS, the TMJ, and tissue destruction.

The CNS comprises the cerebrum, cerebellum, diencephalon (thalamus, hypothalamus, subthalamus, limbic system), brain stem, and spinal cord. The cerebrum is the evolved (new) somatic, or conscious, brain – what we use to think about what we want to do. The brain stem is the primitive (old) brain that controls automatic, or autonomic, functions – such as breathing, heart rate, digestion, and response to stress.

The central nervous system



A disproportionate amount of the brain is devoted to the head and oral cavity. An injury to the TM joints has a much more significant impact on the nervous system than an ankle or knee injury.

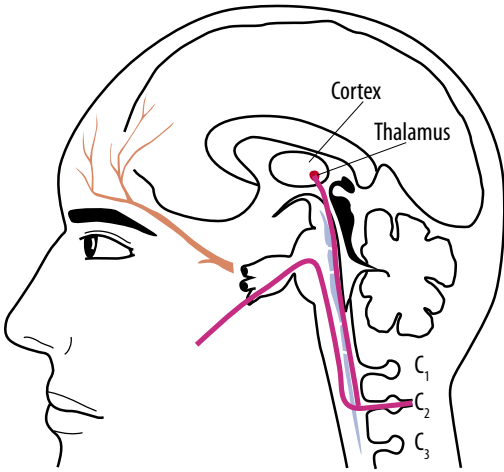
Pain and temperature, proprioception, and light touch are perceived in the somatosensory, or parietal, lobe of the brain. That is where a toothache or jaw joint, ankle, or back pain is interpreted.

The path of nociception

Nociception involves the transmission of a noxious stimulus from a site in the body to the brain. For the TMJ, the pathway leads to the brain's somatosensory cortex, where the stimulus is perceived as pain. Inflammatory neuropeptides (substance P, CGRP, bradykinins) resulting from tissue damage travel up the first nerve/neuron (mandibular branch V3 of the trigeminal nerve). They then travel down the brain stem to where the cervical spine synapses with the second-order neuron in the most inferior portion of the trigeminal spinal tract nucleus before immediately crossing over and ascending to the thalamus, where it synapses with a third-order neuron and ascends to the somatosensory cortex. At the somatosensory cortex, the stimulus is interpreted as pain. *Thus, pain in a tooth or a jaw joint travels down into a patient's neck before it ascends to the brain.*

Diagnosis of head pain is difficult because sensory fibers of the cervical spine as well as branches of the facial nerve, glossopharyngeal nerve, and vagus nerve all commingle with the fibers of the trigeminal spinal tract nucleus. Dysfunction in the cervical spine can produce head pain.

Noxious sensory transmission



In order to treat a patient, a differential and definitive diagnosis must first be made. The American Medical Association has a list of codes that are accepted for submission of treatment claims, with appropriate diagnosis.

Headaches

The prevalence of headaches in the U.S. is overwhelming – 78 percent of adult women and 68 percent of adult men suffer from headaches.⁴ Onset of headache is low after middle age.

Classification of headaches

Headaches are classified as primary or secondary.

Primary headaches are idiopathic (disease of unknown cause), and include migraine, tension-type, and cluster headaches. They are categorized by frequency, location, duration, a person’s response, and the medication that relieves the headache.

It is likely that most primary headaches are the result of skeletal and muscular dysfunctions (spinal or TMJ), medications (producing rebound headaches and/or increasing para-functional activity – such as SSRI anti-depressants), and trauma.

Headaches in the latter part of the day (occipital and frontal) may be the result of skeletal instability and often cervical as a result of stabilizing the other joints.

Temporal headaches may be due to clenching or grinding. Try to determine what the source of the para-functional activity is – for example, it could be pain from a different location (such as a broken or arthritic hip), due to a compromised airway, or due to anxiety.

Secondary headaches are organic headaches symptomatic of an underlying cause such as a brain tumor or a hemorrhage. It is likely that there would be some type

of motor or sensory deficit prior to a person suffering a headache. Fortunately, headaches are more likely to be of primary origin.

If unilateral facial weakness occurs in combination with progressive hearing loss and/or tinnitus, the patient should be referred immediately to a neurologist. These signs and symptoms may be due to an acoustic neuroma (also called a neurinoma or vestibular schwannoma), with compression of the facial and vestibulocochlear nerves. Acoustic neuromas are benign and usually grow very slowly over a period of many years.

Greater and lesser occipital neuritis or neuralgia

These are frequent sources of base-of-skull and frontal head pain. These nerves originate from the cervical vertebrae C2 and C3 and innervate the back of the head (occipital), side of the head (temporal), and top of the head (parietal). These nerves are often trapped as they travel through the extensor muscles (semi-spinalis capitus and splenius capitus) at the base of the skull. Forward head posture results in increased strain on the tendons of these muscles that eventually entraps these nerves. Nerve entrapment may also be the result of ligament laxity due to acceleration – deceleration trauma (whiplash).

Nerve branches and anastomoses



Postural Influences on Headaches

Patients with chronic forward head posture are predisposed to headaches induced by greater and lesser occipital nerve entrapment. They are also predisposed to headaches and TMDs due to the increased load on the cervical spine as a result of forward head posture.

Forward head posture



Image courtesy of Dick Greenan, Imaging Systems, Inc.

Symptoms include occipital pain, which may or may not be unilateral; pain radiating from the occiput in and through the parietal and temporal regions to the anterior temporal, zygomatic, and frontal portions of the head; pain and/or pressure behind the ipsilateral eye; nausea when pain is severe; and pain radiating into the ipsilateral ear, shoulder, and at times, the arm.

Patient Information and Diagnosis

Important directions and questions to ask patients during the clinical examination and diagnosis include:

1. Point with one finger to where you have head pain.
2. At what time of day do you have headaches?
3. Do you wake up with headaches?
4. Do the headaches follow an activity (such as long hours at the computer)?
5. Do you have any ringing in your ears or hearing loss?

Patients will often complain of “inside of the head” headaches and be able to differentiate those from headaches of extra-cranial origin. Red flags that are of concern with respect to headaches include:

1. Late onset (older than age 50), especially in a patient who never or rarely had headaches
2. Abrupt onset of new or different severe headache
3. “Worst” headache ever
4. Progressive worsening over days or weeks
5. Precipitated by exertion (exercise, etc.)
6. HA and general illness
7. HA awakening from sleep
8. HA and abnormal neurological exam

Selection and Referral of Headache Patients

Patients complaining of “inside of the head” headaches should be immediately referred to a neurologist. Vascular headaches such as migraine, which are idiopathic (of unknown origin). It is headaches of extra-cranial origin that we can treat with orthopedics (skeletal asymmetries) and physical therapy.

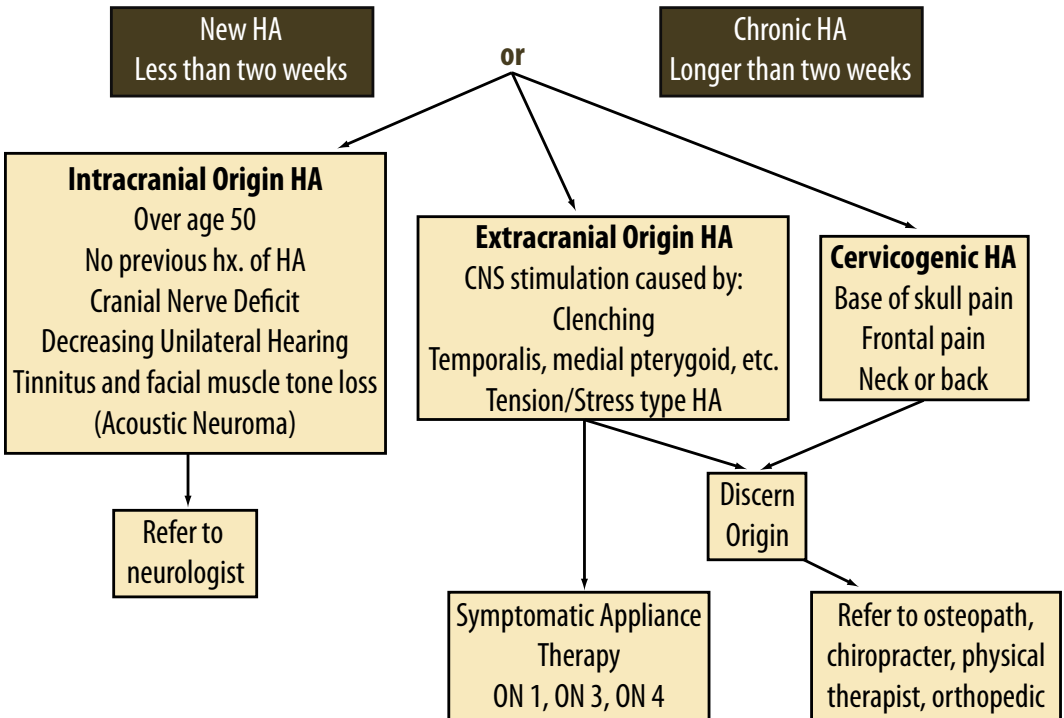
The first step in determining if the patient needs to be referred or can be treated with oral appliances is whether the headache is new or chronic. The second and crucial step, using data from the full clinical examination and patient information, is to consider the age of the patient, and where the headaches emanate from.

- Patients over age 50, with no history of headaches, and with cranial nerves affected should be referred to a neurologist.
- Patients with temporal or tension type headaches will typically have tense TMJ muscles when palpated during the examination (elevator, masseter, temporalis, medial pterygoid). *These patients can be treated with oral appliances.*
- Patients with headaches emanating from the cervical base-of-skull region or frontal region should be referred to a specialist. *These patients may also benefit from oral appliance therapy.*

Differential Diagnosis of TMDs

A differential diagnosis must first be made between disease of intracapsular origin (TMD) and extracapsular origin (muscle). In order to differentiate between these, the clinician must consider history, mandibular interference and restriction, and joint loading.

Decision tree: Treatment or Referral of Headaches (HA)



Typical Signs and Symptoms

	Intra-capsular pathology	Extra-capsular pathology
History of trauma	Possible correlation	Possible correlation
Mandibular restriction	<ul style="list-style-type: none"> • Common • Cannot open wider with mild passive force • “hard end feel” 	<ul style="list-style-type: none"> • Common • Opens slightly wider with mild passive force (this stretches the muscle) • “soft end feel”
Mandibular interference		
Mandibular deviation	<ul style="list-style-type: none"> • Limited contralateral eccentric movement • Ipsilateral normal • Deviation during opening possible 	
Mandibular deflection	Mandible deflects to the involved joint during protrusion; restricted during contralateral movement in early pathology	No deflection on protrusion
Joint loading	Pain with loading when condyles are positioned in a musculoskeletally stable position	No pain with loading when condyles are positioned in a musculoskeletally stable position

Once it has been established that the problem is of intracapsular origin, it remains to diagnose the intracapsular problem. Problems include: inflammatory disorders, derangements (disc displacement, disc dislocation with reduction, disc dislocation without reduction). Signs and symptoms of these vary by disorder.

Intracapsular differential diagnosis

Intracapsular inflammatory disorders

Inflammatory disorders include capsulitis, synovitis, retrodiscitis as well as arthritis.

Capsulitis (local inflammation of the outer fibrous layer of the joint capsule) and synovitis (inflammation of the inner synovial lining) are clinically the same. The symptoms are pain at rest that is intensified during function and when the joint is loaded. Secondly, movement may be limited. They are identified by palpation. If it is painful to touch the lateral capsule, the diagnosis is capsulitis. Swelling of the joint may also be present. There is usually no evidence of osseous structural changes radiographically. MRIs may show evidence of an inflammatory edema. Capsulitis and synovitis may

be associated with other coexisting TMJ disorders such as a disc displacement, hypermobility, or dislocation. Retro-discitis has the same signs and symptoms, and is inflammation of the posterior joint space.

Intracapsular derangements

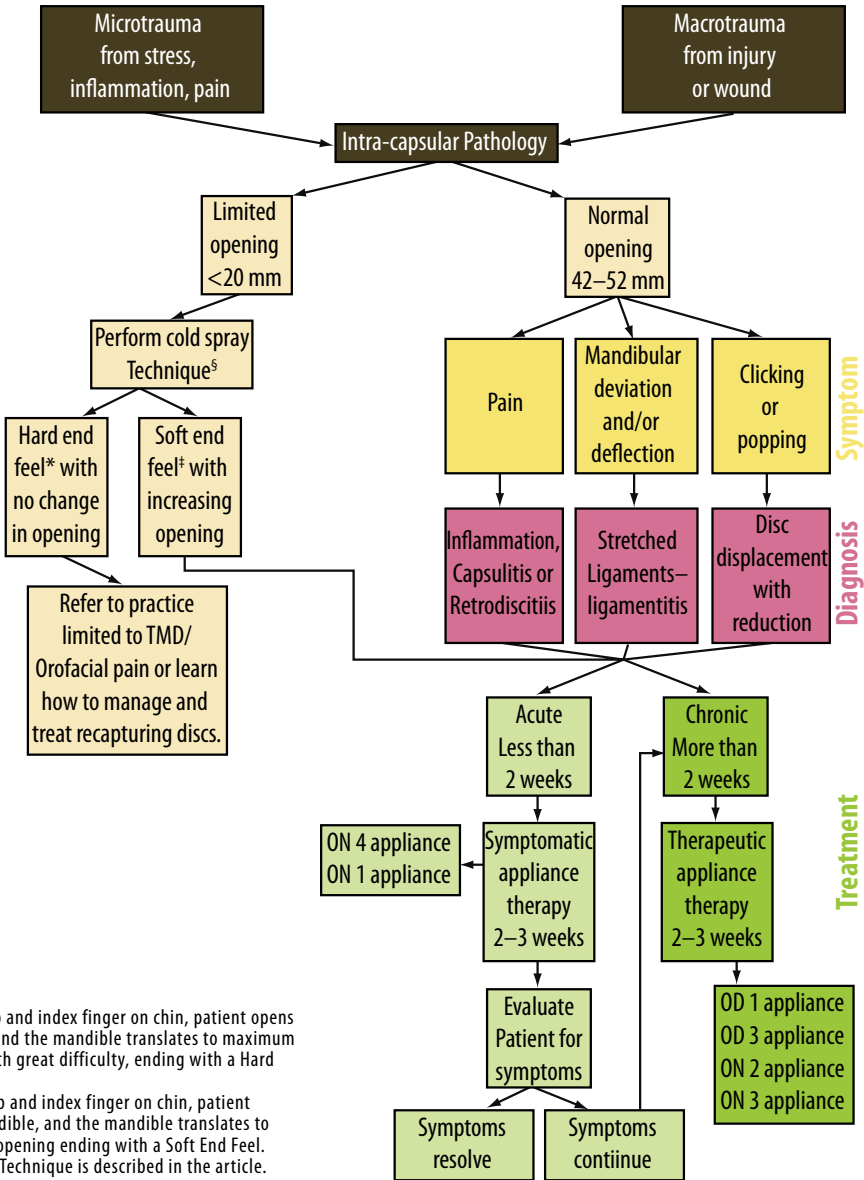
These are the result of micro-/macro-trauma and usually involve the onset of joint noises. They include disc displacement, and disc dislocation with or without reduction. *Patients with disc dislocation with reduction can manipulate their jaw to reposition the condyles onto the posterior border of the discs. Without reduction means that forward translation of the condyles forces the discs in front of the condyles.*

A differential diagnosis of these conditions must consider joint noises and mandibular ranges of movement. It is important to note that chronic disc dislocation without reduction may be difficult to diagnose and in some cases an MRI is the only way to diagnose this condition.

Degenerative joint disease in the early stages will result in a scratchy sound (crepitus). In a more advanced stage, this continues and osseous remodeling is also evident.

	Joint noises	Mandibular movement
Disc displacement	• Clicking during opening and closing	• Normal range of movement
Disc dislocation with reduction	• May be popping on opening and closing (due to recapturing of the disc)	<ul style="list-style-type: none"> • Locking • Limited range of opening • Noticeable deviation
Disc dislocation without reduction	• Quiet	• Deflects to involved joint

Decision tree: Intra-capsular pathology



* With thumb and index finger on chin, patient opens mandible, and the mandible translates to maximum opening with great difficulty, ending with a Hard End Feel.

‡ With thumb and index finger on chin, patient opens mandible, and the mandible translates to maximum opening ending with a Soft End Feel.

§ Cold Spray Technique is described in the article.

Cold Spraying Technique

The cold spray technique is used to aid in the diagnosis of patients presenting with <20 mm of opening as noted in the Intra-Capsular pathology decision tree. The spray is applied in parallel sweeps only in the direction of the muscle or referred pain. Only spray 2 to 3 times before rewarming. The spray is most effective when directed at an acute angle to the skin (approximately 30%), not perpendicular. The bottle is held about 30 cm (12 inches) from the skin. The rationale for performing vapocooling and icing include: a sudden drop in temperature causes additional tactile stimulation; this input has an inhibitory effect on locally generated pain; reduces gamma efferent activity to the muscle spindle to reduce the reflex contraction and reduces tonus level of the muscle so that it can relax.

Products available for use as a cold spray include Gebauer's Fluoro-Ethyl, which is a nonflammable topical anesthetic skin refrigerant that medical professionals have known and trusted for generations. It is the coldest of Gebauer's skin refrigerants and comes

in a convenient aerosol spray can to anesthetize affected areas quickly and easily. Gebauer's INSTANT ICE® can also be used, but is not as cold. Instant Ice is a non-prescription, nonflammable topical skin refrigerant.

Cold Spray Technique



Selection and Referral of Patients

Depending upon the signs and symptoms, the patient can either be treated with oral appliances or referred to a specialist.

Patients with intra-capsular pathology who should be referred include:

- Patients with limited opening; with disc displacement, no reduction, bony or fibrous ankylosis. Less than two weeks duration
- Patients with limited opening that is chronic (over six months duration)

Patients who can be treated with oral appliances are:

- Patients with painful opening of less than two weeks duration
- Patients with painful normal opening (acute or chronic)
- Patients with mandibular deviation and clicking or popping noises in the joint (acute or chronic)

Summary

Following the clinical examination, a differential and definitive diagnosis are essential. Only after this has occurred is it possible to know which patients require a referral and which patients could be treated with an oral appliance and to proceed with therapy.

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Questions

1. One of the more common symptoms of TMD is _____.
 - a. Headaches
 - b. Thirst
 - c. Difficulties with vision
 - d. All of the above
2. An injury to the TMJ has a more significant impact on the nervous system than a knee injury.
 - a. True
 - b. False
3. _____ involves the transmission of a noxious stimulus from a site in the body to the brain.
 - a. Proprioception
 - b. Coriception
 - c. Nociception
 - d. None of the above
4. TMJ tissue damage results in the release of _____.
 - a. Inflammatory neuropeptides
 - b. Insulin
 - c. Prolactin
 - d. None of the above
5. Pain from a tooth travels _____ before ascending to the brain.
 - a. Down into a patient's neck
 - b. Across a patient's shoulders
 - c. Down to the spinal vertebrae
 - d. None of the above
6. All noxious stimuli go through _____.
 - a. The thalamus
 - b. The pons
 - c. The intercostal nerves
 - d. None of the above
7. Intra-capsular derangements of the TMJ can result from _____.
 - a. Macrotrauma
 - b. Microtrauma
 - c. a and b
 - d. None of the above
8. An intra-capsular derangement is _____.
 - a. Disc dislocation with reduction
 - b. Disc displacement
 - c. Disc dislocation without reduction
 - d. All of the above
9. Extra-capsular pathology results in mandibular deflection on protrusion.
 - a. True
 - b. False
10. Capsulitis and synovitis have the same clinical presentation.
 - a. True
 - b. False
11. Degenerative joint disease in the early stages will result in _____.
 - a. Clicking
 - b. Popping
 - c. A scratchy noise (crepitus)
 - d. All of the above
12. Local inflammation of the outer fibrous layer is _____.
 - a. Lateralitis
 - b. Capsulitis
 - c. Retrocapsulitis
 - d. Laterocapsitis
13. Local inflammation of the inner synovial lining is _____.
 - a. Retro-discitis
 - b. Capsulitis
 - c. Synovitis
 - d. None of the above
14. In some cases, _____ is the only way to diagnose chronic disc dislocation.
 - a. A panoramic radiograph
 - b. A joint vibration analysis
 - c. MRI
 - d. All of the above
15. A patient with normal opening that is painful, and that has had this problem for less than two weeks should _____.
 - a. Always be referred to an oral surgeon or osteopath
 - b. Be treated with surgery
 - c. Receive oral appliance therapy
 - d. None of the above
16. A patient with a primary headache should _____.
 - a. Be referred to a neurologist
 - b. Be referred to a physical therapist
 - c. Be considered for oral appliance therapy
 - d. None of the above
17. Temporal headaches may be due to _____.
 - a. Clenching
 - b. Grinding
 - c. a and b
 - d. Breathing
18. Disc displacement results in _____.
 - a. Clicking of the TMJ during opening
 - b. Clicking of the TMJ during closing
 - c. A normal range of movement
 - d. All of the above
19. The cold spray technique is used as a diagnostic aid in patients with limited opening.
 - a. True
 - b. False
20. Intra-capsular pathology results in the patient being able to open wider with mild passive force.
 - a. True
 - b. False

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Diagnosis of TMD and Associated Head Pain

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Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. How would you rate the objectives and educational methods?
 5 4 3 2 1 0
2. To what extent were the course objectives accomplished?
 5 4 3 2 1 0
3. Please rate the course content.
 5 4 3 2 1 0
4. Please rate the instructor's effectiveness.
 5 4 3 2 1 0
5. Was the overall administration of the course effective?
 5 4 3 2 1 0
6. How do you rate the author's grasp of the topic?
 5 4 3 2 1 0
7. Do you feel that the references were adequate?
 Yes No
8. Do you feel that the educational objectives were met?
 Yes No
9. If any of the continuing education questions were unclear or ambiguous, please list them.

10. Was there any subject matter you found confusing?
 Please describe.

11. Would you participate in a program similar to this one in the future on a different topic? Yes No
12. What additional continuing dental education topics would you like to see?

- | | | |
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| <ol style="list-style-type: none"> 1. ① ② ③ ④ 2. ① ② ③ ④ 3. ① ② ③ ④ 4. ① ② ③ ④ 5. ① ② ③ ④ 6. ① ② ③ ④ 7. ① ② ③ ④ 8. ① ② ③ ④ 9. ① ② ③ ④ 10. ① ② ③ ④ 11. ① ② ③ ④ 12. ① ② ③ ④ 13. ① ② ③ ④ 14. ① ② ③ ④ 15. ① ② ③ ④ | | <ol style="list-style-type: none"> 16. ① ② ③ ④ 17. ① ② ③ ④ 18. ① ② ③ ④ 19. ① ② ③ ④ 20. ① ② ③ ④ 21. ① ② ③ ④ 22. ① ② ③ ④ 23. ① ② ③ ④ 24. ① ② ③ ④ 25. ① ② ③ ④ 26. ① ② ③ ④ 27. ① ② ③ ④ 28. ① ② ③ ④ 29. ① ② ③ ④ 30. ① ② ③ ④ |
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