

## 7 Illustrations: Protocol for Calibrated Examination

### E1 Examiner Confirmation of Pain and Headache Location

#### Examiner Instructions of Locations for Pain Reporting



**Figure 1.** Examiner touches each area in turn (from left to right): temporalis, TMJ, masseter, and posterior and sub-mandibular areas. Both sides are touched at the same time, as illustrated. For the temporalis and masseter, the ventral aspect of the fingers contact the entire muscle.

#### Patient Pain Location Reporting

**Figure 2.** (left) Patient is instructed to point with one finger to all of the areas of pain.

(right) Sometimes the patient might use a full hand. Clarify if patient intended to point to the whole area.



#### Examiner Confirmation of Pain and Headache Locations

**Figure 3** (below right). The examiner touches the area(s) where the patient indicated experiencing pain in order to (1) confirm that the touched area is what the patient intended, and (2) identify simultaneously the structure (e.g., muscle, joint).

The left image identifies the TMJ and the right image identifies the masseter muscle. The center image illustrates finger placement for discriminating between muscle and joint. In this position, the patient is asked to clench the teeth—to confirm anatomical landmarks of a muscle, as well as to protrude the mandible—to confirm landmarks of the TMJ.



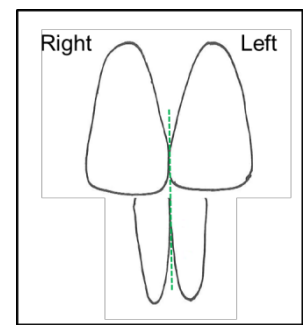
## **E2 Incisal Relationships**

### **Reference Lines**

**Figure 4.** Select the maxillary reference tooth. Draw a horizontal line on the facial surface of the opposing mandibular incisor, using the incisal edge of the maxillary incisor as the guide. Insure that the pencil mark is level with the maxillary incisal edge; holding the pencil at an angle to the patient's horizontal plane will cause the overbite line to be displaced.

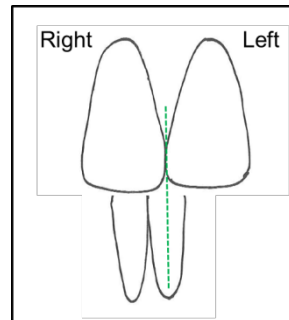


**Figure 5a.** (left) The mesial-incisal edge of the maxillary central incisor (US #8, FDI #11) is within 1.0 mm of being in line with the mandibular incisal midline; these midlines are acceptable landmarks for lateral excursive measurements.

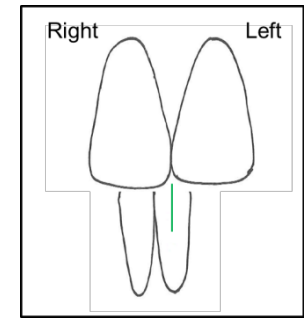


(right) Illustration of congruent midlines.

**Figure 5b.** (left) Mesial-incisal edge of the maxillary central incisor is more than 1.0mm away from the mandibular incisal midline.



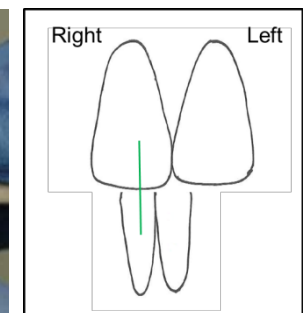
(right) A corresponding vertical line is drawn from the maxillary dental midline down the opposing mandibular incisor.



**Figure 6.** (top) Alternative method for creating midline reference lines: draw a vertical line across the face of the maxillary reference incisor and down onto the opposing mandibular incisor.



(bottom) Illustration of line drawn across center of maxillary central incisor, extending to the opposing mandibular incisor.



## Measurements

**Figure 7.** Extent of horizontal overlap is measured. Note that the ruler is contacting the mesial-distal center of the maxillary central incisor. If an incisor is rotated, as the maxillary central incisor is in this instance, the contact position with the incisor will influence the measured horizontal overlap.

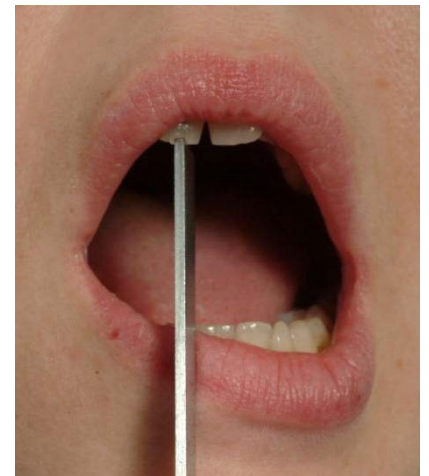


**Figure 8.** Extent of vertical overlap is measured. As shown, the tip of ruler is placed adjacent to the incisal edge, and the distance to the horizontal line is read. Alternatively, especially if the lower lip interferes with ruler placement, the ruler tip may be placed at the line, with the ruler extending toward the maxilla, and the distance to the mandibular incisal edge is read. For all measures, round down to the closest mm.

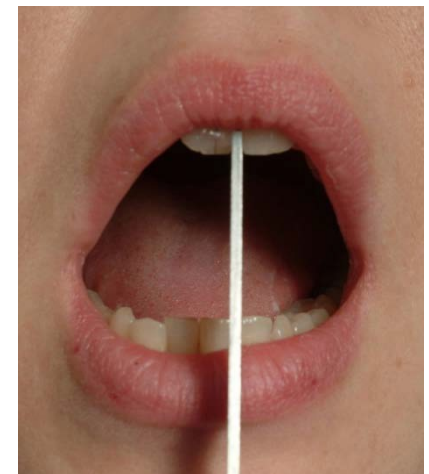


## E3 Opening Pattern (Supplemental)

**Figure 9.** (top) Opening pattern may be assessed with or without any reference lines. Illustrated is a ruler placed against the end of the maxillary central incisor; note that the edge of the ruler is about 2mm from the mesial incisal edge of the right central incisor. Because the lower lip deviated to the patient's left, it appears as though the mandible deviated to the left; however, inspection of the mandibular incisal midline reveals that that midline is also just to the patient's left of the ruler. Since the mandibular midline is within 2 mm of the maxillary midline and because the mandible opened along the path (not shown) illustrated by the ruler, this is a straight opening pattern. See illustrations in Figure 10 for further clarification. If the reference midline is an open incisal embrasure between two teeth (as shown here), placing the ruler against the incisal edge is a stable landmark compared to placing the ruler into the incisal embrasure.



(bottom) In this illustration, the ruler is now placed to the facial side of the incisal embrasure, but *not* in the embrasure between the two maxillary central incisors. Since the mandibular midline has moved more than 2mm to the patient's right during opening, this would be classified as an uncorrected deviation.

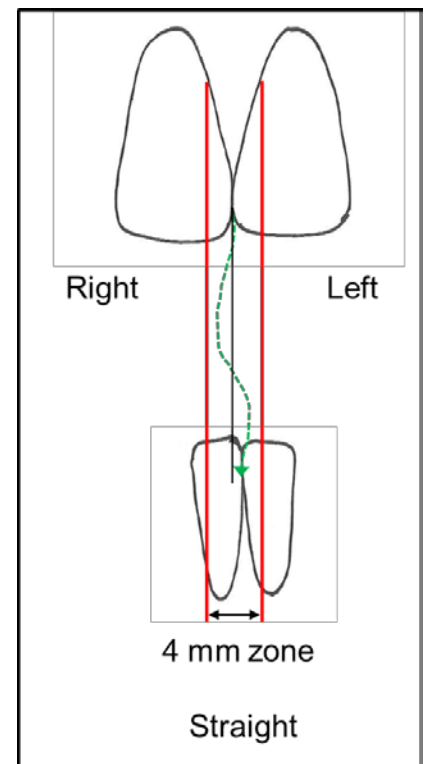
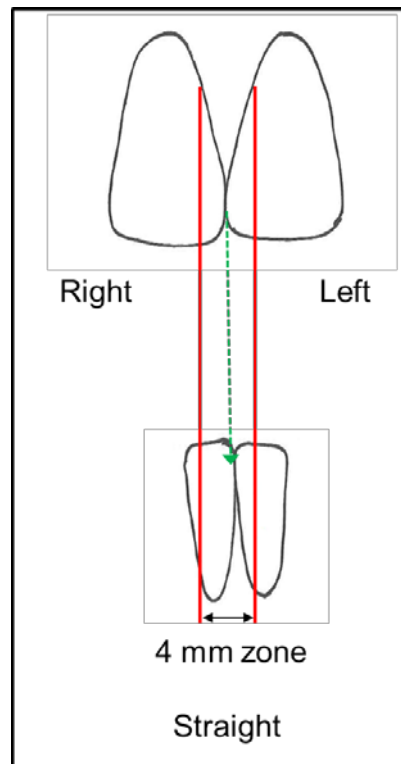


**Figure 10a.** Illustration of the 4 types of opening patterns.

(left) Straight opening; note that mandibular midline is not coincident with maxillary midline.

(right) Slight deviation in opening, but less than 2mm zone from the midline; this is recorded as straight.

**Legend.** Solid red line denotes the 2mm threshold on each of right and left sides from the midline, creating a middle 4mm wide zone. Dotted green line denotes path of mandibular movement. Black line denotes the sagittal midline, as would be visualized if a ruler were placed vertically as shown in Figure 9 (bottom).

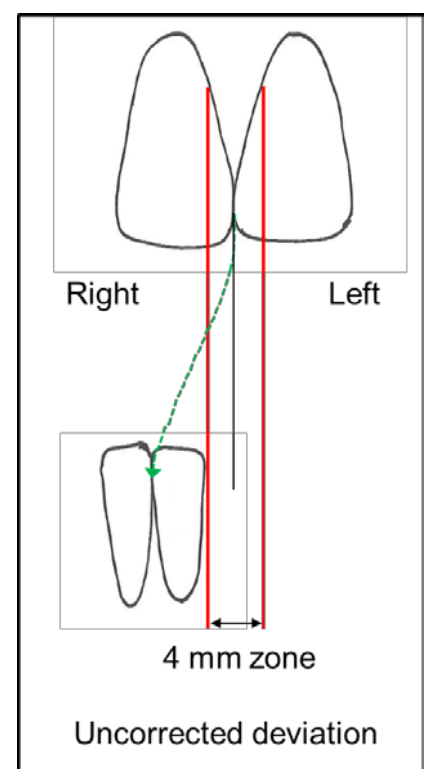
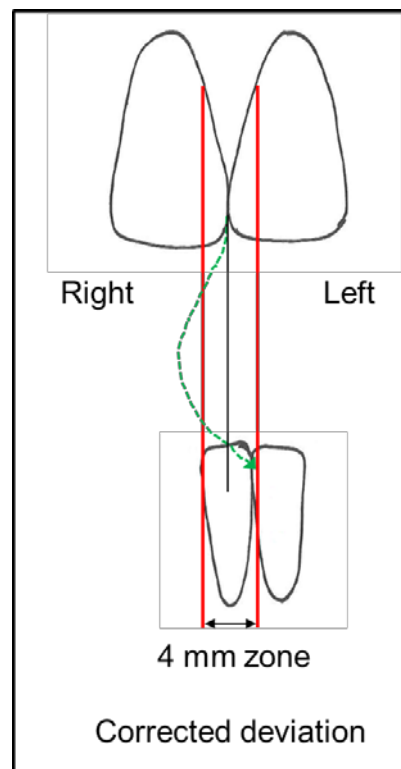


**Figure 10b.** Illustration of the 4 types of opening patterns (continued).

(left) Mandible deviates to the right side, more than 2mm from the midline, and returns to the midline zone (i.e., within the 4mm zone). This would be classified as an corrected deviation.

(right) Mandible deviates to the right side and does not return to the midline zone; this is classified as an uncorrected deviation. The side (whether to the right or left) to which the mandible deviates is also selected.

See Figure 10a for legend.



## **E4    Open Movements**

### **E4\_A    Pain Free Opening**

**Figure 11.** The tip of the ruler is placed against the incisal edge of the mandibular reference incisor, and the distance to the mesial-distal center of the edge of the maxillary central incisor is read. Round the value down to the nearest full mm.



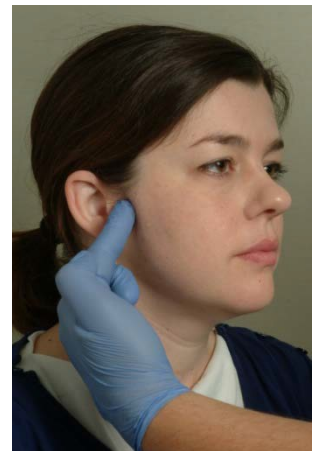
### **E4\_B    Maximum Unassisted Opening**

**Figure 12.** Tip of ruler is placed as before, and patient is asked to open as wide as possible, even if painful.



**Figure 13.** (left) Patient is asked to point to any area(s) of pain experienced with this movement.

(right) The examiner touches the indicated area to confirm underlying structure, and then asks if this pain is “familiar”.



**Figure 14.** (left) Pain that is provoked by a range of motion procedure is sometimes difficult for the patient to localize after returning the mandible to the closed position. In this instance, the examiner asked the patient to again open as wide as possible, even if painful, and the patient is then asked to point to any area of pain while the mandible is still in the maximally open position.

(right) With the mandible in the same position (i.e., maximally open), the examiner touches the indicated area to confirm underlying structure, and then asks if this pain is “familiar”.



#### **E4\_C Maximum Assisted Opening**

**Figure 15.** Examiner first places the ruler in position and after insuring that the patient opened to the same extent as during the prior Maximum Unassisted Opening, the fingers are placed in the scissors-position and the examiner then stretches the mouth further open, if possible.

(not illustrated) If patient requests examiner to stop, then **E4\_D Opening Terminated** is recorded as “yes”. Otherwise, it is recorded as “no”.



**Figure 16.** (left) Patient is asked to point to any area of pain experienced with this movement.

(right) Examiner touches area to confirm underlying structure, and then asks if this pain is “familiar”.



## **E5 Lateral & Protrusive Movements**

### **E5\_A Right Lateral Excursion**

**Figure 17.** Ruler is placed in horizontal position with tip at the mandibular midline reference position. Patient moves mandible to right while examiner retracts lips as necessary with other hand. The extent of movement is 5mm, reading from the mesial-incisal edge of the maxillary right central incisor.



**Figure 18.** Patient is asked to point to any area(s) of pain. As necessary, examiner touches area to confirm underlying structure, and then asks if this pain is “familiar”.



### **E5\_B Left Lateral Excursion**

**Figure 19.** Ruler is placed in horizontal position with tip at the maxillary midline reference position. In this instance, the ruler tip is about 1mm short of being in line with the reference position (i.e., mesial-incisal edge of the maxillary right central incisor), a common source of error with these measurements. Patient moves mandible to left while examiner retracts lips as necessary with other hand. The measured value at the mandibular incisal midline is not quite 6.0mm, so the recorded value would be 5 mm.



The pain location is investigated as described in Figure 18.

## E5\_C Protrusion



**Figure 20.** The ruler is placed in horizontal position with tip on the buccal surface of the maxillary reference tooth (as indicated by the vertical line in the center area of the incisor, which is partially visible in this image). Patient moves mandible in protrusive direction while examiner retracts lips as necessary with other hand.

The pain location is investigated as described in Figure 18.

(left) Ruler is held with face of the ruler directed upward; (right) ruler is held with face of the ruler directed to the side. In this situation, holding the ruler as shown in the left image is generally better than the position shown in the right image since the examiner can read downward from ruler to mandibular incisal edge.

## ALTERNATIVE MEASUREMENT METHOD FOR LATERAL EXCURSIONS

### E5\_A & B Right and Left Lateral Excursions

**Figure 21.** If the alternative vertical reference marks as shown in Figure 6 are used, then lateral excursions are measured as shown. In order to demonstrate the line markings on the mandibular incisors, the ruler is held further away (inferior) from the maxillary incisal edge than would be done in practice.

(top) Ruler is placed in horizontal position with tip at the mandibular midline reference position, as indicated by the vertical line on the mandibular incisor. Patient moves mandible to right while examiner retracts lips as necessary with other hand. The read value on the ruler, corresponding with the vertical reference line on the maxillary reference incisor, is 7mm.



(bottom) Ruler is placed in horizontal position with tip corresponding to the line on the maxillary reference incisor. Patient moves mandible to the left, examiner retracts lips as necessary, and the ruler is read. Although the line on the mandibular incisor is barely visible, the read value is 7mm.





## **E6 TMJ Noises During Open & Close Movements**



**Figure 22.** The TMJ may be examined in one of two ways. In the left and center illustrations, the examiner is standing off to the side in order to facilitate the photography.

(left) Examine each TMJ separately: the examiner places one fingertip on the skin overlying the right TMJ, and the other hand stabilizes the head.

(center) Examine each TMJ simultaneously: one fingertip from each hand is placed on the skin overlying the respective TMJs.

(right) While palpating the joint, the patient is asked to open and close. The left TMJ would be examined in the same manner.

## **E7 TMJ Noises During Lateral & Protrusive Movements**



**Figure 23.** As illustrated, the right TMJ is examined while the mandible is moved (left) to the right, (center) to the left, and (right) protrusively. Not shown is the same examination for the left TMJ.

## **E8 Joint Locking**

**There are no illustrations for this part of the examination protocol.**

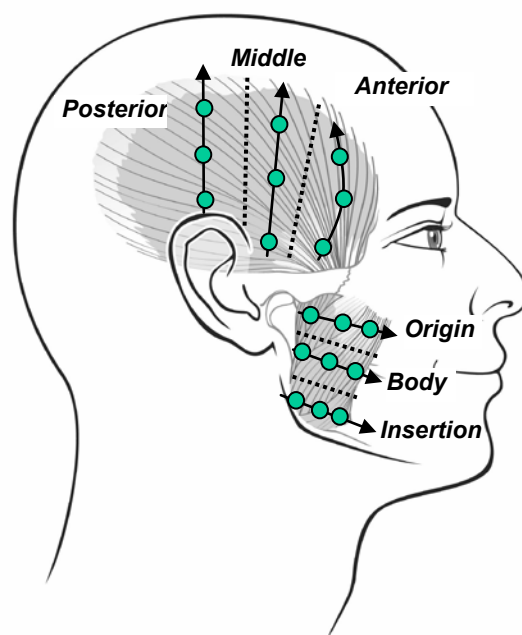
If no open or closed locking occurred during any part of the examination, then the examination form is marked to indicate that neither type of locking occurred. If locking occurred, again during any part of the examination, then on the examination form indicate when the locking occurred (during opening movement, or at maximal opening) as well as whether the patient reduced the lock(s) or the examiner assisted in reducing the lock..

## **E9 Muscle and TMJ Pain with Palpation**

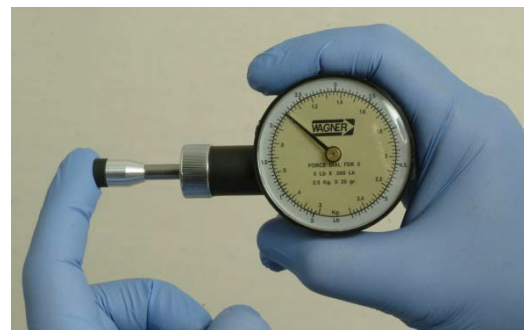
**Figure 24.** Extraoral masticatory muscles: temporalis and masseter. Illustration demonstrates palpation pathways for temporalis and masseter, and with three palpation areas per zone. Note that the anterior zone of the temporalis is slightly curved, corresponding to the outline of the muscle. The goal is to palpate each zone as fully as possible, so palpate a minimum of three areas within each zone using 1 kg of pressure.

The standard DC/TMD examination form denotes only a single recording field for each of masseter and temporalis (given that a diagnosis is muscle based, not muscle-zone based). The use of zones for palpation is recommended because such usage enhances systematic coverage of the muscle during the palpation examination.

Key: filled circle denotes one finger tip.



**Figure 25.** Finger pressure is calibrated (1.0 kg) using a simple hand-held algometer prior to palpation examination of the temporalis and masseter. Note that a single finger is calibrated, and that the palpating finger of each hand must be calibrated if using both hands during the examination.



### Temporalis (1 kg of pressure)

**Figure 26.** Orange areas illustrate the zones of palpation for the three areas of the temporalis: posterior, middle, and anterior.



**Figure 27.** Palpation sequence for the temporalis muscle. Note that the other hand stabilizes the head.

(left) Starting with the anterior zone (posterior to the bony margin of the anterior temporalis), the examiner starts at the area just above the zygomatic arch, as shown by the lowest filled circle in this zone as shown in Figure 24, and continues within the zone until the superior boundary of the muscle is reached. In this image, a middle area of the anterior zone is palpated.

(center) Middle zone (in front of the ear): the examiner starts just above the zygomatic arch, and continues until the superior boundary of the muscle is reached. The tendonous area immediately above the arch should also be included, as shown by the lowest filled circle in this zone as shown in Figure 24.

(right) Posterior zone (in line with the top of the ear): the examiner starts just above the ear corresponding to the lowest filled circle in this zone as shown in Figure 24, and continues until the superior boundary of the muscle is reached.

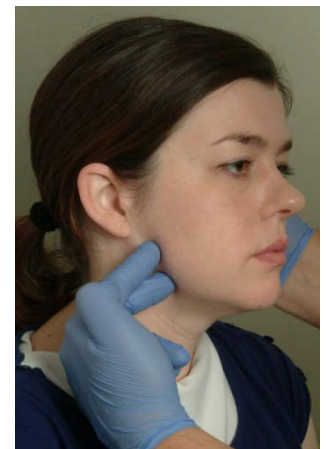
## Masseter (1 kg of palpation pressure)

**Figure 28.** Orange areas illustrate the zones of palpation for the three areas of the masseter: superior, middle, and inferior. Note that the superior zone begins just anterior to the condyle when the mandible is in the relaxed position.



**Figure 29.** Palpation sequence for the masseter muscle while the other hand stabilizes the mandible. (left) Origin zone (inferior to the bony margin of the zygomatic process): the examiner started at the area just anterior to the condyle, corresponding to the filled circle in this zone as shown in Figure 24. (center) Body zone (in front of ear lobe): start at the most posterior aspect of the muscle. (right) Insertion zone: start at the area superior and anterior to the mandibular angle. In each zone, the palpation continues until the anterior boundary of the muscle is reached.

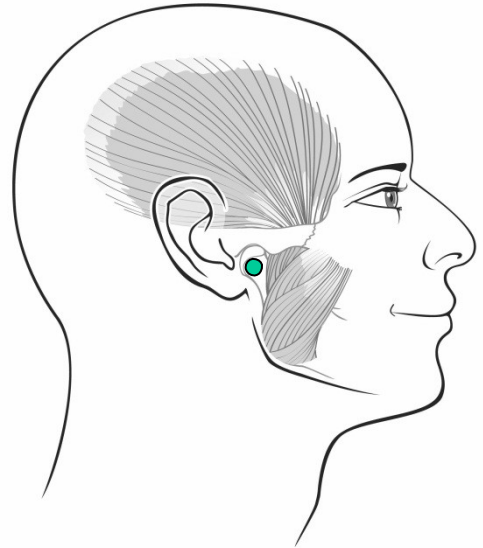
**Figure 30.** Alternative form of palpation for the insertion of the masseter muscle. The skin overlying the insertion area of the masseter often rolls when applying pressure in this area. The forefinger is being used for palpation, as shown in Figure 29 (right), while the middle finger is placed beneath the mandibular border and held in light but firm contact. While placing the middle finger, the skin is drawn downward, thus providing a firmer base for the forefinger to palpate the muscle and simultaneously providing better support for the palpating hand.



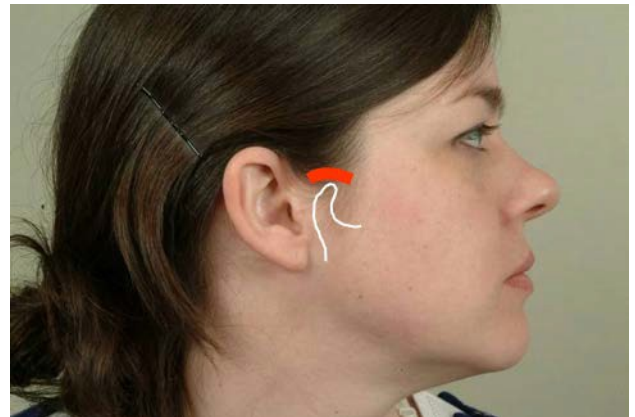
## Temporomandibular Joint

### TMJ lateral pole (0.5 kg of palpation pressure)

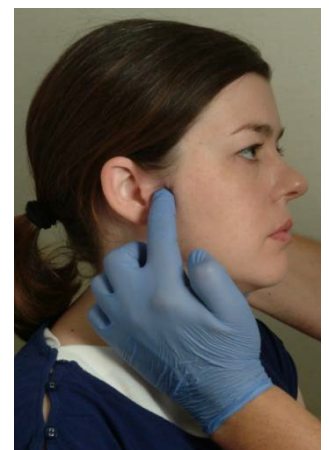
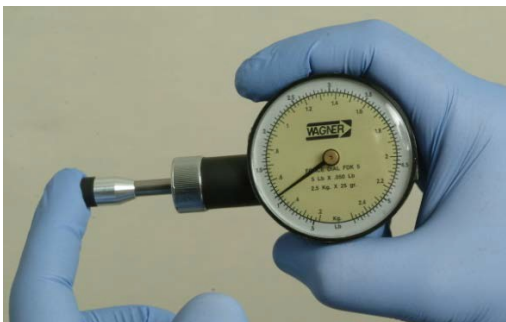
**Figure 32.** Target area for lateral pole palpation of the TMJ.



**Figure 33.** Anatomical landmarks relative to tragus of the ear, with teeth in lightly closed position.



**Figure 34.** One finger is used, and one joint is palpated at a time; the other hand is used to stabilize the head. Note that mouth remains closed. Use 0.5 kg.

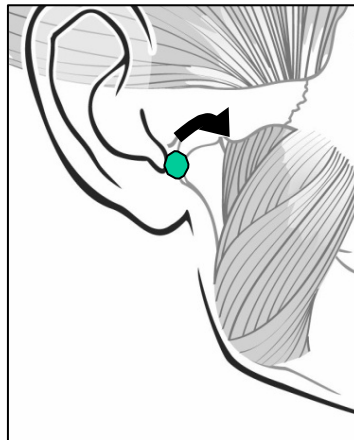


### Dynamic TMJ lateral pole palpation (1 kg of palpation pressure)

**Figure 35.** Condyle is protruded to a forward position (indicated by solid white solid line, as shown here), sufficient to allow access for palpation of the dorsal aspect of the condylar head. Dashed white line corresponds to closed condylar position.

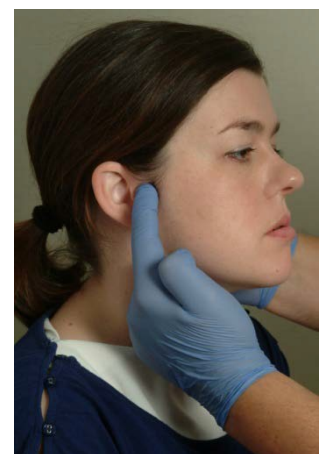
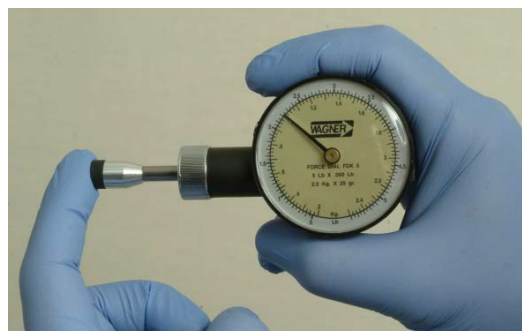


**Figure 36.** (left) The lateral pole is identified. The filled green dot indicates the posterior aspect of the lateral pole which is the starting point for the finger which is rolled first anteriorly and superiorly around the superior circumference of the lateral pole, as shown here. The condyle is shown in the closed position, and as the illustration indicates, it is difficult if not impossible to perform the palpation correctly in many individuals if the condyle is in the closed position; see Figure 35 for correct position of the condyle.



(right) Arrow demonstrates pathway of the palpating finger as it is moved completely around the lateral pole of the condyle while maintaining contact with the pole.

**Figure 37.** Photo shows placement of finger; photo also demonstrates that condyle is moved forward slightly via protrusion. See Figure 35 for further description of condylar position for this palpation procedure. Use 1.0 kg.

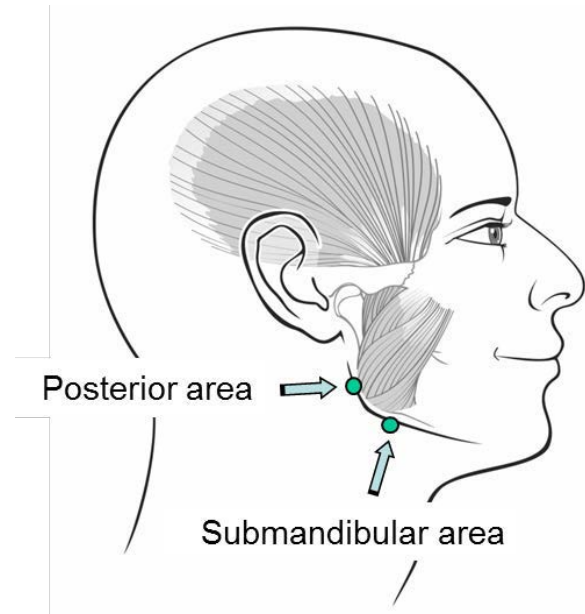


## **E10 Supplemental Muscles Palpation Areas (0.5 kg palpation pressure)**

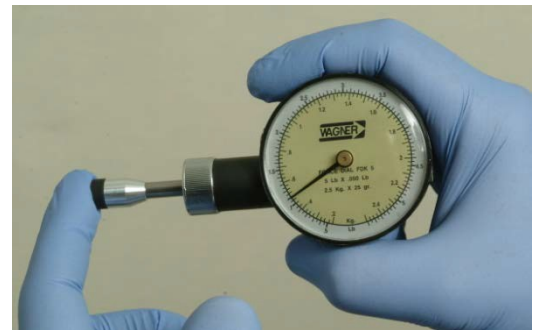
### **Posterior and Sub-mandibular Areas**

**Figure 38.** Posterior and submandibular masticatory muscle areas: green dot indicates finger placements and arrows illustrate direction of the respective forces.

Key: filled circle denotes one finger tip.

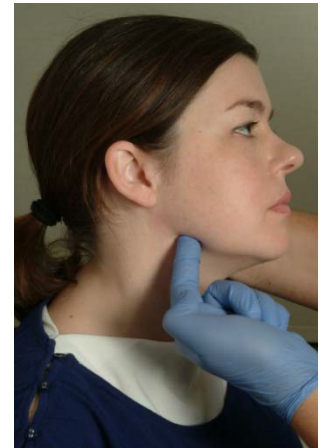


**Figure 39.** Use 0.5 kg.



**Figure 40.** (left) Patient extends head anteriorly in order to open the space posterior and medial to the posterior border of the mandible. The examiner places the finger in the space that is opened, and presses anteriorly and medially.

(right) Finger is placed on the medial aspect of the inferior border of the mandible, as shown, with force directed superiorly and laterally (i.e., against the medial wall of the mandible). The patient can be asked to retract her head and drop the chin in order to allow the palpating finger to move as described.



### **Lateral Pterygoid Area**

**Figure 41.** Finger is placed as shown, while mandible is deviated to the same side. Palpate the most medial, superior, and posterior area in the vestibule.



### **Temporalis Tendon**

**Figure 42.** Finger is placed against the ascending ramus while the mandible is slightly open, and the finger is moved superiorly as far as possible while maintaining contact with the underlying hard surface.



### **E11 Comments**

Examiner records pertinent comments regarding the examination.