# ABNORMAL FUNCTION OF THE TEMPOROMANDIBULAR JOINT

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THE responsibilities of the orthodontist lie in the establishment of correct function and the creation of a permanent result. In this regard, a consideration of the health of the temporomandibular joint is an absolute necessity. This is due to the fact that joint pathology, in a majority of cases, is directly or indirectly the result of malocclusion. Therefore, the orthodontist is in a position to diagnose conditions in the child that may contribute to joint disease in the adult.

The x-ray has proved to be a valuable tool for the diagnosis of temporomandibular joint disturbances, but in order to properly interpret the radiographic film, the characteristics of the normal must first be known. A standard or a yardstick must be available in order to evaluate the abnormal.

## DESCRIPTION OF THE NORMAL

Both joints of fifty persons with no clinical manifestations of joint disorders were studied in order to provide an acceptable description of the normal. Fig. 1 represents three cases which portray the ideal or average conditions. Two common characteristics will be noted in all three examples: first, the condyle is located in a well-centered position in the fossa and, second, the articular surfaces are smooth.

The condyle position was measured and calculated at three sites (Fig. 1). The average distance from the anterior surface to the eminence was 1.5 mm. The mean dimension from the top of the condyle to the floor of the fossa was 2.5 mm., and the average condyle was located 7.5 mm. anterior to the center of the external auditory canal.

This might be considered a description of perfect temporomandibular articulations. If these relationships could be accepted as the standard, diagnosis of abnormal conditions would be a simple matter. However, this is not the manner in which Nature always works. Fig. 2 represents the differences in the joints of naturally occurring cases. When the total natural variation is employed for comparison, the average figures have little value.

Several factors should be considered in evaluating the variations in the anatomy of the joint. First, there is no consistent harmony in *size* of the articulating bodies. In Fig. 2, the examples in the upper left and lower left illustrate this point. The upper tracing demonstrates a small condyle head, while in the lower the condyle appears too large for its fossa. Second, the *form*

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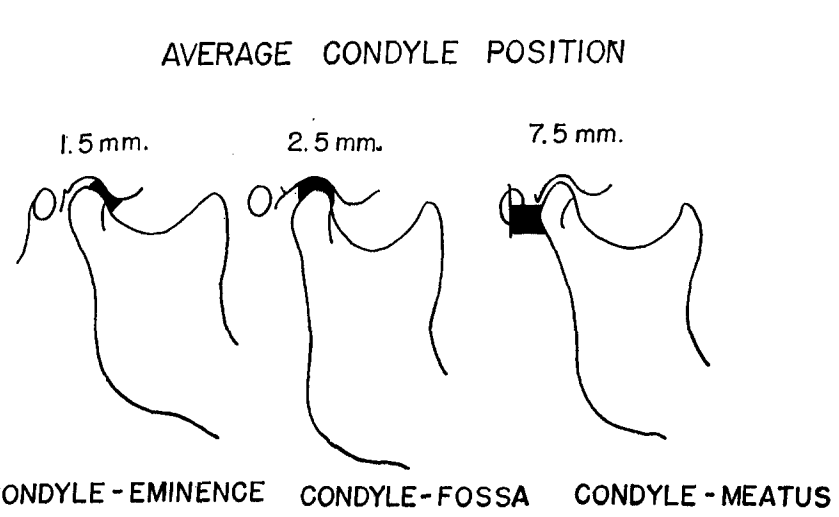


Fig. 1.—Tracing of three laminagraph sections picked from sample of 100 cases to demonstrate ideal condyle-fossa relationship. Note two common characteristics—well-centered condyle and smooth articular surfaces. Left figure represents average condyle-eminence dimension; middle represents average condyle-fossa dimension. Right figure demonstrates avererage distance from condyle to a line through center of external auditory canal.

Comparison to strict "perfect" relationship demonstrated here would be simple. However, range of natural variation (Fig. 2) must be the proper yardstick for comparison of the abnormal.

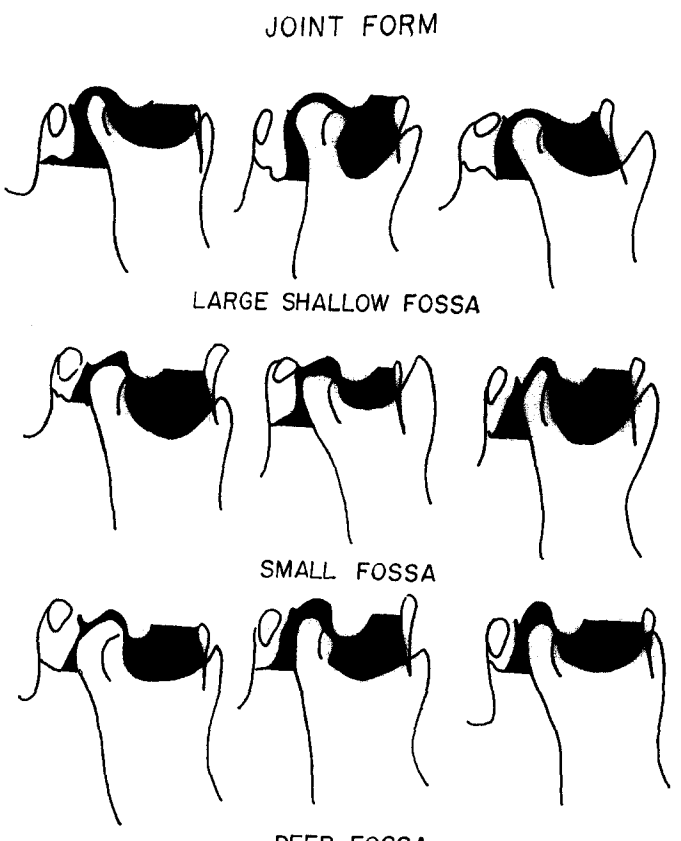


Fig. 2.—Variation in human temporomandibular joints. Three things account for difference in these joints: (1) no harmony in size of condyle and fossa (upper and lower left); (2) little consistency of the form of articulating bodies (left center and upper right); (3) variation in condyle position (note lower right). Natural functional adaptation also must be considered in determining abnormal joints. Note suggested adaptation on condyle in center figure and on eminence in right center figure.

of the mandibular condyle head may be entirely dissimilar to the form of the temporal portion of the joint (note Fig. 2, center figure in particular). Third, the condyle may be *positioned* either deep in the fossa or rather forward and downward in the fossa, as seen in the lower right tracing of Fig. 2. Thus, shallow fossae, small fossae, or deep fossae appear to be independent variables with the condyle head. However, functional adaptation is suggested in some instances, but serial studies would be needed to prove this occurrence (Fig. 2, center and right center cases).

## PATHOLOGY

The wide range of variation almost dispelled any hope of employing a standard for comparison of the abnormal. However, variation in excess of that considered normal was observed frequently enough to warrant the acceptance of a standard range for the evaluation of the pathologic case.

The following cases were selected from a sample of 200 cases. They were chosen to demonstrate four specific types of joint disturbances caused by conditions of occlusion of the teeth.

### TYPE 1, EXCESSIVE FUNCTION (FIG. 3)

The etiology in this type is excessive range of function and abnormal functional position of the condyle. This particular condition is characteristic of Class II, Division 1 type malocclusion cases. In the Class II condition, the patient thrusts the mandible forward as much as five times the normal distance in order to incise food (Fig. 3, upper right). In addition, dual bite cases sometimes masticate in the anterior position. Habitual activity in the anterior position apparently wears the articular disc and eventually the surface of the condyle and eminence. In involved cases, even speaking aggravates the pain and discomfort of the joints. Two such cases encountered were treated orthodontic cases in which a guide had been employed to position the mandible forward. Attempts to heedlessly jump the bite are not consistent, therefore, with an appreciation of the health of the joint structures, especially if no condyle growth remains to aid in the necessary adjustments of the muscles, teeth, and mandible. Advanced pathologic conditions are represented in Cases P63 and P198 in Fig. 3. Case P63 had been injected with sclerosing agents on six occasions.

The physiologic rest position changes during treatment in such cases because the mandible is abnormally downward and forward before treatment. The treatment for joint conditions of this nature is correction of the overjet and reduction of the range of activity for normal and necessary movements. This permits a rehabilitation of the musculature to a balanced condyle relationship (Case P124, Fig. 3). Orthodontic intervention is the method of choice. Removal of anterior teeth and fixed or partial bridgework have also proved effective.

### TYPE 2, DISTAL DISPLACEMENT (FIG. 4)

This type is found quite frequently, but not always, in Class II, Division 2 types of malocclusion. It is characterized by the deep overbite, retruded

anterior teeth, and distal path of closure from rest position. The mandible is usually driven posteriorly into the fossa by incision of the anterior teeth (Case P78, Fig. 4). The ligaments do not permanently withstand the prolonged stretching, as reciprocal innervation produces an inhibition of external pterygoid activity, thereby permitting a retrusion of the condyle head.

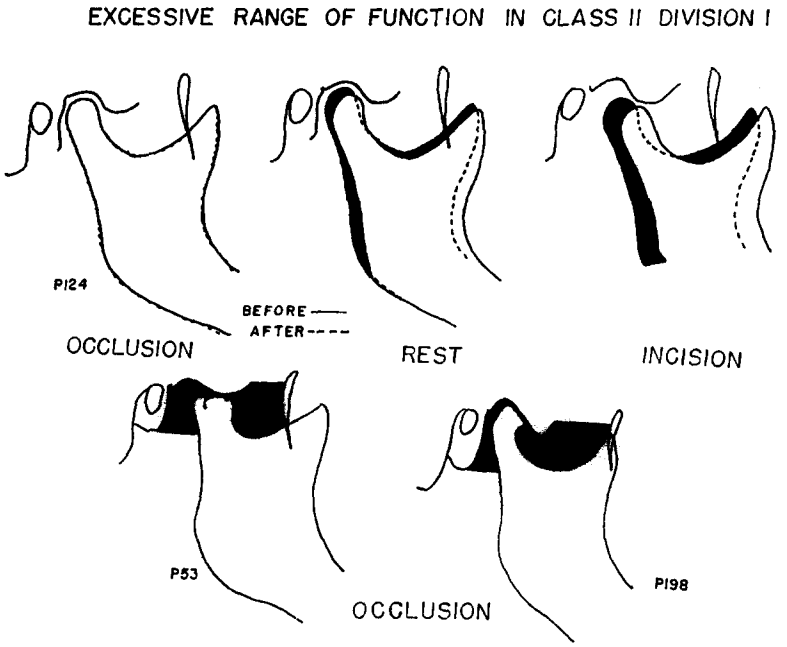


Fig. 3.—Type 1, cases of abnormal function. Case P124 shows abnormal range for incision. (Continuous function of condyle on eminence does not appear to be consistent with normal activity.) Note change in rest position after treatment. Cases P53 and P198 demonstrate advanced pathologic findings in cases of prolonged function in anterior position. Two such cases observed were postorthodontic patients in which unsuccessful attempts had been made to position mandible forward.

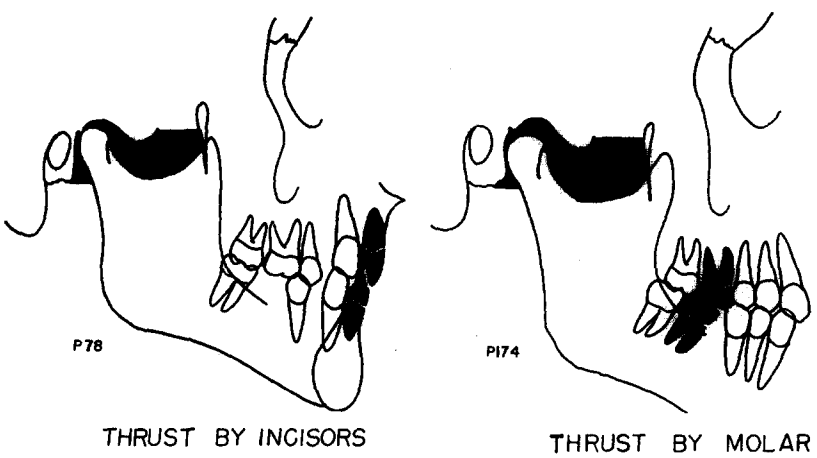


Fig. 4.—Type 2, distal displacement. Note posterior position of condyle in fossa. Dimensions from condyle to eminence outside range. Condition appears to result from Class II, Division 2 relationship and thrust of mandible due to contact of incisors (Case P78.) Displacement also occurs following loss of first molar and drift of teeth (Case P174).

The etiology of this condition is not limited to the anterior teeth. Loss of the lower first molar, shifting of remaining molar teeth forward, even maintaining the same occlusion, will wedge the condyle deeper into the fossa (Case P174, Fig. 4). This is a slow process and requires time to develop.

Slight bite-opening merely to remove the influence of the teeth usually will yield dramatic results. An overlay acrylic splint on the upper arch is the usual method of choice.

### TYPE 3, INTERFERENCE (FIG. 5)

This type is characterized by molar interference during chewing and incising. A common feature in this type is the missing upper third molar and exfoliation of the lower third molar (Case P32, Fig. 5). Under normal circumstances, condyle action against the eminence forces the rows of teeth apart in

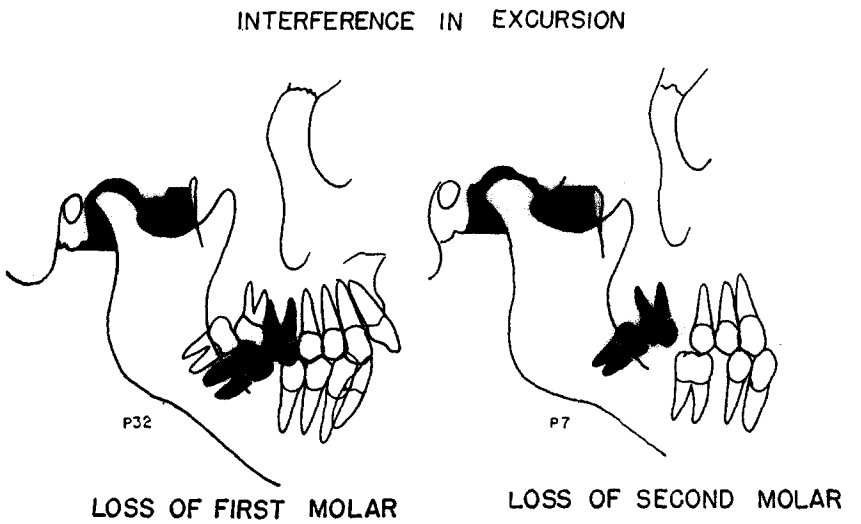


Fig. 5.—Type 3, occlusal interference. Note severe breakdown of both condyle and eminence, apparently resulting from trauma. In Class II cases loss of lower first molar and upper third molar (Case P32) permits elongation of lower third molar past normal line of occlusion. Molar there interferes with condyle action on eminence and lever action of muscles disarticulates joint. The same traumatic condition can be set up in normal arch relationship as upper molar exfoliates into space created by loss of lower molars (Case P7).

the posterior area. However, the supraerupted lower molar contacts the upper teeth and upsets the normal proprioceptive influence provided by the teeth. The muscle pattern becomes confused or imbalanced, and tramatic conditions of both teeth and muscle contribute to the joint involvement. These cases can be caused by the first molars and sometimes even the premolars. Cross-bites frequently behave in a similar manner, especially when occurring unilaterally.

The treatment for this condition usually consists of removing the interfering tooth structure. The occlusal plane can be leveled to promote smooth excursion. The preferred conservative method, however, is an acrylic splint built up in the area of the cuspid to initiate normal reflex activity of the musculature.

### TYPE 4, LOSS OF POSTERIOR SUPPORT (FIG. 6)

This type is also displacement, but in mesial or superior, rather than distal, direction. In the absence of posterior teeth, the anterior teeth are usually used exclusively for chewing. In mesial thrust, the external pterygoid is often in a state of contracture and maintains the condyle against the eminence (Case P107, Fig. 6). Forces usually borne by the teeth are therefore transferred through the joint. It should be pointed out again that it is the damaging effect of musculature in these instances, as well as all the others, that is the final etiological factor.

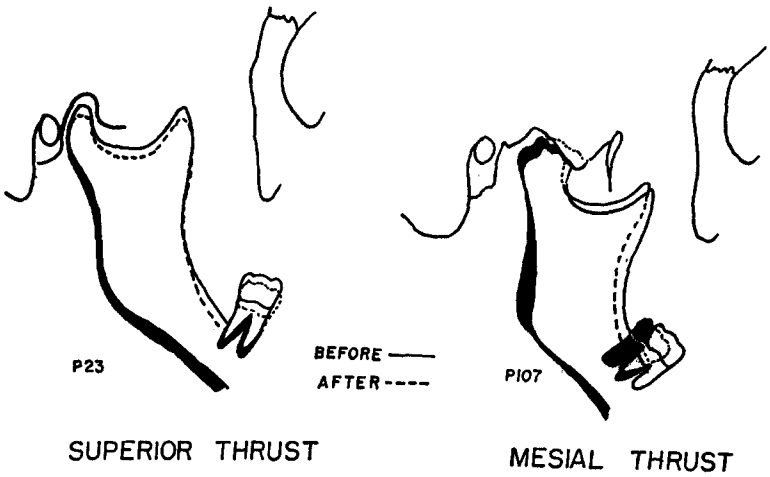


Fig. 6.—Type 4, loss of posterior support. Loss of posterior teeth apparently may cause forces to be transferred through joint that normally would be directed through teeth, maxilla and zygoma, etc. Condyle can be lodged superiorly (P23) or, in Class II conditions, it might be held forward and superiorly (P107). Solid portion and dotted lines indicate mandibular relationship following treatment.

In normal incisor relations, mere placing of bite blocks will relieve the strain in the joint and release the contracture of the muscles (Case P23).

In Class II cases with loss of posterior support, the best results were achieved by placing a lower partial denture with acrylic overlaying the lower anterior teeth. This, in effect, relieved the necessity of excessive forward thrust to incise, as well as providing cuspid activity for smooth lateral excursion.

### SUMMARY AND CRITICAL OBSERVATIONS

In the analysis of any temporomandibular joint case, systemic factors should be recognized. General health was considered, especially in those patients experiencing pain in other joints. Psychologic factors were observed to be important. Anxieties and tensions were thought to promote bruxism and lead to joint involvement. However, occlusal disharmony should be ruled out as an etiological factor before radical treatment is resorted to in all temporomandibular joint cases.

Certain ideas seem pertinent to a consideration of abnormal function of the jaw joint:

1. Occlusion is the basis for joint disturbance in a majority of cases. Our experience permits a classification of four distinct conditions or types of etiological factors, which are: Type 1, excessive function; Type 2, distal displacement; Type 3, interference; and Type 4, loss of posterior support.

2. Musculature, in the final analysis, is the structure treated in the correction of joint disturbance. It is the damaging effect of musculature that produces trauma to the joint surfaces.

3. In addition to considering the development of occlusion, the clinician should apply general orthopedic concepts to joint analysis. This includes the role of stabilization of musculature and the synchronization of muscle activity through the nervous system.

4. It is up to you, as orthodontists, to prevent temporomandibular joint disease. Proper service can be rendered by harmonizing the denture with joint structures and muscles, so have respect for the joint. It can be more important than you think.

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