

Differential Diagnosis of Joint Conditions in Orthodontia*

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Before considering abnormal functioning of the temporo-mandibular articulation, it would be wise for us to mention one or two points about the normal functioning of this joint because only upon this knowledge can we base our reasoning when faced with the abnormal.

Right at the beginning, let it be said that in spite of the fact that this joint controls the function of those parts with which an entire profession is concerned, there is very little actually known about its function. For instance, it has long been stated in the anatomy books that the supra-and infra-hyoid groups of muscles are the chief actors in opening the mouth and this assumption has been reached because these muscles seem to occupy the position of greatest mechanical advantage. Only recently has this view-point been challenged and it now seems very absurd that we should have persisted in error for so long a time. While the physiology is not accurately understood as yet, the fact is pretty well established that the hyoids are not greatly concerned in this function. The activating musculature is that which is centered around the joint itself, the major role apparently being played by the external pterygoid. This muscle, arising forward, inward and below the joint runs to the neck of the condyle and to the inter-articular disc so that its contraction would result in pulling the head in a downward, forward and inward direction. With only one of these muscles active the result is a swinging of the jaw toward the opposite side, with the condyle of that side acting as a pivot, although it may have a slight lateral and distal movement. The result is a shifting of the midline of the lower dental arch away from the side of the moving condyle, with the cusps of the teeth moving out of their normal rest positions in the manner familiar to all of you. Thus it will be seen that masticatory function on the right side is controlled by the left external pterygoid and vice versa.

With the contraction of both external pterygoids simultaneously, we have a protrusion of the mandible, the initial result of which is an edge-to-edge bite in the incisor region and an open bite in the molar area, since the condyles in this position are downward and forward, each on its respective eminence. This complicated mode of function can give rise to quite a variety of apparently similar abnormal conditions although when analyzed, they

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may be found to be radically different both as to cause and effect. The following four cases which I shall describe, all bore resemblances to each other and yet each was due to a different cause.

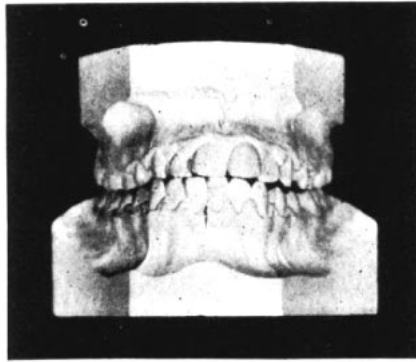


Figure 1

The first case (Fig. 1) was that of a young lady, sixteen years of age, the daughter of a dentist. She presented dental arches that were quite well formed, if considered individually, but classification was very difficult

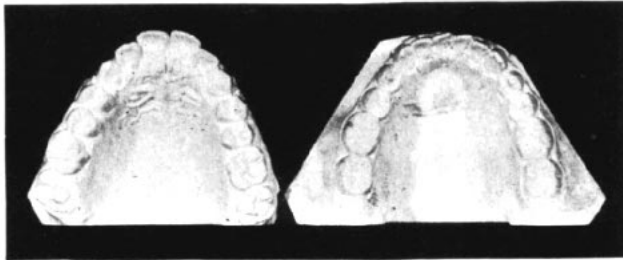


Figure 2

when the teeth were occluded. The molar relationship was a full Class III on one side and almost a Class II on the other. The face was markedly asymmetrical with the arches on one side more rounded than on the other. (Fig. 2). The case had had three years of orthodontic treatment during which time nothing had been accomplished, either for good or ill. Another orthodontist had subsequently kept her under observation for two years but refused to do any treatment because he could not decide on the etiology. Histories had apparently been taken by both men but these failed to reveal anything significant and the history as given to me was just as obscure.

After studying the case for a matter of months, I reached the conclusion that the fault must lie in the lack of function of one of the joints and upon asking the parents point blank whether the child had ever been afflicted with paralysis, I was informed that she had. I was further informed that there had been almost a complete loss of function of the upper right



Figure 3

quadrant of the body but, by means of careful treatment and judicious exercises, complete function had been regained to such a degree that the girl was doing advanced work in music at the piano. Only the muscles of mastication had been overlooked, since she experienced no difficulty in chewing on one side, and the resulting deformity was due to this unilateral function. It was no longer possible for the external pterygoid on the affected side to throw the condyle toward the non-affected side. Hence, we were presented with the strange contradiction of development on the affected side and lack of development on the normal side.

I regret that I do not have more complete records on this case. It was one of those entrusted to me by Dr. Kantor shortly before his death and I left my records with Dr. Dunlap when I moved to Chicago. I could not refrain from using the case, however, because it was this one that started me thinking about the joint over five years ago.

The second case (Fig. 3) is that of a young man, nineteen years of age who came under the supervision of a young dental interne. The case was being worked up in the hospital preparatory to an operation which I shall later describe. There was no history that could be gained except that the patient had stepped on a third rail at some time during his four-

teenth year and was told when he regained consciousness that it had turned him over two or three times and thrown him aside. The deformity that you see in his face was not noticeable at that time but was a gradual development until it reached this stage.



Figure 4

The diagnosis reached by the orthopedic surgeon was an over growth of the ramus of the mandible on the affected side and the remedy proposed



Figure 5

was a resection of a goodly portion of the outside of the mandible of the protruding side, a cartilage graft on the affected side, extraction of all the teeth and then the insertion of artificial dentures, all for the purpose of restoring symmetry. The dental interne asked if there would be any objection

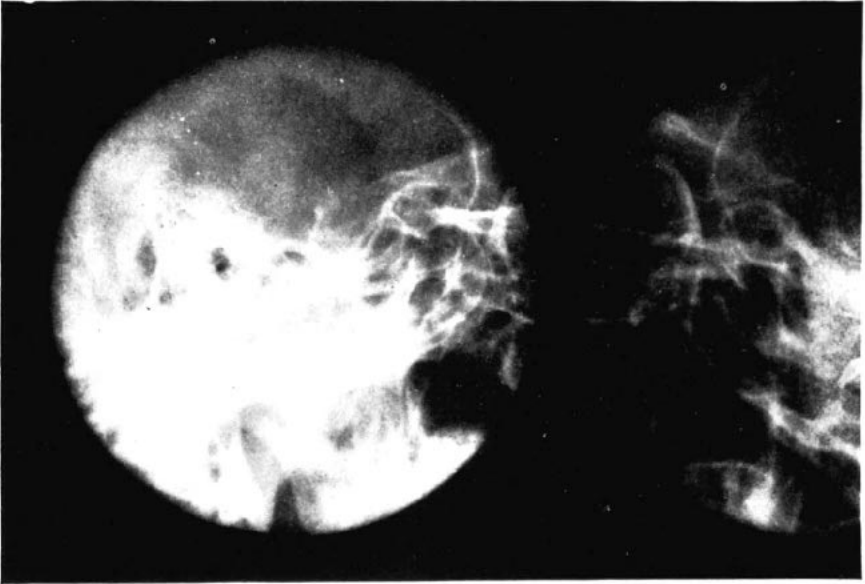


Figure 6

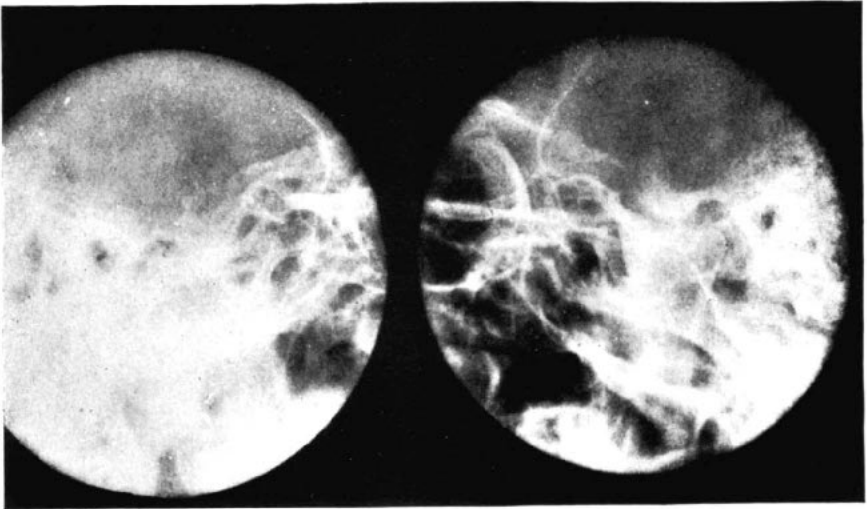


Figure 7

to having an orthodontist examine the case for the purpose of advising whether a less radical procedure might be possible. Permission being granted, the case was brought to the department of graduate orthodontia,

University of Illinois where records were taken. (Fig. 4). Examination revealed that in a closed mouth position the midline of the upper coincided with the interproximal space between the lower right cuspid and lateral but with the mouth wide open, the midline, in spite of this enormous discrepancy, very nearly corrected itself. (Fig. 5). This immediately pointed to a joint condition. X-rays of the joint were ordered and an examination of these disclosed the fact that the head of the condyle on the affected side was forward of its fossa so that in a rest position the normal condyle of the mandible was thrown to the left. (Figs. 6 & 7). In the open mouth position the normal condyle naturally came out of its fossa on to the eminence so that it very nearly matched the abnormal position of its mate, thus centering the lower jaw. These facts, together with the X-ray findings, were sent back to the surgeon who very gracefully and readily changed his

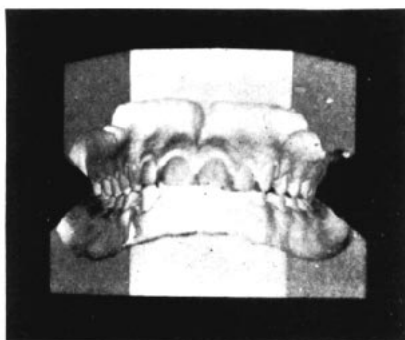


Figure 8

diagnosis to "cartilaginous tumor of the fossa." This explained why the development had been slow. It was proposed that an exploratory operation be performed on the joint but the patient, having heard so many varied opinions, lost confidence and took French leave.

The next case also presented itself at the clinic. It would ordinarily have been taken for a typical Class II, division 1 case except that the face and dental arches showed a marked asymmetry that is not characteristic in these patients. (Figs. 8 & 9). Measured from the midline, the two arches were wider on one side than on the other, although the interdental midline was correct. (Fig. 9). Upon asking this patient to open his mouth wide, it was immediately noted that the jaw swung to one side and, upon further examination, the fact was disclosed that he could not shift the mandible to the opposite side. In short, one external pterygoid was doing all the work. In this particular case we were able to find no history what-

soever. The boy is extremely nervous and much given to affectation and it was decided that the case might be due to a total lack of functional stimulation from a habit long continued. We proceeded on this basis and prescribed



Figure 9

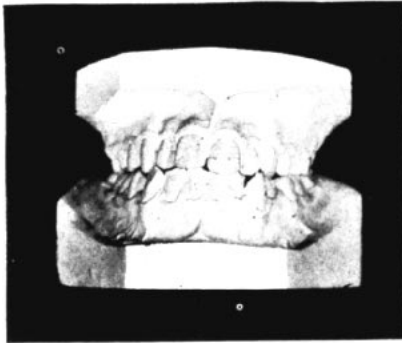


Figure 10

muscle exercises for the non-functional side. At the present time the patient is able to get the mandible over into a cusp-to-cusp relationship. This case will be shown you by Dr. Goldstein who has been treating it.

The next case, one taken from practice, had none of the marks of the unusual about it when it was undertaken. It was accepted as a Class I case with a badly under-developed maxilla. (Fig. 10). At one point in the treatment it became necessary to apply Class III intermaxillary elastics and shortly thereafter, trouble arose. Before long the case was in full Class III relationship on one side and the conclusion was reached that the patient, another very high strung individual, was fighting the elastics and holding the mandible forward on this side. In order to be absolutely certain, pictures were taken of the two joints with the result that you see. (Fig. 11).

In explanation of this diagram, I might say that the patient was placed in position for the ordinary joint X-ray and the head was then fastened so that it could not move between the taking of the open and closed mouth

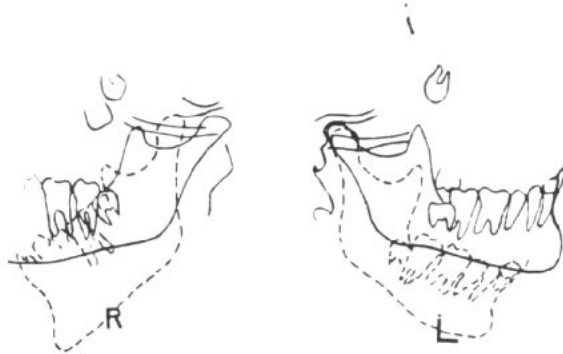


Figure 11



Figure 12



Figure 13

pictures. Immobilizing the head in this manner permitted us to superpose our two pictures on immovable cranial landmarks and thus show the movement of the condyle. You will notice that the one condyle stays in its fossa or very nearly so, while the other moves forward nearly $\frac{5}{8}$ of an inch.

Both were properly seated when at rest. This upset the diagnosis. Furthermore, the excessive movement is in the condyle on the Class III side so that equalizing these two joints would, in no wise, be of benefit. Here we are faced with an unilateral, Class III case and the excessive excursion on one side and the traveling midline are merely incidental and of no significance in the case.

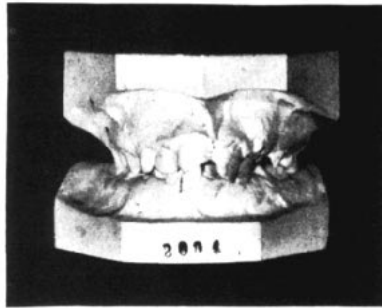


Figure 14

The next and last case is one treated by Dr. Harold Noyes and I have asked his permission to use it. (Fig. 12). This boy, sixteen years of age, has been afflicted with osteomyelitis of the right side almost from birth. It

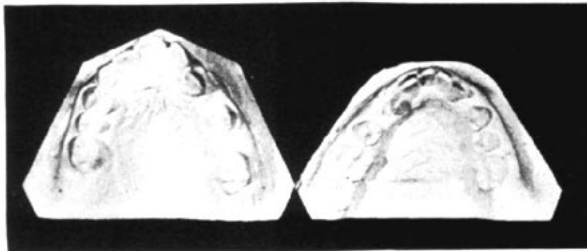


Figure 15

made its appearance in the hip, in the humerus, and elsewhere. There is no history of jaw involvement but that something has hit this joint and put it out of active function is undeniable. The marked asymmetry of the face shows the tremendous lack of development of the *left* side that has followed the lack of function ordinarily taken care of by the right joint. (Fig. 13). You will notice that the jaw swings toward the affected side, as he opens his mouth, showing that he functions only on the right. When we examine the models, (Fig. 14), we find the midline deflected towards the right but even more significant than this is the marked picture of asymmetry presented by the occlusal views. (Fig. 15).

Summary

There is a generally accepted theory that the innervation of any part contributes a direct trophic influence on the bones, in addition to that stimulation which it contributes through muscular activity. The severing of such a nerve supply is followed by a very rapid and severe atrophy of both the muscle and the bones that these control. In these cases it is impossible to tell how much of this atrophy is due to the loss of function and how much is due to the loss of this trophic influence. The greatest developmental factor in the case of the jaws, next to the inherent growth force, is the shock of the occlusion of the teeth. Thus, in the case of the jaws, we have the nerves of one side controlling function on the other side and we have seen in all of these cases a development of the jaws on the side where the joint or nerve supply was abnormal while, on the opposite side where the function was controlled by an abnormal joint, we find lack of development. This would seem to indicate that functional force was of far greater importance in development than was any trophic influence.

I have become so conscious of the possibility of joint abnormalities that it is now routine practice to make it a part of the original examination. This can be done very quickly and thoroughly, first, by noting the relationship of the midline of the two dental arches to each other; second by noting the relationship of the dental midline to the face; third, by noting any asymmetry in either dental arch or in the face, and lastly by testing the patient's ability to move the jaw to each side. This last can be done very easily by placing the tip of a thin shaving of wood, like a sharpened orange wood stick, on the tip of the buccal cusp of an upper bicuspid and asking the patient to bite it. If the patient can do this on both sides we at least know that both external pterygoids are working.

In summing up the possible conditions that may be met with, we must include the following: First, those where the condyle of one side has lost its power to move forward out of the fossa. This may be due to paralysis, disuse, injury or other factors. In these cases the position of the midline, in a closed mouth position, is not significant, but we find the midline traveling off as the mouth is opened.

Second, those cases where, in the rest position, one condyle is unable to return to its seat in the fossa. This might be due to a fracture of the neck, to a dislocation, to a growth in the fossa, or to a habit. In these cases the midline, in the closed mouth position, will almost invariably be found off in the mandible, with a tendency to return to symmetry as the jaw is dropped and the normal condyle comes forward to match the abnormal.

Third, those where the midline is off in the closed mouth condition and remains off as the mouth is opened. Here we are dealing with joints that may be perfectly normal, the fault lying in the over or under development of half of the lower jaw. Our subdivisions of Class II and Class III fall in this category.

Fourth, those cases where the jaw is held in an abnormal position through long continued habit. Here we may have a midline that is either correct or incorrect in both positions.

In closing, I might say that there is no single point upon which one should base the diagnosis of an abnormal joint condition but probably the most important single aid in the examination are correctly taken roentgenograms of the joint, in both open and closed mouth positions.

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