ORTHODONTICS

Orthodontic/Orthopedic Treatment of Craniomandibular Pain Dysfunction
Part 2: Posterior Condylar Displacement

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Craniomandibular pain dysfunction (CMPD) is a phenomenon with multiple causes which confronts most clinicians in dentistry on an almost daily basis. According to Weinberg and Guichet, the various schools of thought regarding the etiology of CMPD mainly focus on occlusion, condyle position, and stress. Because of the various etiological factors, the diagnosis of this problem is not always straightforward. There have been many studies on the condylar position and its relationship to the CMPD problem. This study will investigate the role of posterior condylar displacement in craniomandibular pain dysfunction. The primary mode of treatment used for this study was orthodontic/orthopedic.

Frequency of Occurrence

Of the various condylar displacements that are possible, posterior displacement appears to be the one most likely to be a main etiological factor of TMJ pain dysfunction. Weinberg reported that 71% of TMJ pain dysfunction patients have retruded condyles. Mikhail and Rosen reported that 59% of their TMJ cases had retruded condyles, while Weinberg and Lager found that 53% of their TMJ patients had posterior condylar displacement. In a later study, Weinberg found that 90% of patients with TMJ pain dysfunction had posteriorly displaced condyles. Bush, Butler, and Abbott found that 34% of their patients had clicking, while Greene and Marbach found the incidence to be 28%. Egermark-Eriksson, Carlsson, and Ingervall found the incidence to be 10% in seven-year-olds and 19% in 15-year-olds.

In my own practice, I examined 200 consecutive patients presenting for orthodontic treatment, which included both functional and esthetic considerations. Approximately 55% of them, or 110 patients, had symptoms indicating some form of TMJ dysfunction. These symptoms include clicking of the joint, excessive anterior slide, muscle tenderness, headaches, and condylar displacements. These patients were divided into three age groups: 0-10 years old, 11-17 years old, and over 17 years old. Approximately 40% of the patients 10 or under had some form of craniomandibular dysfunction, as well as 52% of those in the middle-age years (11-17), and 76% of the adults (over 17). These findings are in agreement with those of Williamson and Funt. I also found that 20% of the patients presenting for orthodontic treatment who were 10 or under had retruded condyles, while 31% of the teenagers and 60% of the adults had this posterior condylar displacement.

Farrar and McCarty have shown how distally displaced condyles frequently progress to other internal derangements of the TMJ, especially anterior disk displacement, and, eventually, osteoarthritic changes.

Treatment Methods

In some cases involving retruded condyles, the occlusion allows occlusal adjustments to be made that will produce a "long centric" according to Dawson and a "long protrusive" according to Weinberg. Other studies also encourage occlusal adjustments so that the condyle is given freedom to move anteriorly while the deflecting inclines are removed.

Another approach to treatment has been with the occlusal splint. The splint may be either maxillary or mandibular, with full or partial coverage. The occlusal splint is used to open the bite or to hold the mandible forward, thus allowing the condyle to translate anteriorly. However, Weinberg has pointed out that merely using an occlusal splint does not necessarily guarantee that the condyle will be anteriorly repositioned. The condyle will sometimes rotate and will sometimes move superiorly instead of anteriorly.

If a thicker occlusal splint is used in an attempt to
reposition the condyles, the interocclusal space may be intruded upon, which may prove troublesome. A number of authors30–35 have shown that intrusion into the freeway space can lead to intrusion of the posterior teeth. Figure 1 shows the result of faulty use of a Sears pivot splint.36 The splint was left in place for over 25 months and led to a bilateral posterior open bite. A pretreatment TMJ radiograph of this patient is not available, but Figures 1E and 1F show that both condyles are retruded, in spite of 25 months of splint therapy. Apparently the posterior teeth had been intruded when the pivot splint was worn without being adjusted, and the condyles gradually become posteriorly displaced (as they had been before the splint therapy). Figure 1G diagrams this posterior condylar displacement, showing that the anterior joint space is greater than the posterior. Splints are often helpful to alleviate muscle spasms and posterior capsulitis, but if they are not handled properly, the patient may suffer iatrogenic problems.

An alternative to the bite-opening splint is the anterior repositioning splint. This may take the form of a Sved, a hold-forward splint, or even a bionator. However, we must note here that several authors37–39 caution that excessive anterior repositioning in a patient who has stopped growing (i.e., approximately 17 years old or more) may lead to pathological remodeling of the condyle.

If the mandible is repositioned in an excessive vertical or anterior position, then it is possible that iatrogenic problems will occur. However, it seems that if the mandible is repositioned modestly in both the vertical and anterior directions, or just enough to place the condyles into the therapeutic zone,39 then there is little possibility for such problems. Figure 2 illustrates the principle behind the therapeutic range. The concentric condyle is the most posterior condylar position and the 4-7 (or Gelb) position the most anterior that are within the physiological tolerance of most patients (Figure 2A). Figure 2B shows this range between concentric and 4-7 as the "therapeutic range." The distance from point A to point B varies between 1 and 3 mm for most patients, depending on the anatomy and size of the joint.

A number of authors40–42 have shown that a modest increase in vertical dimension does not appear to be detrimental to the patient. I followed this principle and those mentioned above as much as possible in the cases presented here. If the distally displaced condyle can be treated by means of an equilibration alone, then that is the prefer-

**Fig. 1A**
Splint patient before treatment, anterior view.

**Fig. 1B**
Splint patient after 15 months of treatment, anterior view.

**Fig. 1C**
Splint patient before treatment, right side.

**Fig. 1D**
Splint patient after 25 months of treatment, right side. Treatment resulted in bilateral posterior open bite.
Case One

This 13-year-8-month-old male patient had a crowded Class I overbite malocclusion. Figure 3A illustrates how a Class I case with posterior condylar displacement can develop. If the maxillary incisors are too upright (lacking adequate torque), the overbite gradually deepens. As the overbite becomes excessive, the lower teeth and mandible may retreat posteriorly to avoid anterior interferences. When the overbite is corrected, the mandible is free to reposition itself anteriorly (Figure 3B).

The overbite may be corrected by intruding the maxillary anterior, the mandibular anterior, or both, or by using a functional appliance to erupt the posterior teeth. If the teeth are too crowded, extractions may be necessary. (The choices for extraction could be the first bicuspids, the second bicuspids, the first or second molars, or even other teeth in special situations.) The final objective in treatment should be to provide an anterior repositioning of the condyle while moving the teeth to a stable and esthetically acceptable position.

red treatment. If the case requires more extensive work, then reconstructive procedures such as those described by Weinberg may be necessary. It is the purpose of this article to illustrate some of the possibilities for orthodontic/orthopedic treatment.

As the following case histories illustrate, I have used a variety of therapies. (Four of the patients described here had functional appliances followed by fixed appliances, and two other patients were treated entirely with fixed multi-banded appliances.) Each patient must be evaluated individually in order to determine the most efficacious method of treatment. It would be tunnel vision to use the same treatment for every patient, since patients' needs and morphology vary so much.

FIG. 3A
Posterior condylar displacement in Class I patient with deep bite. The deep bite apparently forces the mandible to assume a more posterior position, thereby producing condylar retrusion.

FIG. 3B
Simultaneous correction of deep overbite and condylar repositioning accomplished by means of a functional jaw orthopedic appliance. If the face would become too long with FJO construction bite, properly designed fixed appliances can produce a therapeutic result.

This patient presented for treatment because of pain and clicking that occurred in his TM joints when he ate. He also wanted to have the esthetics of the anterior teeth improved. Before the treatment, the patient had acceptable frontal and profile soft tissue features (Figures 4A and 4C). Figure 5A shows the intraoral anterior view before
treatment, and Figure 5C shows the occlusal view. There was moderate crowding in both arches.

Significant posterior condylar displacement was evident in both condyles before treatment (Figures 6A and 6C). The displaced condyles were probably responsible for the clicking and pain in the joints.12-15

To treat this patient, I extracted the four first bicuspids and then used full fixed multi-banded appliances for treatment. The facial results of this 28-month treatment are shown in Figures 4B and 4D. The occlusal results are shown in Figure 5 (B, D, E, F). The posttreatment transcranial radiographs show that both condyles have been centered in the fossa (Figures 6B and 6D). The patient now has a full range of movement, and he has had no clicking or pain for the past seven years. This case illustrates that it is possible to remove bicuspid teeth and still have an acceptable TMJ result as long as the appropriate treatment is used.

Case Two

This 15-year-5-month-old female had a mild Class II, Division 1 malocclusion with an excessive overbite. She came to me to have the excessive overjet and crowding corrected. During my examination, I found that the patient had tenderness in and about the external auditory canal, reciprocal clicking, and “tension” headaches. As with Case One, the excessive overbite appeared to have driven the mandible distally (Figure 7A).

For most Class II-1 cases, a functional appliance would be the most likely choice. However, it is important to complete a thorough diagnosis before therapy to determine whether functional jaw orthopedic treatment is indicated, because it is possible to produce a long, esthetically displeasing face, if FJO appliances are used indiscriminately. The occlusion and the condyle may be treated simultaneously using a properly chosen FJO appliance (Figure 7B). I treated this patient using a Fränkel appliance for 15 months. Fixed appliances were then used, and eight months of detailing the occlusion finished the case.

The patient’s pretreatment facial photos are shown in Figures 8A and 8C and the pretreatment intraorals in Figures 9A, C, and E. The right side was nearly Class I, while the left side was end-on with 5 mm of overjet. There was 4 mm of crowding in the mandibular arch. The posttreatment facial photos (Figures 8B and 8D) show that there was no significant change, which was desirable in this patient. The posttreatment intraoral photographs (Figures 9B, D, and F) show a good Class I molar relationship, with the overjet and crowding corrected.

The transcranial radiographs taken before treatment (Figures 10A and 10C) show that both condyles were significantly retruded. The posttreatment radiographs show that the right condyle is now concentric and the left condyle slightly retrusive. All clicking has now stopped, and the patient has had no headaches and only minimal tenderness over the TMJ. She has been free of symptoms for over three years. I should note that I have found it difficult to treat Class II-1 cases with condylar retrusion using only fixed appliances. Usually some combination of functional and fixed appliances is necessary to effectively reposition the condyles while correcting the malocclusion.

Case Three

This 8-year-9-month-old patient had a typical Class II, Division 2 configuration. In cases such as this, the deep overbite can drive the mandible distally, causing posterior condylar displacement (Figure 11A). The first step is to
FIG. 5A
Case One, pretreatment anterior view showing deep bite and crowding.

FIG. 5B
Case One, after treatment.

FIG. 5C
Case One, mandibular arch before treatment.

FIG. 5D
Case One, mandibular arch after treatment.

FIG. 5E
Case One, right view after treatment.

FIG. 5F
Case One, left view after treatment.

FIG. 6A
Case One, before treatment, right joint. Note posterior condylar displacement (AJS greater than PJS).

FIG. 6B
Case One, after treatment, right joint. The condyle is slightly anterior to concentric.

FIG. 6C
Case One, before treatment, left joint. There is posterior condylar displacement (AJS greater than PJS).

FIG. 6D
Case One, after treatment, left joint. Concentric condyle.
FIG. 7A
Class II, Division I patient with posterior condylar displacement, apparently resulting from the excessively deep bite.

FIG. 7B
In cases with mandibular retrusion, FJO treatment would simultaneously correct the overjet and overbite, the condyle position, and the profile. In cases of maxillary protrusion, treatment planning becomes more complex.

FIG. 8A
Case Two, 15-year-5-month-old female, mild Class II-1 malocclusion.

FIG. 8B
Case Two, after 15 months of treatment.

FIG. 8C
Case Two, pretreatment profile.

FIG. 8D
Case Two, profile after 15 months of Fränkel treatment.

FIG. 9A
Case Two, pretreatment anterior view shows mild Class II-1 malocclusion.

FIG. 9B
Case Two, anterior view after 15 months of Fränkel treatment.

FIG. 9C
Case Two, before treatment, left side. Class II molar relation.

FIG. 9D
Case Two, after treatment, left side. Excellent Class I molar relation.
unlock the maxillary central incisors (Figure 11B), using fixed appliances or a sagittal appliance. The case is then treated like a Class II-1 case.

For most growing patients, the best choice for treatment will be to use a functional appliance to correct the occlusal and the condylar malpositions at the same time. Care must be taken to make a thorough diagnosis before treatment (as in Case Two). If an FJO appliance is selected for treatment, the most common appliances are the Fränkel and the bionator. There are also newer designs by Chateau and Bellavia which show promise and which may well be considered.

When this patient came in for a routine orthodontic examination, I found extreme tenderness when palpating the external auditory meatus and the TMJ. I found no clicking, but the child's mother had occasionally noticed a clicking or popping sound during meals. The patient's facial photo is shown in Figure 12A, and the pretreatment intraorals are shown in Figures 13A and 13C. The pre-treatment transcranial x-ray of the right joint (Figure 14A) shows a significant condylar retrusion.

The Fränkel therapy that was used lasted 22 months; the results are shown in Figures 13B and 13D. The posttreatment transcranial of the right joint shows that the condyle is nearly concentric (Figure 14B). (The opposite TMJ x-ray is not available. It is difficult to obtain adequate x-rays on younger patients. It is my opinion that this is due to the lack of calcification.) The patient elected not to go into fixed appliances. The results have been stable for 4 years, and there is no clicking or tenderness in or about the TMJ. The patient presumably had posterior capsulitis due to the condylar retrusion, and this was evidently corrected during treatment.

Case Four

This 14-year-old male patient, who had a Class II-2 malocclusion, presented for treatment mainly for the cosmetic correction of his maxillary anterior teeth. However, I also found during my examination that he had reciprocal clicking, extreme tenderness, and limited jaw movements. Figures 15A and 15C show the pretreatment facial photos and Figures 16A, C, and E show the intraoral views. There was a deep overbite due to the maxillary anterior alignment that is typical for a Class II, Division 2 malocclusion. The retroclined maxillary central incisors had apparently locked the mandible in a distally displaced position, so both condyles were posteriorly displaced.
FIG. 11A
Class II, Division 2 malocclusion with posterior condylar displacement. The maxillary central incisors have presumably forced the mandible to assume a posterior position, causing this condylar retrusion.

FIG. 11B
The first step in correcting the orthopedic and orthodontic problem is to align the maxillary anterior teeth using either fixed appliances or a sagittal appliance.

FIG. 11C
The case can now be treated like a Class II-1 case. The appliance choice depends upon a differential diagnosis of the skeletal factors, dental factors, and profile of the patient.

FIG. 12A
Case Three, 8-year-9-month-old female before treatment.

FIG. 12B
Case Three, after 22 months of Fränkel therapy.

FIG. 13A
Case Three, pretreatment anterior view with typical Class II-2 configuration.

FIG. 13B
Case Three, after Fränkel treatment. No supplementary appliances were used to attain this result, although a sagittal appliance or maxillary utility arch would have improved the result.

FIG. 13C
Case Three, before treatment, left side.

FIG. 13D
Case Three, after 22 months of Fränkel wear.

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FIG. 14A
Case Three, TMJ x-ray before treatment, right side. Posterior condylar displacement.

FIG. 14B
Case Three, TMJ x-ray after treatment, right side. Concentric condyle.

(Figures 17A and 17C).

For this patient, I used two sagittal appliances to reposition the maxillary centrals forward, as can be seen in the progress photos (Figures 16B, D, and F). Fixed appliances would have repositioned the teeth in the same manner, but the sagittal appliance disarticulated the teeth and also gave immediate relief from the posterior capsulitis, which the fixed appliances would not have done. The two sagittal appliances were used for a total of 14 months, and the patient then wore a bionator for another 14 months to correct the overjet and the molar relationships. The patient was extremely cooperative, and he could be treated faster than most people his age. If he had not been so compliant, either a Herbst46,47,48 appliance or a MARS49 appliance would have been used.

The sagittal-bionator treatment corrected the condyles to near the 4-7 (or Gelb) position (Figures 17B and 17D). This was necessary because of the severity of the pretreatment conditions and because any condyle position posterior to this allowed the patient to begin clicking again.

The patient is nearly ready for finalization of the occlusion to hold the treatment position that has been obtained so far. He is presently undergoing fixed appliance therapy, and the reciprocal clicking that was eliminated has not returned. The treatment with fixed appliances is being done without extractions so that the vertical dimension will be better held. In this case, I feel it would be detrimental to extract either the bicuspid or the second molars, and this treatment can be successfully completed without extractions.

Case Five

This patient, a 27-year-old female, also had a Class II Division 2 malocclusion. Her pretreatment facial photos are shown in Figures 18A and 18C, and the pretreatment introral photos are shown in Figure 19 (A, C, E, and G). The patient had a full step Class II molar relationship with the typical Class II-2 maxillary alignment. There was also minor crowding in the mandibular arch. Both her right and her left TMJs had reciprocal clicking and extreme tenderness, particularly on the left side. Both condyles were in severe retrusion before treatment (Figures 20A and 20C). The patient had been experiencing four or five temporal-parietal-frontal headaches each week, some of which were severe enough to be debilitating. However, her chief complaint was the malalignment of her teeth; she was not aware of any possible connection between her occlusion or condyle position and her headaches.

FIG. 15A
Case Four, 14-year-8-month-old male before treatment.

FIG. 15B
Case Four, after 14 months of sagittal appliance and 14 months of bionator wear.

FIG. 15C
Case Four, pretreatment profile, recessive lower lip and chin.

FIG. 15D
Case Four, pretreatment profile showing lip and chin improvement.

According to Weinberg18,30,43,50 the condyle is not always repositioned forward by the use of an occlusal splint. Depending on the patient's anatomy, the condyle may move forward, superiorly, inferiorly, or not at all. It is therefore important to take a transcranial x-ray after the splint is put in place to see if there has been condylar repositioning and whether it is in the desired direction. If the condyle has not been anteriorly repositioned, some type of hold-forward splint must be used.

This patient's condyles moved forward merely by increasing the vertical dimension, so I decided to treat her
FIG. 16A
Case Four, before treatment. Typical Class II-2 alignment.

FIG. 16C
Case Four, before treatment, left side.

FIG. 16E
Case Four, maxillary arch before treatment.

FIG. 16B
Case Four, after 28 months of sagittal and bionator treatment.

FIG. 16D
Case Four, after treatment, left side.

FIG. 16F
Case Four, maxillary arch after treatment.

FIG. 17A
Case Four, TMJ x-ray before treatment, right side. Posterior condylar displacement.

FIG. 17B
Case Four, TMJ x-ray after treatment, right side. Anterior repositioning past concentric, near the 4-7 or Gelb position. This position was the most posterior position of the condyle at which the disk did not become displaced.

FIG. 17C
Case Four, TMJ x-ray before treatment, left side. Posterior condylar displacement.

FIG. 17D
Case Four, TMJ x-ray after treatment, left side. Slightly anterior condylar position. This position was the most physiological for this patient because of his history of anterior disk displacement.
using only fixed appliances, opening the bite by means of bicuspid extrusion rather than by incisor intrusion. After 32 months of treatment, her occlusion was corrected (Figure 19B, D, F, and H). The occlusal results are acceptable, but there has been a compromise of the labial gingiva on the mandibular incisors. This may have been due to the effect of pressure ischemia resulting from the strong mentalis activity, from excessive movement of the incisors, or from a combination of factors.

The condyles were also repositioned anteriorly, (Figures 20B and 20D), and the patient's joints no longer click. The condylar position is slightly anterior to concentric; this was the most posterior condylar position that was possible before the reciprocal clicking began again. (This can be determined during treatment with a wax bite or an anterior jig.) If there is to be an error in condylar repositioning, I feel that a slightly anterior condyle position is more physiological than a posterior position.

According to Guichet and other investigators, any deflecting inclines between centric relation and centric occlusion must be removed in order to prevent muscle bracing and excessive stress on the TMJ.

This patient still experiences occasional headaches, but these are no longer weekly and they are not debilitating. As the functional excursion photos show (Figure 21), there is cuspid protection and adequate anterior guidance in all excursions. The results have been stable for over three years.

While this case shows that the same treatment modalities may be used in an adult as in an adolescent, I must emphasize that the choice should be made only after careful differential diagnosis. The clinician must also have realistic expectations, because it has never been shown that adults experience the same amount of condylar growth as adolescents. Using treatment appliances such as the bionator, it is not realistic to expect quantitative changes in adults as great as those in growing patients. However, the treatment goals should still be to obtain a therapeutic condylar position and a stable occlusion without compromising soft tissues or esthetics, regardless of the patient's age.

In Case Five, if merely increasing the vertical dimension slightly had not repositioned the patient's condyles anteriorly, I would have needed to reposition the mandible forward as well. The bionator is probably the best appliance to hold the mandible forward and open, because it allows fixed appliances to be used concurrently if necessary. Some clinicians feel that there may be some condylar growth, fossa remodeling, or dentoalveolar adaptation when a bionator is used for adults, but these suppositions have not been proven. We must recognize that those changes are minimal, regardless of how desirable they may be, and they are probably not clinically significant. However, in spite of the orthopedic limitations of adult treatment, FIO appliances such as the bionator do reposition the mandible (and the condyle) forward, and in cases of condylar retrusion, that is the treatment objective, as the next case illustrates.

Case Six

This 24-year-old female, who is currently attending law school, also had craniomandibular pain dysfunction. She had had orthodontic treatment as a teenager, during which time the first four bicuspid were removed. Figure 22 shows the facial photos before and after treatment, and Figure 23 shows the intraoral condition.

The orthodontic result obtained ten years earlier had been quite stable. However, the condyles were posteriorly displaced, and the patient had experienced chronic headaches, neckaches, and shoulder and back pain. She could not eat without having audible clicking sounds, and she.
FIG. 19A
Case Five, pretreatment anterior view. Class II-2 malocclusion.

FIG. 19B
Case Five, anterior view after 32 months of fixed appliances.

FIG. 19C
Case Five, before treatment, right side. Full Class II molar relation.

FIG. 19D
Case Five, after treatment, right side. Class I molar relation.

FIG. 19E
Case Five, maxillary arch before treatment.

FIG. 19F
Case Five, maxillary arch after treatment.

FIG. 19G
Case Five, mandibular arch before treatment.

FIG. 19H
Case Five, mandibular arch after treatment.
also had limited jaw movements. The immediate postorthodontic results from the earlier treatment are not available, so it is conjecture as to whether the case was finished with the condyles posteriorly displaced or whether they had changed since treatment.

This patient's maxillary incisors do not have enough torque, which may have allowed the bite to deepen. Excessive overbites appear to drive the mandible distally in many cases, although this hypothesis has never been studied. In addition, over-retracting the maxillary teeth in order to close extraction sites has been cited as a possible cause of condylar retrusion. Either or both of these situations or some other problem could have caused this patient's TMJ dysfunction.
This case reminds us that a careful diagnosis is necessary before bicusps are extracted. In addition, as the case is nearing completion, a transcranial radiograph should be taken to confirm the condyle position. Orthodontic cases can certainly be completed successfully when bicusps have been extracted, and thousands of cases attest to this. (One such case is described in Part 1 of this series.39) However, the clinician must guard against finishing the case with the condyles posteriorly displaced.

In Case Six, a pretreatment test splint revealed that merely increasing vertical dimension did not reposition the condyles anteriorly. This finding agrees with those of Weinberg,18,30,43,50 and this may explain why splint therapy sometimes has no palliative effect. Because an occlusal splint would not bring about concentric condyle positions, I used a bionator for this patient (Figure 25A), because this appliance advances the mandible and also increases the vertical dimension. This patient chose to use only the bionator appliance and to allow dento-alveolar changes to occur over a longer period of time. The progress of treatment after 12 months of bionator therapy is shown in Figures 22-24. It was necessary to reposition the condyles fairly far anteriorly (at the 4-7 position) in order to capture and hold the articular disk (Figures 24B and 24D), because any condylar position posterior to this resulted in an anteriorly displaced disk. It has been my clinical experience that the further the retrodiscal ligament is broken down, the more anteriorly the condyle position will need to be in order to hold the condyle/disk relationship. I have found this approach to be highly successful, and in the past four years, fewer than 4% of my TMJ patients have had to go on for surgery.

This patient's overbite still needs additional correction, as the progress photo (Figure 23D) shows, but the patient chooses to wear her appliance only part-time because of her present life-style, and she accepts the longer treatment time needed. She will need fixed appliances later to increase the maxillary incisor torque so that the overbite result can be held stable. (It would also be possible to use a fixed appliance with up-and-down elastics to accelerate this treatment.) Transcranial radiographs will need to be taken during this treatment to determine whether the desired therapeutic condylar positions are being attained.

Summary

Of all the condyle positions that can occur, posterior condylar displacement appears to be the one most likely to contribute to craniomandibular pain dysfunction. A posterior condyle position can lead to posterior capsulitis, anterior disk displacement, and other internal derangement problems, such as osteoarthritic changes. It is imperative that every orthodontic clinician be aware of patients' condyle positions during treatment and bring the condyles to a physiological, or therapeutic, final position.

Treatment decisions are sometimes complex, and the clinician must choose intelligently. Over-retraction could cause iatrogenic damage, as could leaving the maxillary anterior teeth with inadequate torque. Excessively deep bites can apparently lead to posterior condylar displacement, but shallow bites may not provide for enough anterior guidance. The anterior teeth must be positioned so that there is anterior guidance, but not to the degree of an excessive overbite. All of these factors should be considered when planning treatment.

Class I cases with retruded condyles may require extractions. However, as long as the condyle position is physiologic, extractions by themselves do not appear to predispose patients to future craniomandibular problems. Class II, Division I cases can also have retruded condyles.
FIG. 23A
Case Six, pretreatment anterior view. This patient had orthodontics 10 years previously.

FIG. 23B
Case Six, anterior view after 12 months of bionator wear.

FIG. 23C
Case Six, left side before treatment. Class I molar relation.

FIG. 23D
Case Six, progress photo, left side. Good Class I molar relation, overbite still too deep.

FIG. 24A
Case Six, TMJ x-ray before treatment, right side. Posterior condylar displacement.

FIG. 24B
Case Six, TMJ progress x-ray, right side. Condyle position near 4-7.

FIG. 24C
Case Six, TMJ x-ray before treatment, left side. Posterior condylar displacement.

FIG. 24D
Case Six, TMJ progress x-ray, left side. 4-7 condyle position with bionator in place. This was the most posterior condyle position that did not allow the disk to become displaced anteriorly. There has apparently been some retrodiskal ligament damage or stretch.

Note: It is not unusual to see different condyle shapes in a single patient, but this much variation is unusual, although no etiological link has ever been found between condyle variation from side to side and TMJ dysfunction.

In these cases, correcting the anterior interferences and then stabilizing the mandibular position is usually successful. Class II-2 cases frequently have retruded condyles; once the maxillary anterior teeth are corrected, the
patient should be treated similar to Class II-I patients. Gianelly shows the posttreatment condylar position using the Fränkel appliances. This treatment appears to be nearly ideal for condyle reposition. However, the clinician must exercise care not to leave the patient's condyles in an anteriorly displaced position, since that may predispose the patient to more TMJ dysfunction. The concentric condyle position appears to be the most physiological for the majority of patients, although it is sometimes necessary to choose the 4-7 or Gelb position.

In cases of posterior condylar displacement, adults can be treated as effectively as adolescents or children, although treatment generally takes longer. There is little, if any, orthopedic change in adults, and all treatment must occur in the dento-alveolar region. However, adult therapy can be successful in spite of this limitation.

References