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Chapter 8

Case report of a posterior disc displacement without and with reduction.

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Abstract

The aim was to present the case of a patient with an acute posterior disc displacement without reduction (PDDWR), whose temporomandibular joint (TMJ) showed, after physiotherapeutic manipulation, the characteristics of a posterior disc displacement with reduction (PDDR). Opto-electronic condylar movement recordings in both the PDDR state and the PDDWR state, and MRI's of the TMJ in the PDDR state were made to document the case. The first two manipulations were initially successful in reducing the disc, but a few days later the joint showed a relapse to the PDDWR state. From the third manipulation on, now 12 months ago, the patient is free of symptoms. Condylar movement traces of the joint in the PDDWR state indicated that the condyle was prevented from (completely) entering the fossa. The downward condylar movement deflections during the early phase of closing, recorded after the second manipulation, showed the reduction of the posteriorly displaced disc during closing. The movement recordings also showed that the PDDR could be eliminated by submaximal opening and closing movements. The MRI's, taken after the third, successful manipulation, showed the disc to be in a normal position with respect to the condyle when the mouth was closed, and to be posteriorly displaced when the mouth was maximally opened. In Conclusion: manipulation techniques can successfully reverse an acute PDDWR into a PDDR. The techniques of MRI's and condylar movement recordings look promising in further unraveling the morphological and clinical features of posterior disc displacements.
Introduction

Disc displacements within the temporomandibular joint (TMJ) are examples of frequently occurring internal derangements. The anterior disc displacement with reduction is probably the one that is described most often. It is characterized by an anterior displacement of the articular disc in the closed jaw position, that improves its structural relationship with the condyle during mouth opening (Farrar and McCarty, 1982). For the anterior disc displacements with reduction, clicking sounds are the main symptom, and most, if not all, anterior disc displacements with reduction are painless, and only marginally hamper joint function. However, in rare cases, the disc does not reduce on opening. It then stays permanently displaced with respect to the condyle and the patient has difficulty in full opening the mouth (closed lock). In a few publications, a posterior disc displacement (PDD) has also been reported (Obwegeser and Aarnes, 1973; Blankestijn and Boering, 1985; Gallagher, 1986; Engelke, 1990; Westesson et al., 1998; Chossegros et al., 2001; Nitzan, 2002). It is described as a painful, sudden occurring inability to bring the upper and lower dentition together in maximal occlusion (open lock), as if an elastic material was present in the joint (Blankestijn and Boering, 1985). This latter aspect suggests that in the closed mouth position, the disc is posteriorly displaced with respect to the condyle. No clicking sounds were reported, which indicates that there was no disc reduction on movement. This description fits the clinical condition of a disc which is permanently displaced: a posterior disc displacement without reduction (PDDWR). Descriptions of a posterior disc displacement with reduction (PDDR) are very rare (Wise et al., 1993; Yoda et al., 2002). Its main clinical symptom would be clicking on closing; not on opening.

The aim of this study was to present the case of a patient with presumably an acute PDDWR, who's joint showed, after physical therapy manipulation, the characteristics of a PDDR. The case is documented with MRI's and with the results of condylar movement recordings.
Materials and methods

Clinical history

Two weeks before his visit to the CMD clinic of the department of Oral Function at ACTA, a 28-year-old male experienced a sudden pain in the left TMJ during dinner. From then on, he had problems with chewing and was unable to occlude his posterior teeth because of an obstruction he felt in the left TMJ. The patient had no history of TMJ pain, dysfunction, or trauma before this incident.

Physical examination showed an otherwise healthy young man. The maximum interincisal distance was 57 mm with normal lateral and protrusive excursions. The left TMJ was painful upon preauricular and intra-auricular palpation. The patient occluded in an anterior position, resulting in a posterior open bite on the left side. The joint play test, during which manual distocranial compression of the condyle into the fossa was exerted, was very painful on the left side. Based on these clinical findings and the oral history, a PDDWR was suspected.

Using caudal traction and dorsal compression techniques, the physical therapist was able to reduce the disc. At the time of reduction, the patient and the physical therapist felt a sudden "pop" in the left TMJ. After that, the patient was able to occlude again in maximum occlusion. He was instructed not to open his mouth maximally to prevent another posterior displacement of the disc. However, 3 days later, the patient returned to the clinic with the same complaints. Again it was possible to reduce the disc with the aid of the manipulative techniques. Ten days after the initial visit, a last, third, manipulative attempt had to be performed. From the third manipulation on, now 12 months ago, the patient is free of symptoms. An overview of the time path of this case is given in table 1.

Condylar movement recordings

Mandibular movements were recorded by means of the OKAS-3D system, which is an opto-electronic device capable of accurately recording mandibular motion with six degrees of freedom at a sampling frequency of 300 Hz per coordinate (Naeije et al., 1995). With the use of rigid body mathematics, the movement traces of the kinematic center of the TM condyles (Yatabe et al., 1995; Naeije et al., 1999) and those of the lower incisal point were reconstructed relative to the skull. Small microphones (condenser type) were placed over the palpated lateral pole of the TMJ's to simultaneously record joint sounds. A specialized software procedure graphically visualized the recorded movement.
traces. The occurrence of a joint sound was depicted on these traces with an asterisk.

Two movement recordings were made, one before and one after the third manipulation of the PDDWR, see also table 1.

<table>
<thead>
<tr>
<th>Day</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Onset of sudden pain</td>
</tr>
<tr>
<td>14</td>
<td>Intake, physical examination, first manipulative attempt (relaps within a day)</td>
</tr>
<tr>
<td>17</td>
<td>Second manipulative attempt (relaps within a day)</td>
</tr>
<tr>
<td>21</td>
<td>Opto-electronic movement recording</td>
</tr>
<tr>
<td>24</td>
<td>Third manipulative attempt (successful), opto-electronic movement recording</td>
</tr>
<tr>
<td>54</td>
<td>MRI</td>
</tr>
</tbody>
</table>

Table 1. Overview of the time path of the case.

MRI's

T₁-weighted MR images were performed with a 1.5 T MR imaging system (Gyroscan NT Intera, Philips Medical Systems, Eindhoven, The Netherlands) with a surface coil used as receiver. The patient's head was placed in a headrest in the MR imager. The repetition time was 530 msec; the echo time, 18 msec. Imaging was performed in a closed mouth situation with nine interleaved 3-mm sagittal planes obtained from lateral to medial, followed by nine interleaved 3-mm coronal planes obtained from anterior to posterior. Thereafter, imaging was performed with the mouth maximally opened, controlled with a resin bite block, with nine interleaved 3-mm sagittal planes obtained lateral to medial. For all images made, the data matrix was 205x 256, and the imaging time 4 minutes and 21 seconds.

The MRI's were made one month after the last manipulation (see table 1). After the MRI of the maximally opened mouth was made, the subject temporarily experienced his original complaints again. However, the complaints lasted only about a day and disappeared without therapeutic intervention.
Results

Figure 1 shows the results of the movement recordings made before and after the third manipulation. Prior to the manipulation, the start and end points of the movement traces of the left TMJ condyle and that of the incisal point lied anterior to their original intercuspal positions. Apparently, it was impossible for the left TMJ condyle to completely enter the fossa. After the manipulation, soft clicks at the end of opening and louder clicks during closing were recorded. The sagittal movement traces of the incisal point and those of the left TMJ condyle were longer than before the manipulation, and they started and ended in the intercuspal position. Furthermore, in the first part of closing the movement traces showed a characteristic downward deflection with respect to the opening traces (see figure 1B), which was not noted before the manipulation. Submaximal opening and closing eliminated these downward closing deflections (Fig. 1C), while protrusive opening and closing (Fig. 1D) did not.

Figure 2 shows the Magnetic Resonance Images of the left TMJ with the PDDR. The articular disc was in a normal position when the mouth was closed (Fig. 2A), but was posterior of the condyle when the mouth was opened maximally (Fig. 2B).

Figure 1A. Superimposed sagittal kinematic movement traces made before the third manipulation. The start and end points of the movement traces of the left TMJ condyle and that of the incisal point were anterior to their original intercuspal positions. It was impossible for the left TMJ condyle to completely enter the fossa. The top left point point of each trace is the condylar position with the mandible in the intercuspal position.
Figure 1B. Results of the opto-electronic movement recordings after the third manipulation. Observed clicks are indicated with asterisks (*). The closing traces now show a downward deflection with respect to the opening traces at the time of clicking. Further, the sagittal movement traces of the incisal point and those of the left TMJ condyle were longer than before the manipulation and they started and ended in the intercuspal position.

Figure 1C. Submaximal opening and closing showing that the clicks and the downward deflection in the closing traces were eliminated.
Figure 1D. Protrusive opening and closing, again showing the clicks and the downward deflection in the closing traces (no elimination).
Figures 2A and 2B: Magnetic Resonance Images showing that the disc (indicated with arrows) was in a normal position when the mouth was closed (top part), but was posterior of the condyle when the mouth was opened maximally (bottom part).


Discussion

The PDDWR has only been reported in a few publications (Obwegeser and Aarnes, 1973; Blankestijn and Boering, 1985; Gallagher, 1986; Engelke, 1990; Westesson et al., 1998; Chossegros et al., 2001; Nitzan, 2002), which indicates, that this subtype of TMJ internal derangements is relatively rare. However, since it has been reported that patients with a PDDWR have pain and severe problems with chewing (Blankestijn, 1985), a better understanding of the mechanism of the PDDWR is needed. Although only one patient was described in the present case report, it gives a good insight into the mechanisms of the PDD’s with and without reduction. Unfortunately, due to the long waiting list for MRI’s, only MRI’s were made of the joint in the PDDR state; the condylar movements were recorded with the joint in both the PDDRW and the PDDR state.

Although misdiagnosis of disc displacement is a known problem of MRI’s (Kircos et al., 1987; Barclay et al., 1999; Huddleston Slater et al., 2002c), some studies reported the presence of a PDD on MRI’s in the closed mouth position (Blankestijn and Boering., 1985; Westesson et al., 1998; Chossegros et al., 2001). In these reports, the PDD was clinically described as a sudden, painful inability to bring the upper and lower dentition together in maximal occlusion, as if an elastic material is present in the joint (Blankestijn and Boering, 1985). The results of the present case suggest that these authors described a PDDWR. The present case report is, to our knowledge, the first one to describe the successful manipulation of an acute PDDWR into a PDDR.

The MRI’s and the condylar movement recordings of this study suggest the following mechanism for the PDDR in this patient. The disc was in its normal position with respect to the condyle when the mouth was closed. It got posteriorly displaced in the final part of mouth opening and it restored its relationship with the condyle during mouth closing. Soft clicking sounds on opening and louder sounds on closing were the main clinical manifestations of the PDDR. The opening clicks indicated the dislocation of the disc at the end of mouth opening. The closing clicks and the concomitant characteristic downward deflections in the condylar movement traces in the early part of closing illustrated the slipping of the condyle over the anterior band of the disc. This mechanism of PDDR is in line with suggestions made earlier (Wise et al., 1993; Yoda et al., 2002), but in contrast to the mechanism suggested by Chossegros et al. (2001). It explains why the elimination test for anterior disc displacements with reduction did not eliminate the PDDR. Protrusive opening and closing did not prevent the disc from getting posteriorly displaced, because the dis-
placement did not occur in the final phase of closing, as is the case for the anterior disc displacements, but in the final phase of opening. For this reason, the elimination test for the PDDR was submaximal opening and closing. Whether the sudden onset of the PDDWR in this patient was preceded by an unnoticed PDDR is unfortunately unknown.

As part of an ongoing study to the prevalence and etiology of TMJ clicking, about a hundred condylar movement recordings of clicking TM joints have been made at the department of Oral Function of ACTA. Of these recordings, three showed the same PDDR movement characteristics as described here. One patient reported to have, once in a while, clinical symptoms similar to the PDDWR symptoms presented here, which lasted several weeks and disappeared spontaneously. In another of these patients, the closing click was much louder than the opening click and also painful. This patient had found out herself that not opening maximally wide prevented the occurrence of this painful closing click. It is clear that more research is needed to get a better insight into the morphological and clinical features of PDD’s with and without reduction.

The physical therapist was able to reduce the disc of the PDDWR by using caudal traction and dorsal compression techniques. Although we realize that the treatment was only used in this single case, it suggests that a PDDWR may be reversed to a PDDR if treated early. The manipulation had to be repeated several times, despite instructions to the patient not to open his mouth maximally wide. From the third manipulation on, which was performed 12 months ago, the patient is free of symptoms. He only experienced some transient complaints after the MRI of the maximally opened mouth was made.

In conclusion: manipulation techniques can successfully reverse an acute PDDWR into a PDDR. MRI’s and condylar movement recordings, as techniques to document these cases, look promising in further unraveling the morphological and clinical features of PDD’s.