

Temporomandibular Joint Disk Fracture: A Case Report

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ABSTRACT: A case of a patient with a fracture of the temporomandibular joint (TMJ) disk is reported. The patient presented with posterior bilateral open-bite and difficulty to chew due to lack of contact between the posterior teeth. Diagnosis of disk fracture of the right TMJ was made based on magnetic resonance imaging (MRI), with posterior displacement of the posterior fragment of the disk, causing the posterior open-bite, and anterior displacement of the anterior fragment of the disk. TMJ manipulation failed to reposition the posterior fragment of the disk, and the patient refused to undergo TMJ arthroscopy to try to remove it. After four months, the posterior open-bite was reduced, probably because of remodeling of the posterior TMJ capsule and extrusion of the molars and premolars. Contact with the patient was lost after that time.

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Disk displacement of the temporomandibular joint (TMJ) is the most common arthropathy involving the TMJ.¹ Such disorder is due to an abnormal relation between the mandibular condyle and the articular disk. The most common direction for disk displacement is an anterior, anterior-medial, or anterior-lateral direction,¹⁻⁵ causing joint noises and mandibular deviation during opening and closing movements of the mouth (disk displacement with reduction), or limitation of mouth opening, mandibular deflection during mouth opening and pain (disk displacement without reduction).^{1,3}

Although uncommon, the occurrence of posterior disk displacements (PDD) has been reported in the literature. The first case was described by Behan in 1918,⁶ then, from 1934 to 2008, another 27 articles have been published, reporting over 100 cases of PDD of the TMJ.^{5,7-32}

As in the case of anterior disk displacement, two types of PDD can be diagnosed: PDD with reduction and PDD without reduction, although those definitions were described differently by different authors.⁷⁻⁹ Chossegros, et al.⁷ define the former as characterized by reduction of the posterior disk displacement during mouth opening,

while in the latter case, the disk stays posteriorly displaced both in the closed- and open-mouth positions. Conversely, other authors^{8,9} give a different definition of PDD with reduction, describing a condition where the disk is correctly positioned with the mouth closed but becomes posteriorly displaced with the mouth completely opened. This is usually caused by adhesions between the disk and the glenoid fossa or the articular eminence. When adhesions occur, the disk cannot follow the condyle when it translates forward during mouth opening, and it becomes displaced posteriorly in the open-mouth position.

Three types of PDD were identified by Westesson, et al.¹⁰ and by Okochi, et al.,¹¹ according to the morphologic structure of the displaced disk: a *thin flat disk type*, in which the disk appears like a flat band of tissue on top of the condyle extending posteriorly to it; a *grossly posteriorly displaced disk type*, in which the entire disk is posteriorly displaced; and a *perforated disk type*, in which the disk appears perforated with a large part displaced posterior to the condyle and a small part anterior to it. The thin flat disk type is by far the most prevalent, representing about 80% of the cases.^{10,11}

A common feature of PDD without reduction is a sudden inability to close the teeth into the intercuspal position, showing ipsilateral or bilateral molar open-bite. Pain in the TMJ can be present, especially at the end of mouth closure. Conversely, mouth opening is usually not affected.^{6-8,10-12} Occasionally, a mass protruding from the anterior wall of the external auditory canal is noticed, especially with the mouth closed.^{12,13}

The following is a case of TMJ disk fracture with posterior displacement of the posterior fragment of the disk.

Case Report

A 61-year-old Caucasian male patient came to the dental office for evaluation. His chief complaint was a sudden lack of posterior tooth contact that caused him difficulty chewing. He also reported the presence of noises in the right temporomandibular joint (TMJ), during mandibular movements. The symptoms had started about three weeks previously.

During clinical evaluation, the presence of bilateral posterior open-bite was confirmed. The distance between the maxillary and mandibular first molars was approximately one mm. The mandible was protruded, allowing only contact between the anterior teeth; mouth opening was not limited and was equal to 43 mm. Crepitation was noticed in the right TMJ during mandibular movements. Severe tooth wear was observed, probably due to sleep bruxism, since the patient denied any conscious oral parafunctions.

Tomography of the TMJ in the closed- and open-mouth positions showed osteoarthritis of both TMJ and a forward position of the condyles in the closed-mouth position. Magnetic resonance imaging (MRI) was requested, and it showed a fracture of the right TMJ disk with posterior displacement of the posterior fragment, and anterior displacement of the anterior fragment (**Figure 1**). Bilateral TMJ osteoarthritis and right TMJ effusion was also present. While the anterior fragment displaced anteriorly did not interfere with mandibular movements (neither clicking sounds nor limitation of mouth opening were present), the posterior fragment was dislocated behind the condyle, preventing it from reaching the most posterior position at the end of mouth closing.

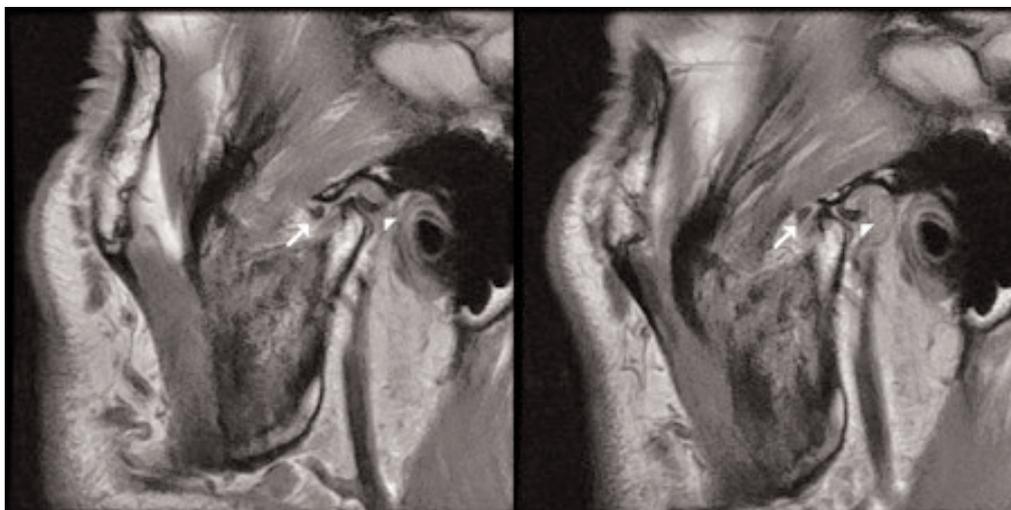


Figure 1
Proton density (PD) weighed magnetic resonance imaging (MRI) of the right temporomandibular joint (TMJ) in the closed- and open-mouth positions. The image shows the TMJ disk fracture with posterior displacement of the posterior fragment (arrow heads) and anterior displacement of the anterior fragment (arrows) in the closed- and open-mouth positions. TMJ: temporomandibular joint.

MRI also showed disk displacement with reduction of the left TMJ (**Figure 2**).

As suggested by many authors,^{8-12,14,15} manual manipulation of the right TMJ was attempted to try to reposition the posterior fragment of the articular disk. Anesthesia was not required because the patient reported no pain at the time of the visit and during the procedure. The mandible was manipulated in a caudal and dorsal direction, opposite to the maneuver commonly used in case of anterior disk displacement without reduction, with continuous and firm pressure. However, the procedure was not successful.

Surgical removal of the posterior fragment of the disk through arthroscopy was suggested, with the purpose of allowing the condyle to move back to its correct position with the mouth closed, and therefore, to restore molar and premolar contacts. Nevertheless the patient refused to undergo any surgical therapy. The patient was instructed to exercise moving the mandible forwards and backwards sliding on a tongue depressor, especially forcing mandibular movements to the back. The purpose was to try to further posteriorly dislocate the posterior fragment of the disk, and allow the condyle to move back to its correct position at the end of mouth closure. This is the same principle used to increase mouth opening in case of permanent anterior disk displacement without reduction. The condition was followed-up four months after the first visit. Posterior bilateral open-bite was reduced from about one mm to about 0.5 mm, probably because of adaptation of the posterior TMJ capsule, and extrusion of the teeth. Pain was absent.

Unfortunately, contact with the patient was lost after that time; consequently, no further information is available as to the progression of the condition.

Discussion

To our knowledge, this is the first case reported in the literature of TMJ disk fracture. The anterior fragment of the disk was displaced anteriorly, and the posterior fragment was displaced posteriorly, causing a sudden inability to close the teeth into the intercuspal position, showing bilateral posterior open-bite. Maximum mouth opening was normal.

Previous reports regarding posterior displacement of the TMJ disk, either intact or perforated, show that continuity between the anterior and posterior portions of the disk was always maintained.⁵⁻³² Clinical signs and symptoms are similar, due to the fact that the condyle is prevented from moving back to its correct position at the end of mouth closing by the presence of an impediment. In the case of PDD, the impediment is represented by the TMJ disk, and in the present case report, the impediment is represented by the posterior fragment of the disk, which originated as a consequence of disk fracture.

Other conditions potentially causing posterior open-bite of sudden onset must be evaluated for the differential diagnosis. The most common are traumatic hematoma in the TMJ, acute TMJ inflammation, and spasm of the lateral pterygoid muscle.⁹ However, these pathologies are characterized by acute TMJ pain, which was absent in the present case report. MRI is crucial for a definitive diagnosis.

Differentiating between disk fracture and disk perforation using MRI can be difficult. In fact, in the central part of the TMJ, both conditions show a separation between the anterior and posterior portions of the disk. However, in case of disk perforation, in the medial and lateral parts of the TMJ the two portions are united, keeping the

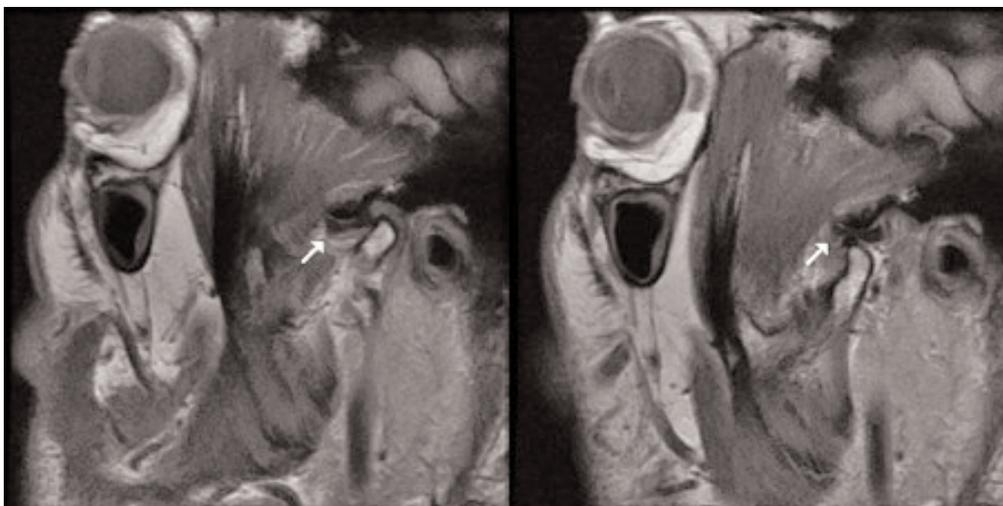


Figure 2
Proton density (PD) weighed magnetic resonance imaging (MRI) of the right temporomandibular joint (TMJ) in the closed- and open-mouth positions. The image shows articular disk displacement in the closed-mouth position (arrow), and reduction of the disk in the open-mouth position (arrow).

integrity of the disk. In the present case MRI showed a complete fracture of the TMJ disk into two fragments. The clinical appearance of PDD and disk fracture with posterior displacement of the posterior fragment is identical, but the outcome of conservative treatment can be different. In fact, the attempts to try to reduce the displacement of the disk manipulating the TMJ can be successful in case of PDD, but were not successful in the present case. When the integrity of the disk is maintained, pulling the condyle in a dorsal and caudal direction helps to release the disk, which is pulled forward by the tissues connecting it to the anterior part of the TMJ capsule and the lateral pterygoid muscle. In the case of disk fracture with complete separation between the anterior and the posterior fragments, the only forces acting on the posterior fragment are directed posteriorly by the retrodiskal tissues (particularly by the superior retrodiskal lamina), while there are no tissues pulling the fragment forward. This is probably the reason why manual manipulation of the TMJ was not successful in the present case. For the same reason, the use of a dental splint, as suggested by Chossegros, et al.⁷ and by Honda, et al.,⁹ was not judged to be useful, and therefore, was not proposed to the patient. The use of a dental splint is aimed at restoring molar support, thus decreasing the pressure of the mandibular condyle towards the posteriorly displaced disk, and consequently, allowing the disk to be pulled forward. This cannot occur if the only forces acting on the displaced fragment are directed posteriorly. For this reason, the only treatment suggested was the complete removal of the posterior fragment of the disk to eliminate the interference in condylar movement during closure. Such treatment can be accomplished surgically, either by an open-joint procedure^{6,20} or arthroscopically,^{30,32} also depending on the size of the fragment to be removed. However, the patient refused to undergo any surgical therapy, especially because pain was absent and the discomfort while chewing was moderate, and further decreased after four months.

The reduction of bilateral posterior open-bite during the period of six months was probably due to three factors: adaptation of the posterior TMJ capsule, changes in the retrodiskal tissues, and dental extrusion.

The authors' hypothesis is that the pressure of the condyle towards the posterior fragment of the disk, produced both during normal mandibular movements and during exercises, was transmitted to the posterior wall of the TMJ capsule, causing its extension. This adaptation might have created a larger space for the posterior fragment of the disk, allowing a more posterior placement of the condyle on mouth closure, thus reducing posterior open-bite. Moreover, reduction of TMJ effusion and thin-

ning of the retrodiskal tissues could also have occurred.

The development of dental extrusion is also likely to occur in teeth that are not in contact for a period of four months, contributing to a reduction in posterior open-bite.

Unfortunately, it was not possible to follow the further evolution of the patient's condition, because contact was lost after the last visit at four months follow-up.

Two different outcomes are possible. Posterior open-bite could have further reduced until tooth contact was achieved. In this case, no further treatment would be needed.

Otherwise, maxillo-mandibular and dental relationships could have stabilized with some residual amount of posterior open-bite. In this case, if TMJ surgery is excluded, restorative and/or prosthetic treatment could be suggested to restore the *missing* vertical dimension and to reestablish proper posterior tooth contact.

With regard to the possible etiology of the disk fracture, a trauma to the mandible or directly to the TMJ would be the most probable; however, any history of trauma associated with the onset of symptoms was denied by the patient. Another hypothesis is that micro-trauma due to bruxism eventually associated with the altered shape of the condyle (osteoarthritis changed the original round profile of the condyle into a wedge-shaped profile, **Figure 1**) could be responsible for causing severe damage to the intermediate zone of the TMJ disk, ultimately leading to complete separation between the anterior and posterior bands. It may also have produced intracapsular edema (right TMJ effusion was observed on the MRI) that could be partly responsible for creating the posterior open-bite.

Conclusions

Fracture of the TMJ disk is a very rare occurrence. When the posterior fragment of the disk becomes displaced posteriorly, it gives the same clinical signs and symptoms as a PDD. Recapture of the posteriorly displaced fragment is unlikely, but conservative treatment can help improve the symptoms due to adaptation of the TMJ capsule, changes to the retrodiskal tissue, and dental extrusion. Nonetheless, the outcome of such disease cannot be deduced based on the present case, because contact with the patient was lost after four months follow-up of conservative treatment.

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References

- de Leeuw R, ed.: *Orofacial pain: guidelines for assessment, diagnosis, and management*. 4th ed. Chicago: Quintessence, 2008.
- Isberg-Holm AM, Westesson P-L: Movement of the disk and condyle in the temporomandibular joints with clicking: An arthrographic and cineradiographic study on autopsy specimens. *Acta Odontol Scand* 1982; 40:151-164.
- Okeson JP: Signs and symptoms of temporomandibular disorders. In: Okeson JP, ed. *Management of temporomandibular disorders and occlusion*, 4th ed. St. Louise: Mosby, 1998;180-233.
- Larheim TA, Westesson P-L, Sano T: Temporomandibular joint disk displacement: comparison in asymptomatic volunteers and patients. *Radiology* 2001; 218:428-432.
- Tasaki MM, Westesson P-L, Isberg AM, Ren YF, Tallents RH: Classification and prevalence of temporomandibular joint disk displacement in patients and symptom-free volunteers. *Am J Orthod Dentofacial Orthop* 1996; 109:249-262.
- Behan RJ: Loose cartilage in the temporomaxillary joint: subluxation of the inferior maxilla. *Ann Surg* 1918; 67:536-537.
- Chossegros C, Cheynet F, Guyot L, Bellot-Samson V, Blanc JL: Posterior disk displacement of the TMJ: MRI evidence in two cases. *J Craniomandib Pract* 2001;19:289-293.
- Huddleston Slater JJ, Lobbezoo F, Hofman N, Naeije M: Case report of a posterior disk displacement without and with reduction. *J Orofac Pain* 2005; 19:337-342.
- Honda T, Shimoda T, Moses JJ, Harada H: Traumatically induced posterior disk displacement without reduction of the TMJ – a case report. *J Craniomandib Pract* 1994; 12:128-132.
- Westesson P-L, Larheim TA, Tanaka H: Posterior disk displacement in the temporomandibular joint. *J Oral Maxillofac Surg* 1998; 56:1266-1273
- Okochi K, Ida M, Honda E, Kobayashi K, Kurabayashi T: MRI and clinical findings of posterior disk displacement in the temporomandibular joint. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008; 105:644-648.
- Gallagher DM: Posterior dislocation of the temporomandibular joint meniscus: a report of three cases. *J Am Dent Assoc* 1986; 113:411-415.
- Laurent F, Cuffel P: Stenosis of the external ear canal due to meniscus intrusion. *Rev Stomatol Chir Maxillofac* 1984; 85:276-279.
- Engelke W: Posterior dislocation of the articular disk – a rare case? *Dtsch Z Mund Kiefer Gesichtschir* 1990; 14:86-89.
- Chiba M, Watanabe N, Echigo S: Longitudinal MRI follow-up of non-reducible posterior disk displacement accompanied by bone marrow edema in the mandibular condyle. *Dentomaxillofac Radiol* 2007; 36:304-307.
- Steinhardt G: Zür pathologie und therapie des gelenkknackens bei kiefer-schliessbewegungen. *Dtsch Zahnärzte Wochenschr* 1934; 37:1013.
- Steinhardt G: Zür entstehung und konservativen behandlung der kiefergelenkstörungen (insbesondere der bewegungsstörungen und des gelenkknackens). *Osterr Z Stomatol* 1957; 54:69-76.
- Obwegeser H, Aarnes K: Luxation of the discus articularis of the temporomandibular joint. *Schweiz Monatsschr Zahnheilkd* 1973; 83:67-70.
- Drommer R, Rudelt HG: Treatment experiences with discus articularis luxation, (Erfahrungen bei der behandlung der diskusluxation). *Fortschr Kiefer Gesichtschir* 1980; 25:35-37.
- Bronstein SL, Tomasetti BJ, Ryan DE: Internal derangement of the temporomandibular joint; correlation of arthrography with surgical findings. *J Oral Surg* 1981; 39:572-584.
- Xu-Chen M, Zhao-Ju Z, Zhen-Kang Z: Temporomandibular joint arthrography. A study of some diagnosis at superior joint cavity arthrography. *Dentomaxillofac Radiol* 1983; 12:17-24.
- Blankestijn J, Boering G: Posterior dislocation of temporomandibular disk. *Int J Oral Surg* 1985; 14:437-443.
- Schellhas KP, Wilkes CH, Omlie MR, Peterson CM, Johnson SD, Keck RJ, Block JC, Fritts HM, Heithoff KB: The diagnosis of temporomandibular joint disease: two-compartment arthrography and MR. *Am J Roentgenol* 1988; 151:341-350.
- Lückerath W, Klett R, Schlolaut KH: Etiology of eccentric posterior and centric-anterior displacements of the articular disk. *Dtsch Zahnärztl Z* 1989; 44:S41-45.
- Lückerath W, Helfgen EH, Schlolaut KH: Forms of eccentric posterior displacement of the articular disk. *Dtsch Zahnärztl Z* 1989; 44:S45-48.
- Kakudo K, Higashino Y, Shirasu R, Shibata R: A case report of posterior disk displacement without reduction of TMJ. *J Jpn Soc TMJ* 1991; 3:359-364.
- Paesani D, Westesson P-L, Hatala MP, Tallents RH, Kurita K: Prevalence of temporomandibular joint internal derangement in patients with craniomandibular disorders. *Am J Orthod Dentofac Orthop* 1992; 101:41-47.
- Pressman BD, Shellock FG, Schames J, Schames M: MR imaging of temporomandibular joint abnormalities associated with cervical hyperextension/hyperflexion (whiplash) injuries. *J Magn Reson Imaging* 1992; 2:569-574.
- Larheim TA, Smith HJ, Aspestrand F: Temporomandibular joint abnormalities associated with rheumatic disease: comparison between MR imaging and arthrography. *Radiology* 1992; 183:221-226.
- Sumiyoshi S, Shimoda T, Honda T: A case of posterior disk displacement of the TMJ treated by arthroscopic surgery. *Jpn J Oral Maxillofac Surg* 1995; 7:653-655.
- Bellot V, Chossegros C, Cheynet F, Guyot L, Sarrat P, Paris J, Blanc JL: Posterior disk displacement of the temporomandibular joint. Apropos 2 cases. *Rev Stomatol Chir Maxillofac* 2000; 101:23-29.
- Ohira A, Kobayashi R, Sato R, Nesori F, Wagai F, Sekiyama S: A case of posterior disk displacement of the temporomandibular joint treated by arthroscopic surgery. *Jpn J Oral Maxillofac Surg* 2003; 49:47-50.

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