CASE REPORT

Fracture of the articular disc in the temporomandibular joint: two case reports

¹S-Y An and ²J-K Jung

¹Department of Oral and Maxillofacial Radiology, School of Dentistry, Kyungpook National University, Daegu, Republic of Korea; ²Department of Oral Medicine, School of Dentistry, Kyungpook National University, Daegu, Republic of Korea

Disc fracture of the temporomandibular joint (TMJ) is a little-known pathological condition owing to its extreme rarity. We report two cases of elderly patients who were diagnosed with disc fracture of the TMJ based on MRI, and we review related reports. On physical examination, an incomplete bite and mild joint pain were observed on the affected side in both patients. An MRI showed a complete fracture in the intermediate zone of the articular disc in the TMJ; the posterior fragment was displaced posteriorly, causing occlusal change in the closed position of the condyle and an incomplete bite. Conservative treatment including manual manipulation, physical therapy and oral appliance had no effect on the occlusal abnormality. Although the inciting cause of the disc fracture remained unclear, the degenerative changes in the joint may have been a factor by increasing the brittleness and reducing the elasticity of the disc.

Dentomaxillofacial Radiology (2015) **44**, 20140218. doi: [10.1259/dmfr.20140218](https://doi.org/10.1259/dmfr.20140218)

Cite this article as: An S-Y, Jung J-K. Fracture of the articular disc in the temporomandibular joint: two case reports. *Dentomaxillofac Radiol* 2015; **44**: 20140218.

Keywords: disc fracture; mandibular condyle; temporomandibular joint disorders

Introduction

Temporomandibular joint (TMJ) disorders are a collective term encompassing a variety of pathological conditions in TMJ, including disc displacement, degenerative change and joint ankylosis.¹ Mechanical trauma is considered a potent cause of TMJ disorders.²⁻⁴ In addition to macro-trauma, chronic microtrauma from normal or partial function is thought to be closely associated with joint damage and osteoarthritis.⁵ Degenerative change of the TMJ is a very common finding in the elderly population and affects all components of the joint, including the bone, articular disc and cartilage. Most studies have exclusively investigated the degenerative changes in the bone and cartilage,^{6,7} but the clinical manifestations of disc degeneration are poorly understood.

During disc displacement, the disc is displaced anteriorly in most cases but may rarely be displaced posteriorly.^{8,9}

Clinical symptoms vary depending on the severity and direction of disc displacement. Whereas anterior disc displacement frequently causes functional problems, such as limited jaw opening, joint pain and sound during opening, posterior disc displacement typically causes symptoms during mouth closure, including limitation during closure and acute occlusal changes.¹⁰ Recently, the first known case of posterior displacement of the posterior disc fragment following TMJ disc fracture was reported; the fracture reportedly caused development of an anterior open bite.¹¹ Disc fracture is the complete separation of the disc, whereas in disc perforation, the disc sustains only a partial tear but maintains its integrity.¹⁰ The clinical presentation and cause of disc fracture is not clearly established, as it is described little beyond one previous report.

In the present report, we describe two patients who developed an acute occlusal change and difficult mastication and were subsequently diagnosed with a complete disc fracture and displacement in the TMJ.

Correspondence to: Professor Jae-Kwang Jung. E-mail: widenmy@knu.ac.kr

This research was supported by the Basic Science Research Programme through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2012-0009326).

Received 23 June 2014; revised 18 September 2014; accepted 9 October 2014

Figure 1 Case 1. (a) Panoramic radiograph and (b) the four temporomandibular joint panoramic views. Cortical outline of the condyles and the range of mouth opening are relatively normal. L, left side.

Case report 1

A 74-year-old man presented with a 1-month history of acute anterior open bite and discomfort during mastication. The patient also reported mild, dull pain in both masseter muscles and the posterior teeth. He had a history of well-controlled hypertension and diabetes. On initial examination, there was no limitation in mandibular movement, and the mouth opening range was 50 mm; however, crepitus was detected in both TMJs. Plain radiography did not show any visible abnormality in either condyle (Figure 1). Tight contact between the upper and lower second molars was present, and a slight gap between the upper and lower anterior teeth was observed when the mouth was closed (Figure 2). An MRI, bite registration and dental impression were performed. The patient then underwent physical therapy, including ultrasound and myomonitoring, along with receiving analgesics and muscle relaxants.

On careful analysis of the dental casts, the maxillary and mandibular arcades occluded normally when the dental casts were manually manipulated, indicating that the acute occlusal change was not owing to tooth movement. The MRI showed that the articular discs in both TMJs were completely separated at the intermediate zone; each disc was fractured into two pieces: an anterior fragment and a posterior fragment (Figure 3). The anterior

fragment was displaced anterior to its normal position, but the posterior fragment was displaced posterior to the condyle head, blocking the condylar head from returning to its normal position in the articular fossa during mouth closure. The anterior fragment did not appear to interfere with condylar movement because it moved in concert with the condyle; this allowed the patient to open his mouth to 50 mm without any TMJ pain. In addition to the disc

Figure 2 Case 1. Clinical photograph on initial examination. A slight gap is present between the maxillary and mandibular anterior teeth in the closed position.

Figure 3 Case 1. (a–c) MR images of the right and (d–f) left temporomandibular joints (TMJs). Proton density-weighted MRI (a, d) and T_2 weighted MRI (b, e) in the closed position, and proton density-weighted MRI (c, f) in the open position. The discs (arrowheads: anterior fragment, arrows: posterior fragment) in both TMJs are completely separated at the intermediate zone. While the anterior fragment is anteriorly displaced from its normal position, the posterior fragment is displaced posteriorly behind the condylar head. Flattening of the condylar head and joint effusion are evident in both TMJs.

fracture, the MRI showed condylar resorption and joint effusion in both TMJs. Laboratory tests were performed to rule out a potential autoimmune arthropathy. The laboratory tests included a routine complete blood count, liver function test, renal function test, urinalysis, urine sediment evaluation, rheumatoid factor, C-reactive protein, C3, C4, anti-cyclic citrullinated peptide and antinuclear antibody measurement; the results were within the normal ranges, except for a mildly increased C4. Based on these collective findings, the patient was diagnosed with complete displaced disc fractures in both TMJs.

To alleviate the acute occlusal change, a manual disc reduction was attempted as described in a previous study.¹² However, the procedure was ineffective. We discussed alternative treatment options with the patient, including surgical treatment, occlusal adjustment, prosthodontic treatment and orthodontic treatment, but the patient declined further treatment owing to the uncertain clinical outcome, potential surgical risks and costs. Unfortunately, the patient was lost during follow up after the third visit, and information on further progression of the disc fracture is unavailable.

Case report 2

A 66-year-old man presented complaining primarily of acute mandibular deviation to the right and dull pain in the left TMJ, which began after an acute cracking sound in the left TMJ during mastication. The patient had

recovered from a cerebrovascular accident 6 years previously and reported that his mouth opening range had decreased since then. However, he noted that the opening range increased suddenly following the joint cracking sound in the left TMJ. Plain radiographs showed erosive change, flattening and osteophyte formation in the left condyle (Figure 4). On clinical examination, the mandible was laterally deviated to the right, and occlusal contact was absent between the left posterior teeth during mouth closure (Figure 5). Occlusal analysis using a dental cast did not indicate any tooth movement. Mandibular movement was only mildly limited at a mouth opening range of 39 mm, despite the crepitus in the left TMJ.

An MRI showed complete fracture of the articular disc in the left TMJ and displacement of the posterior fragment behind the condylar head (Figure 6). The anterior fragment was displaced anteriorly and was separated from the left condylar head. None of the other joints showed any abnormality. Therefore, the patient was diagnosed with a complete displaced disc fracture in the left TMJ based on MRI and clinical examinations. The condyle was displaced anterior to a distance greater than the thickness of the posterior fragment. We initially presumed that the acute disc fracture induced a temporary spasm in the lateral pterygoid muscle, further aggravating the condylar displacement. Accordingly, the patient underwent physical therapy using various transcutaneous electrical nerve stimulation devices and pharmacological treatment with muscle relaxants and non-steroidal

Figure 4 Case 2. (a) Panoramic radiograph and (b) the four temporomandibular joint panoramic views. Degenerative change is evident in the left condyle.

anti-inflammatory drugs. The patient declined surgical treatment. Despite conservative treatment, including physiotherapy, manual reduction and use of an oral appliance, the abnormal occlusion persisted for an additional 4 months.

Discussion

Only three known cases, including the two cases in the present report, of disc fracture in the TMJ have been described; the first case report was published by Melis et al.¹¹ Because of the extreme rarity of TMJ disc fracture, little information has been established on the condition, including diagnostic criteria. Of the available diagnostic modalities, MRI has widely been considered the gold standard for examining the disc and surrounding tissues owing to its non-invasiveness and high soft-tissue resolution. MRI has excellent diagnostic efficacy¹³ and reliability¹⁴ for assessing the disc position. The sensitivity of MRI for disc position was reportedly 0.87 and the specificity was 0.92.¹³ However, discontinuation in the disc, which occurs in disc perforation, is too small to be visualized by MRI.¹⁰ Arthroscopy is considered the confirmative diagnostic modality for examining minor structural abnormalities in the disc.¹⁵ MRI of the disc fractures in the present report revealed

clear distinction between the anterior and posterior fragments, which appeared as two elliptical-shaped structures of low signal intensity. These findings were also observed in the adjacent serial images and confirmed a complete loss of the integrity in the medial and lateral portions of the disc. In the present cases, the anterior disc fragment was distinguished from the lateral pterygoid muscle using serial MR images. The differential diagnosis

Figure 5 Case 2. Clinical photograph on initial examination. Occlusal contact is absent between the left posterior teeth in the closed position.

Figure 6 Case 2. (a–c) MR images of the right and (d–f) left temporomandibular joints. (a, d) Proton density-weighted MRI, (b, e) T_2 weighted MRI in the closed position and (c, f) proton density-weighted MRI in the open position. The disc (arrowheads: anterior fragment, arrows: posterior fragment) on the left side is completely separated at the intermediate zone. There is flattening and the osteophyte formation in the left condyle.

for a low signal intensity within the TMJ includes calcified loose bodies, synovial chondromatosis or chondrocalcinosis;¹⁶ however, these structures are usually evident as a calcification on plain radiography, which was not observed in the present cases. Based on the imaging and clinical findings, the present two cases were diagnosed as disc fracture, even though arthroscopic and surgical confirmation was not performed.

Potentially, the aetiology of disc fracture may be similar to that of disc perforation; disc fracture may represent progression of disc perforation. Disc perforation is thought to arise secondary to degenerative changes or mechanical trauma to the TMJ.^{17,18} During disc perforation, degenerative changes in the disc may alter its biomechanical properties to increase fragility, which can make the disc more vulnerable to mechanical trauma and ultimately trigger a fracture. These degenerative changes are widely thought to be closely associated with ageing,¹⁹ and in humans, calcification of the disc progressively increases its hardness with increased age.^{20–22} All three patients in the previous and present reports of disc fractures were elderly, an age group considered susceptible to degenerative change.

Excessive mechanical trauma is also known to trigger degenerative changes within the joint.^{23,24} Repetitive mechanical microtrauma during parafunctional and even functional activities is also associated with degenerative changes in the TMJ.^{23,24} In our cases, degenerative changes were evident throughout the affected TMJ on MRI. When the articular surface is roughened by degenerative changes in the condylar head, the disc

may be much more prone to abrasion even during routine activities owing to the increased friction between the disc and bony structures of the TMJ, such as the glenoid fossa and condyle.²⁵ Considering the lack of trauma history and the pronounced occlusal attrition in the present two cases, we suspect that the hypothesis of Melis et al.¹¹ is the aetiology, that is, microtrauma may have triggered the disc fractures by causing mechanical damage to the intermediate portion of the TMJ disc.

Considerable joint effusion was also observed on MRI in the present two cases, a finding that was also reported by Melis et al.¹¹ It has been suggested that joint effusion represents an inflammatory response;^{26,27} therefore, these findings suggest a possible relationship between disc fracture and inflammation. Morphological change can also be contributed by the inflammatory cascade, leading to subsequent degenerative changes in the TMJ, such as increased surface roughness, depleted lubricant and, ultimately, increased friction.²⁸

In the clinical manifestation of disc fracture, the chief complaints of the patients in our report were an acute occlusal change followed by difficult mastication. Both patients noted only mild pain and discomfort, except during the acute onset of the occlusal change. These symptomatic profiles were consistent with those in the previous report.¹¹ The altered occlusal pattern seems to depend on the affected site. Disc fracture is thought to cause acute occlusal change mainly by displacement of the posterior fragment behind the condylar head, which prevents the condylar head from returning to its normal closed position. Accordingly, the first patient who had

bilateral disc fractures presented with an anterior open bite, whereas the second patient who had a unilateral disc fracture presented with mandibular deviation in the contralateral direction. In Case 2, the condylar head was displaced more anteriorly when compared with the thickness of the posterior fragment. One possible cause for this further displacement may include an abnormal muscular tone in the surrounding musculature, including the lateral pterygoid muscle, but it is difficult to determine the factors contributing to further anterior displacement of the condyle in Case 2. Notably, both patients showed significant occlusal attrition, which suggests excessive mechanical load, although their medical and dental history and reports by the patients and their families did not suggest any significant parafunction. Occlusal wear is usually considered a cumulative event reflecting both functional and parafunctional activities, as well as multiple factors such as age, gender and diet; thus, excessive mechanical stimuli are likely to induce microtrauma prior to the occurrence of disc fracture. Unlike the posterior fragment, the anterior fragment was able to move anteriorly in concert with the anterior movement of the

condyle, enabling relatively normal movement during mouth opening.

In the treatment of acute occlusal change caused by disc fracture, it appears impossible to manually reduce the displaced disc fragments to a normal position owing to the complete loss of the disc intermediate zone, which is critical in maintaining the normal disc position. Conservative treatment, including use of an oral appliance, physiotherapy and pharmacotherapy, appears to be ineffective. Contrary to the previous report that described spontaneous improvement of the occlusal change, mandibular deviation can last over 4 months, as observed in our second case.

In conclusion, disc fracture is a little-known disc disease within TMJ disorders and appears to cause acute occlusal changes and mild joint pain. The posterior fragment is likely to displace posterior to the condylar head, which may limit the backward movement of the condyle during mouth closure. While conservative treatments are recommended initially, surgical intervention may be considered in a patient with persistent occlusal changes and masticatory difficulty.

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