Case Report

Non-Surgical Management of Disc Displacement Without Reduction: A Case Report

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Abstract

Disc displacement can cause limited mouth opening, jaw locking, and joint pain. Although it can resolve on its own over months to years, timely conservative treatment is essential to prevent further disc deterioration and improve quality of life. A 25-year-old woman reported difficulty opening her mouth for six months, along with tightness and pain radiating to the right temple. She reported a history of joint clicking that later disappeared. Clinical examination and magnetic resonance imaging confirmed disc displacement without reduction. Additionally, she presented with right masseter muscle pain, rated seven out of ten on the pain scale, radiating to the temporal region during mouth opening, which was diagnosed as myofascial pain with referral. The combined treatment involved patient education, warm compresses on the masseter muscles, a hard upper occlusal splint with increased thickness, active jaw exercises in front of a mirror, and passive exercises using silicone tubes and wooden tongue depressors. After ten months, her mouth opening improved from 15 mm to 52 mm, with normal jaw movements and no pain. This case demonstrates that non-surgical management can effectively treat chronic disc displacement without reduction, along with myofascial pain with referral, resulting in significant improvements in mouth opening and jaw function.

Keywords: Disc displacement, Jaw exercise, Occlusal splint, Temporomandibular disorders

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Introduction

Disc displacement refers to the condition where the articular disc of the temporomandibular joint (TMJ) is displaced from its normal position.[1] When the mouth is opened, the disc remains displaced, a condition known as disc displacement without reduction.[2] In this situation, patients are typically unable to open their mouths wider than 40 mm and may experience jaw locking.[3] Magnetic resonance imaging (MRI) can reveal anterior disc displacement in the closed and open mouth positions.[4] Limited mouth opening combined with MRI findings supports the diagnosis of disc displacement without reduction with limited opening, according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD).[3] However, dentists should also consider other potential causes for restricted mouth opening, such as

muscle spasms, anchored disc phenomenon, and ankylosis, which may result from trauma, local infection, or rheumatoid disease.[5] A precise and comprehensive examination is essential for accurate diagnosis.

Although disc displacement without reduction often resolves on its own, the process can take several months to years.[6] During this period, patients may suffer from jaw locking and pain when attempting to open their mouth wider,[7] which can greatly impact their quality of life. Without appropriate treatment, the shape and position of the articular disc can deteriorate further over time.[8,9] Therefore, timely and appropriate treatment is essential for patients with this condition.[6]

Treatment for disc displacement without reduction can be categorized into three types based on invasiveness:[1,6,10] 1) non-invasive treatments, e.g., patient education, mandibular manipulation, jaw exercises, splint therapy, and pharmacotherapy, 2) minimally invasive treatments, e.g., arthrocentesis, and 3) invasive treatments, e.g., arthroscopy and open joint surgery. Additionally, tissue engineering approaches for articular disc treatment are being explored.[11] However, conservative therapy should be the first line of treatment.[6] If conservative treatment is unsuccessful after at least six months, invasive procedures may be considered.[6,11] The treatment of disc displacement should involve a conservative, multimodal approach tailored to the specific symptoms and needs of the patients, focusing primarily on symptom relief and functional recovery.[12] Surgical intervention should be considered only for cases where there is a definitive and accurate diagnosis, a well-established underlying cause, and the condition reaching a more advanced or late stage.[12,13] Hence, this case report presents the clinical presentation, diagnosis, and non-surgical treatment of a patient with chronic disc displacement without reduction, managed collaboratively by dental specialists using patient education, warm compresses, occlusal splint, active jaw exercises, and passive jaw exercises.

Case Report

A 25-year-old Thai woman sought dental care due to difficulty fully opening her mouth. She experienced tightness around the right preauricular area for about six months and had previously heard clicking sounds when yawning. After the clicking stopped, her mouth opening became restricted, and she felt intense pain radiating to the right temple when trying to open her mouth wide. The previous team of oral and maxillofacial surgeons prescribed anti-inflammatory medication, warm compresses on the masticatory muscles, and active jaw exercises using silicone tubes between the left and right molars while applying upward pressure on the chin. Her condition did not improve, leading to her referral to the Occlusion and Orofacial Pain Clinic.

The extraoral examination revealed a symmetrical face. Muscle tenderness was noted in the right masseter muscle (Fig. 1A), and mouth opening causing pain in the right cheek that radiated to the right temple (Fig. 1B), with a pain intensity rated as 7 out of 10 on the numeric rating scale, occurring only during jaw function. No pain was reported at rest. The right TMJ had hypomobility and pain during function. Intraorally, occlusion in intercuspal position showed contact between teeth 17/47, 27/37, and 28/38 (Fig. 1C). In centric relation, the first contact was between teeth 27/37, with nonworking contact on teeth 17/47 during left excursion. The patient could open her mouth 15 mm without pain (Fig. 1D), increasing to 17 mm with finger assistance, accompanied by a hard end-feel and pain. There was a right deflection while opening (Fig. 1E and 1F). The jaw movements were 7 mm right, 4 mm left, and 6 mm protrusion.

The patient underwent additional diagnostic tests. The panoramic radiograph demonstrated extrusion of tooth 28 and mesioangular impaction of tooth 38, but no abnormalities in the TMJ or surrounding structures (Fig. 2A). An MRI of the right TMJ revealed anterior disc displacement during mouth opening (Fig. 2B) and closing, whereas the left TMJ showed the normal position of the articular disc (Fig. 2C). The primary diagnosis for this patient, according to the DC/TMD,[3] was disc displacement without reduction with limited opening. The secondary diagnosis was myofascial pain with referral. The contributing factors in this case included: 1) occlusal instability, 2) sleep bruxism, 3) extrusion of tooth 28, and 4) impaction of tooth 38.

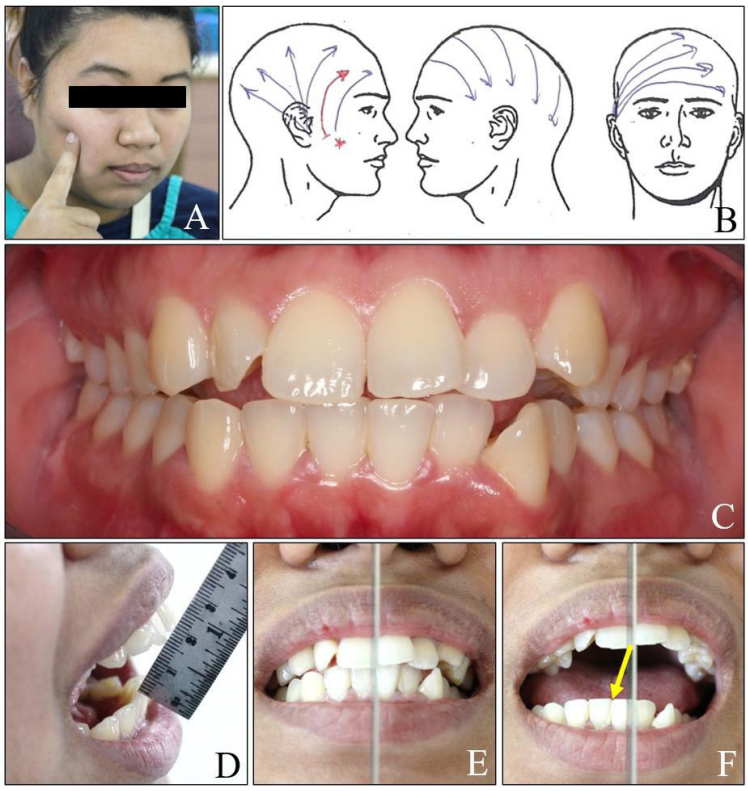

Figure 1 *Clinical examination: A) Location of pain during mouth opening, B) Diagram of the pain location and radiation (red asterisk indicates the pain location, red line shows the pain referral during mouth opening, and blue lines represent the pain referral during prolonged mouth opening and extended jaw function, C) Preoperative intraoral photographs, D) Maximum mouth opening measured from incisal edges (15 mm), E) The lower teeth midline was aligned with the ruler in intercuspal position, and F) The lower teeth midline deviated from the ruler to the right-side during mouth opening, as indicated by the yellow arrow.*

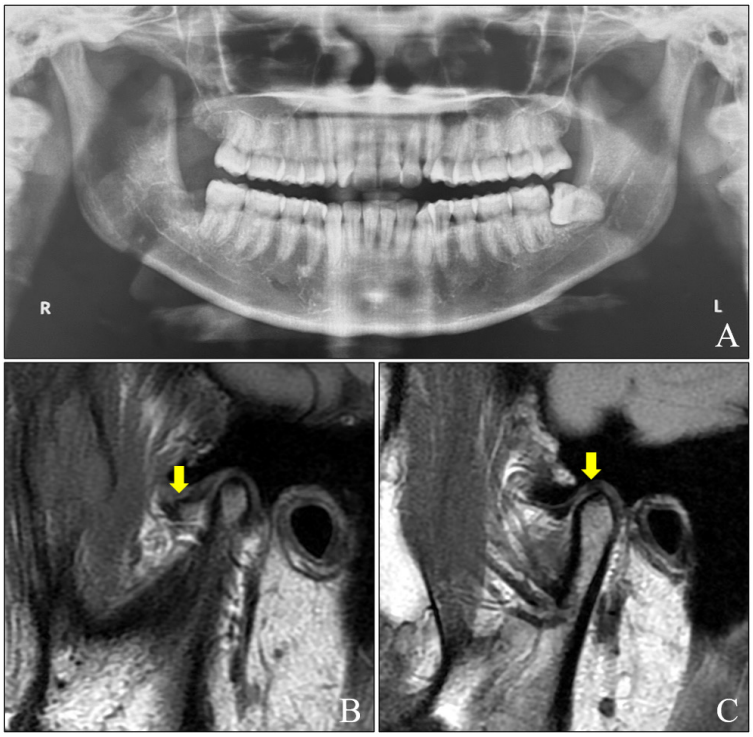

Figure 2 *Additional investigation images: A) Panoramic radiograph showing extrusion of tooth 28 and mesioangular impaction of tooth 38, B) MRI of the right TMJ during opening revealing anterior displacement and deformation of the articular disc (black color), indicated by the yellow arrow, and C) MRI of the left TMJ during opening showing the articular disc in a normal position, with the posterior band of the articular disc located on top of the condyle as shown by the yellow arrow.*

The treatment plan consisted of two phases. Firstly, during the period of limited mouth opening, the patient was prescribed warm compresses, use of an occlusal splint, and both passive and active exercises to address her conditions, including disc displacement, myofascial pain with referral, and sleep bruxism. Secondly, once her mouth opening improved, she was referred to remove teeth 28 and 38, followed by orthodontic treatment to ensure long-term occlusal stability.

The patient received comprehensive dental treatment to address her problems and manage the contributing factors. Her conditions were thoroughly explained, and she was educated about her issues. Warm compresses were continuously recommended for her masseter muscles for 15 to 20 minutes at a time,[14] intended to relax muscle contractions and alleviate pain. An occlusal splint was designed as a Michigan splint,[15] a typical full-coverage design made of heat-cured acrylic resin contacting all lower teeth, featuring two canine rises, and having a thickness of 2-3 mm at the nearest interocclusal space, as observed during the mounting of the working casts on the articulator. The occlusal splint was provided for nightly use during sleep and, if feasible, during the daytime (excluding mealtimes and brushing) (Fig. 3A), aimed to decrease intracapsular pressure within the TMJ and enhance the chances of the articular disc returning to its normal position.[16] Additionally, it could reduce muscle activity, relax the masticatory muscles, and prevent the adverse effects associated with sleep bruxism.[16] The thickness of the occlusal splint gradually increased by adding self-cured acrylic resin to accommodate the ability of the patient to open her mouth (Fig. 3A), supporting jaw stability and improving mouth opening, with regular follow-ups to monitor her progress. She was instructed to perform active jaw exercises in front of a mirror using a 5 x 5 x 5 regimen[17]: hold the mouth open for five seconds per repetition, five minutes per session, and five sessions per day. Lateral and protrusive jaw movements were also recommended as parts of these exercises, aimed at re-establishing coordination among the masticatory muscles during function. For passive jaw exercises, the patient was instructed to bite on silicone tubes positioned at the molars while applying an upward force with her fist on her chin (Fig. 3B). This technique utilized the silicone tube as a fulcrum for the mandible, with the upward force acting like a lever to help break the restricted TMJ. Additionally, another technique involved placing wooden tongue depressors between the upper and lower posterior teeth,[18] with the patient encouraged to gradually add more depressors to slowly decrease intracapsular pressure in the TMJ, thereby increasing mouth opening ability (Fig. 3C). These passive jaw exercises were recommended to be performed five times a day.

During follow-up, the patient reported consistently wearing the occlusal splint at night, which showed noticeable wear reflecting sleep bruxism, and occasionally using it during the day. She also adhered well to the prescribed jaw exercises. After 1 month, with no change in pain and mouth opening (Fig. 4A and 4B), the splint thickness increased to be 11 mm at the interincisal distance, which was 2-3 mm less than the mouth opening of the patient to facilitate insertion and removal of the splint (Fig. 3A). By 2 months, the pain score had decreased to 4, and mouth opening increased to 19 mm (Fig. 4), which led to an adjustment in the splint thickness to 16 mm, measured at the interincisal distance. At 4 months, the patient experienced a sustained period of pain relief (Fig. 4A). During this visit, the patient was fitted with a thicker occlusal splint and silicone tubes were used as a fulcrum. As a result, the mouth opening improved to 22 mm (Fig. 4B), and the tongue depressor technique for the passive jaw exercise was introduced to further aid in treatment. The eccentric jaw movements returned to their normal range (Fig. 4C). By 10 months, the patient demonstrated significant improvement, achieving a 52-mm mouth opening while continuing to use the occlusal splint at night. The patient reported occasional clicking in the right TMJ. During this visit, the thickness of the occlusal splint was reduced to nearly its initial thickness. At the 22-month follow-up, the mouth opening had reached 54 mm, with normal jaw movements, no musle pain, and no clicking sounds or tenderness in the TMJ. The dental occlusion remained stable with no significant improvement. So, the patient was referred to remove teeth 28 and 38, with subsequent orthodontic treatment recommended.

Figure 3 *Patient treatments: A) An upper hard occlusal splint with thickness added using self-cured acrylic resin, B) Passive jaw exercise involving biting silicone tubes at the molars, while applying an upward force with the patient's fist at the chin, and C) Passive jaw exercise by placing as many wooden tongue depressors as possible between the upper and lower teeth.*

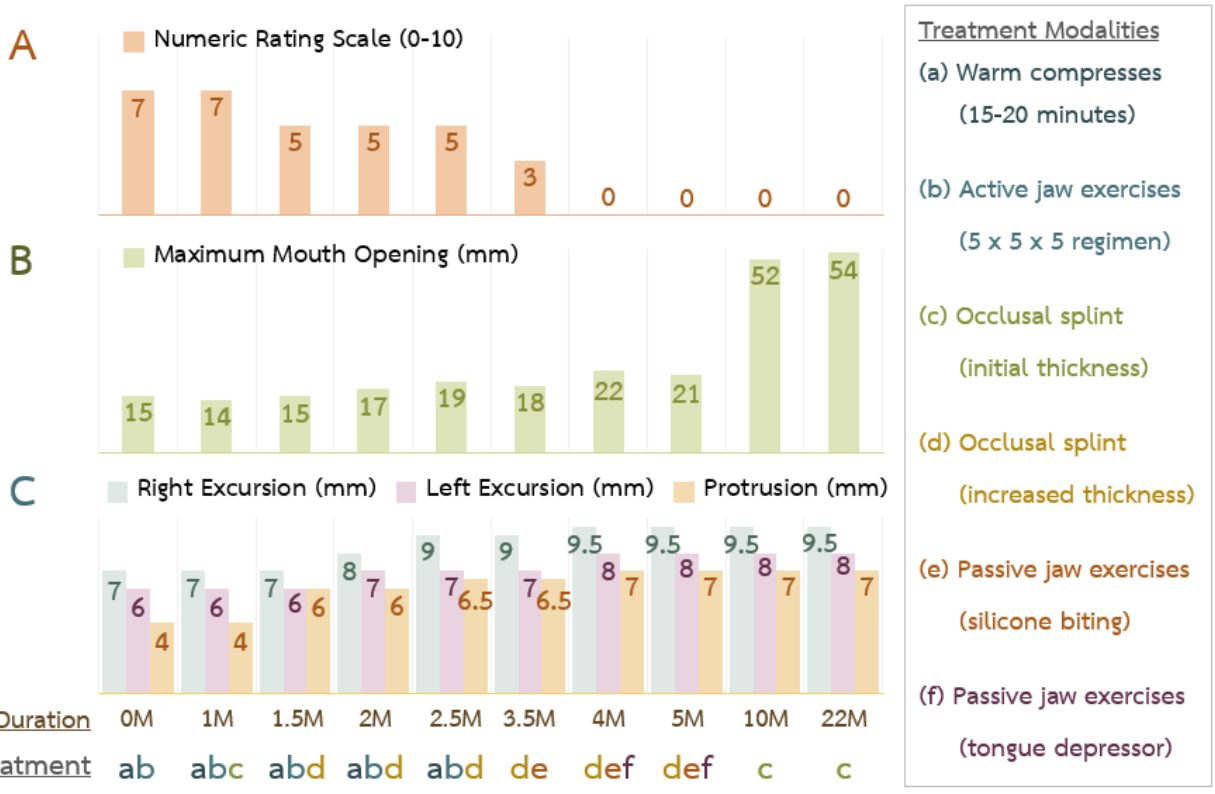

Figure 4 *The treatment outcomes for a patient with disc displacement without reduction showed improvement over the course of treatment, with various modalities used: A) The numeric rating scale (0 to 10) for pain, as rated by the patient; B) The maximum mouth opening achieved without assistance; and C) The range of motion observed during eccentric jaw movements.*

Discussion

Although the diagnosis of disc displacement without reduction can be supported by the history and clinical symptoms of the patient, An MRI remains the gold standard for confirming this diagnosis.[3,19] In cases

where a patient is unable to access an MRI, a dentist can diagnose disc displacement without reduction based on the DC/TMD criteria.[3] The diagnosis can be made if all the following conditions are met: 1) the patient reports a history of jaw locking, 2) the patient experiences limited jaw opening that affects their ability to eat, and 3) the dentist observes a maximum assisted mouth opening of less than 40 mm. For patients with a restricted mouth opening who are not improving with conservative methods, additional imaging, such as panoramic radiographs, transcranial oblique radiography, or computerized tomography may be considered to rule out other abnormalities.[19] Patients with untreated disc displacement without reduction may develop greater deformation of the articular disc, more bone changes, and reduced joint effusion.[20] In some cases, it may be necessary to refer to a specialist, such as oral and maxillofacial surgeons, neurological surgeons, or otolaryngologists.

A systematic review by Al-Baghdadi *et al.*[10] found that jaw manipulation is effective for patients with recently closed locks, while occlusal splints can reduce TMJ pain. Combining splints with jaw exercises has been shown to improve the mouth opening more than splints alone.[10,21] Comparisons between conservative and invasive treatments suggest that conservative and invasive approaches are equally effective,[10,11,22] however, the duration of the closed lock impacts treatment efficacy. Longer periods of closed lock reduce the effectiveness of the treatment.[23] This indicates that disc displacement without reduction should be managed promptly with appropriate treatments. This case involved a six-month history of jaw locking, accompanied by significant muscle pain and sleep bruxism, which interfered with treatment progress and delayed successful outcomes. The initial treatment plan focused on pain management and restoring muscle coordination, using warm compresses, active exercises, and an occlusal splint. The next phase aimed to alleviate the jaw locking, employing passive exercises with a thicker occlusal splint. Finally, the occlusal instability, tooth extrusion, and tooth impaction of the patient were addressed to ensure long-term and sustainable results. These occlusal problems may have served as predisposing factors for jaw locking or as perpetuating factors that interfered with treatment and recovery. However, due to the limited mouth opening, these occlusal issues were only addressed once the patient regained the ability to open her mouth.

Multiple studies reported on the use of occlusal splints for disc displacement without reduction.[24] Muhtarogullari *et al.*[25] designed a pivot splint with an additional pivot on the occlusal surface, which helps in repositioning the disc by reducing joint pressure. Schmitter *et al.*[26] compared two types of splints: the centric splint (which contacts all lower teeth) and the distraction splint (which contacts only the molars). Both types reduced pain and increased range of motion, however, the centric splint showed slightly better results. Conversely, Seedorf *et al.*[27] found that pivot splints might increase internal joint pressure due to the forces from the masseter and temporalis muscles. In this case, a centric occlusal splint was chosen to increase space within the TMJ[28] and reduce internal pressure during rest and function.[29] The splint thickness was progressively increased to enhance its effectiveness, because greater splint thickness can more effectively reduce intra-articular sounds and alleviate joint pain.[30,31] If no TMJ sounds or pain are present, a thicker splint may not be necessary.[30] Similarly, masticatory muscle activity, as measured by electromyography, does not significantly differ between different splint thicknesses.[32] Therefore, in cases of disc displacement without reduction, it is recommended that the patients should wear a 4-6 mm thick occlusal splint for up to one year.[30-32] This case illustrates the challenge of managing the complexities of temporomandibular disorders. Initially, a thinner occlusal splint was used to manage pain, while a thicker splint was introduced in the later phase to help recapture the TMJ locking and reduce muscle activity. The decision to use a thicker occlusal splint should consider factors such as the ability of the patient to adapt to the splint, their level of compliance, pain severity, and overall comfort during sleep.

Jaw management was used in conjunction with occlusal splint therapy to help increase the mouth opening.[10] Jaw management techniques include self-traction, where

the patient uses their index and middle fingers to hold the lower front teeth and gradually pulls the jaw downward to reduce intra-articular pressure.[33] Additionally, the TheraBite device, designed to push the upper and lower front teeth apart, can aid in increasing mouth opening when the patient applies pressure to the device.[18] Moreover, dentists can modify dental instruments by using a prefabricated soft silicone bite block and a mouth prop to facilitate mouth-opening exercises.[34] Another popular method is using a wooden tongue depressor placed between the upper and lower teeth. This cost-effective treatment can be performed by the patient and has been found to be as effective as other methods.[18] Hence, this treatment was chosen to complement the use of the occlusal splint.

Sato *et al.* reported that patients with disc displacement without reduction who awaited natural recovery and received no treatment were able to open their mouths 35.3 mm at six months, 36.9 mm at 12 months, and 38.0 mm at 18 months, along with improvements in joint and muscle tenderness.[35] This suggests that although patients can recover some jaw function, their range of motion may not fully return to normal. In contrast, patients who received single or combined treatments, including conservative, minimally invasive, or surgical approaches, show varying outcomes.[10,23,36] Hence, there is no consensus on the optimal treatment duration or the best approach for transitioning between treatments for these patients.[10,23,36]

The treatment outcomes for this case were assessed using the numeric rating scale, the patient's ability to open her mouth, and the range of motion during eccentric movements. As shown in Figure 4, during the first 2.5 months, the pain level of the patient decreased to the numeric rating scale of 3. At 3.5 and 4 months, passive exercises were introduced to help recapture the jaw locking. This phase was crucial for encouraging patient compliance with the exercises, as the pain level had significantly decreased. By the 10-month follow-up, with continued use of the thick occlusal splint and ongoing passive exercises, the patient was able to open her mouth 52 mm without masticatory muscle pain. These outcomes demonstrate that a multimodal approach for managing chronic disc displacement without reduction and painful masticatory muscles should be prioritized and tailored to the individual patient, ensuring optimal treatment and recovery. Additionally, periodic assessment of treatment satisfaction and costs are essential.[11] However, it is important to note that this report pertains to a single patient, and further studies are required to evaluate the efficacy of this treatment approach in a broader patient population.

Conclusion

For treating a patient with chronic disc displacement without reduction along with limited mouth opening, conservative management could be effective. This included using patient education, warm compresses, occlusal splint, active jaw exercises, and passive jaw exercises. These approaches could help reduce pain and increase the range of jaw movement.

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Conflicts of interest

The author declares that there is no conflict of interest regarding the publication of this article.

Consent

Written informed consent has been obtained from the patient to publish this journal.

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