Clinical diagnosis and treatment of temporomandibular disorders in children and adolescents: a case series

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The early diagnosis of temporomandibular disorders (TMDs) in children and adolescents is important because they can affect oral and maxillofacial growth and development. This case series introduces patients with various clinical features of TMDs and demonstrates how symptoms were reduced through appropriate interventions in collaboration with oral medicine specialists and pediatric dentists. TMDs symptoms in children are often mild and difficult to express accurately; therefore, diagnosis through clinical evaluation is important. Pediatric dentists should be aware of TMDs in children and adolescents, and should diagnose, treat, and refer to specialists in a timely manner.

Keywords: *Temporomandibular joint dysfunction syndrome, Arthritis, Juvenile, Myalgia*

INTRODUCTION

Temporomandibular joint disorders (TMDs) is an umbrella term that refers to diverse problems in the masticatory system[1]. Pain in the masticatory muscles, preauricular area, or temporomandibular joints (TMJs) is the most common symptoms of TMDs. In addition to pain, various other clinical symptoms can occur, such as limited opening, deviation of mandibular movement, TMJ dysfunction, and clicking sounds[1,2].

The prevalence of TMDs has been widely reported, ranging from 4.2% to 88%. Women are predisposed to the condition, and the prevalence of signs and symptoms increases with age[1,3–5]. In children and adolescents, the prevalence of TMDs diagnosed according to the Research Diagnostic Criteria for TMD (RDC/TMD) or the Diagnostic Criteria for TMD (DC/TMD) ranges from 7.3% up to 30.4%[6,7].

The etiology of TMDs is as diverse and multifactorial as the various symptoms. There is no single etiology that explains all symptoms. Several local systemic factors such as occlusal condition, trauma, emotional stress, deep pain, parafunctional activity, and systemic diseases could interact to trigger TMD signs and symptoms[1,8]. Similarly, in children and adolescents, macro-trauma, parafunctional habits, psychosocial factors, and systemic factors have been reported as etiologies of TMDs[9].

TMDs can be classified in various ways based on diagnostic criteria. According to the DC/TMD, which provides reliable evidence-based criteria, it can be classified as myalgia, arthralgia, disc displacement, or a degenerative joint disease. To diagnose for TMDs, history-taking, examination, and imaging procedures are necessary. In clinical, history-taking of the present illness is important to identify the contributing etiological factors. History-taking should include the follow-

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ing: onset of pain, behavior-associated pain, pain intensity, parafunction, psychosocial factors, TMJ locking history, joint noise, and limitation severe enough to interfere with the ability to eat. A clinical examination should include palpation of muscles or TMJ and evaluation of signs of TMDs, such as opening movements, lateral or protrusive movement, and clicking or popping noise present with jaw movements. A diagnosis of DC/TMD based on a clinical examination should be supported by the results of appropriate imaging modalities [10–12].

The successful management of TMDs is dependent upon appropriate diagnosis and control of these etiological factors [10]. Therefore, an appropriate diagnostic and therapeutic approach through clinical and radiographic examinations is important [1]. The goal of treatment for TMDs in children and adolescents is to recover their quality of life through pain relief and restoration of TMJ function [13,14]. However, as symptoms are often mild and a child's expression of them can be inaccurate, diagnosis is often difficult in children and adolescents [15]. This report introduces three different cases of TMD that were diagnosed and treated.

CASE REPORTS

Case 1

An 11-year-old boy with no significant medical or dental history was referred to the Department of Oral Medicine at Jeonbuk National University Hospital from a local dental clinic because of a painless loss of strength during chewing.

On presentation, the child complained of "loss of muscle strength" when eating meals. There was no discomfort while eating his favorite snacks. Clinical examination revealed pain on palpation of the masseter and temporalis muscles. There were no joint sounds or mouth opening limitation. Panoramic radiographs showed no remarkable pathological findings in either TMJ (Fig. 1).

The child was diagnosed with myalgia based on the DC/TMD. He was treated using conservative modalities, including physical and behavioral therapy. Physical therapy was administered twice a week, and his discomfort began to improve after 3 weeks. After 6 weeks of treatment, the muscle weakness disappeared.

Case 2

A 13-year-old girl visited the clinic with left TMJ pain during mouth opening that had started a month previously. Her medical and dental histories were unremarkable, except for a few dysfunctional habits (clenching and chin leaning).

Clinical examination revealed limited mouth opening (32 mm) with left TMJ pain and leftward deflection on opening. Additionally, the maximum assisted opening was also limited (33 mm). There was no history of joint sounds, but the impression was a disc displacement without reduction (DDWoR). Magnetic resonance imaging (MRI) was performed to confirm this impression. MRI showed that the discs of both TMJs were displaced anteriorly in both the open and closed states (Fig. 2). We provided the patient with an occlusal stabilization appliance (OSA) and administered behavioral and physical therapy.

The patient wore the OSA while sleeping, and there were no associated adverse side effects. After 3 months of treatment, the TMJ pain was alleviated; after 6 months, the mouth-opening limitation was relieved. She received ongoing follow-up care.

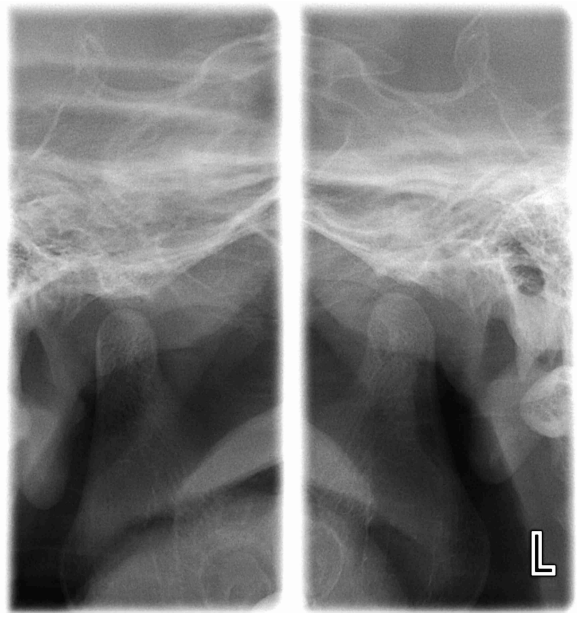

Figure 1: Panoramic temporomandibular joint (TMJ) radiograph showing no remarkable pathological findings in either TMJ in an 11-year-old boy diagnosed with myalgia.

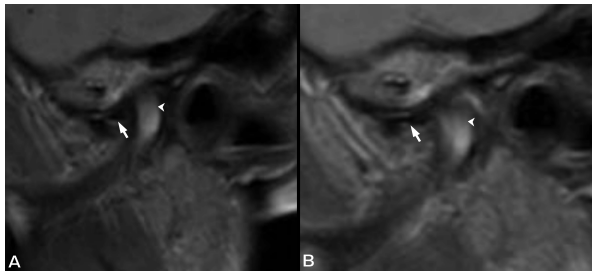

Figure 2: Magnetic resonance imaging of 13-year-old girl with left TMJ pain during mouth opening. Sagittal oblique proton density image shows anteriorly displaced disc (arrow) of the joint (arrowhead) in the (A) closed and the (B) open mouth state.

Case 3

A 5-year-old child visited our clinic with trauma to the maxillary primary teeth. Panoramic radiography revealed asymptomatic bony destruction of the left condyle. Cone-beam computed tomography (CBCT) revealed extensive erosion of the left condyle (Fig. 3).

Clinical examination revealed limited mouth opening and leftward deflection on opening. Her medical history was significant for juvenile rheumatoid arthritis 3 years previously.

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Extensive erosion of the left condyle was thought to be associated with systemic rheumatoid arthritis. The child was provided with an OSA to stabilize the condyle. Considering the mixed dentition, a temporary OSA was selected with subsequent replacement of the appliance according to tooth eruption (Fig. 4). She was also referred to a pediatric rheumatologist for systemic control.

The child has adapted well to the OSA, which is constantly being replaced according to the eruption of the child's permanent teeth. Follow-up care is ongoing.

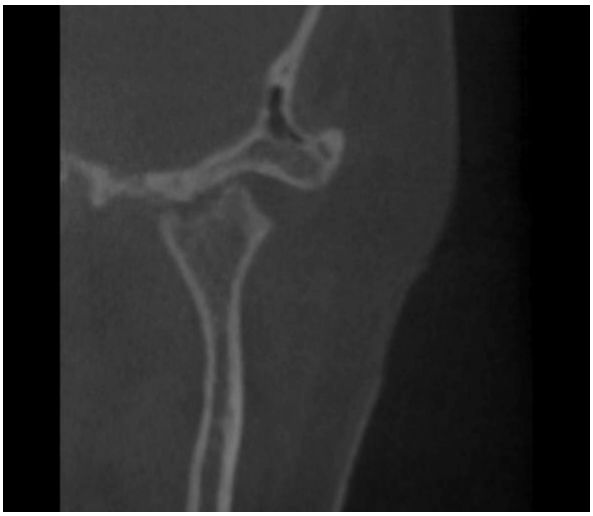

Figure 3: Cone-beam computed tomography showing a large defect area and erosion of the left condyle in a 5-year-old child with trauma to the maxillary primary teeth.

Figure 4: Occlusal stabilization appliance (OSA) treatment of 5-year-old girl with rheumatoid arthritis. (A) Temporary OSA. (B, C) Five-year-old child wearing the device.

DISCUSSION

Accurate and early diagnosis is important for the successful treatment of TMDs[1]. However, various factors make diagnosis difficult in children and adolescents. The DC/TMD suggests criteria for TMDs diagnosis according to objective examination results that confirm the subjective functional limitation or pain. The DC/TMD is the international standard for the evaluating TMD and shows high diagnostic accuracy for TMD in adults[11]. Although the DC/TMD has been validated for adults with TMD, the use of the DC/TMD in children and adolescents requires validation in each age group[15]. Insufficient comprehension of orofacial pain in children and adolescents is an obstacle to successful treatment[14]. Christidis *et al.*[16] reported that the quality of evidence in pediatric dentistry research related to orofacial pain is weak and limited.

Children often do not accurately express their discomfort. It has been reported that TMD symptoms in children are rare and variable compared to adults. Moreover, the children do not clearly explain these symptoms[14]. In this case report, only one child accurately expressed her discomfort. Pain is a subjective sensation, and individuals learn to apply appropriate words to express pain through childhood pain experiences[17]. Pain assessment in children is difficult for various reasons, including the subjective and complex nature of pain and children's limited language for expressing pain[18]. In Case 1, we considered the possibility that the atypical symptom of losing strength expressed a feeling of muscle weakness accompanied by mild pain. A feeling of muscle weakness may appear with muscle pain and dysfunction in various masticatory muscle disorders, such as local muscle soreness and protective co-contraction[13,19,20]. In particular, protective co-contraction is painless at rest but is reported clinically as a "feeling of muscle weakness" and increased pain during muscle use[13]. Although our patient did not complain of pain, "loss of muscle strength" was inferred as a feeling of muscle weakness during function, and pain was confirmed upon palpation of the bilateral masseter and temporal muscles in clinical examination. The patient was diagnosed with myalgia according to the DC/TMD, and his chief complaint disappeared after treatment. A thorough history of the present illness is very important for the accurate diagnosis of TMDs in children and adolescents.

TMDs are associated with pain and dysfunction of the masticatory system and are a significant health problem in children and adolescents[15,16]. As in Case 2, when a child shows limited opening, an accurate diagnosis of the cause is important. On clinical examination, the maximum assisted opening test is helpful for the diagnosis. If the maximum assisted opening movement is less than 40 mm (including vertical incisal overlap), clinical DDWoR with limited opening is considered according to the DC/TMD. However, the diagnostic validity of DDWoR in the DC/TMD showed a sensitivity of 0.80 and a specificity of 0.97. Thus, the diagnosis needs to be confirmed using MRI[11]. In addition, cutoff values for jaw opening limitation in children and adolescents are different from those in adults. Müller *et al.*[21] reported the mean maximal mouth opening capacity (MOC) of healthy children in a retrospective cross-sectional study; the mean age was 9.9 (3.3–18.3) years for girls and 10.0 (2.8–18.7) years for boys. The mean MOC was 45 mm (25–69 mm in girls) and 45 mm (25–70 mm in boys), similar to that in adults. However, they showed a wide MOC range when compared with children of the same age. They suggested that the cutoff value for jaw opening limitation in adolescents is 36 mm (third percentile at 10 years of age). Accordingly, MRI may be helpful for accurate diagnosis when the child complains of limited jaw opening.

Limited jaw opening due to DDWoR requires appropriate intervention. The prevalence of disc displacement is approximately 8.3%[6]. Macro-trauma can directly cause tissue injury. Persistent microtrauma can also result in ligament elongation, leading to slow development of disc displacement[13,22]. In addition to trauma, various mechanical and physiologi-

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cal factors such as abnormal stress or strain of the condyle and/or retrodiscal ligaments, muscle hyperactivity, and malpositioning of the joint related to growth could cause displacement[23,24]. DDWoR associated with persistent limited jaw opening, TMJ pain, and degenerative joint disorder (DJD) should be addressed appropriately. The prevalence of DJD, which can cause serious complications such as irreversible jaw asymmetry and condylar deformity, is higher in patients with DDWoR than in those with other types of TMDs[25,26].

We selected an OSA as the main treatment strategy for this patient (in Case 2). Although the treatment mechanism for the OSA remains unclear, OSA therapy is known to be a successful treatment for patients with TMDs. The OSA could effectively reduce pain and increase the range of mouth opening compared to other treatments. Previous studies provided evidence of that OSA treatment was effective and considered to have several treatment effects[13,27]. Inducing orthopedic stability and altering the functional relationships of the TMJ are believed to be the main effects. An OSA can also minimize pathological load and protect tissues such as the condyle, TMJ ligaments, masticatory muscles, and retrodiscal ligaments[13]. It is thought that the reduction of pathological load, maintenance of a stable position of the TMJ, and protection of tissues gradually allow the condyle to perform normal translation movement[27].

Juvenile idiopathic arthritis (JIA) is the most common form of arthritis of unknown etiology in children under 16 years of age. In JIA, TMJs are commonly affected, but early diagnosis is difficult because most patients are asymptomatic. In fact, many patients with JIA present with significantly advanced TMJ degeneration[28–30]. In Case 3, the child was also asymptomatic and discovered incidentally during an examination after trauma. Although her systemic arthritis was well managed, CBCT revealed extensive erosion of the left condyle. TMJ involvement in JIA can alter dentofacial development and lead to many complications, such as malocclusion, asymmetry, micrognathia, and facial deformity. In previous studies, micrognathia and malocclusion in children with JIA have been reported in 30% and 66% of children, respectively. These complications reduce these patients' quality of life[29–31]. Appropriate interventions are needed to minimize jaw deformity and micrognathia in patient with JIA with TMJ involvement. However, there is no consensus on the treatment for complete remission of TMJ osteoarthritis in patients with JIA. Various treatment modalities, such as systemic medication, occlusal appliances, and intra-articular treatment have been suggested. Unfortunately, the response of the TMJ to systemic medication may be poorer than that of other joints, and it is recommended to limit intra-articular injection in children[32]. In Case 3, the child was provided with an OSA to minimize the destruction of the condyle. As previously stated, using an OSA is a successful treatment for TMDs patients. It also applies to osteoarthritis of the TMJ. When the OSA is in place, it can maintain the condyles in the most stable musculoskeletal position[13]. Musculoskeletal stability of the condyle can minimize condyle deformation and mandibular asymmetry caused by TMJ inflammation. On follow-up, our patient showed no symptoms or pathological changes. In addition to possible jaw deformities, children with JIA have a higher prevalence of orofacial pain, including headache, neck pain, and TMDs[33]. This suggests that early diagnosis and treatment of TMJ arthritis in children with JIA are important, and periodic TMJ examination is necessary. Studies on the preventive effects of periodic TMJ examination on TMJ arthritis in patients with JIA are still lacking. However, further research on this topic is required.

In this case series, we report on pediatric patients with various types of TMD. The prevalence of TMDs in children and adolescents has been reported, but there is a lack of consensus on its diagnosis and treatment[16]. TMDs can cause pain in the masticatory system and related dysfunction, which can adversely affect the quality of life of pediatric patients. However, compared to other oral diseases, their importance has been relatively under-emphasized, which has led to a lack of research on TMDs in children[15]. Therefore, it is necessary for clinicians to be interested in TMDs in children and adolescents. Clinicians should evaluate the signs and symptoms of TMDs during periodic checkups. A simple questionnaire containing the following information may help screen the TMDs history of children: limitation of jaw movements, pain during eating, and joint sound. The range and path of mouth opening should be assessed during clinical examinations. Palpation of the TMJ and temporalis and masseter muscles can be performed to determine pain in the masticatory system. In addition, pathological findings such as cortical erosion, flattening, and sclerosis of the condyle can be evaluated using radiological images[10–12]. It should be noted that the various types of TMDs observed in adults can also occur in children[6,7].

CONCLUSIONS

Because symptoms in children and adolescents are often mild and difficult to express clearly, thorough clinical examinations are recommended for the early diagnosis of TMDs. In addition, patients with risk factors such as parafunctional habits and systemic diseases should be carefully evaluated for TMDs during periodic follow-up examinations. With interest in the field of pediatric TMDs, various studies on the prevalence of TMDs and validation studies on the DC/TMD in children should be conducted.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the institutional review board of Jeonbuk National University Hostpital (IRB No: 2022-09-039) and the written informed consent have been obtained from all participants (or the guardian) in this article.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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