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Case Report

Practical Orthognathic Surgery Approach to the Old Bilateral Mandibular Condylar Head Fractures

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Abstract

Introduction: Fractures of the mandibular condylar head occur frequently and account for 25% to 40% of all mandibular fractures. Treatment includes conservative and surgical methods; however, there is no international consensus on which treatment should be performed. Furthermore, bilateral mandibular condylar head fractures are often accompanied by masticatory disorders due to malocclusion and sleep apnea syndrome due to respiratory disorders, resulting in decreased quality of life and impaired social rehabilitation. The treatment of mandibular condylar head fractures may be delayed when the situation is accompanied by brain or other trauma, and the fractures often become old fractures. This paper will discuss how to treat old bilateral condylar head fractures because very few reports are available.

Presentation of Case: A 65-year-old female underwent trauma on the mandibular body after two falls in 2004 and 2016. She experienced fractures of the left side of the mandibular body and both mandibular condyles. The treatment of her thoracic compression fractures was prioritized, and the fractured mandible remained untreated. The patient visited the hospital later in 2020 with complaints of masticatory disorders due to occlusal deficiency and sleep apnea syndrome due to a respiratory disorder. She was diagnosed with old fractures on the left mandibular body and both mandibular condylar heads. The patient's occlusal relationship was Angle Class II with an open bite. She underwent a short-split technique of the Sagittal Split Ramus Osteotomy (SSRO) under general anesthesia. Postoperative improvement of sleep apnea syndrome was observed due to improved occlusal relationship and respiratory distress. One year after the surgery, the mandible showed no relapse, and the patient was in good condition.

Conclusion: For old bilateral mandibular condylar head fractures, the short-split method of SSRO used in orthognathic surgery improved the patient's occlusal relationship and facial profile. The airway was expanded, and sleep apnea was resolved. By using this surgical technique, relapse was prevented, and the patient maintained a stable occlusal relationship.

Keywords: Bilateral mandibular condylar head; Old fractures; Sagittal split ramus osteotomy

Introduction

Mandibular condylar head fracture is one of the most common types of mandible fractures [1]. This is because the mandibular condylar head is the thinnest of the mandibular bones. When an external force is applied to the mandibular body, stress is indirectly applied to the condylar head and easily fractures [2]. The condylar head comprises three fracture levels subdivided into the head, neck, and base regions [3]. Surgical or conservative treatment is selected depending on factors such as the fracture's location and the patient's age, condition, and social background. There is currently no international consensus on treatment selection [4]. Recently, there have been some reports recommending surgical treatment [5]. Patients with bilateral condylar head fractures who chose conservative therapy but were not well-managed had masticatory disorders due to occlusal deficiency and respiratory disorders

resulting in sleep apnea syndrome due to airway constriction [6].

Although various treatment methods have been reported for cases of mandibular fractures [7], very few reports exist on treating old bilateral mandibular condylar head fractures [8]. This case study presents a patient with old bilateral mandibular condylar head fractures, facial deformation, and mastication disorder due to occlusal deficiency. Since the condition was left untreated for years, uneven lengths of the ramus mandibulae resulted in mandibular retraction, causing sleep apnea syndrome. Sagittal Split Ramus Osteotomy (SSRO) was performed on the patient, which improved malocclusion and sleep apnea syndrome [9].

Case Presentation

A 65-year-old female experienced a fall in 2004; however, she did not undergo treatment because the fractures in her left mandibular body and right mandibular condylar head showed no pain. The patient fell again in February 2012 and was taken to a hospital due to her chin and chest injuries. She was diagnosed with a thoracic compression fracture and a left mandibular condylar head fracture. Conservative treatment for her thoracic compression fracture was prioritized during hospitalization, and her left mandibular condylar head fracture was left untreated, resulting in malunion.

After her second accident, the patient complained of malocclusion and drowsiness during the day. She was diagnosed with sleep apnea syndrome (AHI 22.3 ODI16.3) and began using a Continuous Positive Airway Pressure (CPAP); however, she discontinued CPAP treatment since she did not notice any improvement in her condition. The patient was admitted to the oral surgery department in June 2019 with complaints of mastication disorders due to occlusal deficiency and sleep apnea syndrome due to a respiratory disorder. The patient was diagnosed with old fractures on the left mandibular body and bilateral mandibular condylar heads. The patient's occlusal relationship was Angle Class II with an open bite. She underwent a short-split technique of the Sagittal Split Ramus Osteotomy (SSRO) under general anesthesia. Postoperative improvement of sleep apnea syndrome was observed due to improved occlusal relationship and respiratory condition. One year after the surgery, the mandible showed no relapse, and the patient was in good condition.

The patient was 158 cm tall, weighed 47 kg, and was well-nourished and healthy. She was diagnosed with osteoporosis after her injury in 2012 and has been undergoing bisphosphonate therapy since. Her face was asymmetric (shifted to the right) and showed mandibular retraction. Her occlusal relationship was an Angle Class II open bite, +15 mm overjet, -6 mm overbite, 43 mm opening amount, with no trismus (Figure 1). There was no pain in her temporomandibular joint area. The radiograph taken at the initial visit showed anterior displacement of the bilateral mandibular condylar heads in front of the mandibular fossa, no contact of the anterior teeth, and early contact of the bilateral molars. Lateral cephalograms show increased FMA and right lateral displacement of the mandible due to the deformation of the right condylar head (Figure 2).

Figure 1: Facial and intraoral photographs at the initial examination The mandible is retracted and shifted to the right. The occlusal relationship is Angle Class II open bite.

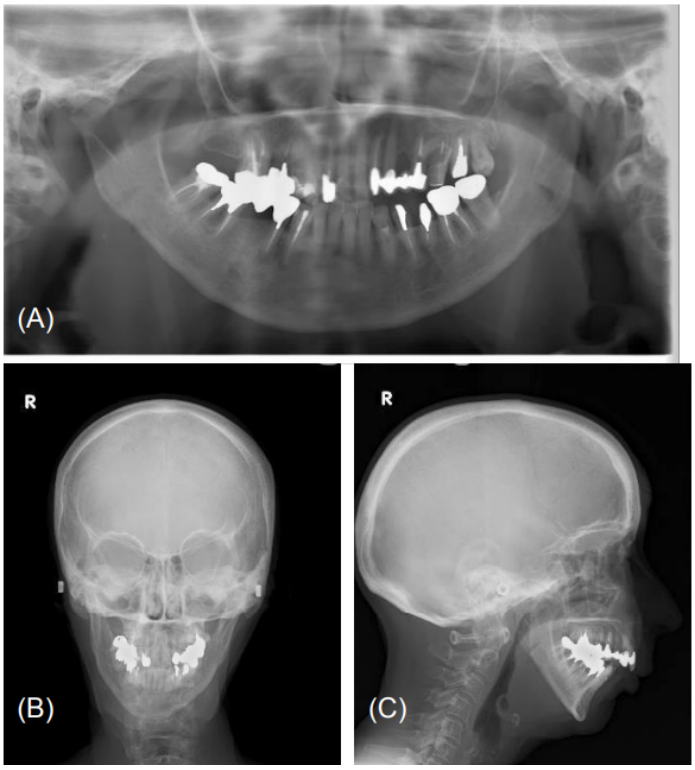

Figure 2: Radiographs at the initial examination. (A): Panoramic radiograph taken during her initial visit. It is observed that the bilateral mandibular heads are unclear; (B): Cephalogram: The mandibular midline has deviated to the right; (C): Lateral cephalogram: The mandible is retracted, indicating open bite of the anterior teeth.

CT images showed deformation of the bilateral mandibular condyles and a high-density structure, which was suspected to be a bone fragment, behind the right mandibular condyle. The bone reduction was difficult due to the small size and unclear presence of the bone fragments around the mandibular condyles (Figure 3). Before surgery, a simulation using ProPlan CM F3.0 was performed. During the simulation, a plan was devised to rotate the mandible in a counterclockwise direction and move it forward by approximately 8 mm using bilateral SSRO to obtain mandibular height (Figure 4). A final bite splint was prepared for use during surgery (Figure 5A). The surgery was performed under general anesthesia. The short-split method of SSRO was selected. The bilateral ramus mandibulae were approached and split from the oral cavity. The final mandible position was determined by intermaxillary fixation using an IMF screw implanted in the alveolar region with a final bite splint. The bone fragments were firmly fixed intramaxillary with titanium plates (Figure 5B). No complications such as abnormal fractures or nerve injury were observed during surgery. Physical therapy was initiated two weeks after surgery. One year after surgery, the patient's occlusal relationship improved, the amount of mouth opening was 45 mm, and there was no pain in the temporomandibular joint (Figure 6). Upon examining images, bone junctions had ossified and stabilized (Figure 7). The lateral cephalogram showed that the airway was expanded (Figure 8). The patient showed no drowsiness, and sleep apnea syndrome symptoms improved (AHI 10.2 ODI 0.52).

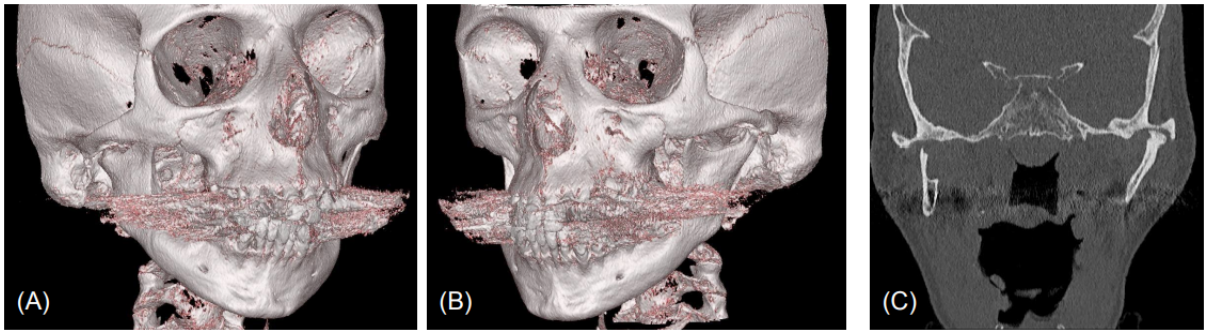

Figure 3: CT image at the initial examination. (A)(B)(C): CT imaging revealed shortened bilateral mandibular ramus and deformed bilateral mandibular condylar heads.

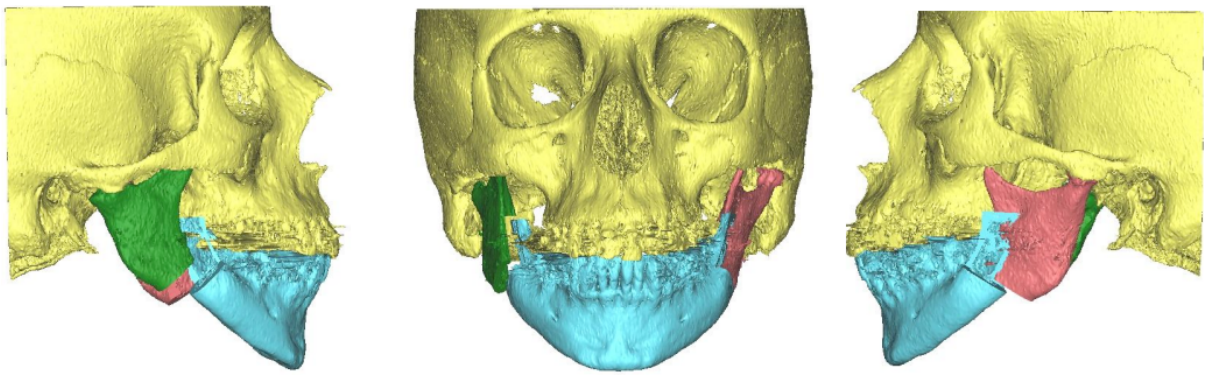

Figure 4: It selects the SSRO and moves the mandible forward about 8 mm.

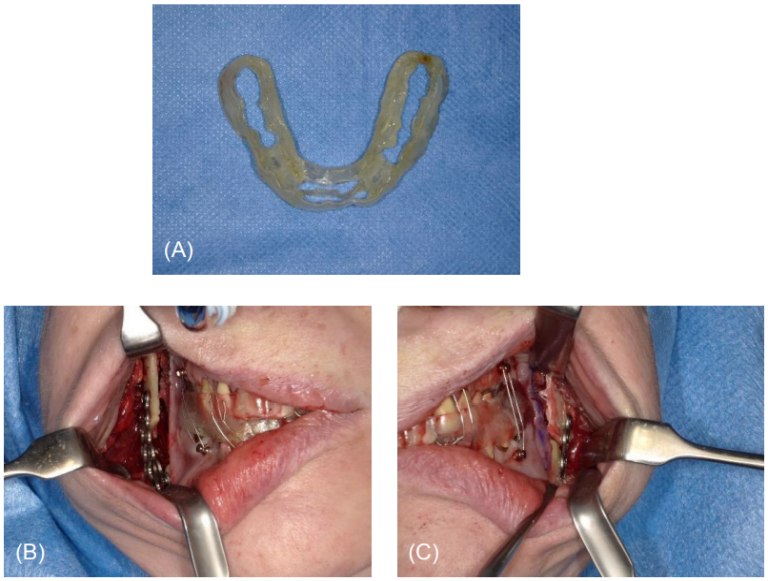

Figure 5: Operative findings. (A): The final occlusal plate used in the surgery; (B)(C): The final occlusal plate was occluded and intermaxillary fixed. The titanium plate was then used for intramaxillary fixation.

Figure 6: Facial and intraoral photographs one year after surgery She has regained a beautiful E-line and normal bite.

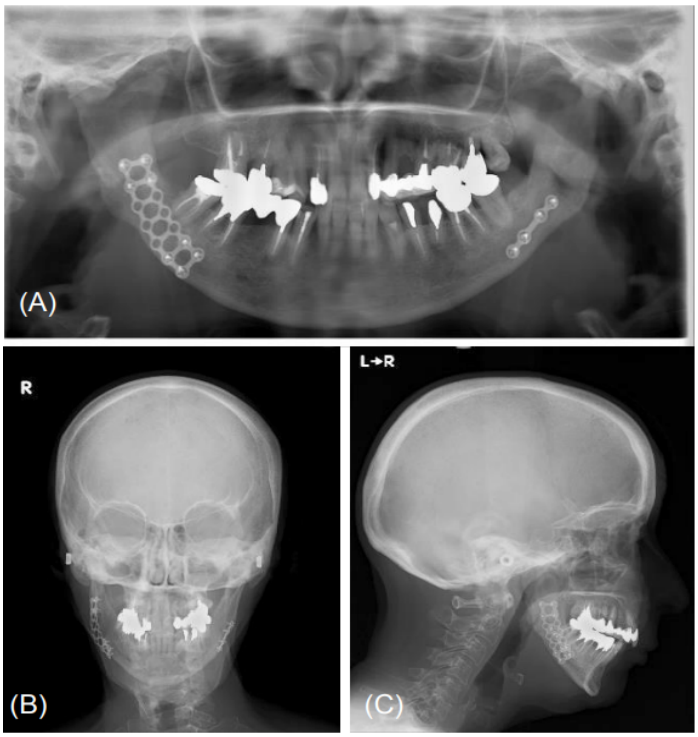

Figure 7: Radiograph one year after surgery. (A): Panoramic radiographs show bone growth around the titanium plate. (B)(C): Occlusion is normal and has not relapsed.

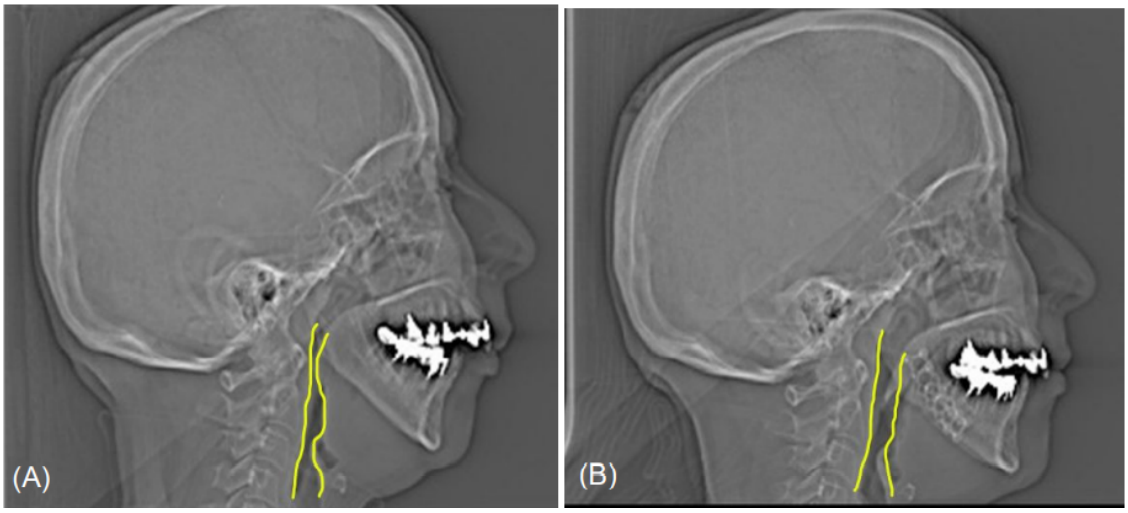

Figure 8: Pre- and postoperative lateral cephalogram. The yellow line indicates the Airway in the pharyngeal region.(A): Preoperative; (B): One year after surgery.

Discussions

Mandibular condylar head fractures account for 25% to 40% of all mandibular fractures [10]. It is often caused by traffic trauma or falls [11]. The mechanism of mandibular condylar fracture is an indirect fracture [9]. In other words, external forces on the mandibular body indirectly stress the condyle of the mandibular process, resulting in a fracture. Treatment includes conservative and surgical methods; however, there is no international consensus on which treatment should be performed [4]. Recently, many reports have recommended surgical treatment to shorten the treatment period [12,13]. The treatment method is determined by the height of the ramus mandibulae and the angle of deviation of the bone fragment [14,15]. Although the fracture heals fast, some complications interfere with daily life, such as facial scarring, facial nerve paralysis, and ankylosis [16]. Reports suggest using endoscopy equipment and techniques to avoid these issues [17]. However, there are many cases where conservative therapy is selected based on the patient's condition, fracture location, and other complications [7,18]. In cases where conservative treatment is selected but the patient is not well managed, complications such as trismus, malocclusion, facial asymmetry, and pain in the temporomandibular joint may become a problem [6]. There are ongoing discussions on the best treatment method; however, there is still no gold standard for treating mandibular condylar head fractures [4].

After bilateral condylar head fractures, the ramus's height is lost, the mandible retracts, and the molars develop early occlusal contact, like in Angle Class II open bite. Symptoms include masticatory disorders due to malocclusion and respiratory disorders due to airway narrowing, affecting social life [19]. Therefore, the standard treatment policy recommends that surgery be performed at least on one side [20]. However, if life-threatening injuries are associated with brain or other trauma, treatment for those is often prioritized, and the treatment of mandibular fractures is delayed. The follow-up determines the prognosis of mandibular fractures [9]. In this case, both the right and left mandibular condylar heads were fractured at different times; however, the treatment of other injuries was prioritized, which resulted in old bilateral mandibular condylar head fractures. Since a long time had passed since the trauma, the fractured bone fragments were absorbed, and re-fixation was impossible due to the small bone size. There are currently few reports on the treatment method for old bilateral mandibular condylar head fractures [8].

Since the patient displayed malocclusion and respiratory distress, it was necessary to secure the height of the ramus mandibulae, restore the occlusal relationship, and secure the airway. During the conventional SSRO, there is a concern that the mandible position will relapse due to the influence of the infrahyoid muscles [9]. She did not want to have scars on her face. Therefore, the Short-split technique was selected, a method commonly used for Angle Class II open bite. The Short-split technique, also called the Canal-split technique, was introduced by Worford, Precious, and Epker as a modified version of SSRO. Unlike the conventional SSRO, the inner mandibular ramus is not split to the mandibular ramus posterior margin but is split towards the mandibular canal. This procedure reduces the chance of relapse by keeping the medial pterygoid muscle, the sphenomandibular ligament, and the stylomandibular ligament attached to the proximal segment of

the bone chip, reducing the tissues that pull the distal bone chip posteroinferiorly. In addition, since many muscles and ligaments are attached to the proximal bone chip that prevents the position of the proximal bone chip from changing, this procedure reduces 'Condylar Sag' [21-23].

Preparation for this surgery was done through preoperative simulation. In addition, because the Short-split method of the SSRO was used, it was possible to avoid scarring, facial nerve paralysis, and TMJ ankylosis, which are complications of surgical treatment for mandibular condylar head fractures. The anterior and molar teeth displayed good occlusion and masticatory ability after surgery. The amount of mouth opening was 38 mm before surgery and 45 mm after surgery, demonstrating significant improvement. These results were consistent with other reports on average postoperative mouth opening. The lateral cephalogram displayed clear indications of an expanded airway improving her respiratory condition. The patient showed no signs of daytime drowsiness as sleep apnea syndrome improved from preoperative AHI 22.3 and ODI 16.3 to postoperative AHI 10.2 and ODI 0.52. One year after her surgery, the patient was very pleased as her occlusion, mastication, and respiratory condition remained stable, and her mandible had not relapsed.

This case study suggested that the Short-split method of SSRO was effective for old bilateral mandibular condylar head fractures.

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