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A mandibular body fracture related to mouth-opening training in a dialysis patient

CASE REPORT

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Abstract – A mandibular body fracture related to mouth-opening training in a dialysis patient is reported. A 61-year-old male patient had noticed pain in the right mandibular body and difficulty in mouth opening a week previously. The patient had been performing mouth-opening training for a couple of weeks. The right lower face was slightly swollen with tenderness at the right lower border of the mandible. Hypoesthesia of the right lower lip was also observed. A bone step was palpable on the alveolar ridge of the right mandible, but mobility was not marked. The mandible was atrophic in the body region with only four anterior teeth left. Panoramic X-ray examination revealed a moderately displaced fracture in the right molar region of the mandible. The patient had no severe pain or difficulty in eating using a partial denture. The patient had received dialysis for 17 years and had also been treated by warfarin and aspirin. The patient was followed up under restricted mouth opening. Osteosynthesis with bone remodeling was confirmed after 6 months by X-ray examination. No complication requiring further treatment occurred during the follow-up period. In this patient, a medically compromised condition under long-term dialysis is considered a predisposing factor, which made the atrophic mandible more susceptible to the stress related to mouth-opening training.

Maxillofacial fractures in the elderly have been recently increasing as a consequence of their increased life span and more active lifestyle (1–4). In the elderly, maxillofacial fractures often occur by falling, related to physiologic consequences of aging such as a reduced ability to balance and to avoid environmental hazards, the presence of systemic disease and the use of drugs (2, 5). In falls, a traumatic impact is typically applied to the symphyseal region of the mandible and causes fractures directly at the site of the impact or indirectly at the condylar process (6). In an atrophic or edentulous mandible, the impact may induce body fractures (7, 8); however, even in atrophic mandibles, body fractures without obvious trauma or during mastication rarely occur (9) unless there is a pathologic condition in the mandible.

In this paper, we reported a mandibular body fracture related to mouth-opening training in a dialysis patient. In this patient, a medically compromised condition under long-term dialysis was considered a predisposing factor, which made the atrophic mandible more susceptible to the stress related to mouth-opening training.

Case report

A 61-year-old male patient was referred to our clinic for the evaluation of mandibular fracture. The patient had been performing mouth-opening training up to three fingerbreadth of interincisal distance without using device for a temporomandibular joint disorder for a couple of weeks. The patient had noticed pain in the right mandible and difficulty in mouth opening a week previously. The patient consulted a dental clinic and fracture of the mandible was identified. The patient had no idea when the fracture occurred. On examination, the right lower face was slightly swollen with tenderness at the right lower border of the mandible. Hypoesthesia of the right lower lip was also observed. Intraorally, a bone step was palpable on the alveolar ridge of the right mandible, but mobility at the fracture site was not marked. The mandible was atrophic in the body region with only four anterior teeth left. Panoramic X-ray examination revealed a moderately displaced fracture in the right molar region of the mandible (Fig. 1). The diagnosis of mandibular fracture at the right body was made. The patient had no severe pain or difficulty in eating using a partial denture. The bone fragments were in contact in spite of moderate displacement without marked mobility during function, suggesting the maintenance of periosteal sheath continuity. The patient had received dialysis for 17 years due to chronic kidney disease and had also been treated with warfarin potassium and aspirin after aortic valve replacement; therefore, the patient was followed up under restricted mouth opening. Condition of the fracture line was monitored by panoramic X-ray examination. Further displacement of the bone fragments did not occur. Osteosynthesis with bone remodeling was confirmed after 6 months by X-ray examination (Fig. 2). No complication requiring further treatment occurred during the follow-up period. The patient was in a good condition with only slight hypoesthesia of the right lower lip.

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Fig. 1. Panoramic X-ray film at the first visit. A moderately displaced fracture was found in the right mandibular body.

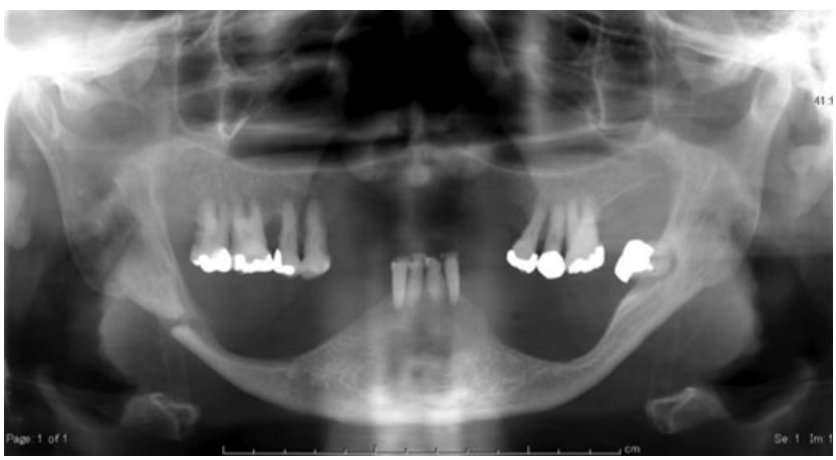

Fig. 2. Panoramic X-ray film 6 months after the first visit. Osteosynthesis with bone remodeling was observed at the fracture site.

Discussion

A case of mandibular body fracture without an obvious traumatic impact is reported. Spontaneous fracture of the mandible is not commonly encountered even in an atrophic or edentulous mandible, although such cases may be underreported (9). It was not clear why the fracture occurred in the present case but several local and general factors are considered to have contributed.

One factor was atrophy of the mandible itself. The patient was almost edentulous with only four anterior teeth left and the mandible was relatively atrophic in the body region. After loss of teeth, the mandible usually becomes atrophic by decreasing body height and loss of bone volume (8, 9). Such changes are also accompanied by reduced vascularity or decreased blood flow as a consequence of aging (10–12). This loss of bone mass and reduced vascularity is thought to decrease the strength of the mandible and to make it more susceptible to a traumatic force (10).

The second factor was the medically compromised condition of the patient. The patient had been receiving dialysis for 17 years due to chronic kidney disease. It is well known that dialysis patients show several metabolic and hormonal abnormalities, including decreased renal synthesis of $1,25(OH)_2D_3$, hyperphosphatemia, hypocalcemia, increased secretion of parathyroid hormone, chronic metabolic acidosis, premature hypogonadism, and, more recently, recognized 25(OH) vitamin D deficiency (13). These abnormalities may adversely affect the bone remodeling process in one or more of the following ways by increasing bone resorption, decreasing bone formation or impairing osteoid mineralization (13). These changes in bone remodeling have the potential to accelerate the deterioration of the bone microstructure that accompanies normal aging and therefore may decrease bone quality and strength and increase fracture susceptibility (13–15). The patient had also been taking oral anti-coagulants, warfarin potassium and aspirin, after aortic valve replacement a year previously. Warfarin, an antagonist of vitamin K, interferes with γ-carboxyglutamate formation and consequently inhibits the accumulation of osteocaltin in the extracellular matrix (16). Therefore, warfarin may have potential to induce osteoporosis, although there is insufficient evidence of this as yet (17, 18).

The third factor was the stress applied to the mandible. Since the patient did not recognize the moment of the fracture, it is not likely that the fracture occurred as the result of an obvious traumatic impact on the mandible. The patient had been performing mouth-opening training for a couple of weeks before noticing pain in the right mandible. Therefore, we

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consider that accumulation of the stress related to mouth-opening training on the atrophic body of the mandible bounded anteriorly by depressors and posteriorly by the elevator muscles is responsible for the fracture under the medically compromised condition described above (9).

In fractures of the atrophic mandible, special consideration is necessary for treatment. There has been debate on the treatment modalities for atrophic/edentulous mandibular fractures (19). Most recent studies recommended surgical treatments such as open reduction and rigid internal fixation under proper management (20–23), although conservative treatments such as maxillomandibular fixation are also a viable option (10). In the present case, several factors were taken into account to choose the treatment modality. The patient had no severe pain or difficulty in eating. Bone contact without marked mobility during function in spite of moderate displacement suggested the maintenance of periosteal sheath continuity to allow spontaneous healing. In contrast, disruption of the blood supply by open reduction may lead to poor wound healing or nonunion of the fracture (3, 10). The medically compromised condition was also a great concern for the development of complications as well as the physical stress on the patient by the treatment itself (4); therefore, the patient was followed up under restricted mouth opening. Osteosynthesis with bone remodeling was achieved successfully without any complication requiring further treatment. Although, panoramic X-ray was used to monitor the healing of the fracture site, cone beam computed tomography might be better for the early confirmation of osteosynthesis if available.

In conclusion, a mandibular body fracture related to mouth-opening training in a dialysis patient was reported. A medically compromised condition under long-term dialysis was considered a predisposing factor that made the atrophic mandible more susceptible to the stress related to mouth-opening training.

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