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Reconstruction of the mandibular condyle using liquid nitrogen–treated autograft in a case of fibrous dysplasia

KEYWORDS
Fibrous dysplasia;
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Autograft;
Navigation

Fibrous dysplasia (FD) is a benign developmental disorder characterized by the replacement of normal bone with fibro-osseous tissue, leading to abnormal mineralization.[1] Monostotic FD, the most common form, accounts for 80–85 % of the cases, often affecting the maxillofacial region unilaterally, with a higher prevalence in the posterior maxilla than the mandible.[2] While FD generally has no gender predilection, its progression in the jaws often extends into adulthood, unlike extragnathic FD, which typically stabilizes post-puberty. Treatment ranges from conservative management to extensive surgery, depending on the disease severity. Recent advancements in medical management, such as bisphosphonates and denosumab, have shown promise in reducing bone resorption and lesion growth.[3] This article reported a case of mandibular FD treated with a novel approach involving the reconstruction of the left mandibular condyle using a liquid nitrogen–treated autograft.

A 58-year-old female presented with painful swelling on the left lower face and the restricted mouth opening (maximum mouth opening, MMO = 8 mm). The panoramic radiography and computed tomography (CT) scan revealed a "ground-glass" appearance of the left mandible extending to the condylar region. An incisional biopsy of the lesional bone confirmed the histopathological diagnosis of FD. Despite initial medical management with denosumab, her condition progressed over three years, resulting in complete ankylosis of the left mandibular condylar head (Fig. 1A, B, and C). The patient ultimately decided to proceed with surgical intervention.

Preoperative planning included the integration of CT DICOM files into a 3D model to simulate the mandibular condylar shape and develop a surgical cutting guide in collaboration with a medical engineer (Fig. 1D). The procedure involved preauricular and retromandibular incisions, followed by exposure and segmental resection of the affected mandibular bone (Fig. 1E and F). The excised bone was treated with liquid nitrogen for 20 min, thawed for 15 min, and rinsed. The liquid nitrogen-treated bone was reshaped and then reimplanted as an intercalated graft with a silastic sheet placed to reconstruct the articular surface (Fig. 1G, H and I). Fixation was achieved using plates and screws, and intermaxillary fixation ensured a proper alignment (Fig. 1J). Postoperatively, the patient demonstrated normal facial nerve function, stable occlusion, and a final follow-up MMO of 25 mm (Fig. 1K). The follow-up radiographs confirmed the stable reconstruction and correct left mandibular condyle position.

FD in the jaws can lead to functional impairments, deformities, and dental complications. While nonsurgical options like bisphosphonates and denosumab offer symptom relief and disease control, progressive cases with functional limitations may require surgery. Traditional surgical options, including shaving or resection, carry risks

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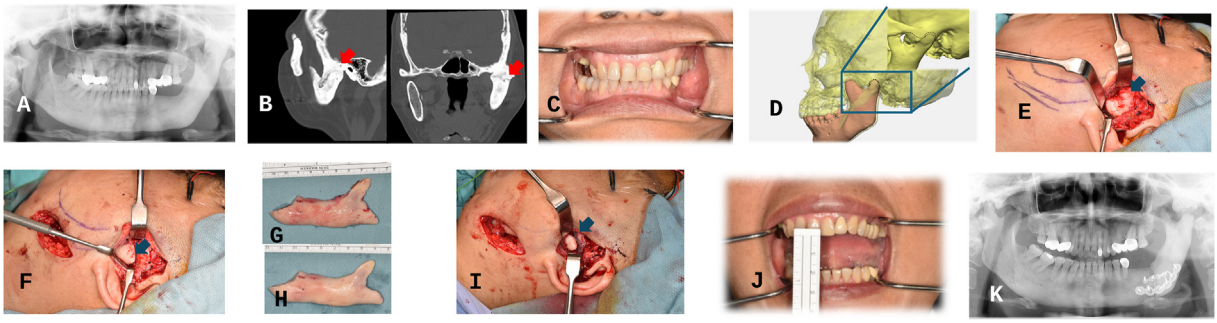

Figure 1 The radiographs, clinical photographs, and related photographs of our patient with the left mandibular fibrous dysplasia. (A and B) Ankylosis of the left mandibular condyle confirmed by the panoramic radiography and computed tomography scan. (C) Severe limitation of the mouth opening with the maximum mouth opening (MMO) of 0 mm. (D) Surgical treatment planned using the mirroring technique to identify the surgical separation site intraoperatively. (E) Intraoperative confirmation of ankyloses. (F) The ankylotic bone mass was surgically separated. (G) View of the separated mandibular condylar segment. (H) The segment was reshaped and modified. (I) The mandibular condylar segment was repositioned into its original anatomical location following cryosurgery with subsequent artificial disc replacement and anchorage. (J) Postoperative panoramic radiograph showing the left mandibular condyle at the correct position. (K) The MMO improved to over 25 mm at the one-month follow-up.

of recurrence or complications. Recent advancements, such as liquid nitrogen-treated autografts, offer a promising alternative. Liquid nitrogen effectively devitalizes tumor cells while preserving bone structure, facilitating osteoinduction and osteoconduction.[4] Studies have demonstrated successful outcomes with this technique, including reduced recurrence and reliable bone healing.[5] In this case, the use of liquid nitrogen-treated autograft ensured complete removal of diseased tissue while preserving structural integrity, achieving functional and aesthetic restoration.

This case highlights the efficacy of combining segmental resection with liquid nitrogen-treated autograft in managing the mandibular FD. This novel approach offers reliable long-term outcomes, minimal recurrence risk, and improved functional restoration, making it a promising option for treating complex cases of FD. Further studies are needed to establish its broader applicability and long-term benefits.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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