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## Osteochondroma of the mandibular condyle: Resection and reconstruction using vertical sliding osteotomy of the mandibular ramus

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### Abstract

Osteochondroma is one of the most common benign bone tumours, although not in the craniofacial region. More than half of these appear in the coronoid process. It can appear on the mandibular condyle, especially in its medial half, and mainly affects women aged around forty years. We present the case of a 51-year-old woman with pain of several months' duration in the right temporomandibular joint (TMJ) and no other symptoms. Panoramic radiography showed an enlarged condyle with no subchondral cysts. Computed tomography showed a bony proliferation with benign signs and a scintigraphy revealed an increased uptake in the condyle. Due to the painful clinical symptoms, a surgical procedure using preauricular and retromandibular approaches was performed to excise the condyle. The resulting defect, which was 9 mm high, was reconstructed by means of a vertical sliding osteotomy of the mandibular ramus and two miniplates for osteosynthesis. Almost two years later, the patient is symptom-free and has a normal opening with no malocclusion or deviation in the opening pattern. We present and discuss different reconstruction options after condylectomy.

**Key words:** Osteochondroma, mandibular condyle, condylectomy, osteotomy, sliding osteotomy, temporomandibular joint.

## Introduction

Osteochondroma or osteocartilaginous exostosis (World Health Organization International Classification of Diseases for Oncology code 9210/0), one of the most common benign bone tumours, consists of an exophytic bone proliferation with a hyaline cartilage cap. It is frequently observed on the metaphyses of long and flat bones, with no transition to the underlying normal bone.

It is rather infrequent on the skull. The coronoid process and mandibular condyle are the most commonly affected areas (1), especially the medial aspect in the latter (2). Most cases are diagnosed in women aged around forty years. Different etiologies have been proposed. The most recent theory is based on the presence of nests of chondrocytes in the periosteum (3). Mechanical stress may lead to hyperplasia of these cells, because the lesion is usually located in areas such as tendon insertions. On the mandible, especially the condyle, Meckel cartilage remains may play a role.

Sarcoma arising from osteochondromas has been described. Approximately 2 % of all osteochondromas become malignant. No case has been reported in the skull.

Resection, while sometimes complex, is curative, depending on the defect and the associated dentofacial deformity. Relapse is possible, although no cases have been reported on the mandible.

## Case Reports

A 51-year-old woman presented with pain in the right temporomandibular joint (TMJ) that had been present for several months, with no accompanying symptoms. Physical examination did not reveal any relevant signs apart from absent molars in the first and third quadrants. Panoramic radiography (Fig. 1), showed an enlarged, well-circumscribed condyle with no osteophytes or subchondral cysts. Computed tomography revealed a benign enlargement of the condyle, and bone scintigraphy showed activity in the same area. A presumptive diagnosis of osteochondroma was made. The patient gave her informed consent, and a surgical procedure using preauricular and retromandibular approaches was performed to excise the condyle with the aim of improving the symptoms. After the condylectomy, a 9-mm vertical defect was observed. This was reconstructed using a vertical sliding osteotomy of the mandibular ramus (Fig. 2 and 3). Bone fixation was achieved by means of two titanium miniplates (2.0-mm system, KLS Martin, Tuttlingen, Germany). The patient suffered a mild paresis of the frontal and marginal rami of the facial nerve, although this resolved completely three months after surgery. Twenty months after the procedure, the patient is symptom-free with good mouth opening and no deviations or malocclusion.



**Fig. 1.** Panoramic radiograph. Bottom left: enlargement of the right condyle with the osteochondroma.



**Fig. 2.** Osteosynthesis using miniplates (2.0-mm system, KLS Martin, Tuttlingen, Germany).



**Fig. 3.** Postoperative panoramic radiograph.

### *Surgical technique of the vertical sliding osteotomy of the mandibular ramus.*

A temporary intermaxillary fixation is performed to maintain the vertical dimension and occlusion. This can be carried out before or after condyle resection, although we think condylectomy is better achieved without previous fixation, as opening and closing of the mouth can make resection easier. Both preauricular and retromandibular approaches are used for resection and reconstruction, with identification and preservation of the marginal mandibular branch of the facial nerve. The

masseter muscle is retracted anteriorly. Condyle resection and are designed and performed to create a neocondyle with a functional shape and proper positioning. During condylectomy, the articular disc is preserved if possible and if it is in good condition. After evaluation of the resulting defect, the osteotomy is performed with preservation of medial soft tissue to maintain blood supply. The lingula of the mandible can be identified inferiorly, but proximal identification of the inferior alveolar nerve is not possible without compromising the blood supply to the condyle and the nerve itself.

After osteotomy, the neocondyle is placed in the glenoid fossa and shaped according to the previous design. Semi-rigid fixation is achieved with 2.0-mm miniplates, and intermaxillary fixation can be removed immediately.

## Discussion

Osteochondroma is one of the most common benign condylar tumours together with chondroma and osteoma. However, this tumour is most frequently found on the metaphyses of long bones (femur, tibia, etc) and is unusual on the skull.

Several osteochondromas located throughout the skeleton are observed in the hereditary multiple exostoses condition, an autosomal dominant disorder with multiple exostoses causing bone deformities and impaired joint mobility that may be complicated by pathological fractures and compression of nerves, vessels and tendons. Langer-Giedion syndrome (4) is accompanied by learning difficulties, redundant skin, multiple exostoses, characteristic facial features and cone-shaped phalanges. Sarcomatous degeneration of an exostosis can occur, as the probability of degeneration of a single exostosis increases with the number of lesions. No sarcomatous degeneration has been reported in the skull.

A macroscopic analysis of the surgical specimen reveals a bone proliferation with a hyaline cartilage cap. histology reveals a normal osteochondral junction, as on the growth plate.

Most cases of condylar osteochondroma manifest with facial asymmetry or malocclusion (ipsilateral posterior open bite, contralateral cross bite) with no impairment of TMJ movements, as a pseudojoint is slowly formed around the tumour. Any slow-growing proliferation, such as condylar hyperplasia, presents with these symptoms (5).

Complete resection of the tumour using condylectomy is curative. Some authors propose conservative resection with preservation of most of the condyle by tumor-ectomy in multiple fragments (6) and minimal condyle reshaping through burring. This approach is difficult in most cases because of the typical location of the tumour (medial part of the condyle) and adjacent structures.

### *Reconstruction after condylectomy.*

Several reconstructive options are available depending on the resulting defect after resection of the condyle.

Not performing reconstruction would lead to a decrease in the vertical dimension on the affected side, facial asymmetry, malocclusion (lateral open bite), deviation of the mandible with mouth opening and laterognathia, in other words, symptoms similar to those present before the procedure but in the opposite direction.

Several reconstructive options can be considered:

1. Free costochondral grafting: This is a reconstruction method. Rib ossification is of endochondral origin, with characteristics similar to those of cortical bone. Unpredictable revascularization from the bony end of the graft explains the erratic resorption (7) and the possibility of fragmentation in bone and cartilage. Rib grafts are usually harvested from the 5th to 7th ribs (in women the incision is made 5 mm above the inframammary fold).

2. Free flaps: Vascularised metatarsal grafts (8) are a good option for reconstructing the TMJ. They have been used in bilateral ankylosis. The main drawbacks are the aesthetic deformity at the donor site and the complexity of the procedure. In larger resections involving condyle and ramus other flaps can be used, mainly the fibular free flap.

3. Orthognathic surgery (9): The use of bilateral sagittal split osteotomy and other related procedures can re-establish proper occlusion. This is a good option in cases of concomitant dentofacial deformity.

4. Prosthesis: Prosthetic devices with a ramus-condyle unit can be used after large resections. However, these are expensive, placement is complex, and there is a high risk of postoperative ankylosis.

5. Sliding osteotomy: This technique (10) involves bone flaps with a soft tissue pedicle. It can be used after resection of the mandibular condyle. It is a good option in cases such as the one we report, where the defect is small.

Vertical sliding osteotomy of the mandibular ramus as described by Loftus et al. (11) avoids the disadvantages of other techniques (e.g. donor-site morbidity, bone resorption in the graft, progressive ankylosis with the use of prostheses, etc). Moderate displacement of the bone fragments leaves enough bone in contact able to form a fracture callus and restore continuity by forming a new ramus able to resist mastication forces. Sliding osteotomy can be performed obliquely (12) or vertically, as in the case we report. Morbidity, which is low, is caused by the approach. Vertical sliding osteotomy can be considered a type of local random pattern bone flap with both a medial pedicle (internal pterygoid muscle) and a posterior pedicle (soft tissue, if left undamaged) that can supply enough blood to prevent bone resorption.

We consider this technique to be an alternative for the reconstruction of small and medium defects resulting from condylectomy, as well as small vertical dimension losses derived from posttraumatic avascular necrosis of the condyle and idiopathic condylar resorption.

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