Osteochondroma of the Mandibular Condyle: Literature Review and Report of a Case

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Abstract

Aim: The intent of this report is to present a brief review of the literature on osteochondroma and to present a case involving the surgical removal and replacement of a major portion of the condyle and angle of the mandible using free autogenous mandibular bone.

Background: While osteochondroma is the most common tumor of skeletal bones, it is relatively uncommon in the jaws occurring at the condyle or the tip of the coronoid process. This benign cartilage-capped growth is usually discovered incidentally on radiographic examination or on palpation of a protruding mass in the affected area. Malocclusion and progressive facial asymmetry are common findings in most cases of condylar osteochondroma.

Report: A case of a 29-year-old woman with an osteochondroma of the mandibular condyle is presented. Surgical treatment was tumor resection, grafting, and reshaping of the mandibular angle and ramus. As this lesion is usually asymptomatic and discovered incidentally on radiographic examination, the general practitioner usually is the first professional to make the diagnosis.

Summary: Condyllectomy cannot be recommended as routine in all cases. Common surgical treatments include condyllectomy and reconstruction. If the tumor involves only a limited area of the condylar surface, then preservation of the remaining portion of the condyle and reshaping should be done. Reasons for not taking...
such a conservative approach are the possibilities of malignancy and the risk of recurrence. In this case report
the extraoral vertical ramus osteotomy, associated with free autogenous mandibular bone, presented several
advantages.

**Keywords:** Osteochondroma, oral neoplasias, oral surgery, benign tumors

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**Introduction**
Osteochondroma or solitary osteocartilaginous exostosis is characterized by a cartilage-capped,
osseous projection protruding from the surface of affected bone. While osteochondroma is
considered the most common tumor of skeletal bones,¹ it is relatively uncommon in the jaws.²
This tumor can occur singly or as part of an autosomal dominant syndrome known as
osteochondromatosis.³

This report provides a review of the literature on osteochondromas, with a focus on the condylar
region, and presents a case of osteochondroma of the condyle.

**Review of the Literature**
Several theories have been proposed to explain the pathogenesis of osteochondroma. In 1891
Virchow⁴ postulated the physeal theory: a portion of the physeal cartilage becomes separated
from the parent tissue then rotates 90 degrees and grows in a direction transverse to the long
axis of the bone. He could not provide reasons for the separation and rotation of the detached
physeal cartilage. In 1920 Keith⁵ proposed a defect in the perichondral ring surrounding the
physis is the cause of osteochondroma. Müller's periosteal theory states exostoses are produced
by small nests of cartilage derived from the cambium layer of the periosteum.⁶ Lichtenstein⁷ theorized the periosteum has the potential to
develop osteoblasts and chondroblasts. The osteochondroma could develop by spontaneous
or induced metaplasia of the periosteum to form cartilage that subsequently undergoes
endochondral ossification.

The rare osteochondroma of the mandible occurs at the condyle or the tip of the coronoid process.⁸
This cartilage-capped growth accounts for 35.8% of benign bony tumors and for 8.5% of bony
tumors overall.⁹

Malignant change is rare in solitary osteochondromas but does occur in
approximately 5% of cases of multiple hereditary
osteochondromatosis.¹⁰ It occurs in adolescents
or young children with the lesion being discovered
between 10 and 20 years of age in about 80% of
cases. Both sexes are equally affected.¹¹

The histological distinction between
osteochondroma and chondrosarcoma can be
difficult, particularly when only a limited sample of
tissue is available for histological analysis. Lack
of high cellularity, pleomorphism, and plump cells
with large or double nuclei favor a benign lesion.¹²

The lesion is usually discovered incidentally
on radiographic examination or on palpation
of a protruding mass in the affected area.¹³
Malocclusion in the form of a lateral open bite
on the contralateral side and progressive facial
asymmetry are common findings in most cases of
condylar osteochondroma. Pain may precede or
accompany facial asymmetry in some cases.¹⁴

The radiographic image is one of a globular,
radiolucent, lobulated mass which distorts the
normal morphology of the mandibular condyle
and can be differentiated from the elongated
condylar process seen in hyperplasia.¹⁵¹⁶ The
radiographic appearance of osteochondroma

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can be pathognomonic, especially in long bones. The lesions usually point away from the joint space and can have a pedunculated stalk or sessile base. On a conventional radiograph the osteochondroma may exhibit density with a sclerotic appearance. Computer assisted tomography (CT) scanning may help delineate the anatomy of the lesion and that of surrounding structures.

An extensive review by Vezeau et al. revealed the condylectomy is the surgical treatment of choice. The preauricular surgical approach, alone or in combination with other approaches, is most often used by the majority of surgeons. No reconstruction was reported in most cases. For cases in which joint reconstruction was performed, condyloplasty and disectomy were more frequently mentioned in the literature than costochondral grafting.

Conservative surgeries as viable treatment options for osteochondroma of the mandibular condyle were described. In cases of condylectomy, total joint prosthesis reconstruction may be necessary such as in the case of a patient with a large osseous mass arising from the mandibular condyle and extending superiorly to the level of zygomatic process.

Case Report

Diagnosis
A 29-year-old woman presented with the complaint of increasing facial asymmetry over a period of four years. Mouth opening was normal, but the mandible deviated 8 mm to the right side. There were no associated temporomandibular joint (TMJ) complaints nor associated pain. Clinical examination revealed an increased length of the left ascending ramus and a prominence of the left mandibular angle (Figure 1).

Panoramic radiograph revealed a mandibular asymmetry and a marked enlargement of the left mandibular condyle (Figure 2).

Sagital and coronal CT images revealed a large globular, mixed radiopaque/radiolucent condylar mass of the left TMJ (Figures 3 and 4).

The lesion extended superiorly into the articular fossa, but the cortical bone of the fossa was intact. The cortex of the tumor was continuous with that of the normal condylar bone. The pattern of the trabecular bone of the tumor blended with the intramedulary host bone.

A cintilographic image of the entire axial skeleton showed an increased captivation in the left condyle. Excluding this lesion, a normal symmetrical uptake pattern of the radionuclide was present throughout the skeletal structure, showing no evidence of multiple osteochondromas. Based in the clinical and imaging findings, a provisional diagnostic of osteochondroma or osteoma of the mandibular condyle was made.

Treatment
The patient was admitted to the University Hospital of the Pontifical Catholic University of Paraná, Brazil for surgical removal of the tumor. The electrocardiogram, chest radiography, and routine urine and blood values were within normal limits.

The tumor resection, grafting, and reshaping of the mandibular angle and ramus were planned by tracing the intended osteotomies on acetate sheets (Figures 5 to 8).

A Risdon approach was created below the left mandibular angle to access the ramus and condylar neck. The pterygomasseteric sling was cut and detached, and the masseter muscle was vertically split to facilitate access to the angle, ramus, and neck of condyle.

An osteotomy was carried out as planned (Figure 6): a piece composed of the condyle (with the tumor), the posterior part of the ramus, and part of the horizontal border was removed (Figures 9 and 10).

The compromised condyle was also removed, and a graft was prepared by splitting and then fixing the fragments with #2 wires (Figures 7 and 11).

The graft was positioned into the fossa and fixed to the ramus with a #2 wire osteosynthesis (Figures 8, 12, 13, and 14). Intermaxillary fixation was maintained for two weeks.

Microscopic examination revealed cancellous, free autogenous mandibular bone with trabeculae of variable size. Cartilaginous inclusions were visible,
lined by a broad layer of partially loosened periosteal collagen tissue (Figure 15).

At the three-year follow-up, the patient presented with good facial symmetry and a stable occlusal relationship. Mandibular function was excellent, with a maximal incisal opening of 45 mm. A panoramic radiograph revealed good symmetry of the mandible, an adequate position of the graft, and a favorable condyloid shape (Figure 16).

**Discussion**
A total of 42 cases affecting the mandibular condyle, including the present case, have been reported in the English language literature. A literature review revealed tumors found in this region developed primarily during the fourth decade, with a mean age of 38.5 years and a male to female ratio of 1.0:1.2. Symmetry of the face was present in 83.3% of the reported cases. In 52.3% pain was a complaint, and in 30.9% there was mandibular hypomobility. As for surgical treatment, the preauricular approach was used in 64.2% of the cases, and in 64.2% of these cases condylectomies were performed. Reconstruction was performed in 50% of the cases. Reconstruction included either free autogenous bone or costochondral grafts and the insertion of a TMJ prosthesis (Table 1).

**Summary**
Condylectomy cannot be recommended as routine in all cases. Common surgical treatments include condylectomy and reconstruction. If the tumor involves only a limited area of the condylar surface, then preservation of the remaining part of the condyle and reshaping should be done. Reasons for not taking such a conservative approach are the possibilities of a malignancy and the risk of recurrence.

The placement of the stump of the posterior border of the mandible into the glenoid cavity with reinsertion of the lateral pterygoid muscle and posterior fixation of the articular disc results in an anatomical remodeling and subsequently leads to very favorable stable function.

The extraoral vertical ramus osteotomy associated with free autogenous mandibular bone used in this report presented several advantages. This technique allows immediate reconstruction and minimizes the risk of an infection and loss of the graft due to its similar histological characteristics. Furthermore, it prevents possible complications with a different donor site.
Figure 2. Initial panoramic radiograph showing the bulky shape of the left condyle and a marked deformity of the left mandibular body, angle, and ramus.

Figure 3. Axial CT. In this cut the tumor is clearly visible affecting the center of the condyle. The tumor is well delimited and the bone cortical is preserved.
Figure 4. Coronal CT. Cortical preservation and tumor delimitation.

Figure 5. General plan of the osteotomies using a tracing on the panoramic radiograph.
Figure 6. Planned osteotomy.

Figure 7. Planned autogenous graft.

Figure 8. Planned position of the graft.

Figure 9. Osteotomy
Figure 10. Removed fragments including the condyle/tumor.

Figure 11. Bone split and construction of an autogenous graft.

Figure 12. Prepared bed for insertion of the graft.

Figure 13. Positioned autogenous graft.

Figure 14. Immediate post-operative radiograph.
Figure 15. Cancellous bone with trabeculae of variable size; cartilaginous inclusions lined by a broad layer of periosteal collagen tissue. (HE 40 X)

Figure 16. A post-operative radiograph taken at three years. Note the fairly good shape of the condylar extremity.
Table 1. Summary of published cases of mandibular condyle osteochondromas.

<table>
<thead>
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<th>Author(s)</th>
<th>Position</th>
<th>Side</th>
<th>Sex</th>
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<th>Approach</th>
<th>Technique</th>
<th>Reconstruction</th>
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Table 1. Continued.

| Strickland et al 1985 | Superior | | | | | |
| Mizuno et al 1983 | Anterior-posterior-superior-medial | | | | | |
| Kaneda et al 1982 | Anterior-medial-superior | | | | | |
| Johnson et al 1982 | Anterior-medial | | | | | |
| Eiler et al 1977 | Anterior-medial-inferior | | | | | |
| Keen and Caffahen 1977 | NS | | | | | |
| Koehl and Tison 1977 | Medial | | | | | |
| Sanders and McKeown 1977 | Anterior-superior | | | | | |
| Simon et al 1977 | Medial | | | | | |
| Wang-Norderud et al 1975 | Anterior-medial | | | | | |
| Thompson et al 1969 | Anterior-superior | | | | | |
| Hayward and Megquier 1968 | Anterior-medial-inferior | | | | | |
| Melarkey et al 1966 | Anterior-medial | | | | | |
| Grossman 1965 | Medial | | | | | |
| Ramon et al 1964 | Medial | | | | | |
| Schultz et al 1960 | Anterior-inferior | | | | | |
| Curtin and Creeley 1959 | NS | | | | | |
| Kanthak and Harks 1938 | Anterior | | | | | 

**Abbreviations:**
- **Position:** NS, not specified;
- *Location of lesion not specified in text, but panoramic radiographs locate lesion anterior to condyle (mediolateral orientation of lesion not known).*
- **Side:** L = left; R = right.
- **Sex:** F = female; M = male.
- **Symptoms:** A = asymmetry; H = hypomobility; N = noise; P = pain.
- **Approach:** IO = intraoral; PA = preauricular, SM = submandibular; TF = temporals flat; ZA = zygomatic arch osteotomy, HC = hemicoronal.
- **Technique:** EX = excision; CL= condylectomy.
- **Reconstruction:** CC = costochondral graft; CO = coronoidectomy; CP= condyloplasty; DE = disectomy; DP= discoplication; EVRO = extraoral vertical ramus osteotomy; EP = eminoplasty; IVRO = Intraoral vertical ramus osteotomy; SIS = silastic spacer; TJP = total joint prosthesis, SLFI = segmental Le Fort I; BSSO = bilateral sagittal split ramus osteotomy of the mandible; Lt SSO = left unilateral sagittal split ramus osteotomy of the mandible; IIIBO = ipsilateral inferior border osteotomy.
References
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