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Digital cutting guide and endoscopically-assisted vertical ramus osteotomy to treat condylar osteochondroma: a long-term study

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Abstract

We have introduced an effective treatment for mandibular condylar osteochondroma with a digital cutting guide and endoscopically-assisted vertical ramus osteotomy (VRO). Eleven patients with unilateral condylar osteochondroma, who did not require orthognathic surgery or had less than 3 mm deviation of the chin and a stable occlusion, were treated during the period April 2013–January 2017 with a digital cutting guide and endoscopically-assisted VRO. Clinical data collected included the occlusion, facial contour, and maximum mouth opening (MMO). Computed tomographic (CT) scans were taken before and after operation. Two patients also had additional shaping of the mandibular contour. The pathological diagnosis was confirmed to be osteochondroma in all cases. A mean (range) 19 (12–40) months of follow-up for all 11 cases showed stable postoperative occlusion and facial aesthetics. There were no functional disturbances, recurrence, or condylar absorption. VRO is an alternative to orthognathic surgery for patients with osteochondroma who do not have severe malocclusions. The digital cutting guide and endoscopically-assisted VRO make it possible to achieve precise resection of the tumour and maintain the occlusion with minimal invasion.

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Keywords: vertical ramus osteotomy; endoscope; temporomandibular joint; Osteochondroma; Digital cutting guide

Introduction

Osteochondroma, also known as exotosis, is the most common benign bony tumour, and is prevalent in large joints.¹ When it develops in the temporomandibular joint (TMJ),

symptoms such as swelling of the area round the ear, pain on chewing, and disorders of condylar movement may develop. It may even lead to secondary occlusal disturbance and maxillofacial deformity.^{2–3}

Resection is currently the most effective treatment for condylar osteochondroma and, because of varying degrees of malocclusion and facial asymmetry, simultaneous orthognathic procedures or orthodontic treatment, or both, may be necessary. However, for some patients with slight maxillofacial deviation or who do not need orthognathic surgery, how to reconstruct the height of the ramus after removal of the tumour is a challenge. A coronoid process, costochondral graft, and total joint prostheses have been described.^{4–7}

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A vertical ramus osteotomy (VRO) for condylar reconstruction is also one of the options, and was first introduced in the late 1970s.⁸ It has some advantages over other reconstructive methods such as proximity to the donor site, because it is of similar shape to the real condyle, has an adequate blood supply, and is cost-effective. However, simultaneous ramus osteotomy and refixation may not be possible without aids through a preauricular and temporal incision, from which it is possible to remove the condylar osteochondroma. The traditional procedure usually requires an additional intraoral or submandibular incision.

Based on our previous experience of endoscopically-assisted reconstruction of the TMJ with a costochondral graft,⁹ we thought that endoscopically-assisted VRO with a digital cutting guide would be possible to treat condylar osteochondroma through a preauricular and temporal incision. Eleven patients with slight maxillofacial deviation or fear of orthognathic surgery volunteered for the study. We report details of the surgical technique and follow up for more than one year.

Patients and methods

The protocol was approved by, and in accordance with, the recommendations of the Human Research Committee at our hospital. All patients gave written consent before the procedure.

Patients

The inclusion criteria were: the diagnosis based on computed tomographic (CT) examination was osteochondroma; the occlusion was stable; after resection of the tumour the shortening of the ramus could result in mandibular deviation; and patients would not accept orthognathic surgery or have only slight facial deviation (within 3 mm at the point of the chin).

We recorded general information (sex and age) and clinical data (duration of symptoms, clicking of the joint, maximum mouth opening (MMO), malocclusion, and pain score on a visual analogue scale (VAS)).

Surgical technique

Data from a thin-layer CT scan (0.625 mm) were imported into ProPlan CMF 1.6 system (Materialize) in DICOM format. The inferior alveolar canal was traced and reconstructed. The osteotomy line was designed posterior to the inferior alveolar canal from the mandibular notch to the angle of mandible (Fig. 1). The cutting guide was produced by a rapid prototyping machine.⁶

Under general anaesthesia with intubation, the lesion was exposed through a modified auricular and temporal approach,¹⁰ and the tumour was resected,³ or we did a partial condylectomy with preservation of the disc (Figs. 2 and 3).

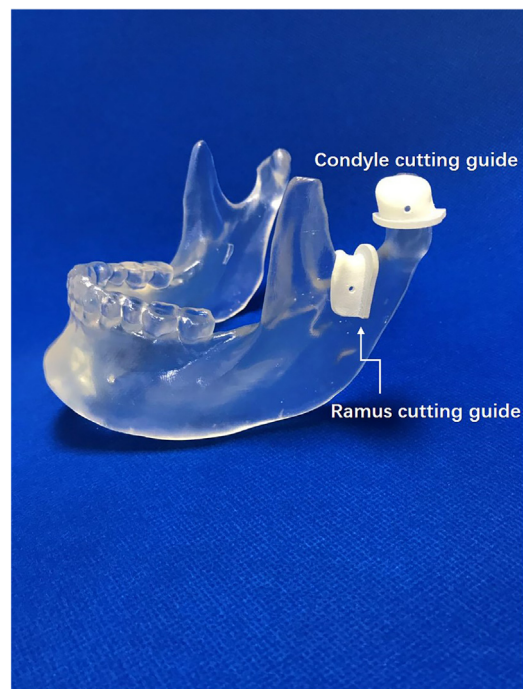


Fig. 1. Three-dimensional computed tomographic reconstruction of an osteochondroma and preoperative design of the guiding plate on the model.

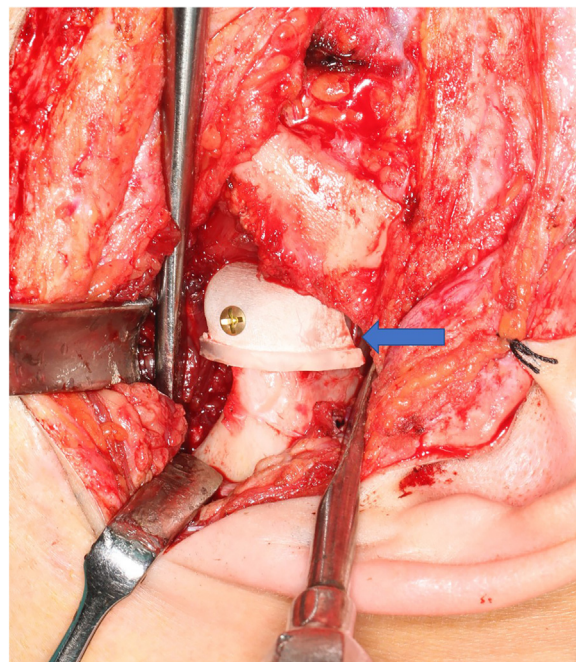


Fig. 2. Surgical procedures of the exposure of the osteochondroma and fixation of the guide for resection of the tumour (arrow).

The residual condyle was shaped according to the glenoid fossa. The attachment of the masseter muscle on the lateral side of ramus was dissected and, after maxillomandibular fixation, the cutting guide was fixed on to the ramus. Because of the natural outline of the sigmoid notch the position of the plate is limited and stable, and even fixation with only one

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