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# Management of facial asymmetry due to overgrowing costochondral graft: A case report



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## ABSTRACT

Costochondral grafts are used to replace the mandibular condyle in cases of TMJ ankylosis, and are generally viewed as a gold standard for autogenous reconstruction of the mandibular condyle (Güven, 2000; Posnick and Goldstein, 1993 [1,2]). We report a case where overgrowth of costochondral grafts is seen, resulting in asymmetric mandibular growth and dentofacial asymmetry (Posnick and Goldstein, 1993 [2]).

A 17 year old male patient presented with an existing costochondral graft performed due to TMJ ankylosis during childhood. He fell from a height at the age of 4, and was lost to follow up through non-attendance until the age of 9, when he presented with a progressive reduction in maximal incisal opening (MIO).

At this stage his maximal incisal opening was noted to be 11 mm, and the CT showed a grossly deformed ankylosed left TMJ. This post traumatic ankylosis was managed with gap arthroplasty and costochondral graft reconstruction. This immediately improved his MIO to 22 mm and at 1 year follow up was noted to be 30 mm.

At age 12 he was noted to have a clinically obvious overgrowth of the left ramus of the mandible, and deviation of the chin point to the right. MIO remained at 38 mm.

He declined orthognathic surgery and represented 2 years later requesting treatment without orthodontic intervention for his facial asymmetry. He subsequently underwent a Le Fort 1 impaction osteotomy, right BSSO and left condylar ostectomy, coronoidectomy and left lower border mandibulectomy. Regrowth of the CCG occurred during the 6 months of follow up.

This case illustrates the problems that can occur after condylar trauma. It also highlights issues with costochondral grafts which can continue to grow.

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## 1. Introduction

TMJ ankylosis results in hypomobility of the affected joint, and has well known aetiological risk factors, namely trauma and local infection [1]. Trauma affecting the TMJ often results in haematoma formation, which undergoes reorganisation and remodelling, eventually resulting in ossification of the joint [1]. Treatment requires excision of the affected structures and consideration for immediate replacement [2]. In children management is dictated by requiring further growth to reduce the risk of further intervention. In order to achieve this an autogenous graft is often used, of which the gold standard is a costochondral graft [3,4]. However the growth potential of the graft can be difficult to predict long term, and this can ultimately result in under- or overgrowth, causing facial asymmetry.

## 2. Case presentation

A 17 years old patient re-attended to the oral and maxillofacial department with facial asymmetry with a clinical appearance similar to hemi-mandibular hypertrophy with chin point deviation to the contralateral side and enlargement of the body and ramus of the mandible with a downwards cant of the occlusion. His main complaints were the aesthetic appearance, and the fact that he was unable to occlude his teeth on the left hand side. The patient had a costochondral graft to replace the ankylosed left condyle following a fall from height that occurred when the patient was 4 years of age. The patient was lost to follow up, and re-attended aged 9 year, when the costo-chondral graft was placed (Figs. 1–4).

At a subsequent follow up, an evolving left facial asymmetry was noted, with a marked deviation of the chin point to the right hand side. This was a result of overgrowth of the costochondral graft, resulting in elongation of the left ramus and compensatory dental alveolar growth. In order to correct this, orthodontic treatment was proposed to align the teeth, with subsequent orthognathic

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**Fig. 1.** CT of the patient ages 9, showing left side TMJ ankylosis which was treated with the costochondral graft.



**Fig. 3.** Intra view demonstrating lateral open bite and occlusal cant.



**Fig. 2.** Pre-op facial view, showing chin point deviated to right hand side due to overgrowth of left side costochondral graft.



**Fig. 4.** Pre-operative CT scan showing failing costochondral graft.

surgery. The patient declined orthodontic treatment as he was not concerned about the position of his teeth but was concerned with the position of his chin, and was eager to have corrective surgery performed.

The procedure was planned with the aid of 3D models from his CT scan. A levelling Le fort 1 osteotomy corrected the occlusal cant. Following this, a left sided wedge condylectomy with a left coronoidectomy was undertaken to vertically impact the left mandible with a contralateral saggital split to allow the levelling of the mandible and derotation. After achieving the correct position, internal fixation was used to stabilise the mandible, and a bone graft derived from excess bone harvested during the left wedge condylectomy was placed between the segments of the right osteotomy site as there was a large intersegmental gap.

Finally, the left gonial angle and lower border were reduced to achieve an aesthetic result via the retromandibular approach to the condylar neck.

Histology showed that the section included lamellar bone with an intervening collagenous area of low cellularity. The section showed no other specific features (Fig. 5).

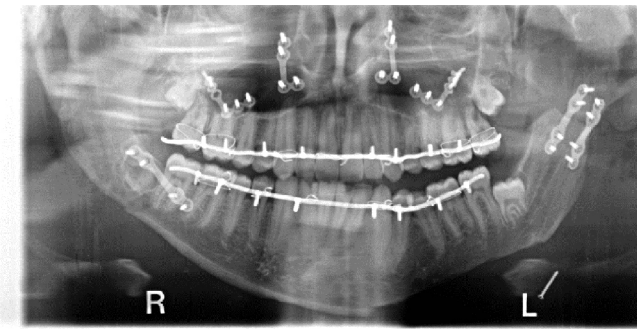


Fig. 5. Post-operative OPT showing post-operative plates and their position.



Fig. 6. 6 Month post-operative view of the patient showing continued overgrowth at the L condyle, with a left sided open bite. The image shows that this change has not been as a result of failure of fixation.

The patient was followed up 6 months later, and unfortunately there has been further growth of the costochondral graft since the procedure was performed causing a renewed open bite (Fig. 6).

### 3. Discussion

Costochondral grafts have variable growth potential when compared with normal bone, which can cause issues long term. Different theories as to what causes the overgrowth of these grafts have been put forwards, including differing growth potentials, hormonal factors and functional loads [5,6]. It has also been suggested that chostochondral grafts may act as primary growth centres due to their cartilaginous nature (which is the reason for their use in children), and as such possess an intrinsic growth potential [6]. However a systematic review has confirmed that some grafts actually undergo resorption or reankylosis, some grafts have no growth, whereas others show favourable growth or even overgrowth [4].

This case describes the sequelae and management of a patient with overgrowth. In this case, a wedge condylectomy would not have sufficed, as doing this alone would cause excessive torque on the right condyle. Therefore a sagittal split osteotomy was performed in order to allow repositioning of the mandible, alongside a differential impaction Le Fort 1 osteotomy to correct his secondary occlusal cant.

Unfortunately follow up has shown that this graft still has growth potential, likely to be as a result of the patient's age and associated hormonal factors during puberty. Histology confirmed

that there were no neoplastic lesions affecting the area. On reflection, resection of the condylar cartilaginous head (the presumed growth centre) could have been carried out to counter-balance any continued growth. The downside to this being the increased risk of reankylosis and restricted condylar function. Predicting growth in these cases can be challenging, and it is difficult to know where and how much to resect [4].

Moving forward further surgery will now be required to resect the cartilaginous portion of the graft and thus prevent further growth. This carries the risk of reankylosis and reduced function so it may need to be combined with an alloplastic reconstruction.

### Conflicts of interest

None.

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### Ethical approval

Patient has consented for pictures to be used in publication.

### Consent

Consent has been obtained from patient, and patient is happy for open publication.

### Author contribution

Arif Razzak: DCT1 OMFS, lead author and surgical assistant.

Nabeela Ahmed: OMFS SPR: supervisor and second surgeon.

Andrew Sidebottom: Consultant OMFS: proof reading, lead surgeon on case and final editing.

### Guarantor

Arif Razzak.

### References

- [1] O. Güven, A clinical study on temporomandibular joint ankylosis, *Auris Nasus Larynx* 27 (1) (2000) 27–33.
- [2] J.C. Posnick, J.A. Goldstein, Surgical management of temporomandibular joint ankylosis in the pediatric population, *Plast. Reconstr. Surg.* 91 (5) (1993) 791–798.
- [3] H. Sharma, S. Chowdhury, A. Navaneetham, S. Upadhyay, S. Alam, Costochondral graft as interpositional material for TMJ ankylosis in children: a clinical study, *J. Maxillofac. Oral Surg.* (2014) 1–8.
- [4] P. Kumar, V. Rattan, S. Rai, Do costochondral grafts have any growth potential in temporomandibular joint surgery? A systematic review, *J. Oral Biol. Craniofac. Res.* 5 (3) (2015) 198–202.
- [5] S. Yang, et al., Overgrowth of costochondral grafts in craniomaxillofacial reconstruction: rare complication and literature review, *J. Craniomaxillofac. Surg.* 43 (2015) 803–812.
- [6] Sarman, et al., Overgrowth of a costochondral graft in an adult male, *Int. J. Oral Maxillofac. Surg.* 24 (1995) 333–335.

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