

# Overgrowth of costochondral graft in temporomandibular joint ankylosis: An unusual case

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## ABSTRACT

Costochondral graft (CCG) replacement of the mandibular condyle was first described by Gilles in 1920. Since then CCGs have gained increasing popularity in reconstruction of the TMJ and condyle in children. The influence of CCGs on mandibular growth and function is not known in detail. Adaptation of the graft has been observed to be better in children, but CCGs have also been shown to grow in adult patients. One of the major disadvantages of the CCGs is its growth pattern, which is extremely unpredictable and may manifest as excessive growth or no growth at all. A mandibular overgrowth on the grafted site can actually be more troublesome than lack of growth. Furthermore, maxillary growth is proportionality influenced by vertical mandibular growth of the graft. This is a report of such a case in which a bizarre overgrowth of the graft was seen following a reconstruction of TMJ by CCG and the devastating outcomes of the treatment. He required one further resection because the grafted tissue had overgrown five years later.

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## INTRODUCTION

Ankylosis of the temporomandibular joint (TMJ) involves fusion of the mandibular condyle to the base of the skull. When it occurs in a child, it can have devastating effects on the future growth and development of the jaws and teeth.<sup>[1]</sup> Costochondral graft (CCG) replacement of the mandibular condyle was first described in 1920 by Gilles.<sup>[2]</sup> CCGs have gained increasing popularity in reconstruction of the TMJ and condyle in children.<sup>[3]</sup> Indications for surgery have included congenital dysplasia of condyle, ankylosis, condylar deformation due to trauma, intrinsic bone or cartilage disease and severe osteoarthritis.<sup>[3]</sup> The basis for the use of CCGs in growing individuals have been the fact that the condylar

cartilage has been regarded as the major growth center for the mandible, and chondrocyte proliferation has been thought to be essential for the growth of the whole mandible. Poswillo<sup>[4]</sup> was the first surgeon to truly establish the physiologic compatibility of costochondral grafting for the TMJ.<sup>[2]</sup> However, later he rejected the idea and said that the CCG was not an autogenous growth center, but rather was adaptive to the environment and function. According to one study, the costochondral rib graft can withstand the biomechanical stresses of the TMJ and act as a new growth center.<sup>[5]</sup>

The influence of CCGs on mandibular growth and function is not known in detail; adaptation has been observed better in children.<sup>[6]</sup> The incorporation and remodeling of CCG is difficult to evaluate clinically or by conventional radiologic methods.<sup>[6]</sup> Overgrowth of the graft and subsequent asymmetry of the mandible has been reported quite a few many times.<sup>[1,3,6-8]</sup> This article presents a case report of a patient who underwent CCG for the reconstruction of TMJ following surgery for ankylosis and the postoperative sequelae were very drastic and bizarre leading to gross facial asymmetry and a severely disturbed occlusion.

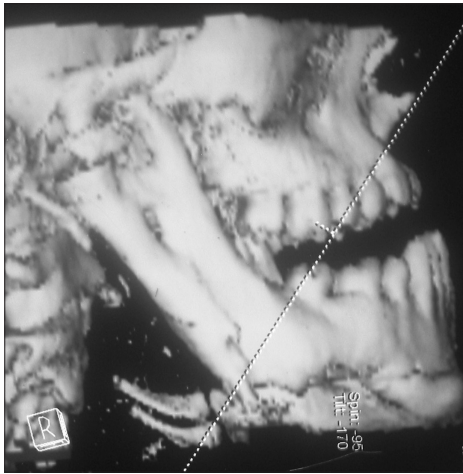
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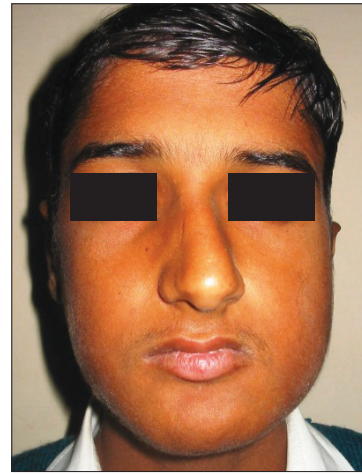
**Figure 1:** Pre-operative photograph of patient showing increased vertical facial height and asymmetry



**Figure 2:** Deranged occlusion and open bite



**Figure 3:** 3D CT scan showing overgrowth of the costochondral graft



**Figure 4:** Postoperative patient's photograph



**Figure 5:** Postoperative occlusion

## CASE REPORT

A patient aged 12 years was first seen in the Medical College, PGIMS, Rohtak by the department of Plastic Surgery. The patient's chief complaint was inability to

open the mouth since 2–3 years and gave history of trauma to the chin in childhood. He was diagnosed as TMJ Ankylosis (right side) and the surgical treatment instituted was resection of ankylotic segment followed by replacement with CCG. Patient first noticed the overgrowth in the form of facial asymmetry, which began about 2–2<sup>1/2</sup> years after surgery. The growth continued to increase with a concomitant increase in the facial asymmetry and marked changes in the occlusion.

For this the patient was referred to the Department of Oral and Maxillofacial Surgery, Govt. Dental College, Rohtak, where he was diagnosed as an 'Overgrowth of CCG'. Routine radiographs (OPG, Lat. Oblique, PA view) were advised in addition to CT scan of the face. The extent of deformity can be seen [Figures 1–3]. There was a marked deviation of the chin to the left side with a prominent shift of midline and marked increased vertical facial height. The whole mandible appeared to be shifted to the left side. Patient had a high-arched palate with a protruded mandible and an open bite both in anterior and posterior region.

Patient was planned for the correction of his deformity under general anesthesia. For this 'inverted L-osteotomy' of the ramus, vertical shortening and sliding genioplasty of the mandible was performed. Postoperative facial profile and contour was excellent [Figure 4]. Occlusion was also satisfactory [Figure 5]. Patient is on post-surgical orthodontics for further correction of his occlusion.

## DISCUSSION

CCG has remained the mainstay in the treatment of TMJ ankylosis in children where grafting to replace the TMJ is opted as the surgery of choice.<sup>[1,3,8,9]</sup> The rationale for its use is two-fold. Firstly it is regarded as primary growth center as the graft maintains the vertical height of the ramus and helps maintain the symmetry of the face,<sup>[5]</sup> although the exact influence of CCGs on mandibular growth and function is not known in detail. Secondly, it acts as an adaptive center, which responds to changes in the environment and function.<sup>[4]</sup> First reported case of overgrowth of a costochondral graft in an adult male was published in the year of 1995. The case supported the notion that this graft partly exhibits features of a primary growth center with inherent potential for growth.<sup>[7]</sup>

Till long CCG continued to be the mainstay, but after using it for so long the problems which were not recognized earlier became apparent later on. The growth pattern of the CCG is extremely unpredictable, which can be in the form of no growth at all or excessive growth,<sup>[3,8]</sup> and mandibular overgrowth on the grafted site can actually be more troublesome than the lack of growth.<sup>[1]</sup> The CCGs tended to have a more vertically directed condylar growth pattern and a more laterally positioned condyle.<sup>[9]</sup> In a study lateral contour overgrowth of the articulating surface was observed rather than linear overgrowth with malocclusion.<sup>[10]</sup> We also observed linear growth in our patient. The resultant effect seen was bizarre to an extent causing significant facial deformity and severe derangement of the occlusion.

Numerous theories have been advocated for the inherent growth potential of the graft, with none gaining full acceptance. It appears possible therefore that when active growth, in contrast to adaptive remodeling takes place in the condylar head, hyperplasia results.<sup>[4]</sup> This potential for hyperplasia was observed in animal studies conducted by Ware and Taylor.<sup>[11]</sup> The success

or failure of an approach to the reconstruction of the mandibular condyle may be more closely related to the adaptive capacity of the articular cartilage and the constitution of the functional periosteal matrices than the transplantation of a 'growth center'.<sup>[4]</sup>

Adequate amounts of soft tissue retained between the skull base and the graft, and harvesting the graft from the fourth or fifth rib may reduce the potential for overgrowth.<sup>[3]</sup> Care should also be taken to ensure proper postoperative functional therapy and to examine the role of cartilage thickness on future growth in young patients.<sup>[6]</sup>

The results of previous experiments designed to study the growth of the CCG have shown inherent growth potential of the graft and the cases reported now have established the fact. This should be anticipated before selection of this graft, and other means of TMJ reconstruction should also be given a chance.

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