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Original Research Article

Various Reconstruction Modalities of Ramal Condylar Unit (RCU) in TMJ Ankylosis Patients: Our Experience in a Tertiary Care Centre

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Abstract

Introduction: Comprehensive management of TMJ ankylosis including restoration of form, function and aesthetics is a challenging aspect for Oral & Maxillofacial Surgeon. Various treatment modalities have been reported in the literature with their merits, demerits and diverse success rate. ***Materials and Method:*** We report our experience in reconstruction of Ramal Condylar Unit (RCU) in temporomandibular joint ankylosis patients in a retrospective review. A total of 06 cases of TMJ ankylosis were included in the review. The cases were managed in our tertiary care centre from June 2019 to June 2020. Demographic distribution of the patients, preoperative findings, surgical modalities used for RCU reconstruction and postoperative outcome were recorded and compared. ***Results:*** Average mouth opening increased from 8.5 mm pre-operatively to 29.5 mm 3 months postoperatively. 02 cases of Sawhney's type I and II ankylosis were managed by interpositional gap arthroplasty using temporalis myofascial flap. 01 case of Sawhney's type I ankylosis was managed by gap arthroplasty interposed with dermis-fat graft. 02 cases of Sawhney's type III ankylosis were managed by osteoarthrectomy and reconstruction of RCU by costochondral graft. In 01 case with Sawhney's type III ankylosis, functional joint was reconstructed using distraction osteogenesis. We encountered 01 case of recurrence in a case managed by costochondral grafting. ***Conclusion****:* Amongst the various modalities suggested in the literature, the RCU reconstruction with distraction osteogenesis and costochondral grafting provide best result functionally and aesthetically. The diagnosis, timely management and post-operative follow up are the key to success in TMJ ankylosis.

Keywords: Temporomandibular joint, ankylosis, ramal-condylar-unit, reconstruction, dermis-fat.

INTRODUCTION

True ankylosis of the temporomandibular joint occurring due to fusion of the glenoid fossa and condylar process of the mandible by osseous or fibrous tissue results in restricted mouth opening of varying degree. It is a debilitating problem especially in developing countries affecting primarily growing children below ten years of age [1]. The dominating etiologies of this problem are trauma (26-75%) and infection (10-49%) [1].

The various treatment modalities for TMJ ankylosis are osteoarthrectomy, gap arthroplasty, interpositional arthroplasty and osteoarthrectomy followed by joint reconstruction using autogenous grafts or alloplastic materials, distraction osteogenesis and bioengineered tissue etc [2].

Various treatment modalities for reconstruction of the Ramal Condylar Unit (RCU) have been reported in the literature with their merits, demerits and diverse success rate. The selection of a graft is case specific and influenced by the availability of the resources. There is no ideal graft that can replace the joint anatomy and function.

We report our experience in reconstruction of Ramal Condylar Unit (RCU) in temporomandibular joint ankylosis patients in a tertiary care centre based in New Delhi.

MATERIALS AND METHOD

A total of 06 cases of unilateral TMJ ankylosis managed in our tertiary care centre from June 2019 to June 2020 were included in this retrospective review. The required data from hospital database was retrieved. Demographic distribution of the patients, probable aetiology, preoperative clinical and radiological findings as per Sawhney's classification [3], surgical modalities used for joint reconstruction and postoperative outcome were recorded, tabulated and graphically represented. Regular follow up was carried out weekly, for a month and then at 3 months intervals.

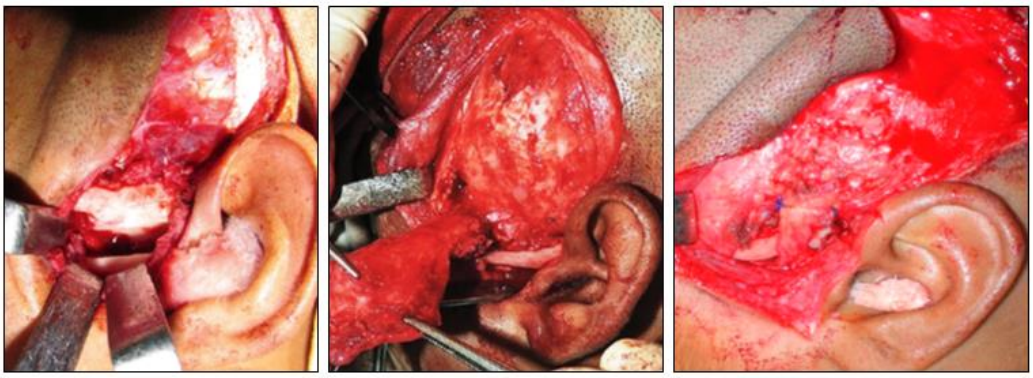


Fig-1 to 3: Interpositional arthroplasty using temporalis myofascial flap

Fig-4 to 6: Interpositional arthroplasty using dermis fat graft

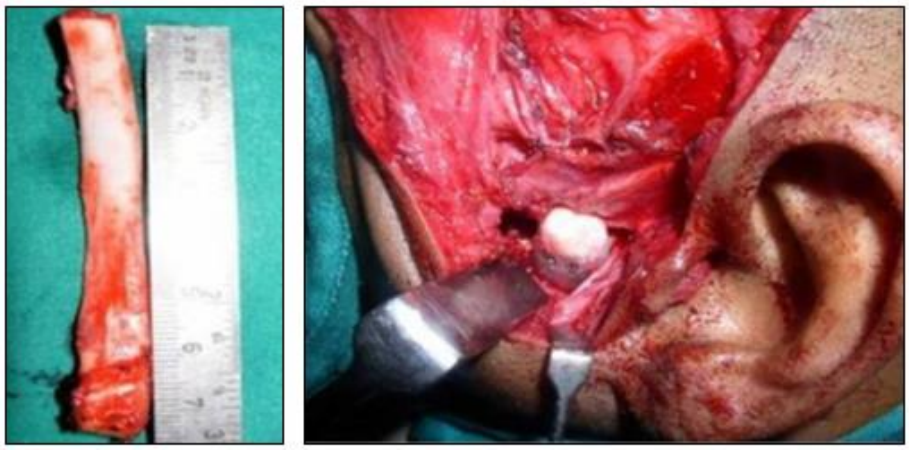


Fig-7 and 8: RCU reconstruction with CCG

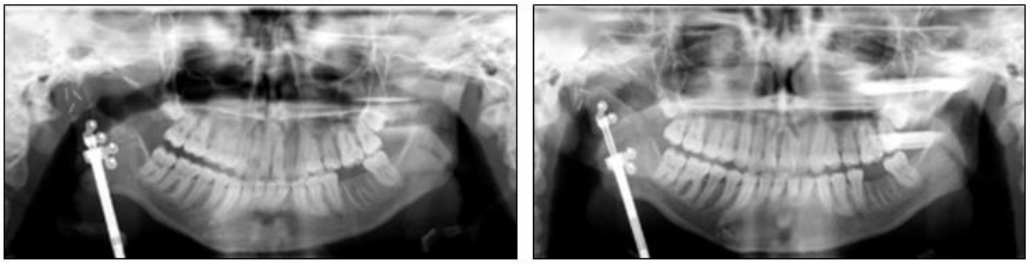


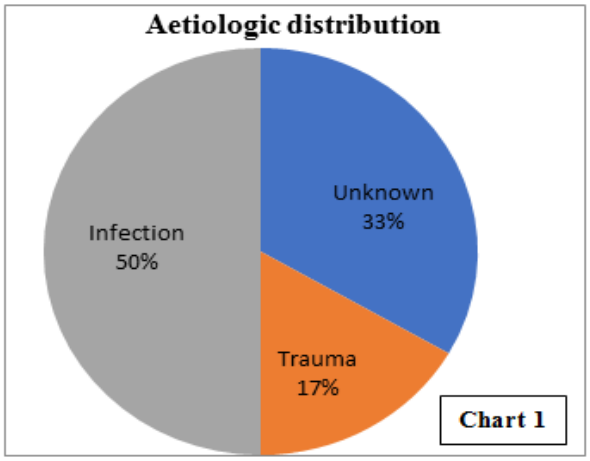
Fig-9 and 10: RCU reconstruction with distraction osteogenesis

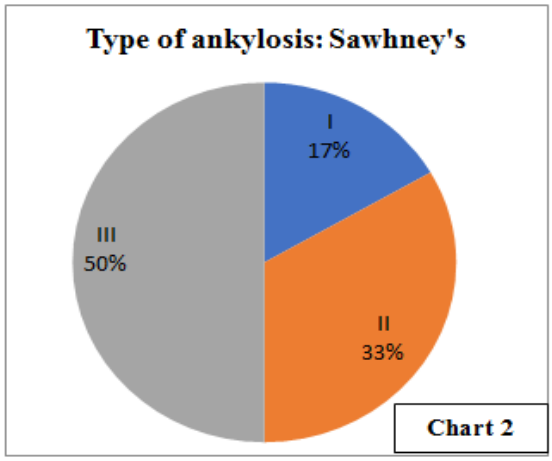
RESULTS

Out of 06 patients, 04 were female and 02 were male with age ranging from 3 years to 29 years (Table 1) Different aetiological factors were trauma in 01 case, infection in 03 cases and unknown aetiology in other 02 cases (Table 1, chart 1). 03 cases of Sawhney's type III, 01 case of type II and 02 cases of type I were addressed (Table 1 and chart 2).

Table-1

Ser No	Age (Yr)	Sex	Aetiology	Sawhney's type
Case 1	09	M	Unknown	II
Case 2	03	F	Systemic infection (Scarlet fever)	III
Case 3	19	F	Infection	I
Case 4	29	F	Trauma	III
Case 5	08	F	Infection	III
Case 6	10	M	Unknown	I



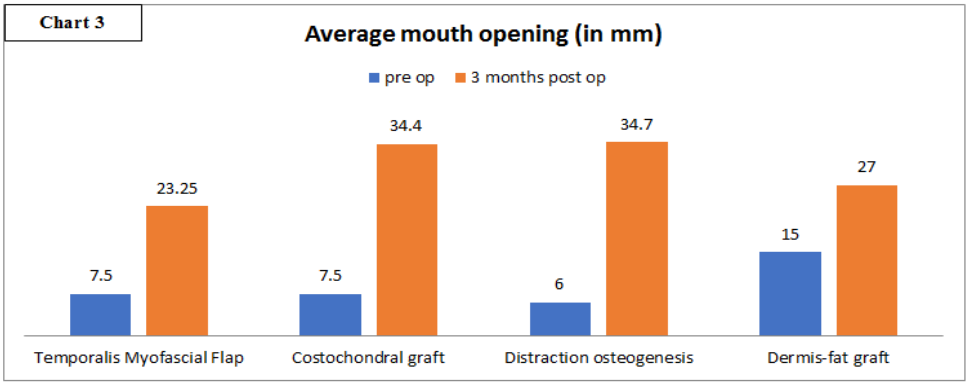


Case 1 (Sawhney's type II) and case 6 (Sawhney's type I) were managed by interposition arthroplasty using temporalis myofascial flap (Fig 1 to 3). Case 3 (Sawhney's type I) was managed by gap arthroplasty interposed with dermis-fat graft (Fig 4 to 6). Two patients with Sawhney's type III ankylosis (Case No 2 and 5) were managed by osteoarthrectomy and reconstruction of RCU by costochondral graft (Fig 7 and 8). In another one patient with Sawhney's type III ankylosis (patient number 4) functional joint was reconstructed using distraction osteogenesis (Fig 9 and 10).

Different treatment modalities used, average pre and post-operative mouth opening and incidence of complications are summarized in table 2 and chart 3. Average mouth opening increased from 8.5 mm pre-operatively to 29.5 mm 3 months postoperatively. We encountered 01 case of recurrence after 1 year in a case initially managed by costochondral grafting.

Table-2

Ser No	Sawhney's type	Treatment done	Pre op mouth opening	Post op mouth opening (3 months)	Post op Complication
1.	II	Interpositional arthroplasty and temporalis myofascial flap	09 mm	25 mm	-
2.	III	Osteoarthrectomy and costochondral grafting	08 mm	31 mm	**Recurrence**
3.	I	Gap arthroplasty with dermis-fat graft	15 mm	27 mm	-
4.	III	Gap arthroplasty and distraction osteogenesis	06 mm	34.7 mm	-
5.	III	Osteoarthrectomy and costochondral grafting	07 mm	37.8 mm	-
6.	I	Interpositional arthroplasty and temporalis myofascial flap	06 mm	21.5 mm	-



DISCUSSION

Ankylosis of TM joint is an incapacitating problem commonly affecting growing children and usually associated with trauma or infection [1]. Observation of our study also supports the etiology and age distribution of the affected individuals. Ankylosis impairs jaw function as well as jeopardizes mandibular growth resulting in severe alteration in form and esthetics too.

The definitive treatment of TMJ ankylosis is always surgical by various form of osteoarthrectomy with an attempt of reconstructing the joint function [2]. In addition to restoration of joint function, important aspects while reconstructing RCU are establishment of ramal height and imparting growth potential for the mandible in growing child. Kaban, Bouchard and Troulis in 2009 formulated their protocol for management of TMJ ankylosis cases and suggested the use of either costochondral graft (CCG) or distraction osteogenesis (DO) for reconstruction of RCU after an aggressive osteoarthrectomy and temporalis myofascia interposition [4]. In this case series, we used CCG in two cases and DO in one case with excellent post operative mouth opening. All these three cases were Sawhney's type III and findings of this study support the use of CCG and DO as RCU reconstruction modalities [5]. The problem with CCG is unpredictible growth or graft resorption [6]. We encountered recurrence in one case, probably due to excessive growth of CCG and inadequate patient's compliance to post operative physiotherapy.

Use of temporal myofascial flap as an interpositional material after osteoarthrectomy in TMJ ankylosis case was first reported by JB Murphy in 1914. Presently it is one of the most commonly practiced modality though it does not impart any growth potential or does not maintain the verical height. Various modifications like anteriorly pedunculated flap rotated under the zygomatic arch (Rowe 1986), posteriorly pedunculated flap passed over the zygomatic arch (Toller 1990) etc have been reoprted. In our case series, two cases with Sawhney's type I and II ankylosis were managed by interpositional arthroplasty using temporalis myofascial flap which resulted in stable outcome with reasonably good post-operative mouth opening.

Georgiade in 1957 used dermis-fat graft as an interpositional reconstruction material after osteoarthrectomy in TMJ ankylosis based on the previous study by Loewe (1913). It is easy to mold and adapt, resistant to impact and pressure during mastication with superior viability and minimal resorption rate (15%) [7]. Restoration of some amount of vertical height is also achieved. In one of our case we used modality with satisfactory result.

The use of various other autogenous grafts for the reconstruction of RCU has been reported in the literature with varying degree of success i.e. 4th metatarsal head (Gillies 1920, Dingman 1964), metatarsophalangeal joint (Entin 1958, Dierks 2000), vascularized fibula, iliac crest, rib, sternoclavicular joint (Steinhardt 1953) etc. The anatomical and physiological similarity of human sternoclavicular joint and TMJ and the studies of Wolford *et al*. (1994) and Edward Ellis III (1986) strongly suggested the use of sternoclavicular graft as a viable treatment option. However in our case series we did not use this modality. R Gunasheelan (1997) used resected segment as a free graft for reconstruction of RCU [8].

Alloplastic joint replacement for TMJ has been adopted from the principles of alloplastic prosthetic hip replacement reported by John Charnley (1960). Since the advent of newer materials, technique and diagnostic and planning devices, alloplastic TMJ replacement has come up as a preferred treatment option especially in adult cases with severe morphologic alteration (Sawhney's type III and IV), reankylosis, resorption of autogenous graft etc.

CONCLUSION

Our experience from the present case series supports definitive reconstruction of RCU using distraction osteogenesis, costochondral graft or other available better treatment modality especially for cases with severe anatomical alterations (Sawhney's type III or more) for better functional outcome. Provision of future prospective studies using 3D printed custom

made joint prosthesis and bioengineered tissue will lead to further better outcome.

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