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Temporomandibular joint ankylosis, heterogeneity of management - A retrospective 12-year study

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Abstract

Background: Temporomandibular joint ankylosis is a disorder causing pathological modifications in the joint surfaces with minimal mandibular mobility, resulting in an almost total failure in TMJ movements. Gap or inter positional arthroplasty, and TMJ reconstruction are only a few of the treatments for this issue that have been discussed; nonetheless, there is no published consensus and recurrence is still the main problem.

Method: A retrospective study of 12 years starting from March 2008 till March 2021 was conducted in department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Bareilly consisting of patients who reported to and were operated in the department afflicted with bilateral/unilateral TMJ ankylosis

Result: A total of 168 patients which constituted for 210 joints were included in the study. A total of 130 patients were operated for gap arthroplasty and 38 patients were operated for inter positional arthro plasty.

Total there were 12 cases of recurrence in patients treated with gap arthroplasty and 4 cases in patients treated with inter positional arthroplasty.

Conclusion: We can conclude that inter positional gap arthroplasty with temporalis myofascial graft is a superior form of treatment modality with relatively less recurrence rate over a long period follow up.

Keywords: TMJ ankylosis, Gap arthroplasty, Inter positional arthroplasty, Retrospective study.

Introduction

Mandibular hypomobility results from a variety of disorders affecting the tempo romandibular joint (TMJ) and surrounding structures.[1]

Temporomandibular joint ankylosis is a disorder causing pathological modifications in the joint surfaces with minimal mandibular mobility, resulting in an almost total failure in TMJ movements.[2]

It may be unilateral or bilateral, and facial deformity is governed by the type of ankylosis, and its onset and duration. Trauma (31% to 98% of cases), local or systemic infection (10% to 49%), illness (1%) are the most common causes of ankylosis. [3]

Gap or inter positional arthroplasty, and TMJ recons truction are only a few of the treatments for this issue that have been discussed; nonetheless, there is no published consensus and recurrence is still the main problem. [4, 5]

Temporomandibular ankylosis occurs in two forms: Intra- articular type, there is alteration of the joint structures with a fibrous or actual bony fusion of the parts. Extra-articular, or false, ankylosis occurs by pathologic lesions outside the joint proper. [6, 7, 8]

For the treatment of temporomandibular joint (TMJ) ankylosis, Kaban et al. presented a management protocol in 1990 that included aggressive resection, ipsilateral coronoidectomy, contralateral coronoidectomy when needed, use of temporalis fascia for padding of the TMJ restructuring the ramus with a costochondral graft, rigid fixation, early mobilisation, and aggressive physical therapy.[1,8]

Several techniques have been described: first is gap arthro plasty, whereby the bone mass between of man dibular ramus and the articular cavity is removed. Second, inter positional arthroplasty, in which a gap is made and a non-bio logical material—such as acrylic or silastic—or bio logical material—such as a temporal muscle flap—is placed. Finally, the skeletal mass is removed, and a complete joint prosthesis or autogenous bone trans plants are used to repair the joint.[8]

Recent clinical research supports the use of the auto genous coronoid process graft (ACPG) as a suitable bone resource for condylar reconstruction when it is not involved in the ankylotic mass.[3]

Aims and objectives

Aim of this study is to compare the surgical outcomes and approaches used in the treatment of Temporomandibular joint ankylosis based on the aetiology and pattern of ankylosis in a 12-year retrospective study.

- To record age and various etiological factors responsible for TMJ ankylosis.
- To check between pre operative and post operative mouth opening in mm
- To check the post operative sequelae for various inter positional grafts used in the management.

Material and methods

It is a retrospective study of 12 years starting from March 2008 till March 2021 conducted in department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Bareilly consisting of patients who reported to and were operated in the department afflicted with bilateral/ unilateral TMJ ankylosis. Inclusion criteria consisted of patients operated in Department of Oral and Maxillo facial Surgery over the given time period of 12 years & diagnosed with bony or fibrous ankylosis with or without deformation of the joint anatomy. Exclusion criteria consisted of all the patients with incomplete history or follow up records.

Sociodemographic details such as age, gender and aetiology were recorded. Clinical data retrieved were the type of ankylosis (unilateral or bilateral) (acc. to Sahawney's and Topazian's), pre operative and post

operative mouth opening, management done (gap arthro plasty or inter positional gap arthroplasty), coronoidec to my done, whether distraction procedure performed, and complications encountered if any in a follow up period of 3-48 months. 86 patients were included in this study, out of them 78 were male and 90 were females, age range between 2 months to 50 years old. All the patients were operated according to the conventional surgical pro cedure and various inter positional graft materials were used. (fig.2, 3, 4)

For temporalis muscle as inter positional graft the pedicled superficial temporalis fascia was harvested rotated under the zygomatic arch and sutured medial to the gap created to the medial pterygoid muscle.[2] (fig 5)

In cases with subdermal fat, in the suprapubic region or inguinal fold an elliptical incision is given with the long axis of the graft coincident with the inguinal fold or skin creases of the lower abdomen. Epidermis with a layer of dermis and subcutaneous fat was dissected. The dermal-fat graft was placed in normal saline immediately after removal from the donor site. The graft was folded and sutured so that the dermal surface was between the two fat layers. The graft is used to fill the gap created in the ankylosed portion.[7] (fig 5)

In cases with buccal fat pad as a graft, it was harvested via the intraoral approach. Prior to making the incision, 5 ml of 1:200,000 Adrenaline was infiltrated into the upper buccal sulcus opposite the upper second permanent molar. A 2-cm-long horizontal incision was then placed in the trough of the upper vestibule; blunt dissection was then done to expose the BFP. A non-toothed tissue forceps was then introduced through the extraoral incision, passing in between the created inter bony gap. The BFP was carefully picked with the non-toothed forceps and withdrawn into the gap where it was sutured to the surrounding soft tissue to avoid its displacement.[5] (fig 5)

In cases with costochondral graft, it was usually taken from the contralateral fifth, sixth, or seventh rib. Enough rib was harvested to provide 3 to 4 cm bone and 1.5 cm cartilage. The graft was trimmed to the required length with a cartilaginous cap of about 5 mm. The costal cartilage and the bone were then trimmed and carved to resemble the condylar form. Through the same exposure, the graft was inserted and oriented anatomically and fixed with stainless steel bone plate and screws.[8] (fig 5)

Result

A total of 168 patients which constituted for 210 joints were included in the study out of which 126 were unilateral ankylosis and 42 were bilateral ankylosis. Out of these 78 were male and 90 were female in our study. All patients varied in age ranging from 0-50 years of age with a higher no. of cases in 11-20 years of age in life. Mean age of patients in our study was 14.3±8.2 years. (p value 0.05) Thus, the demographic details suggested a female predilection, with a mean decade of 11-20 years and trauma to be the dominant etiological factor followed by ear infection of the same side. In our study all the patients were operated using Al-Kayat Bramley's tempo ralis flap modification in pre auricular incision.

Our study showed that the maximum no. of patients was categorized into Sahawney's type III in case of unilateral and had equal distribution in terms of bilateral ankylosis into Sawhaney's type II and III. In terms of Topazian's classification the study showed predilection of stage 2 in both bilateral and unilateral cases. All the patient's records were then evaluated for a preoperative and post operative mouth opening at 1 year in both unilateral and bilateral cases. Mean preoperative mouth opening in unilateral case came out to be 3.1±1.5 mm and 3.4 ±1.2 mm in cases with bilateral ankylosis.

A total of 130 patients were operated for gap and 38 patients were operated for inter positional arthroplasty. Mean postoperative mouth opening in unilateral cases was 32.6mm and in bilateral cases was 32.2 mm.

Our study showed surprising results in terms of total gain in mouth opening as it was more in terms of patients with unilateral ankylosis operated for gap arthroplasty i.e., 29.4 mm ± 11.2 mm while it was 26.4 ± 12.40 mm for patients operated for inter positional arthroplasty and in bilateral cases it was 29.1 ± 10.12 mm in gap arthroplasty patients and 26.2 ± 11.32 mm in inter positional arthroplasty. (p value > 0.05) (Graph 1)

In patients with inter positional gap arthroplasty most used graft was temporalis myofascial graft in 10 unilateral and 4 bilateral cases followed by subdermal fat in 12 patients with unilateral ankylosis then buccal fat pad with 6 patients of unilateral ankylosis and cos to chondral rib graft in 4 bilateral and one unilateral case. The use of temporalis myofascial graft was dominant in our study due to the local site of flap and no secondary incision required for the access. (Table 1)

Total 92 patients underwent ipsilateral coronoidectomy procedure and 34 patients underwent coronoidectomy on contralateral side as well. Other than this all the patients with bilateral ankylosis underwent bilateral coronoidec to my to achieve maximum mouth opening. In our study, total 8 patients underwent distraction osteogenesis pro cedure to augment the body and ramal length. Out of which 4 patients had procedure after the release of ankylosis while 4 had it before the release of ankylosis. In our study, total of 6 patients underwent the procedure of genioplasty for retrognathic chin.

Out of which 4 were unilateral and one was bilateral ankylosis. Out of 4 unilateral ankylosis one was done in a single surgical procedure while other was done post 6 months of surgery. Treatment of tempo romandibular joint ankylosis as seen earlier can be done in several ways. All these treatment modalities are associated with early and late set of complications. In our study we have retro spectively evaluated various forms of associated com plications and analysed them accordingly.

The most common form of complication in our study was transient facial nerve injury caused due to variety of reasons in unilateral ankylosis and malocclusion in bilateral ankylosis cases caused due to growth discre pancy because of the bony fusion of condyle adding up to 60.3% and 61.9 % respectively.

Discussion

The ankylosis of the TMJ is a severely disfiguring disorder and the management requires cautious treatment planning and accurate execution. The main aim of treating TMJ ankylosis is to achieve adequate mouth opening with minimal chance of recurrence in long term follow up, thereby striving to achieve functional efficiency and structural stability.

Patient's age, underlying etiology and duration of anky losis plays and important role in deciding the manage ment protocol for the release of ankylosis. Kaban's protocol is followed in our study along with inter positional grafting if required.[6,3] According to the studies done by Monika Gupta et al,[9] Al Morassi et al[10] and others most common decade for ankylosis of tempo romandibular joint is 0-10 years which was in accordance with our study. Gender predilection in most of the studies showed a male predilection due to increased incidences of trauma or fall with the male gender as in contradiction to our study which showed female predilection in total.

According to the retrospective study by Taranjit Kaur et. al. in 2013, trauma accounts for 75 % of the times as an etiological factor especially childhood trauma in the chin region causing intra-articular fracture of the condyle and haemarthrosis with resultant fibrous or bony ankylosis as

in accordance with our study.[10] More commonly trauma occurs in male children compared to the female children due to their natural behaviour of violence which contrasted with our study where history of trauma was more common in females followed by males. Second most common etiology was infection in the ear or pre auricular region which had male predilection in our study.

Most common type of ankylosis encountered in our study according to Sawhaney's was type III and Topazian's was stage 2 which were the most common findings in most of the studies. The normal mouth opening in adults ranges from 40 to 56 mm but varies in children depending upon the age and growth pattern of the child.

In our study, the mean pre operative mouth opening in unilateral cases is 3.2± 0.2 mm and in bilateral cases is 3.1 ± 0.1 mm which was in accordance with various studies on TMJ ankylosis. Mean post operative mouth opening at 1 year follow up in unilateral cases was 32. 6 mm ± 4mm and in bilateral cases was 32.2 mm ± 2mm in gap arthroplasty patients. Most of the authors recommend bone removal of 1.5cm the least (Chossegros et al., 1997; Kaban, Bouchard and Troulis, 2009; Elgazzar et al., 2010; Kumar et al., 2013) in accordance with our study this measure prevented the incidences of reankylosis along with aggressive removal of the ankylotic mass. We compared the most used grafts which are temporalis, subdermal fat graft, buccal fat pad and costochondral graft.

Since the issues faced with the different materials available are that the muscle shrinks and gets fibrosed; fascia loses bulk; cartilage appears to fibrous and calcify, whereas under practical loads, alloplastic implants disintegrate and induce giant cell reactions of the foreign body. Although temporal myofascial flaps are still the most common grafts, temporal muscle dissection contributes to scar contracture at the donor site, which can further intensify trismus Ipislateral / Contra lateral coronoidectomy (mouth opening ≤ 35mm achieved) recommended, to prevent inadequate intra-operative inter-incisal opening.[3]

Mean intra-operative mouth opening in all 20 TMJ in our sample ankylosis cases were 36.20 ± 4.14 mm as compared to 36.5 ± 4.5 mm by Ramezanian[11] and 37.5 mm by Kaban.[3]

Most common complication occurring in our study was facial nerve injury as in accordance with most of the studies. Second most common associated complication was facial nerve injury in bilateral cases which was transient in most of the cases adding up to 57.1% of total no. of cases. Other than this, we also encountered late complications such as jaw deviation in total 28.6% of unilateral cases and 33.3% of bilateral cases. This may occur due to failure of adaptation of muscle resulting in deviation of the jaw towards the operated site.

Least common complication occurring in our study was parotid fistula which was an immediate post operative complication resulting in salivary leak from the site of incision. It comprised of total 15.9% of unilateral cases and 23.8% of bilateral cases. All the patients in our study were analysed for recurrence in a mean follow up time of 25.6 months in unilateral cases and 20.6 months in bilateral cases thus making it a long-term study.

Total there were 12 cases of recurrence in patients treated with gap arthroplasty and 4 cases in patients treated with inter positional arthroplasty. Out of the 12 cases 4 were of unilateral ankylosis and 8 were of bilateral ankylosis while in inter positional arthroplasty 2 was unilateral and 2 was bilateral.

Conclusion

Thus, from the study conducted we can conclude that inter positional gap arthroplasty with temporalis myo

fascial graft is a superior form of treatment modality with relatively less recurrence rate over a long period follow up but has its own set of complications and requires a skilled surgeon.

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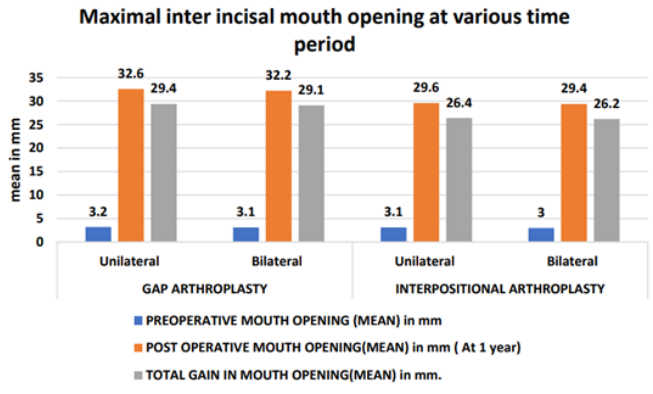
Legend Table

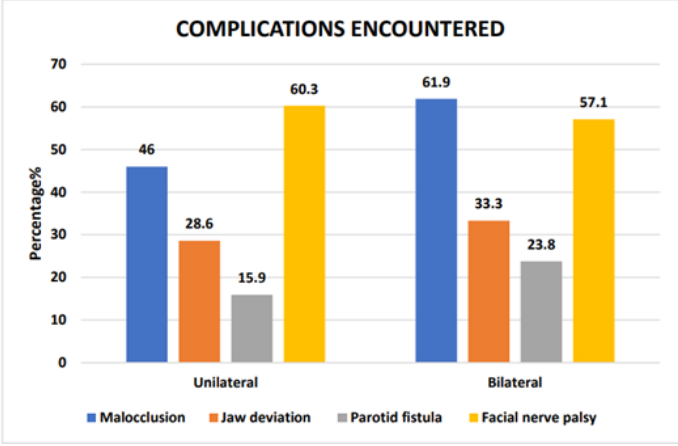
Table 1: various graft material used in inter positional arthro plasty

Interpositional arthroplasty	Temporalis graft no (%)	Subdermal fat no (%)	Buccal fat pad no (%)	Costochondral graft no (%)
Unilateral	10(7.9)	12(9.5)	6(4.8)	2(1.6)
Bilateral	4(9.5)	0(0)	0(0)	4(9.5)

Graphs



Graph 1: Maximal inter incisal mouth opening at various time period



Graph 2: Complications Encountered

Fig. 1: Al-Kayat Bramley Incision.

Fig.2: Gap Arthroplasty.

Fig. 3: Various grafts used in TMJ ankylosis.