

To Evaluate the Efficacy of Pedicled Buccalfat Pad as Interpositional Material in the Management of TMJ Ankylosis

Dr. Amita Mahaney, ¹ Dr. Vinay Kumar, ² Dr. Sankalp Mittal, ³ Dr. Mohit Aggarwal, ⁴ Dr. Bharpur Sharma, ⁵ Dr. Sunil Jakhar ⁶

1. Dr. Amita Mahaney

Post Graduate Student M.D.S. (Oral & Maxillofacial Surgery Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

2. Dr. Vinay Kumar

Professor, Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

3. Dr. Sankalp Mittal

Professor, Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

4. Dr. Mohit Agrawal

Associate Professor, Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

5. Dr. Bharpur Sharan Sharma

Assistant Professor, Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

6. Dr. Sunil Jakhad

Associate Professor, Department of Oral and Maxillofacial Surgery, Government Dental College & Hospital, Jaipur, Rajasthan, India

Abstract

Background - The purpose of the study is to determine the efficacy of pedicled buccal fat pad as interpositional material in the management of TMJ ankylosis.

Results -. Based on the results of this study, we conclude that after release of TMJ ankylosis, inter positioning of pedicled buccal fat pad followed by vigorous physiotherapy is a successful strategy for the management of TMJ ankylosis. Advantages of BFP in terms of better functional movements, maintenance of intraarticular space and prevention of recurrence because of its vascularity and effective reduction in potential dead space. MRI studies on immediate, 3 months and 6 months followup have shown mild regression in volume of fat. Hence signifying the efficacy of BFP as inter positional material in management of TMJ ankylosis.

INTRODUCTION

Temporomandibular joint (TMJ) is a ginglymoarthroidal joint, it is the only mobile joint in the entire maxillofacial region and is a part of craniomandibular articulation. It is unique because of the fact that both the joints need to move simultaneously for proper functioning and the force per unit area is much larger than most weight

bearing joints of the body.

TMJ Ankylosis is common problem in developed countries yet unfortunately it is quite common in underdeveloped world. Ankylosis is greek word meaning "stiff joint".fossa. Surgery is the only effective mean for correction of in order to restore and maintain normal function. Treatment of true ankylosis is controversial but can be divided into

three groups: gap arthroplasty, inter positional arthroplasty, and total joint reconstruction using either autogenous or alloplastic materials.

A number of interpositional materials have been used including alloplastic materials (acrylic, proplast-teflon, silastic), and autogenous tissues (temporalis muscle flaps, dermis, costochondral grafts, metatarsal, fibula, tibia, iliac crest, cranial bone and sternoclaviculargraft and cartilage.)⁷⁷

Pedicled buccal fat pads are used in the reconstruction of various oral and maxillofacial defects, and their use as interposition material after gap arthroplasty in cases of ankylosis of the temporomandibular joint (TMJ) has been well-documented. Their proximity to the surgical defect, their blood supply, and their easy availability makes them a versatile option for interposition after gap arthroplasty and after replacement of the TMJ.⁷⁶ Anatomically a buccal fat pad has a body and four processes (buccal, pterygoid, superficial, and deep temporal), and one of the main advantages is the pedicled blood supply. Interposition of a pedicled buccal fat pad reduces the dead space, prevents formation of a hematoma, reduces the formation of heterotopic bone, and consequently improves the range of movement of the jaw.⁷⁴

MATERIAL & METHODS

Study Site

The study was conducted in the Department of Oral & Maxillofacial Surgery, RUHS College of Dental Sciences & Hospital, Jaipur, Rajasthan.

Study Subjects

All TMJ ankylosis patients for study were selected from the Department of Oral & Maxillofacial Surgery, GDC Jaipur between march 2019 – February 2020 subjected to the following criteria and conditions; for surgical management of TMJ ankylosis.

Inclusion Criteria

1. Patient of any gender, religion or socioeconomic status.
2. Patient suffering from unilateral or bilateral ankylosis
3. Patient falling in any type of Sawhney's classification
4. Both non operated and recurrent cases

Exclusion Criteria

1. Medical contraindication for surgery
2. Refused consent

Basic oral and maxillofacial surgical instruments

Examination of each patient was done in the following order-

Inspection - extra oral examination was carried out to look for

- Mouth opening
- Facial deformity
- Chin deviation
- Scar mark

Intraoral inspection was done for:

- Midline deviation
- Mid incisor shifting
- Maximum Lateral excursion
- Maximum protrusion
- Occlusion

Palpation

Both affected and non-affected side of TMJ were examined for restricted/ diminished movements. Both joints were palpated at rest as well as during function:

- Chin deviation was measured on mouth opening and without mouth opening from midline considering as a guide line with other clinical parameters.
- Antegonial notch was also palpated on affected side.

Radiological examination

1. Pre operative 3-D CT SCANS in all patients with both coronal and axial view were obtained to determine the extent of ankylosis in mediolateral direction.
2. Post operative CT SCANS
3. Immediate and follow up post operative MRI in sequence-T1,STIR AXIAL,T1 and CORONAL,T2 SAGGITAL in close and open mouth position to evaluate viability of buccal fat pad, it's presence or absence as interpositional material, intensity of fat present and it's volume in cc.

Photographs

Preoperative, intra operative and postoperative photographs were taken for comparison and to visualize gradual changes at follow up period.

Preanaesthetic evaluation

All patients undergoing surgery have undergone preanaesthetic evaluation using routine blood profile, chest radiograph and other relevant investigations as the particular case required.

Anesthesia

All the patients were operated under general anesthesia with fiberoptic assisted naso-endotracheal intubation. Intravenous glycopyrrolate and midazolam were given as premedication. All patients were induced with inhalational isoflurane and intravenous fentanyl, succinylcholine and propofol. And maintained with inhalational isoflurane, 1:1 nitrous oxide: oxygen mixture and atracurium. Reversal was done with intravenous neostigmine and glycopyrrolate.

Surgical Technique

1. Exposure

The TMJ was approached through Alkayat Bramley incision (*fig.1*). Incision was carried through the skin and superficial fascia to the level of the temporal fascia. Starting at the root of the malar arch, an incision running at 45 ° upwards and forwards is made through the superficial layer of the temporal fascia (*fig.2*). The periosteum over the arch was incised horizontally, and the incision was continued inferiorly over the bony mass and extended to the identifiable unaffected portion of the ramus. The masseter muscle was dissected off the zygomatic arch, exposing the posterior and anterior border of ramus. After exposure and identification of the site of ankylotic mass (*fig.3*), aggressive excision of bony mass was performed.

2. Osteoarthrotomy

Bony block removal was executed using a combination of motorised surgical burs and osteotome and mallet. A plane was created with osteotome to complete the separation of the ankylotic mass and the roof of the glenoid fossa. Also special attention was directed to the medial aspect of joint to ensure the total resection. After resection, bur was used to reshape the glenoid fossa. When the excision was complete, usually created gap was 0.5 to 1 cm (*fig4*). The maximal opening was at least 30-35 mm (*fig.7*)

3. Ipsilateral and contralateral (if necessary) coronoidectomy/ Coronoidotomy

In cases with long standing ankylosis, the ipsilateral, and sometimes the contralateral coronoid processes become hyperplastic, thus they create additional obstruction to jaw movement even after removal of ankylotic mass. Thereby, through the same incision, ipsilateral coronoid was resected. If the maximal incisal opening (MIO) remained less than 35 mm, the contralateral coronoid was also resected through intraoral incision.

4. Herniation and interpositioning of buccal fat pad

The BFP was approached through the same preauricular incision as used for TMJ exposure. The main body of BFP and its temporal extension lie in close proximity to coronoid process and temporalis muscle tendon (Diagram. 1)

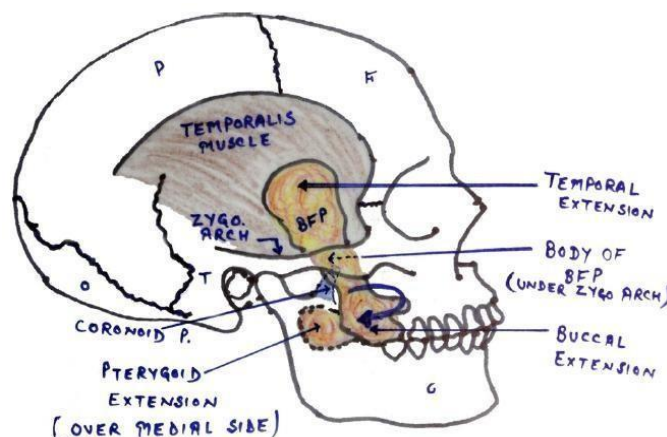


Diagram -1

The periosteal elevator was inserted anterior to the coronoid process. Blunt dissection was done with curved haemostat anterior and medial to the coronoid process to breach the periosteum. External pressure was applied over the cheek area by an assistant. The BFP easily popped into the operative area (*fig.5*). A continuous traction was applied to BFP with one curved artery forceps while another was used to open the surgical field. The BFP could be easily manipulated and brought to the TMJ region. Depending upon the amount of the fat

required, temporal or buccal or both processes of fat pad were manipulated and used as pedicled fat flap. The BFP was sutured to the adjoining tissue with one or two absorbable sutures (*fig.6*). Incision was closed layerwise (*fig.8*) and dressing was done.

5. Early mobilization of jaw & aggressive physiotherapy

In all patients physiotherapy was started on second postoperative day with heister (jaw opener). Patients were instructed to strictly follow the aggressive physiotherapy for at least one year.

Fig.1 Marking of Alkayat- Bramley incision



Fig.2 Oblique incision through the superficial layer of the temporalis



Fig.3 Exposure of ankylotic mass



Fig.4 Osteoarthrotomy done and gap of 1 cm created



Fig.5 Herniation of buccal fat pad through fascial envelope

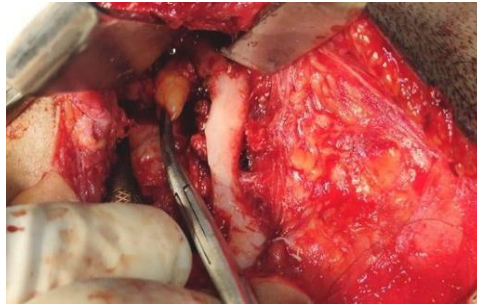
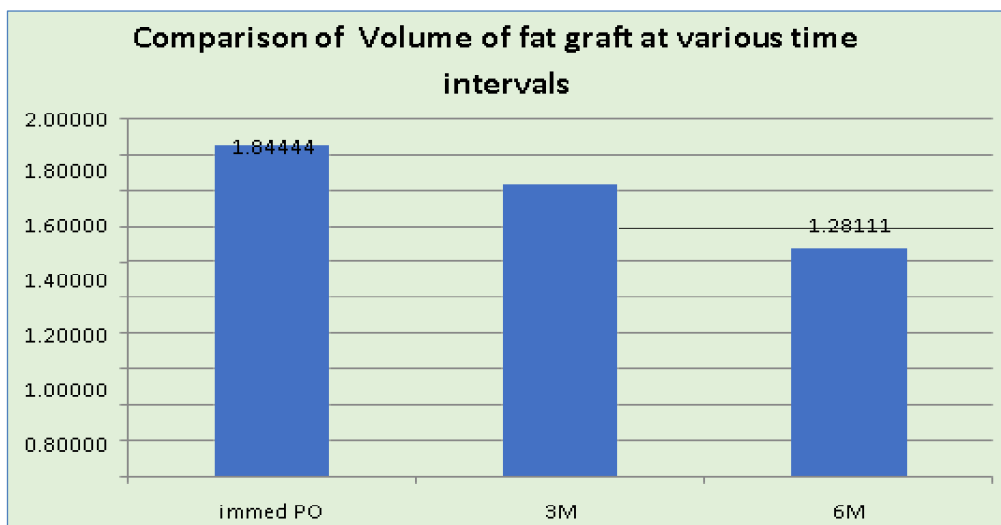


Fig.6 Packing of buccal pad fat into dead space created



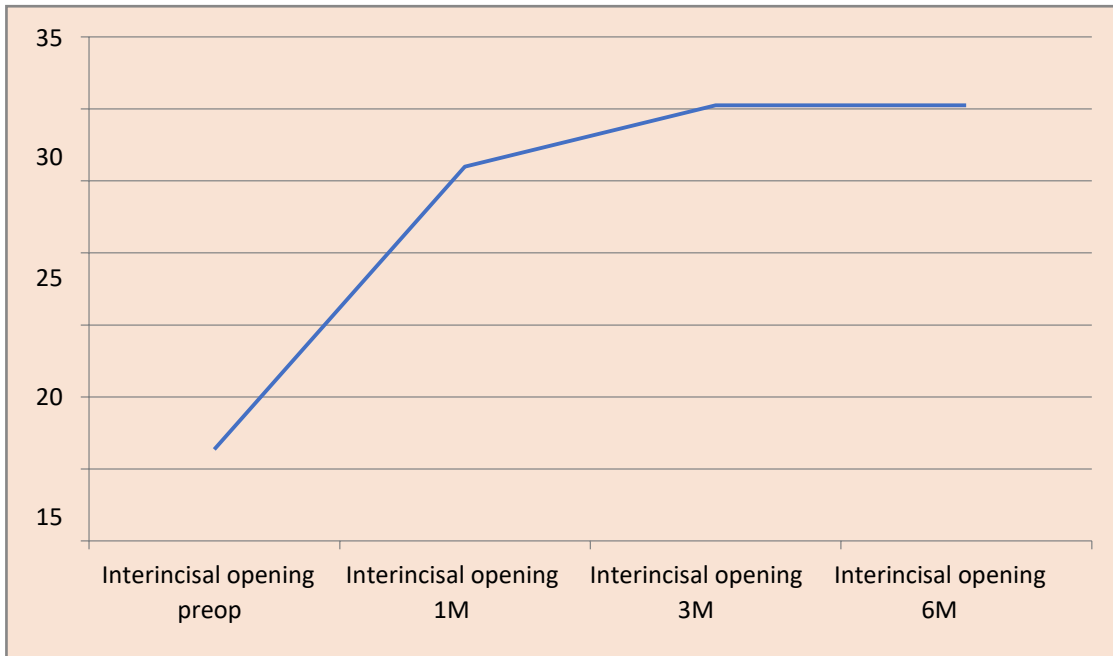
OBSERVATIONS AND RESULTS



In all the patients immediate post operative MRI revealed hyper intense fat within and along lateral aspect of joint which was of grade 1 intensity except for one patient where it was of grade 2 intensity.

On follow up postoperative MRI intensity of fat graft reduced and was of grade 2 /grade 3 intensity as graft was subjected to constant motion of normal TMJ movement.

Since the p value is <0.01, suggestive of statistically highly significant difference in volume of fat among different time intervals which means volume of fat shrunked with time.



The mean interincisal opening in mm and improvement at the end of 1st month, 3 months and 6 months is depicted in the table.

Preoperative mean interincisal mouth opening was 6.38 mm with standard deviation of 5.290.

At the end of first postoperative month, mean interincisal mouth opening was 26.00 mm with standard deviation of 3.703.

At the end of 3rd postoperative month, mean interincisal mouth opening was 30.25 mm with standard deviation of 4.833.

At the end of 6th postoperative month, mean interincisal mouth opening was 30.25 mm with standard deviation of 4.833.

Since the p value is <0.01, suggestive of statistically highly significant difference (all means were not alike).

Comparison of Pre & Post operative Midline Deviation

	N	Mean	Std. Deviation	Minimum	Maximum	Median	Meanrank	Chi square value	p value of Friedman Test
Preop	8	2.25	1.581	0	4	2.50	3.06	9.000	.029
Post op1month	8	1.75	1.669	0	4	2.00	2.31		
Post op 3 month	8	1.75	1.669	0	4	2.00	2.31		
Post op 6 month	8	1.75	1.669	0	4	2.00	2.31		

Midline deviation: two reference marks were made over maxillary dentition corresponding to the mandibular midline at resting position and at open mouth position. The horizontal distance in mm between reference marks at resting position and mesioincisal angle of maxillary central incisor was read as midline deviation at close mouth position whereas distance between two reference marks was read as midline deviation on mouth opening.

The mean of preoperative midline deviation is 2.25 with standard deviation of 1.581.

Mean of 1 month postoperative midline deviation is 1.75 with standard deviation of 1.669.

Mean of 3 months postoperative midline deviation is 1.75 with standard deviation of 1.669.

Mean of 6 months postoperative midline deviation is 1.75 with standard deviation of 1.669.

Since the P value is 0.029 which is <0.05 , suggesting statistically significant difference.

DISCUSSION

TMJ ankylosis is one of the most disabling condition which can affect a person. This condition during childhood will jeopardize proper development of face and result in considerable facial deformity, lack of function, social unacceptance and psychological stress. Along with this loss of masticatory ability, pain from infected teeth which cause extensive agony cannot be removed due to restricted mouth opening, improper oral hygiene, amount to a social and physical handicap.⁸¹

The primary goal of treatment of TMJ ankylosis is to restore the jaw function as well as prevent recurrence. Conventional methods for treatment of ankylosis were mainly dependent on gap

arthroplasty and placement of interpositional autogenic or all oplastic graft to decrease or prevent fibrous formation and the chances of reankylosis. Surgical method of release and correction has been directed toward the creation of pseudoarthrosis.^{4,5}

Interpositional arthroplasty is widely accepted as the primary surgical treatment for TMJ ankylosis. Rowe (1982)^{38,39} laid down certain criteria for restoration of ankylosed TMJ cases. The prime objective which he emphasized was release of ankylosis by cutting 1.5 – 2 cm of ankylosed bone thus achieving a functional articulation with adequate mouth opening. He further emphasized that lost capability of growth can be restored in young children by use of autogenous graft with growth potential, improving existing facial deformity. In spite of implanting a growth centre, the remnant facial deformity must be corrected by orthosurgical procedures. All these procedures should be done with all precaution to prevent relapse.

Based on the results of this study, we conclude that after release of TMJ ankylosis, inter positioning of pedicled buccal fat pad followed by vigorous physiotherapy is a successful strategy for the management of TMJ ankylosis. Advantages of BFP in terms of better functional movements, maintenance of intraarticular space and prevention of recurrence because of its vascularity and effective reduction in potential dead space. MRI studies on immediate, 3 months and 6 months followup have shown mild regression in volume of fat. Hence signifying the efficacy of BFP as inter positional material in management of TMJ ankylosis.

BIBLIOGRAPHY

1. AL-Kayat and Bramley P.A. modified preauricular approach to the temporomandibular joint and malar arch. *Br J Oral Surg* 1979; 17:91.
2. Bowerman J. Reconstruction of the temporomandibular joint for acquired deformity and congenital malformation. *Br J Oral Maxillofacial Surg* 1987;25:149.
3. Bellinger DH. Temporomandibular ankylosis and its surgical correction. *JADA*, 1940;27:1563.
4. Blair VP. The consideration of contour as well as function in operations for organic ankylosis of the lower jaw. *Surg Gynaecol Obstet* Feb. 1928; 46:167.
5. Brady F, Sanders B. Traumatic ankylosis of the temporomandibular joint. *Clin Otolaryngol* 1978;3:127.
6. Burket LW. Congenital bony temporomandibular joint ankylosis and facial hemiatrophy. *JAMA* 1936;106:1719.
7. Converse JM. Surgical release of bilateral, intractable temporomandibular ankylosis. *Plastic Reconstructive surg.* 1979;64:3.

9. Daniel S, Ellis E III and Carlson DS. Histologic analysis of costochondral and sternoclavicular grafts in TMJ of the Juvenile Monkey. *J Oral Maxillofacial surg.* 1987;45:675.
10. Dingman RO and Grabb WC. Reconstruction of both mandibular condyles with metatarsal bone grafts. *Plastic recon surg.* Nov. 1964;34:441.
11. Dingman RO. Ankylosis of temporomandibular joint. *Am J Orthod* 1946;32:120.
12. Durkin JF. Secondary cartilage: A monometer? *Am J Orthod* 1972;61(1)15.
13. El Mofty s. Ankylosis of the temporomandibular joint. *Oral Surgery* 1972;33:650-660.
14. Ellis E III, Carlson DS. Histological comparison of the costochondral, sternoclavicular and temporomandibular joint during growth in *Macaca mulatta*. *J Oral Maxillofacial surg* 1986;44:312.
15. Figuerora AA, Gans BJ and Pruzensky S. Long term follow-up of a mandibular costochondral graft. *Oral Surg Oral Medicine Oral Path* 1984;58:257.
16. Habbi I, Murname TW and Doku HC. Silastic and supramid in arthroplasty of temporomandibular joint in rabbit. *J Oral Surg* April 1970;28:270.
17. Henning TB, Ellis E III, Carlson DS. Growth of mandible following replacement of the mandibular condyle with the sterna end of clavicle. *J Oral Maxillofacial surg* 1992;50:1196.
18. Hinds CE and Pleasents JE. Symposium on maxillofacial surgery: Reconstruction of TMJ. *Am J Surg* Dec 1955;90:931.
19. Hunsuck EE. Autogenous graft for replacing temporomandibular joint and mandibular condyles in the rhesus monkey. *Oral Surg* 1969;27:167.
20. Kaban LB, Perrot DH, Fisher K. A protocol for management of TMJ ankylosis. *J Oral Maxillofacial surg* 190;48:1145.
21. Kazanjian VH. Ankylosis of temporomandibular joint. *Am J Orthod* 1938;24:1181.
22. Kazanzian VH. Symposium on maxillofacial surgery. Temporomandibular joint ankylosis with mandibular retrusion. *Am J Surg* 1955;90:985.
23. Kummoona R. chondro-osseous iliac crest graft for one stage reconstruction of the ankylosed TMJ in children. *J Maxillofac surg* 1986;14:215.
24. Kummona R. functional rehabilitation of ankylosed temporomandibular joints. *Oral Surg* 1978; 46:495.
25. Laskin DM, Sarnet BG. Metabolism of fresh, transplanted and preserved cartilage. *Surg Gynae Obstet* 1953;96:493.
26. Lindquist C et al. Adaptation of autogenous costochondral graft used for TMJ reconstruction. A long term clinical and radiological follow up. *J Oral Maxillofacial Surg* 1988;16:465.