Temporalis muscle flap in treatment of temporomandibular joint (TMJ) ankylosis

Kamal T. Al-Kubaisi BDS, FIBMS (1)
Tahrir N.N. Al-Delaimi BDS, MSc (2)
Mohamed K. Al-Rawi BDS, FIBMS (3)
Rafil H. Rasheed BDS, MSc (4)

ABSTRACT

Background: TMJ Ankylosis is common sequelle of trauma to mandible and / or infection. The aim of the study was to use and describes our surgical experience in treatment of TMJ ankylosis by the Temporalis muscle flap.

Materials and methods: In this study; 6 patients including 4 females and 2 males who have TMJ ankylosis were treated in maxillofacial surgery department, Ramadi General Hospital, Anbar Dental College.

Results: Satisfactory surgical correction of temporomandibular joint ankylosis is obtained.

Conclusion: There is evidence for successful use of temporalis muscle flap in treatment of TMJ ankylosis.

Key words: TMJ, Ankylosis, Temporalis muscle flap.

INTRODUCTION

The Temporalis muscle flap was first used by Golovine (1) to obliterate a dead space after orbital exenteration. In 1948, Campbell (2) used this flap to repair maxillary defects. Rambo (3) used the muscle flap in the middle ear and mastoid cavities. Wise and Baker (4) mentioned the use of the temporalis muscle flap in reconstruction of the orbital floor to support the orbital contents. Horton (5), Bakamjian and Souther (6) used the muscle flap for maxillary and orbital reconstruction. Bradley and Brockbank (7) in their extensive study illustrated the fundamental points in the use of this flap. Habel and Hensher (8) described the use of the temporalis muscle flap after tumor resection in the maxilla, oropharynx, in facial reanimation and restoration of facial contour. Kummoona (9) used inferiorly based pedicle flap from temporal muscle and fascia in surgical reconstraction of subluxation and dislocation of TMJ. The temporomandibular joint (TMJ) is the joint that allows mastication and speech, It is a synovial joint formed between the mandibular condyle below and the articular fossa of the temporal bone above, it is liable to suffer from a number of diseases; commonly fractures of the mandible, some of which predispose to TMJ ankylosis. Ankylosis is defined as loss of joint movement resulting from fusion of bones within the joint or calcification of the ligaments around it (10,11).

The anatomy of the TMJ and temporalis muscle is adequately described by Last (12) and by the cadaveric studies of Bradley and Brockbank (13). The temporomandibular joint is the articulation between the condyle of the mandible and the squamous portion of the temporal bone; it is the points of attachment of the lower jaw to the skull, two joints, one on each side of the face, just in front of the ears. It is the joint formed by the temporal bone of the skull (Temporo) with the lower jaw or mandible (mandibular). These joints have to move in synchronization each time we chew, talk or swallow. They are among the most complex joints in the human body. There are two different movements associated with the opening and closing of the mouth. For about the first third of the opening range the movement is hinge-like, and in the last two thirds of the opening range the condylar head slides forward and down. Closing movement occurs in reverse order. The temporomandibular joint also contains a piece of specialized disc, which is primarily made of cartilage, called the Articular Disk. This lies between the condylar head and the temporal bone and prevents these bones from rubbing against each other. The joints are also held together by a series of ligaments and muscles (12). The Temporalis muscle is described as fan-shaped, bipinniform, thin peripherally and thick centrally. It takes origin from the side of the skull over the entire temporal fossa, from the inferior temporal line above to the infra-temporal crest below. The muscle is inserted to the coronoid process and the anterior border of the ramus of the mandible to the level of the retromolar area. The muscle’s arterial supply runs on its deep surface and arises from two vascular pedicles, the anterior and
posterior deep temporal arteries, which arise from the internal maxillary artery and supply the anterior and posterior portions of the muscle respectively. The anterior and posterior vascular pedicles enter the muscle on its deep surface anterior and posterior to the coronoid process, both vessels enter the muscle below the level of the zygomatic arch. Both vessels may lightly groove the outer plate of the skull, emphasizing the need for careful subperiosteal dissection (10-12). The nerve supply is via the anterior and posterior deep temporal nerves with, occasionally, a middle temporal nerve, all of which are branches of the anterior division of the mandibular nerve (12).

Temporomandibular joint (TMJ) ankylosis is a structural disease that can cause asymmetry resulting in severe facial disfigurement as well as difficulties in eating, breathing, and speech. Should it occur before facial growth is completed, ankylosis produces micrognathia, especially if the disease is bilateral (8,9). TMJ ankylosis was classified by Kazanjian (14) as either true or false. True ankylosis is a condition that results in osseous of fibrous adhesion between the surfaces of the TMJ, within the limits of the articular capsule. False ankylosis results from diseases not directly related to the joint. Various factors can cause TMJ ankylosis, including trauma, systemic and local infections, and neoplasms in the area. Problems associated with ankylosis of TMJ are manifold and can be Functional, Aesthetic (Cosmetic), Psychological (Emotional) or Social.

Ankylosis of Temporomandibular joint may result in; restricted jaw movements, inadequate masticatory function, restricted mouth opening, impaired speech, reduced growth of mandible, facial asymmetry if only one side is affected, difficulty in breathing and swallowing, snoring and difficulty in sleeping on lying down, insufficient access for dental care resulting in multiple decayed teeth, poor oral hygiene leading to gingivitis, malposed and malocclude teeth because of lack of space for the eruption of the normal component of teeth and Other emotional, social and psychological disturbances (14,15,17).

Management of TMJ ankylosis is through surgical intervention as soon as the condition is recognized. Early surgery can minimize the severity of the restriction of facial growth (7,9,10,15,16).

The aim of the study was to use and describes our surgical experience in treatment of TMJ ankylosis by Temporalis muscle flap.

MATERIALS & METHODS

The study was conducted on 6 patients (4 females and 2 males), aged 4 to 18 years old; presenting at Oral & Maxillofacial Surgical Department, Anbar Dental College. Preoperative assessment of temporomandibular joint (TMJ) mobility was done by clinical assessment of jaw movement and measurement of interincisal distance by wooded tongue blade. Plain radiographic examination and/or CT scan request were done (Fig. 1&2). A tracheostomy had been previously performed for all cases. A surgical approach consisted of preauricular incisions as reported Kummoona (16,17). On the affected side, a condyle-like structure and the strong bony (with fibrous) adhesions were found. A gap was created by removing the fibrous / osseus tissue with surgical burs and chisels. The zygomatic arch was exposed via an incision of the periosteum. The temporal fascia was incised and the muscle flap was obtained and raised from the exposed temporal muscle and rotated inferiorly into the space created by the osteotomy. The flap was sutured medially, anteriorly, and posteriorly with 2/0 black silk suture; temporalis muscle was used as interpositional material, then the fascia returned, apposed and sutured with vicryl 3/0 and skin closed with 3/0 black silk suture (Figure 3-8). Mouth opening exercises were started the day after surgery. Patients kept under the proper medication (amoxicillin vial 500mg, metronidazol vial 500mg and diclofenac sodium ampole 75mg) Patients were discharged after 5-7 days on average. Stitches were removed after 7-10 days. Follow up recommendations included mouth opening exercises for 6 months. Post operative assessment for jaw movements and complications were performed as in preoperative stage. Soft diet instructions and vigorous post operative physiotherapy was performed to maintain the mobility and to prevent hypomobility secondary to fibrous adhesions for at least 6 weeks (7,8,16). Follow up assessment was performed at one month, 3 months and 6 months. All patients were referred for conservative, periodontics treatments and any orthognathic surgery should be postponed until cessation of growth.

RESULTS

Six patients including 4 females and 2 males, aged 4 to 18 years old fall is the most common cause of the ankylosis in the presented cases. Five patients were new cases of ankylosis, while one patient had had one prior operation. Duration of ankylosis ranged from 18 months to 15 years which estimated from the time of trauma when they attend the hospitals seeking help. Ankylosis...
was unilateral in all cases. Operative findings were simple bony ankylosis in 5 patients, massive bony growth in one case. The interincisal distances were improved at immediate postoperative period with distances ranged 25-35mm while one-month and six-month postoperative distances were ranged 35-45mm. All patients had an uncomplicated outcome till six months follow up except temporary weakness of temporal branch of facial nerve was noticed in one case due to traction on tissue which improved gradually by the end of six weeks post operatively.

DISCUSSION
Although the Temporalis muscle flap was used more than one hundred years ago by Golovine (1). It is still a very reliable tool in the reconstruction of the maxillofacial region. The principal advantages of the Temporalis muscle and fascia flap are their autogenous nature, resilience, and adequate blood supply. Its proximity to the joint allows for a pedicled transfer of vascularized tissue into the joint area similar to the findings of Kummoona (6,9,16,17).

As shown in the table, children were more exposed to TMJ trauma in primary school aging because of their activity and TMJ nature (condyler head is bulbous, thin cortex, broad neck and higher vascular with high osteogenic potential) which is similar to finding of Kazanjian (14) and Kummoona (16,17). According to our study, fall is the most common type of trauma that cause of the ankylosis which is agreed by Kummoona (16,17). The key factors for the successful use of the flap are careful dissection of the muscle in the subperiosteal plane without harming the vascular pedicle to increase the arch of rotation of the muscle flap. In the treatment of temporomandibular joint ankylosis, we use the muscle as an autogenous interpositional material as shown by Pogel and Kaban (18). There was no motor deficit on the side of the face (only one temporary weakness mainly due to flap retraction). The flap is easily rotated inferiorly below zygomatic arch and into the joint space which of acceptable bulkiness and there is no need for surgical reducing the thickness of the zygomatic arch which is agreed by Kummoona (16,17) and Pogel and Kaban (18).

The success may be considered good based on the increased mobility of the mandible, maximum mouth opening and improvement of function and growth as well as no sign of recurrence similar to the finding of Su Gwan (19). Coronoid process was not identified because there is no interference with mouth opening as mentioned by Bradly and Brockbank (13). Regarding operative details, simple ankylosis was the most common finding at operation followed by massive bony outgrowth in but soft tissue fibrosis not found in any case treated in our center. The cases with massive bony outgrowth included the patient who had undergone previous operation for ankylosis removal only when a Simple gap arthroplasty appears to be of limited value in TMJ ankylosis surgery, particularly due to the high risk of recurrent joint ankylosis. All patients responded well to operative procedure with good intraoperative interincisal openings achieved; and there was further improvement in the interincisal openings at follow up of one month and six months as agreed by Bradly and Brockbank (13), Kummoona (16,17).

All patients had no serious complications till six months follow up except temporary weakness of temporal branch was noticed in one case due to traction by flap retractor on tissue which improved by physiotherapy (including massage, thermal applications and simple medications) by the end of six weeks post operatively as agreed by Kummoona (16,17).

Figure 1: Preoperative CT scan, coronal view

Figure 2: Preoperative CT scan, axial view
Table 1: Patients' characteristics

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>Type</th>
<th>Cause</th>
<th>Side</th>
<th>Duration</th>
<th>Features</th>
<th>Complication</th>
<th>Interincisal distance(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pre</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>M</td>
<td>Simple</td>
<td>RTA</td>
<td>R</td>
<td>5yr</td>
<td>New case</td>
<td>Nil</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>F</td>
<td>Simple</td>
<td>Fall</td>
<td>L</td>
<td>18mo</td>
<td>New case</td>
<td>Nil</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>F</td>
<td>Simple</td>
<td>Fall</td>
<td>R</td>
<td>24mo</td>
<td>New case</td>
<td>Nil</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>F</td>
<td>Simple</td>
<td>Fall</td>
<td>R</td>
<td>20mo</td>
<td>New case</td>
<td>Nil</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>M</td>
<td>Simple</td>
<td>Fall</td>
<td>L</td>
<td>3yrs</td>
<td>New case</td>
<td>Temporal branch weakness</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>F</td>
<td>Massive</td>
<td>Fall</td>
<td>L</td>
<td>15yrs</td>
<td>Prior operation</td>
<td>Nil</td>
<td>10</td>
</tr>
</tbody>
</table>

REFERENCES