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Temporomandibular joint ankylosis; aetiology, pattern and treatment

Abstract

Introduction: Temporomandibular joint ankylosis is fusion of the head of mandibular condyle to the glenoid fossa of temporal bone at skull base. Untreated ankylosis causes distressing conditions such as speech impairment, difficulty in chewing, poor oral hygiene, malocclusion, facial disfigurement, and compromise of the airway. The two main causes are trauma and infection in or around the joint regions.

Methodology: A retrospective cross sectional study was conducted in 25 patients (n=14 male and n=11 female) with mean age of 21.9(ranged 6-50) diagnosed with Temporomandibular joint ankylosis at Addis Ababa University, Oral and Maxillofacial Surgery affiliate Hospitals both Yekatit 12 Hospital medical college and St. Peter specialized Hospital. Data was collected from patients' medical records registered in a period of 3 years from January 2017 to December 2019. Epidemiological information (EPI- INFO 7) computer software was used for data analysis.

Result: The study results revealed trauma was the most common cause of TMJ ankylosis representing (80%) of all causes. Males were more affected (56%) than females. The highest incidence of ankylosis was between the age of 11 and 20 (40%). Unilateral ankylosis was reported in (60%) and (68%) was bony ankylosis based on tissue involved. A total of (40%) of the patients were treated by interposition gap arthroplasty by using temporal muscle and fascia as an interposition material.

Conclusion: The findings of this study conclude trauma was the commonest cause of ankylosis. A proper screening of childhood injuries and early referral to maxillofacial centers recommended ensuring proper evaluation of specific post traumatic aetiologic factors and for early treatment to prevent ankylosis.

Keywords: temporomandibular joint, ankylosis, trauma, arthroplasty, Ethiopia

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Introduction

Temporomandibular joint (TMJ) is a synovial diarthrodial joint that is formed between the condyle of the mandible and the glenoid fossa of the temporal bone that are separated by an articular disc.[1] Temporomandibular joint (TMJ) is a specialized joint that can be classified by anatomic type as well as by function. From an anatomic standpoint, the TMJ is classified as a diarthrodial joint, which is a discontinuous articulation of two bones allowing freedom of movement that is dictated by the associated muscles and limited by the associated ligaments.[2]

Ankylosis of Temporomandibular joint referred as a pathologic fusion of the head of mandibular condyle to the glenoid fossa of temporal bone at skull base, which causes distressing conditions such as impaired speech, difficulty in chewing, poor oral hygiene, facial disfigurement, compromise of the airway, and psychological stress.[3,4]

There are different classification methods of ankylosis of the temporomandibular joint. This classification include: depending on anatomic site classified into; intra-articular or extra- articular, type of tissue involved; bony, fibrous, or fibro-osseous. The extent of fusion and obliteration of the joint space is another criteria to classify ankylosis into; complete and incomplete. Based on side of involved joint ankylosis is classified as unilateral and bilateral. TMJ ankylosis is also distinguished into true and false ankylosis.[5,6]

TMJ ankylosis can be caused by various aetiological factors: trauma, post-surgery, post radiation neoplasm, local infection and systemic diseases. There are many local infections such as TMJ infection, otitis media, osteomyelitis and mastoiditis that can cause ankylosis. The Systemic conditions that can cause ankylosis include; ankylosing spondylitis, septic arthritis, sickle cell anaemia, and Psoriasis. The most common causes are trauma and infection.[6–9]

The mechanism of TMJ ankylosis was represented by schematic diagram whether the cause is trauma or infection (Figure 1). Organization and ossification of hematoma is the classical theory concerning the underlying pathophysiology, but it could not explain all the unique character of TMJ bony ankylosis.[10] The outcome, whether ankylosis is fibrous or bony it depend on the severity and impact of the primary TMJ trauma. Relatively milder injury of TMJ leads to fibrous ankylosis, whereas serious TMJ trauma results in bony ankylosis. Targeting pathways such as, following intracapsular condylar fractures result in TMJ ankylosis.[11] The diagnosis of TMJ ankylosis usually consists of careful using history, physical examination and TMJ imaging. Imaging modalities that aid in the diagnosis of ankylosis include plain radiography, orthopantomograph, tomograms, both conventional and three dimensional Computed tomography (CT), arthrography, magnetic resonance imaging, ultrasonography, and radionuclide imaging.[12,13]

Treatment of TMJ ankylosis involves a number of surgical approaches to restore normal joint functioning and prevent re-ankylosis. Regardless of age the patient surgical intervention is the treatment of choice. The treatment of temporomandibular joint ankylosis poses a significant challenge because of technical difficulties and the high incidence of recurrence.[14] The management goal in TMJ ankylosis is removal of the ankylotic mass, restoring the

form and function of the joint, mouth opening, relief of upper airway obstruction, and prevention of recurrence.[14,15]

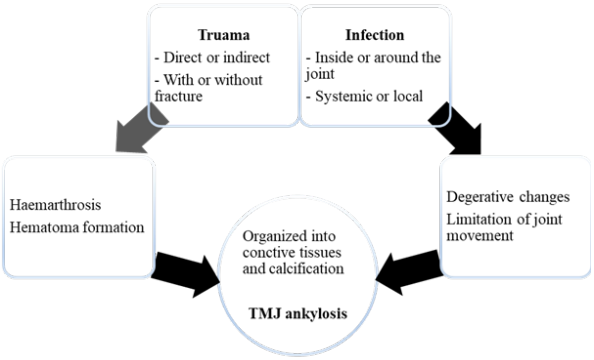

Figure 1 Schematic diagram of mechanisms of TMJ ankylosis

In regard to prevalence of TMJ ankylosis it is one of the common acquired pathologies affecting the skeleton and it is also the most overlooked and under managed problem specifically in children. It is usually develops before the age of 10 year, but could develop at any age.[16]

Materials and methods

A retrospective cross sectional study was conducted Addis Ababa University, Oral and maxillofacial surgery affiliate Hospitals, both Yekatit 12 Hospital medical college and St. Peter's specialized Hospital, Addis Ababa in patients consecutively diagnosed with TMJ ankylosis in a period of 3 years from January 2017 to December 2019. Data was collected from patients' medical records. For each patient, a number of variables were recorded including their demographic data, types of ankylosis, aetiology, duration of ankylosis, treatment received, previous history of surgery and complications. Data was collected, summarized, coded and entered to EPI-Info 7 computer program software. Frequency distribution tables, graph were used to represent the results.

Ethical consideration

Before starting the research work, ethical clearance was obtained from both St. Peter specialized Hospital Ethical review committee office and Addis Ababa Public health research and emergency management directorate.

Results

Demographic characteristics of participants

A total of 25 patients were seen between 2017 and 2019 with temporomandibular joint ankylosis. According to their gender result showed that 56% (n=14) were males while 44% (n=11) were female. Addis Ababa 8(32%) and Oromia 7(28%) contributed highest number of patients while Amhara region 2(8%) contributed the least. The study revealed that, the most frequently seen age groups were ranges from 11 – 20 years 10 (40 %), followed by 21 – 30 years age groups were reported in 9 (36 %) and only 3 (12 %) were < 10 years .The mean (SD) age was 21.9 (10.7) year. The minimum age was 6 years and the maximum was 50 years (Table 1).

Aetiology of ankylosis

The cause of ankylosis was trauma in 20 (80%) and infection in 2 (8%) patients. Congenital, post radiation and post-surgery were equally reported as cause of ankylosis in 3 patients (Figure 2). The most common cause of trauma was fall while playing 8 (40%). Road traffic accident (RTA) was reported in 4 (20%) patients, fall from bicycle, fall from tree and hit over chin equally contribute for six patients, 2 (10%) each. Other traumatic incidents including kicks from Horse and direct hit over joint were reported in two patients (Table 2).

Table 1 Demographic details of 25 patients with temporomandibular joint ankylosis surgery, Addis Ababa, Ethiopia

	Variable	Number (%)
Sex	Female	11(44%)
	Male	14(56%)
Location	Addis Ababa	8(32%)
	Amhara	2(8%)
	Oromia	7(28%)
	SNNP	5(20%)
Age groups (Years)	≤ 10 years	3(12%)
	11 - 20 years	10(40%)
	21 - 30 years	9(36%)
	31 - 40 years	2(8%)
	41 - 50 years	1(4%)
	Mean±SD	21.9±10.7

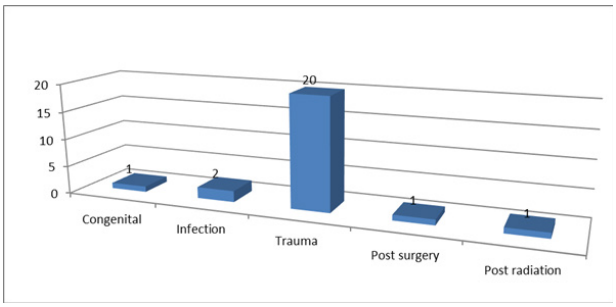

Figure 2 Aetiology of temporomandibular joint ankylosis in 25 patients, Addis Ababa, Ethiopia

Table 2 Injury pattern of post-traumatic temporomandibular joint ankylosis in 25 patients, Addis Ababa, Ethiopia

Causes	Number (%)
Direct hit over joint	1(5%)
Fall from bicycle	2(10%)
Fall from tree	2(10%)
Fall while playing	8(40%)
Hit over chin	2(10%)
Horse kick	1(5%)
RTA	4(20%

Types and duration of ankylosis

In this study unilateral ankylosis was predominant that account 15 (60%), and the unilateral ankylosis on the right side 9 (36%) was larger than the left side 6 (24%). According to tissue involved TMJ ankylosis was bony in 17 (68%) and fibrous ankylosis were reported in 8 (32%) patients shown in Table 3. Duration of ankylosis ranged from 1 - 30 years with mean of 8.8 years.

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Table 3 Types and duration of temporomandibular joint ankylosis in 25 patients, Addis Ababa, Ethiopia

Features	Number (%)
Tissue involved	
Bony	17(68%)
Fibrous	8(32%)
Side of involved joint	
Bilateral	10(40%)
Unilateral (Left)	6(24%)
Unilateral (Right)	9(36%)
Duration of ankylosis	
< 5 years	5(20%)
5 - 10 years	6(24%)
> 10 years	14(56%)
Mean	8.8

Types of surgery

Treatment was done for 22 patients and various treatment modalities were documented in this study. Majority of the patients 10 (40%) had underwent Interpostional gap arthroplasty as means of surgical treatment followed by Gap arthroplasty in 3(12%) patients. Chostochondreal graft, Interpostional gap arthroplasty + Cornoidectomy, Gap arthroplasty + Cornoidectomy and Condylectomy were done in 8(32%) patients, 2(8%)) for each procedure. Condylectomy + Cornoidectomy were done in 1(4%) patient. Three patients were not operated for unknown reason (Table 4).

Table 4 Types of surgery performed in 25 patients with temporomandibular joint ankylosis, Addis Ababa, Ethiopia

Types of surgery	Number (%)
Chostochondreal graft	2(8%)
Condylectomy	2(8%)
Condylectomy + Cornoidectomy	1(4%)
Gap arthroplasty	3(12%)
Gap arthroplasty + Cornoidectomy	2(8%)
Interpostional gap arthroplasty	10(40%)
Interpostional gap arthroplasty + Cornoidectomy	2(8%)
Surgery not done	3(12%)

Previous history of surgery and complications

Regarding recurrence of ankylosis only 2 (8%) had previous history of surgery. Post op complications were reported in 4 patients; transient facial nerve weakness in 3 (13.64%) and surgical site infection in 1(4.54%) patients (Table 5).

Table 5 Previous histories of surgery and post op complications in 25 patients with temporomandibular joint ankylosis, Addis Ababa, Ethiopia

Characteristics	Number (%)
Previous history of surgery	
Yes	2(8%)
No	23(92%)
Post op complications	
Transient facial nerve weakness	3(13.64%)
Surgical site infection	1(4.54%)

Discussion

Temporomandibular joint ankylosis is fusion of head of mandibular condyle to the glenoid fossa of temporal bone and it is a common disorder of the temporomandibular joint. This study was based on retrospective chart review in 25 patients who had been seen for TMJ ankylosis from January 2017 to December 2019.

Socio demographic

In this study, majority of patients were males 14(56%). Male predominance in present study was similar to that reported in previous studies.[17,18] The age range from 6 -50 years with mean of 21.9 years and the frequency of TMJ ankylosis was highest in second decade (11-20 years) of life followed by third decade in our study in both females and males. It may be due to injury to TMJ in growing population remains unreported due to lack of facilities and trained professionals in diagnosis and lack of awareness subsequently leading to ankylosis. Younger trauma patients tended to develop more severe types of ankylosis than older patients. The finding of most frequently occurring age group was the same with the study done in Pakistan as reported second decade was the most frequent age group,[19] but frequently occurring age group was third decade from 21-30 years in the study done in Marrakesh, Morocco.[20]

Aetiology of ankylosis

The remarkable finding of this study, trauma was the most common causative factors of TMJ ankylosis representing (80%) of all causes. This finding was comparable to reports of previous local study from Saint Paul Millennium Hospital medical college Ethiopia, (84.5%)[21] And as well as other developing countries like India.[22] Our study, revealed that only 2(8%) of unspecified infection cases were reported as aetiology of ankylosis. This could be explained by the use of antibiotics for the treatment of various infections reduces the risk of infection related TMJ ankylosis.

In regard to specific trauma, falls while playing and Road traffic accidents were considered to be the major causes of TMJ ankylosis. Out of twenty patients with trauma related TMJ ankylosis 11 patients were male and 9 patients were female. Females were found to be more prone to fall while playing; males were more prone to RTA and falling from bicycle. This finding coincides with the study done in Pakistan.[23] This is probably due to the difference in playing activities of boys and girls and in Ethiopia more home bound nature of female population makes them less prone to RTA and fall from bicycle.

Types of ankylosis

In this study, it was found that bony ankylosis reported in majority (68%) of cases. However, this number was still less when compared to other studies.[23] This difference could be accounted for by variations in types, mechanism of injury, age of patient and duration of ankylosis during diagnosis. The frequency of unilateral (right and left) ankylosis was more (60%) than bilateral ankylosis. This result was in line with the finding of other literatures.[17,25]

About (36%) of our patients had unilateral ankylosis on the right which was more predominant than the left side. Right side predominance was not similar with the study done in India, were both left side and right side equal involved.[25]

Duration

We analyzed that association between types of ankylosis and duration. Majority (75%) fibrous ankylosis cases was reported

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having less than 5 years duration of complaint and (58.82%) cases of bony ankylosis reported having 5- 10 years duration of complaint. This indicates that as time increase the extent of bony fusion and joint obliteration is more significant. Additionally, long post-trauma periods were related to the development of severe ankylosis.[26]

Types of surgery

To date, various treatment approaches have been described to achieve successful management of ankylosis. The most common treatment modality used was Interpostional gap arthroplasty for (40%) and only (4%) patient was underwent Coronoidectomy + Condylectomy. Temporalis muscle and fascia were used as interpositional material. In contrast to this, study conducted in Sudan revealed that majority of patients underwent Coronoidectomy + Condylectomy as means of treatment modality and Interpostional gap arthroplasty was not done.[27] The difference in treatment modality could be due to surgeons experience, preference and institutional protocol. Long-standing TMJ ankylosis contributes to coronoid process hyperplasia. Therefore, attention should be drawn to the coronoid process in patients with TMJ ankylosis. A coronoidectomy together with arthroplasty is recommended in patients with TMJ ankylosis.[28]

In present study carried out, management strategy varies weather it is bony or fibrous ankylosis. Majority (52%) of bony ankylosis in our study population were treated by interpostional gap arthroplasty. Condylectomy and Gap arthroplasty were done for most of patients with fibrous ankylosis; in (37.5%), (25%) respectively. Condylectomy was advocated in cases of fibrous ankylosis where joint space obliterated with deposition of fibrous bands but there was not much deformity of condyle.[29] Because of luck of literatures that put separately types of ankylosis versus treatment done, it was not evident to put comparison.

Complications

Complications following TMJ ankylosis surgery include; infection around surgical site, bleeding, persistent pain, facial nerve weakness or limited range of motion. In this study, the most common post op complication seen was transient facial nerve weakness reported in three patients. The type of complications reported in present study was the same with complications reported in previous study i.e. facial nerve weakness.[30] The probability of transient facial nerve weakness might be associated with tissue retraction and compression on facial nerve during surgery of TMJ ankylosis.

Reankylosis is another challenging condition of temporomandibular joint following ankylosis release. In this study only 2(8%) had history of previous surgery (recurrence) of TMJ ankylosis. This recurrence rate is the same with the study done in Egypt (8%).[31] To prevent recurrence, active mouth exercises are started and patients encouraged to start gentle and gradually increasing mouth opening exercise using their own fingers. Regular post-operative follow up by operating surgeon and patients also need physiotherapy follow up as required.

Conclusion

In this study, clearly stated that childhood trauma was the most common cause of temporomandibular joint ankylosis. A proper screening of childhood injuries and early referral to maxillofacial centers recommended ensuring proper evaluation of specific post traumatic aetiologic factors and for early treatment to prevent ankylosis and associated growth deformities. Hence concentered effort among health care provider at all levels and increasing the number of professionals trained in maxillofacial surgery is recommended. Clinicians in rural healthcare set ups need training to diagnosis, manage and proper referral of patient with facial injuries and infections to reduce risk of ankylosis. There is also a need of community health education including preventive measures and seeking of treatment following injuries.

Author contribution

Gelana Garoma ((DMD, Oral and Maxillofacial surgeon**):** have made substantial contributions to conception, design, analysis and interpretation of data and participated in the critical review and editing of the manuscript drafts for scientific merit and depth.

Demerew Dejene (DMD, Oral and Maxillofacial surgeon): have made substantial contributions to conception, design, analysis and interpretation of data and participated in the critical review and editing of the manuscript drafts for scientific merit and depth.

Girma Uma (DDS, Oral and Maxillofacial surgeon): has been involved in analysis, interpretation of data and drafting the manuscript and revising it critically for important intellectual contents.

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Conflicts of interest

The author declares no conflicts of interest.

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