

Incidence, Clinical Presentation and Surgical Management of Temporomandibular Joint Ankylosis: A 5 Year Retrospective Study

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Abstract

Background: Temporomandibular joint (TMJ) ankylosis is not uncommon in Ethiopia. These patients, usually of lower socioeconomic status, are seen at varied intervals after the onset of the disease, which is usually early in childhood. Ankylosis of the TMJ is one of the most serious complications of condylar fracture. Asymmetrical mandibular growth has been observed in about 25% of children who have sustained condylar fractures. The management of TMJ ankylosis has always been difficult and frustrating, particularly when dealing with long-standing or recurrent cases, or if the case is complicated by deformities of the jaw bones. Extreme poverty was the main predisposing factor. There is a need for a concerted effort among healthcare providers, policy makers, and the world in general to eradicate poverty and improve healthcare to limit the incidence of ankylosis of the TMJ.

Objective: To assess the Incidence, Clinical presentation and surgical managements of Temporomandibular joint Ankylosis.

Methods: A retrospective cross-sectional study was conducted from April to October 2016 G.C. The required minimum sample size for the study was calculated by using the formula and found to be 384.16. Convenient sampling method utilized as sampling technique.

Result: A total 1856 new patients were seen at the department of Oral and maxillofacial surgery in SPHMMC from 2011 till 2015. Sample size for the study was calculated by using the formula and found to be 384.16. From this 58 patients were diagnosed with TMJa. The incidence rate of TMJa out of the total maxillofacial region diseases were 15.1% and the most frequent age group was 10 - 19 years. Trauma was the commonest aetiology (93.1%). Various types (bony (87.9%), fibrous (5.17%), fibro osseous (6.89%). Gap arthroplasty showed most utilized surgical management account (70.68%).

Conclusion: The main causes of ankylosis of the temporomandibular joint are trauma and infection. Ankylosis of the TMJ is distressing because it compromises function and the facial deformity has an adverse psychological effect on the child. There is a need for concerted effort among healthcare providers to institute preventive measures including adequate treatment of infections and early treatment of maxillofacial injuries.

Keywords: Temporomandibular Joint Ankylosis; Trauma; Infection; Gap Arthroplasty; Interpositional Arthroplasty

Introduction

The temporomandibular joint (TMJ) is composed of the temporal bone and the mandible, as well as a specialized dense fibrous structure, the articular disk, several ligaments, and numerous associated muscles [1].

Ankylosis of the temporomandibular joint is a serious and disabling condition. Impairment of speech, difficulty with mastication, rampant caries, poor oral hygiene, disturbances of

facial and mandibular growth, and acute compromise of the airway invariably result in physical and psychological disability. This is particularly true of young children who are completely unable to open their mouth [1-4].

Trauma can result in an intra-articular haematoma leading to fibrosis, excessive bone formation and ultimately to hypomobility of the joint [5]. The region of the TMJ can also become infected from local sites such as otitis media and mastoiditis, or through

haematogenous spread from diseases such as tuberculosis, gonorrhoea and scarlet fever [5]. Systemic diseases that are implicated include ankylosing spondylitis, rheumatoid arthritis, and psoriasis [6,7].

The incidence of the condition is declining in Europe and North America, partly as a result of better earlier management of condylar fractures and partly because of the use of antibiotics, which has reduced the persistence and recurrence of otitis media [8]. Ankylosis is common in developing countries [1,9].

Ankylosis of the temporomandibular joint may be classified by a combination of: location (intra-articular or extra-articular); type of tissue involved (bony, fibrous, or fibro-osseous); and extent of fusion (complete, or incomplete) [6,10].

Inter incisors opening is an indicator of the severity of the ankylosis, and clinically, complete ankylosis is defined as a condition when opening is less than 5 mm. In unilateral cases the mandible can be forced to open because of its elasticity and the minimal mobility of the cranial sutures [11,12].

The digastric and mylohyoid muscles produce marked notching in the lower border of the mandible in front of the insertion of the masseter and medial pterygoid muscles [11].

The notching at the antegonion and the apparent distortion of the mandibular structure (which is pathognomonic of the condylar growth arrest) are thought to be caused by continuous growth at the angle of the mandible as a result of subperiosteal apposition. Because of a failure of growth at the condyle, forward and downward movement of the body of the mandible does not occur, and a localized thickening of the bone at the angle accentuates the antegonion. This, coupled with the obtuse angle formed between the cranial base and the lower border of the mandible, is responsible for the characteristic "warping" [13].

The onset of disease usually occurs in children under 10 years [14] with a roughly equal gender involvement [15]. A progressive reduction in jaw movement is the main clinical presentation. It should be noted that most patients can still move their jaws slightly at the initial examination, and complete limitation of mouth opening is rare [16,17], which means that opening movement exists throughout the entire course of bony ankylosis. Generally, the formation of bony ankylosis takes long time, ranging from several months to several decades after the occurrence of injury [4].

Salins described an ankylotic mass as being abnormal bone that replaces the articulation and results in restriction of mandibular movement [19]. Although it is not a neoplastic process, the bone is capable of continued growth, and it can be considered a reparative process similar to that found in an exuberant callus, typical of fractures in children or of fractures that have not been mobilized adequately. Remodeling does not occur in ankylosis of the TMJ, and the joint is usually surrounded by very dense fibrous tissue, particularly on its medial aspect, which further limits mandibular movement [19]. A poor outcome after surgery for ankylosis of the TMJ in children may be because of a lack of compliance with physical therapy, which leads to a tendency for recurrence [6].

Statement of the problem

Temporomandibular disorder is a generic term used for any problem concerning the jaw joint [1]. Among these disorders Temporomandibular ankylosis is one of the most debilitating and can have an adverse effect on quality of life. It is a challenging problem, and often starts during the active growth stage of early childhood [4].

Temporomandibular joint (TMJ) ankylosis is not uncommon in Ethiopia. These patients, usually of lower socioeconomic status, are seen at varied intervals after the onset of the disease, which is usually early in childhood. Eating is difficult, and patients rely mostly on having the food pushed through the vestibule of the mouth and then behind the last molar teeth. Impairment of speech, difficulty in mastication, poor oral hygiene, rampant caries, and acute compromise of the airway pose a severe functional and psychological burden on the tender minds of children [20].

Ankylosis of the TMJ is one of the most serious complications of condylar fracture. In the cases of trauma, it is hypothesized that intraarticular hematoma, with scarring and excessive bone formation, leads to hypomobility. Infection of the TMJ is most commonly the result of contiguous spread from otitis media or mastoiditis but may also result from hematogenous spread, including tuberculosis, gonorrhea, and scarlet fever. Systemic causes of TMJ ankylosis include ankylosing spondylitis, rheumatoid arthritis, and psoriasis [7].

Asymmetrical mandibular growth has been observed in about 25% of children who have sustained condylar fractures [21]. The development of mandibular asymmetry is thought to result from growth disturbance from either injury to the condylar cartilaginous cap or from disruption in function due to ankylosis

and hypomobility. Functional disturbances and esthetic deformities can result. If growth is disrupted, the affected ramus height is decreased, resulting in a shorter facial lower third, while the unaffected side grows normally. Also, the chin will deviate toward the affected side. Furthermore, dental compensations, crossbites on the ipsilateral side and hyper eruption of the teeth on the contralateral side, producing an occlusal imbalance will eventually occur to reestablish a functional occlusion. Several factors are found to influence growth including age, the severity of the injury, and the period of immobility. The earlier in life a condylar process fracture occurs, the greater the resultant skeletal changes [22,24].

Moreover, the younger the individual, the more complete and rapid the restitution of a morphologically, anatomically, and functionally normal condylar articulation. In adolescents, the potential for significant restitution and remodeling is still present but not to the degree seen in children under 12 years of age. In adults, functional adaptation of the TMJ occurs [25].

The purpose of this study is to describe the rate TMJ ankylosis seen and treated in St. Paulos Hospital Millennium Medical College Addis Ababa, Ethiopia- emphasis being placed on the etiology, clinical features, location and type of ankylosis, and special problems of management. This is one of the tertiary referral hospital in the country and among in which oral and maxillofacial surgical services are available in the country. The patients are therefore a fair representation of the whole country regarding oral and maxillofacial problems [26]. The management of TMJ ankylosis has always been difficult and frustrating, particularly when dealing with long-standing or recurrent cases, or if the case is complicated by deformities of the jaw bones. It can be extremely problematical when the patient's compliance is limited, especially in the younger age group or when they come from far or rural areas where postoperative follow-up is expected to be difficult [20].

Extreme poverty was the main predisposing factor. There is a need for a concerted effort among healthcare providers, policy makers, and the world in general to eradicate poverty and improve healthcare to limit the incidence of ankylosis of the TMJ [36].

Literature Review

In virtue of better understanding of the management of condylar fractures, and also the reduced incidence of middle ear infections since the introduction of antibiotics, the incidence is decreasing in the west, but it is still high in Asia and Africa (Ajike S. Temporomandibular joint ankylosis: analysis of 65 cases.

Paper presented at 17th International Conference on Oral and Maxillofacial Surgery, 2005) [14].

Disabling interruptions to chewing and malformed facial development may be caused by bony and fibrous ankylosis of the temporomandibular joint (TMJ) as a result of trauma (31 - 98%) of cases), local or systemic infection (10 - 49%), systemic disease (10%), or neoplasm [27,28]. Study done in Nigeria shows however, infection resulting in cancrum oris (NOMA) was directly responsible for the greatest number of the cases (57.9%), trauma was next (30.3%). It was the overwhelming cause of ankylosis rather than the other factors just mentioned [1].

Ankylosis of the TMJ usually develops before the age of 10, 28 but could be found at any age, the usual range being 20 - 30 years [29,30]. It is slightly commoner in boys than girls in a ratio of 1.4:1.2.32 Unilateral ankylosis has been reported to be commoner than bilateral, the ratio being 1.5:1.2,3,14 Patients present with limitation of mouth opening and a maximum interincisal distance of between 0 and 20 mm [31]. It causes aesthetic defects to the face, malocclusion, inability to enjoy eating, and malnutrition, particularly when it develops in childhood [32,33].

The Indians experience since the mid-1960s until 1991 the Oral and maxillofacial surgeons of the all-India Institute of Medical Sciences have been performing condylectomy and coronoidectomy for TMJ ankylosis with excellent results. Of 206 cases surgically treated, 75 specimens from 61 patients were available for study. 190 (92.2%) of the 206 surgically treated cases were post-traumatic juxta-articular ankylosis. The ankylosis was bilateral in 14 (2.2%) patients, and the remaining 47 (77%) had unilateral ankylosis: 22 (46.8%) on the left side and 25 (53.1%) on the right. There was a total of 69 bony ankyloses and six fibrous ankylose [8].

The study reports the experience in managing TMJ ankylosis in Delta Nile, Egypt (1995 - 2006) and compares the surgical modalities used. 101 patients (109 joints) were reviewed in this retrospective study. Pre- and postoperative assessment included history, radiological and physical examination, and mouth opening. Age, sex, aetiology, joint(s) affected, surgical modality, complications and follow up periods were evaluated. Various types (fibrous, fibro-osseous and bony) of TMJ ankylosis were diagnosed; trauma was the commonest aetiology. The patients' age range was 2 - 41 years, 62% were female, and the follow up period ranged from 14 to 96 months. Average mouth opening was significantly increased from 5.3 mm pre-operatively to 32.9 mm

12 months postoperatively ($P = 0.0001$). Marked improvement in mouth opening was documented when the ramus-joint complex was reconstructed using distraction osteogenesis (34.7 mm), costochondral graft (34.4 mm) and Surgibone (34.6 mm). Gap arthroplasty showed least satisfactory mouth opening compared with other techniques ($P = 0.001$). Minor and major complications were encountered in 33% of cases, including 5% recurrence rate. Early release of TMJ ankylosis; reconstruction of the ramus height with distraction osteogenesis or bone grafting combined with interpositional arthroplasty, followed by vigorous physiotherapy is successful for managing TMJ ankylosis [34].

The 10-year period review from (January 1982 to December 1991) were seen and treated in the Oral and Maxillofacial department of Harare Central Hospital, Zimbabwe focusing on aetiology, sex, age at time of treatment, clinical features, radiographic findings, anaesthetic techniques, surgical treatment, complications, and results in 32 patients with ankylosis of the temporomandibular joint. Trauma and infection were the commonest causes of ankylosis: 50% and 41% ($n = 13$), respectively. The 21 - 30 year age group had the most trauma cases. The youngest patient was a 1 week old girl with an undisclosed first branchial arch syndrome. The oldest patient was a 60-year-old woman. There were 19 male and 13 female patients, giving a male: female ratio of 1.5:1. Most patients presented with varying difficulties in speech, mouth opening, and mastication. The restricted mouth opening caused occlusal derangement, poor oral hygiene, rampant caries, generalized gingivitis, periodontal disease, and gross calculi. Those patients who had had unilateral intracapsular ankylosis since early childhood also had mandibular asymmetry. Twenty (63%) of the patients presented with bilateral ankylosis [35].

The techniques used for general anaesthesia for the most patient's intubation was difficult. Direct nasotracheal intubation was achieved in four patients (13%) who had sufficient mouth opening to allow direct laryngoscopy. Blind nasotracheal intubation was successfully used in 18 patients (56%) but was sometimes achieved only after several attempts. Fiberoptic techniques were successful in six patients (19%). Tracheostomy was required in four patients (13%) in whom blind nasotracheal intubation was unsuccessful. The various surgical techniques used in the release of temporomandibular joint ankylosis. Bilateral condylectomy 20 (63%) were taking the lead followed by Unilateral condylectomy 9 (28%), Excision of fibrous bonds 3 (9%). Failing to do jaw-opening exercises was the main cause of relapse [35].

A six years (1975 - 1981) survey of 76 cases of ankylosis of the mandible in Nigerians is presented. Etiology, clinical features, radiographic findings, anesthetic techniques, surgical treatment, complications, and results are discussed. Children were predominantly affected. Of the 76 cases, 50 (65.8%) occurred in children under 10 years of age. The youngest patient was 2 years old, while the eldest was 44 years old. Forty patients were male and 36 were female; there was no overall sex predilection. However, the intracapsular lesions were more common in males whereas extra-articular disease affected females more frequently. Age at Onset of Ankylosis of the mandible in 76 Patients 6 - 10 years account the highest 42% followed 0 - 5 years 23.7% [1].

The relative frequency of extra-articular ankylosis due to infection or trauma was significantly different from that of intracapsular ankylosis. The majority of the cases of infective origin (42) were extra-articular; only two were intracapsular. Most of the cases due to trauma (18) were intracapsular; only five were extra-articular. Although the overall sex ratio was almost equal, the sex distributions according to etiologic factors varied considerably. Ankylosis caused by trauma was approximately five times more frequent in males than in females, but cases caused by cancrum oris were about twice as common in females as in males [1]. In a substantial majority (64.5%), the disease occupied a large area of the mandibular bone; the minimum involvement was the molar area, whereas certain lesions extended from the canine region to the condylar process. The condition was confined to the condylar or coronoid process in only 27 cases (35.5%) [1].

Unilateral ankylosis was far more common than bilateral, accounting for 71 (93.4%) of the cases. There were no statistically significant differences in the frequencies of the bony, fibrous, and combined fibrous and bony types of ankylosis. However, combined fibrous and bony ankylosis was strikingly predominant in cancrum oris. Also, extra-articular ankylosis was about 3.5 times more common than intracapsular in these patients [1]. Of the 74 patients who underwent surgery, 69 (93.2%) required general anesthesia; the remaining five (6.8%) were given local anesthesia. For the most part, intubation was difficult. Blind nasotracheal intubation utilized most for 56.7% then direct nasotracheal intubation was achieved in 12 patients (16.2%) because sufficient mouth opening or a large buccal fistula allowed laryngoscopy. transtracheal ventilation was used successfully in nine cases (12.2%) of ankylosis. The corrective procedure used in 74 cases (97.4%) was surgical, Angle ostectomy was most used operative technique 31.6% followed by Excision of fibrous bands 11.9% [1].

A retrospectively studied the aetiology and clinical features of patients with ankylosis of the TMJ who presented to the Maxillofacial Unit, National Hospital, Abuja, Nigeria, between 2004 and 2009. There were 13 male and 10 female patients, M: Fratio 1.3:1, age range 6 - 62, mean (SD) 20 (13) years. The aetiological factors were trauma (n = 11) that comprised falls (n = 6), untreated fractures of the zygomatic arch (n = 4) and myositis ossificans (n = 1); infection (n = 9), that comprised cancrum oris (n = 3) and ear infection (n = 6); congenital or unknown (n = 2) and coronoid hyperplasia (n = 1) [14].

In 1990, Kaban, *et al.* proposed a protocol for the management of TMJ ankylosis [6]. Since then, most authors have reported cases that followed the basic tenets of the principles for management suggested in that series [27,28]. Disagreement still persists concerning the optimal reconstructive method utilized [4].

In this algorithm, the first step is aggressive resection of the ankylotic mass. This is followed by ipsilateral coronoidectomy and stripping of the pterygomasseteric sling, in order to accomplish an intraoperative incisal opening of 35 mm. If this is not achieved, contralateral coronoidectomy is performed. This is followed by lining of the joint space with either temporalis muscle and fascia or cartilage, reconstruction of the ramus with a costochondral graft, rigid fixation of the graft, and finally, early immobilization. It has long been recognized that prolonged immobilization of the mandible results in fibrosis or atrophy of the associated muscles of mastication [29].

If this is not addressed, mouth opening will be hindered, despite adequate release of the ankylotic joint. Therefore, coronoidectomy and muscular release must be performed. A jaw mobilizer may also be utilized to release scar tissue and to obtain optimum mobility prior to reconstruction. The critical surgical defect required has not been fully elicited with respect to TMJ ankylosis. The necessary resection of bone to prevent reankylosis has been reported to be anywhere from 0.5 to 4.0 cm [21]. Increased bony resection theoretically decreases the likelihood of reankylosis, but at the expense of ramus height [30].

An alternative approach to the above protocol includes creating an osteotomy and subsequent pseudoarthrosis below the ankylotic mass, as described by Salins [31]. Because with this technique there is less exposed raw bone, the incidence of reankylosis is reportedly decreased [31] conversely, reconstruction without lining of the joint space, particularly in the pediatric population, has been presented [2].

Gap arthroplasty with interpositional grafting remains the mainstay of joint reconstruction following ankylosis [32-34]. In 1966, Topazian compared 40 patients treated with gap arthroplasty, with and without the use of interpositional grafting. He found that half of the patients without grafting had reankylosis, and those who were grafted had no recurrence [21]. It was hypothesized that interpositional grafting shields the exposed bony surface, preventing reankylosis. Since then, many different materials, including autogenous tissues, such as fat, dermis, temporalis muscle and fascia, and auricular cartilage, have been used as interpositional grafts [31,35].

Alloplastic materials have included silastic, silicone, acrylic, and various metals [31]. The most popular autogenous interpositional graft reported is the temporalis myofascial flap. The advantages of this flap include its good vascular supply, durability, and relative proximity to the surgical site. In their study of 115 reconstructed joints using magnetic resonance imaging evaluation, Umeda, *et al.* reported on the long-term (mean follow-up of 1.7 years) viability of this flap [23].

Costochondral grafting has been the primary treatment option in the growing pediatric patient. This type of graft has been utilized because of its ideal shape, remodeling capacity, growth potential, and good bony union. Furthermore, the use of autogenous tissues prevents the potential for foreign body reaction [14]. Recent reports have questioned the utility of costochondral grafts due to their unpredictable growth characteristics, necessitating secondary corrective surgeries. Other disadvantages include donor site morbidity, including the possible need for chest tubes and excessive lateral bulkiness of the graft [35].

McCarthy and others have demonstrated the feasibility of using distraction osteogenesis to correct mandibular deficiencies. External distraction hardware anchored by transcutaneous pins was used to achieve transport and stabilization of the skeletal fragments. Development of internal distraction devices is necessary to make the treatment acceptable in the mainstream practice of pediatric maxillofacial surgery [36].

The long-term effect of early skeletal correction with distraction osteogenesis is unclear. Further study is required to evaluate the potential of early surgery to limit compensatory growth abnormalities. One of the current challenges is to determine how best to achieve a stable neuromuscular matrix to support the reconstructed skeleton [36].

Significance of the Study

The purpose of this study is to contribute for the descriptive epidemiology of clinical TMJ ankylosis and it is intended that data from this study will also serves as a template for comparison for future intended prospective study.

Objective of the Study

General objective

To assess the Incidence, Clinical presentation and surgical managements of Temporomandibular Joint Ankylosis.

Specific objective

- To describe the causes of TMJ Ankylosis.
- To describe age and sex distribution of TMJ Ankylosis.
- To assess the clinical presentation of TMJ Ankylosis.
- To assess the surgical treatment modalities of TMJ Ankylosis.

Materials and Methods

Study area

The study conducted in St Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. The St. Paul's Hospital Millennium Medical College is a tertiary referral hospital under Ethiopian Federal Ministry of Health (FMOH). It is the second largest public hospital in the nation, built by the Emperor Haile Selassie in 1961 with the help of the German Evangelical Church. It have 800 clinical and non-clinical staff members that provide medical specialty services to an estimated 110,000 people annually who are referred from all over the country. The main reason this hospital has been chosen for this study is because of one of the pioneer hospital who establishes Maxillofacial Unit and treats many cases of TMJ ankylosis patients.

Study design

A cross-sectional study of was conducted. A secondary data which was collected from September to October 2016 G.C will be utilized.

Source population

The source population were included all patients who had been treated in the past 5 years at St Paul's Hospital Millennium Medical College Maxillofacial Unit.

Study population

All patients that had been seen and received treatment with the diagnosis of TMJ ankylosis in the past five years at St Paul's Hospital Millennium Medical College Maxillofacial Unit.

Inclusion criteria

Patients with hypo mobility disorders of Temporomandibular joint.

Exclusion criteria

Patients with hypermobility disorders of Temporomandibular joint.

Sample size determination and sampling procedure

The required minimum sample size for the study will be calculated by using the formula $n = Z^2 p(1-p)/W^2$, taking reasonable estimate of the key proportion to be studied (P) as 50% = 0.5, margin of error to be accepted (W) 5% = 0.05 with level of confidence (Z) at 95%. As value $Z_{.025} = 1.96$ $n = 1.96^2 \times 0.5/0.05 = 384.16$.

However, since it is feasible, all eligible medical cards of the patients who visit Department of Oral and maxillofacial surgery at St. paulos Hospital from January 2011 to December 2015 G.C were included in the study.

Measurements

Age, sex, duration of the ankylosis and location, presence of the pathology, anesthetic technique and type of the surgical managements were considered as independent variables while type of ankylosis as dependent variables.

Data collection

Data was collected using a data collection format prepared by the researcher from which extracted from the study objectives. From medical records of clients treated for TMJ ankylosis in the past 5 years at St Paul's Hospital Millennium Medical College Addis Ababa, Ethiopia. Data will be collected over a 20 days period by 2 data collectors being supervised by 2 supervisors.

The data were collected by dental professional (BDS) with supervision of dental surgeon (DMD). A week prior to the data collection, two session training will be conducted for data collectors as well as supervisors on the quality of data anticipated and the way data from medical records will be retrieved.

Data quality control

The format was pre-tested on similar setting prior to the actual data collection by the data collectors. The necessary adjustments made after the pre-test. At the end of each day, the collected data will be checked by the supervisors for completeness. The principal investigators were blinded to the raw data prior to analysis.

Data processing and analysis

Before analysis data exploration can be done by means of summary of statistics and graphic representation. It is very crucial to see hidden picture of the data particularly refers to checking outliers and handling missing values. A code should be chosen to denote a missing value (e.g. a code '9' or '99'). Missing values should not be entered as a 'blank', because some statistical packages interpret blanks as zero.

The collected data were entered to SPSS version 22.0 windows software computer program for analysis. Incidence Frequency and percentage of the variables were determined. The result will be presented using figures, tables and pictures.

Ethical consideration

Ethical clearance were obtained from Research and Ethical committee of Jimma University and permission were granted from the St Paul's Hospital Millennium Medical College board before the study was conducted. Patient's name not recorded on the checklist to guarantee confidentiality of the information.

Plan for dissemination of the results

The finding of the study will be presented to all concerned bodies such as Jimma University College of health science, school of Dentistry.

The pertinent finding will also be shared with the St Paul's Hospital Millennium Medical College. Effort will be made to publish the finding in peer reviewed journal.

Limitation of the study

As the study was based on secondary data, the required information might not be complete.

Operational definition

Otitis media a process in which the middle ear shows the signs and symptoms of acute inflammation.

Osteomyelitis an acute or chronic inflammatory process of the bone and its structures secondary to infection with pyogenic organisms.

Cancrum oris is a rapidly progressive, polymicrobial, often gangrenous infection of the mouth.

Ankylosing spondylitis is a chronic, multisystem inflammatory disorder primarily involving the sacroiliac (SI) joints and the axial skeleton.

Rheumatoid arthritis a chronic systemic inflammatory disease of unknown cause. An external trigger (e.g. cigarette smoking, infection, or trauma) that triggers an autoimmune reaction, leading to synovial hypertrophy and chronic joint inflammation along with the potential for extra-articular manifestations.

Psoriasis is a complex, chronic, multifactorial, inflammatory disease that involves hyperproliferation of the keratinocytes in the epidermis, with an increase in the epidermal cell turnover rate.

Intra-articular meaning within into a joint space.

Extra-articular meaning outside the joint space.

Unilateral meaning occurring on, performed on, or affecting one side of the body or one of its parts.

Bilateral refers to both sides of the body, or two of something.

Local Anesthesia is the temporary loss of sensation or pain in one part of the body produced by a topically applied or injected agent without depressing the level of consciousness.

Conscious sedation is a combination of medicines to help you relax (a sedative) and to block pain (an anesthetic) during a medical or dental procedure. You will probably stay awake but may not be able to speak.

Nasotracheal intubation is performed in patients undergoing maxillofacial surgery or dental procedures or when orotracheal intubation is not feasible (e.g., patients with limited mouth opening).

Tracheostomy is an incision in the windpipe made to relieve an obstruction to breathing.

Gap arthroplasty the surgical correction of ankylosis by creating a space between the ankylosed part of a joint and the portion for which movement is desired.

Interpositional arthroplasty form of arthroplasty with interposition of some other tissue like skin, muscle or tendon to keep inflammatory surfaces apart or excisional arthroplasty in which the joint surface and bone was removed leaving scar tissue to fill in the gap.

Costochondral grafts is replacement of the mandibular condyle was first described by Gilles in 1920.

Clavicle is two slender bones in humans that extend from the manubrium of the sternum to the acromion of the scapula.

Iliac crest is the superior border of the wing of ilium and the superolateral margin of the greater pelvis.

Metatarsal head is the expanded distal end of a metatarsal bone that articulates with the proximal phalanx of the same digit.

Alloplastic material is biological materials either manufactured completely synthetically, or produced by extensive physical or chemical processing of xenogeneic (not species-related) types of tissue and/or structures

Bleeding is loss of blood from the vascular system, either internally into the body or externally through a natural orifice or break in the skin: to bleed from the mouth.

Infection is an invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body.

Open Bite is lack of occlusion of the front teeth when the jaw is closed normally.

Facial Nerve Injury is a common problem that involves the paralysis of any structures innervated by the facial nerve.

Result

Three hundred eighty four patients extracted from the source population with standard sample size formula. From this fifty eight patients were diagnosed with TMJa between 2011 till 2015. The mean age of this patient series was 21.14 years (range 2-60 years) and the most frequent age group was 10 - 19 years (Table 1 and 2). The incidence of TMJa cases seen at St. paulos Millennium Hospital Medical College from 384 sample patients were 15.1% of cases of different disease affecting Oral maxillofacial regions.

Age group (years)	Frequency	Percentile
0 - 10	7	12.1
11 - 20	29	50
21 - 30	11	19
31 - 40	6	10.3
41 - 50	4	6.9
51 - 60	1	1.7
Total	58	100

Table 1: Age at onset of temporomandibular joint ankylosis in 58 patients.

Variable	Percentage (%)	Mean (Age in year)	SD	Mean (Duration of Ankylosis in year)
Gender				
Male	72.4	21.64	11.726	8.12
Female	27.5	19.81	12.475	6.0

Table 2: Distribution of duration of alkalosis by gender.

Aetiologically, trauma was reported in 49 (84.5%) cases and infection in 4 (6.9%) (Table 3). Bilateral ankylosis was diagnosed in majority of the case 51 (87.9%) patients, while Unilateral TMJa was diagnosed in 7 (12.1%) patients (Table 4).

Three different types of ankylosis were identified: bony ankylosis in 51 (87.9%) patients; fibrous ankylosis in 3 (5.17%) and fibro-osseous ankylosis in 4 (6.89%) patients (Figure 1). One unilateral ankylosis case operated with Local anesthesia while the rest of 57 case operated under general anesthesia (Table 5). The Majority of patients intubation were achieved by tracheostomy 50 (86.2%) and rest with nasotracheal intubation 6 (10.3%) (Table 6). Two patients were not operated for unknown reason.

	Unilateral						Bilateral					
	Interacapsular			Extracapsular			Intracapsular			Extracapsular		
Cause	Bony	Fibrous	Fibro-osseous	Bony	Fibrous	Fibro-osseous	Bony	Fibrous	Fibro-osseous	Bony	Fibrous	Fibro-osseous
Trauma	3						51		4			
Infection Otitis Media					1			3				
Total	3				1		51		4			

Table 4: Cause and type of ankylosis of the mandible in 58 patients.

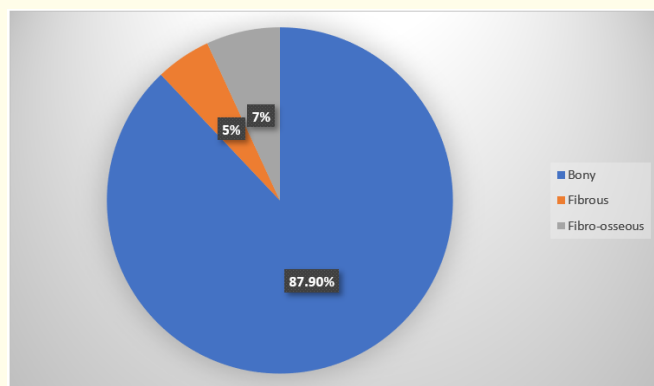


Figure 1: Type of tissues involved for the TMJa.

Type of Anesthesia	Frequency	Percentage (%)
Local Anesthesia	1	1.7
General Anesthesia	55	94.8
Total	56	96.5

Table 5: Type of anesthesia used for 58 TMJa patients.

Type of intubation	Frequency	Percentage (%)
Nasotracheal intubation	5	9.09
Tracheostomy	50	86.2
Total	55	96.6

Table 6: Type of intubation engaged for 58 TMJa patients.

Gap arthroplasty was the main surgical management employed for TMJa without interposition material 41 (70.68%) and with TMF interposition arthroplasty in 15 (25.9%) cases (Table 7).

Surgical Management	Frequency	Percentage (%)
Gap Arthroplasty	41	70.68
Interpositional Arthroplasty	15	25.9
Total	56	96.58

Table 7: Type of Surgical management employed for 58 TMJa patients.

There was three recorded post-operative complication registered which account (5.1%) of all cases. One facial nerve transit paralysis on the right side of the face, signs of re-ankylosis were reported in 1 case within the first 12 months postoperatively and one was anterior open bite.

Discussion

In this study there is wide age range distribution of TMJa from 2 to 60 years, with a mean of 21.14 years and the most frequent age group was 10 - 19 years. In this study there is similarity with previously reported case from Zimbabwe youngest patient was a 1 week old girl with an undisclosed first brachial arch syndrome [35]. The oldest patient was a 60-year-old woman [35]. In our study Men had the highest incidence of ankylosis 42 (72.4%) with male: female ratio of 2.6:1. This study has similar finding with study done in Zimbabwe with a male: female ratio of 1.5:135. But there was different reported from Egypt [34] and Nigeria [1] with 62.4% female over 37.6% male and no overall sex predilection respectively.

In this particular study the main causes of ankylosis of the temporomandibular joint were trauma 54 (93.1%) followed by infection specifically otitis media 4 (6.89%) which is consistent with studies conducted in Zimbabwe trauma and infection were the commonest causes of ankylosis: 50% and 41% (n = 13), respectively [35], in Egypt trauma reported in 92 (84%) while infection less than 1% [34]. However, it is in contrast to a study conducted in Nigeria 35 years ago the main cause of ankylosis was Cancrum Oris 48.7% followed by trauma 30.3%1. In the same country 23 years later the study conducted in 23 patients showed Cancrum Oris account less than 13% while trauma and infection excuse more than 73.9% [14].

In this study the most common location of TMJa was intracapsular TMJa (57) 98.2% which is similar with previously reported series from India 86% [8] and Egypt 70.6% [34]. In the contrary in Nigerian study extra-articular ankylosis was about 3.5 times more common than intracapsular which was predominant in cancrum oris patients [1]. In this particular study three different types of ankylosis were identified: bony ankylosis in 51 (87.9%) patients; fibrous ankylosis in 3 (5.17%) and fibro-osseous ankylosis in 4 (6.89%) patients. This is in line with study done in Egypt bony ankylosis in 77 (71%) patients; fibrous ankylosis in 6 (6%) and fibro-osseous ankylosis in 26 (24%) patients [3], Nigeria bony (60.87%), fibrous 4.34% [1], Zimbabwe bony 71.87%, Fibrous (18.75%) [35].

Current study showed Bilateral ankylosis was far more common than unilateral, accounting for 51 (87.9%) of the cases which is in consistent with Zimbabwe 63% were bilateral TMJa [35]. But this is different from Nigeria Unilateral TMJa 78.2% [14], Egypt 92.1% [34] and India 77% [8].

In this study the techniques used for anesthesia of the patients underwent general anesthesia 55 (94.8%) and only one patient done under local anesthesia for unilateral fibrous ankylosis while two patients were not operated for unknown reasons which is similar with study in Nigeria of the 74 patients who underwent surgery, 69 (93.2%) required general anesthesia; the remaining five (6.8%) were given local anesthesia [1].

The remarkable finding in this study majority of patients intubation achieved with elective tracheostomy 50 (90.9%) fortunately no death was recorded with tracheostomy complication, the only complication documented as result of tracheostomy was Subcutaneous emphysema. The main reason for this decrease complication could be because majority of the patients' extubated from tracheostomy 24 hours after the procedure to decrease risk of tube obstruction. Blind nasal intubation was successful in 5 (9.09%) cases without reported complication. In the contrary study done in Zimbabwe Blind nasotracheal intubation taken the lead 18 (56%) followed by fiberoptic intubation 6 (19%), direct nasal intubation 4 (13%) and Tracheostomy was required in four patients (13%) in whom blind nasotracheal intubation was unsuccessful [35] and study in Nigeria Blind nasotracheal intubation utilized most for 56.7% then direct nasotracheal intubation was achieved in 12 patients (16.2%) because sufficient mouth opening or a large buccal fistula of cancurium oris allowed laryngoscopy [1]. transtracheal ventilation was used successfully in nine cases (12.2%) of ankylosis [1]. The experience in Egypt 85 (85%) patients were successfully intubated blindly under spontaneous respiration with oxygen, nitrous oxide and halothane. The remaining 16 (15%) patients, including all (8%) the bilateral cases, failed blind nasal intubation and were anaesthetized via tracheotomy or fiberoptic intubation [34].

Regarding the surgical technique utilized for the release of TMJa of 56 patients who underwent surgery 41 (70.68%) undergo Gap arthroplasty followed by 15 (25.9%) TMF (temporomaxillary flap) interpositional arthroplasty as previously explained two patients were not operated for unknown reasons which is consistent with in study done Zimbabwe 29 (91%) went for gap arthroplasty and 3 (9%) silastic implants as interpositional arthroplasty [35] and in Nigeria 77.7% used gap arthroplasty, 22.3% different type of Interpositional arthroplasty exploited from this 2 (2.6%) reconstruct the joint with costochondral graft [1]. In contrary Egyptian experience CCG was mainly used in growing patients to reconstruct the ramus joint complex. It was employed without

interpositional material in 20 (18%) cases, combined with TMF interposition in 15 (14%) cases, buccal fat interposition in 9 (8%) cases and retained autogenous disc in 1 (10%) cases. Unilab Surgibone implants were used to reconstruct the vertical ramus and angle of the mandible without interpositional material in another 11 cases (10%) [34]. Gap arthroplasty was employed without interposition material in 11 adult cases (10%) and with TMF interposition in 14 (13%) cases. The resected elongated coronoid process was employed to act as a condyle with TMF interposition in 8 (7%) cases. A technique of intraoral distraction osteogenesis, modified by Sadakah, *et al.* [32], was employed in 11 (10%) cases to correct the mandibular deformity and maxillary canting. This was followed by TMF interpositional gap arthroplasty. Transosseous stainless-steel wires, screws or bone plates were used to fix the bone graft to the ramus of the mandible in 20 (18%), 45 (41%) and 8 (7%) cases, respectively. Despite the absence of the TMJ condyle, most patients had a functioning articulation with an adequate range of mandibular movement, regardless of the surgical technique used [34].

In this study the intra and post-operative TMJa complications were three cases (5.1%) reported one left transient facial nerve weakness, one case of reankylosis reported after one year post-operatively and one case of anterior open bite reported. Because of the lack of documentation it is not visible compare with other finds. While study conducted in Egypt Intra- and postoperative complications were encountered in 36 (33%) cases [34]. The two most frequent complications were intra-operative bleeding (6 cases, 6%) and postoperative transient facial nerve weakness (12 cases, 10%). Such complications were usually controlled locally and conservatively. Signs of re-ankylosis were reported in 5 (5%) cases within the first 3 months postoperatively. Infection, due to looseness of the hardware and unknown causes, was diagnosed in 5 (5%) cases within the first 3 - 8 weeks postoperatively [34]. Study from Zimbabwe Moderate surgical wound infections developed in four cases (12.5%) patients, re-ankylosis occurring in six patients (9%) within 6 months of initial release [35].

Conclusion

From the current study, the authors summarize and conclude that early release of TMJa, reconstruction of the ramus height with distraction osteogenesis or bone grafting combined with interpositional arthroplasty, followed by vigorous physiotherapy is a successful strategy for the management of TMJa.

Ankylosis of the TMJ is distressing because it compromises function and the facial deformity has an adverse psychological effect on the child. There is a need for a concerted effort among healthcare providers to institute preventive measures including adequate treatment of infections and early treatment of maxillofacial injuries. The only truly effective way to prevent “the face of poverty” is to improve the economic position of the poorest of the poor throughout the world.

Recommendation

The health care professionals should be aware of public health significance of any trauma to maxillofacial region and referral to oral and maxillofacial surgeons following diagnosis using the standard detection method is strongly recommended in order to get early management.

Data compilation, reporting and keeping should be emphasized by SPHMMC recording unit to improve patient management and to take lessens and to manage resources appropriately.

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Annex

Check List

College of health sciences department of Dentistry, Oral and Maxillofacial surgery, Jimma University, Jimma Ethiopia.

Data Collection Format for research on Incidence, clinical presentation and surgical management of Temporomandibular joint Ankylosis: A 5 year Retrospective study January 2011 to January 2016.

Date _____

Code number _____

Ser. N ^o	Information to be filled	Proposed response		Coded response
	Age			
	Sex	1. Male		
		2. Female		
	Etiology of TMJ Ankylosis	Trauma		
		Infection	Otitis Media	
			Osteomyelitis	
			Cancrum oris	
		Systemic diseases	Ankylosing spondylitis Rheumatoid arthritis Psoriasis Neoplasm	
	Classification	Intracapsular		
		Extrarticular		
		Bony		
		Fibrous		
		Fibro-osseous		
		Unilateral		
		Bilateral		
	Type Anesthesia	General anesthesia		
		Local anesthesia		

	Method of intubation	Nasotracheal		
		Tracheostomy		
	Surgical Management	Gap arthroplasty		
		Interpositional arthroplasty		
		Osteotomy and excision of the ankylotic mass within the TMJ		
	Reconstruction of the ramus and condyle	Costochondral grafts		
		Grafts using fibula		
		• Clavicle • Iliac crest • Metatarsal head • Alloplastic material		
		Intra Operative Bleeding		
	Complications	Post-Operative		
		Infection		
		Open Bite		
		Facial Nerve Injury		

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