

# Temporomandibular Joint Ankylosis in a Nigerian Teaching Hospital

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## ABSTRACT

Twenty-six patients (12 males and 14 females) between two days and 41 years old with temporomandibular joint ankylosis were retrospectively reviewed. Thirty-three joints were involved; 19 unilateral and six bilateral. The aetiologies were trauma, 69.2%; infection, 15.4%; unknown, 11.5% and congenital, 3.9%. The majority, 31 were intracapsular while the remaining two joints were extracapsular. 51.6% were limited to the condyle, 32.2% extended to the coronoid process and the zygomatic, 9.7% extended to the sigmoid notch while the remaining 6.5% had maxillomandibular fusion. Tracheostomy (48%) was the most common mode of intubation. Gap arthroplasty was carried out in 20 joints while 11 joints had interposition arthroplasty. Postoperative complications were seven anterior open bite, three facial nerve weakness, three infections and two recurrences.

**Keywords:** Ankylosis, arthroplasty, tracheostomy, temporomandibular joint

## Anquilosis de la Articulación Temporomandibular en un Hospital Docente de Nigeria

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## RESUMEN

Veintiséis pacientes (12 varones y 14 hembras) entre dos días de nacidos y 41 años de edad que presentaban anquilosis de la articulación, fueron objeto de un examen retrospectivo. El examen abarcó el estudio de treinta y tres articulaciones – 19 unilaterales y seis bilaterales. Las etiologías fueron traumas (69.2%), infecciones (15.4%), causas desconocidas (11.5%) y causas congénitas (3.9%). La mayoría – 31 en total – fueron intracapsulares, en tanto que las otras dos restantes fueron extracapsulares. El 51.6% estuvieron limitadas al cóndilo, 32.2% se extendían al proceso coronoides y el cigomático, 9.7% se extendían hasta la escotadura sigmoidea, mientras que el restante 6.5% presentaba fusión maxilomandibular. La traqueotomía (48%) fue el modo de entubación más común. La artroplastia de intervalo se llevó a cabo en 20 articulaciones, mientras que 11 articulaciones tuvieron artroplastia de interposición. Las complicaciones post-operatorias fueron siete casos de mordida abierta anterior, tres casos de debilidad del nervio facial, tres infecciones, y dos recurrencias.

**Palabras claves:** Anquilosis, artroplastia, traqueotomía, articulación temporomandibular

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## INTRODUCTION

Temporomandibular joint ankylosis is an affliction that occasions much misery for the unfortunate victim, interfering with mastication and digestion of food denying the body the

benefit of a balanced diet and preventing participation in the pleasures traditionally associated with culinary arts (1). Kazanjian (2) classified temporomandibular joint ankylosis as either true or false. True ankylosis results in osseous or fibrous adhesion between the surfaces of the joint and false ankylosis results from disease not directly related to the joint. Rowe (1) classified it based on the location, intra- or extra-articular, type of tissue involved, bony, fibrous or fibro-osseous, and the extent of fusion: complete or incomplete. The aetiology of temporomandibular joint ankylosis includes trauma, infection, forceps delivery and rarely congenital (1–9).

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The ankylotic patient usually present with facial deformity, retrognathic and hypoplastic mandible, class II dental relationship, impairment of speech, difficulty in mastication, poor oral hygiene, obstructive sleep apnoea, a shift of the mandibular midline to the affected side in the unilateral cases and in the bilateral cases, it produces the typical bird face appearance (1, 8, 10, 11).

The surgical treatment remains a challenge to both the patient and the surgical team. Many surgical techniques have been practiced with no general consensus. This basically consists of gap or interpositional arthroplasty (9, 11–15). Recurrence is a major problem that occurs following the release of temporomandibular joint ankylosis (16).

In the developed world, the advances in the management of otitis media, osteomyelitis, cancrum oris and condylar fractures has greatly reduced the incidence of ankylosis to case reports and series (8, 17). In this environment, the presence of cancrum oris and poor management of condylar fractures coupled with scarce resources and facilities has made the condition persistent. When temporomandibular joint ankylosis has occurred, advances in anaesthetic techniques and treatment procedure give patients in developed centres a better outcome. However, management of these patients in this environment remains a daunting challenge as a result of scarce resources and poor facilities in hospitals in developing countries.

The purpose of this paper is to analyse 26 patients with temporomandibular joint ankylosis and the problems related to management.

## SUBJECTS AND METHOD

The files of the Oral and Maxillofacial Unit, Ahmadu Bello University Teaching Hospital, Kaduna, were reviewed from January 2000 to December 2008 and all cases with the diagnosis of temporomandibular joint ankylosis were retrieved. Information regarding aetiology, gender and age of patients, tissue type and type of ankylosis, mode of anaesthesia, surgical procedure and follow-up complications were obtained from the patients' records and then analysed using Microsoft Excel 2007.

## RESULTS

During the 9-year period, there were 26 patients: 12 males and 14 females, a male: female ratio of 1 to 1.6 with 19 unilateral and seven bilateral joints giving a total of 33 joint ankylosis. The aetiologies were trauma 18 (69.2%), infection 4 (15.4%), unknown 3 (11.5%) and congenital 1 [3.9%] (Table 1). The age range at presentation was from two days to 41 years with a mean of  $14.9 \pm 9.1$  years. The majority, 11 (42%), were in the second decade of life.

There were 31 intracapsular and two extracapsular ankylosis. Based on the tissue type of ankylosis, the majority, 23 were bony, two fibrous and eight fibrous. With regards to staging of the bony and fibrous ankylosis, 16 (51.6%) were limited to the condyle, 10 (32.2%) had exten-

Table 1: Aetiology and sex distribution of 26 patients with temporomandibular joint ankylosis

| Aetiology    | No (%)          | Gender    |           |
|--------------|-----------------|-----------|-----------|
|              |                 | Male      | Female    |
| Trauma       | 18 (69.2)       | 10        | 8         |
| Infection    |                 |           |           |
| Otitis media | 2 (7.7)         | 1         | 2         |
| Cancrum oris | 3 (11.5)        |           | 2         |
| Unknown      | 2 (7.7)         |           | 2         |
| Congenital   | 1 (3.9)         | 1         |           |
| <b>Total</b> | <b>26 (100)</b> | <b>12</b> | <b>14</b> |

sion into the coronoid process and part of the zygomatic arch, 3 (9.7%) had ankylotic bone extending to the sigmoid notch while the remaining 2 (6.5%) had maxillomandibular involvement with scar tissues due to postcancrum oris defect (Table 2). The mode of anaesthesia of 25 patients were

Table 2: Features associated with temporomandibular joint ankylosis

| Side of ankylosis   | No of patients | %            |
|---|----------------|--------------|
| Left  | 7              | 26.9         |
| Right   | 12             | 46.2         |
| Bilateral   | 7              | 26.9         |
| <b>Total</b>  | <b>26</b>      | <b>100.0</b> |
| Type of ankylosis   |                |              |
| Bony  | 23             | 69.7         |
| Fibro-osseous   | 8              | 24.2         |
| Fibrous   | 2              | 6.1          |
| <b>Total</b>  | <b>33</b>      | <b>100.0</b> |
| Stage of bony/fibro-osseous ankylosis                                 |                |              |
| Ankylotic bone limited to condyle                                     | 16             | 51.6         |
| Ankylotic bone extending to Sigmoid notch                             | 3              | 9.7          |
| Ankylotic bone extending to the coronoid Process and part of the arch | 10             | 32.2         |
| Ankylosis involving the maxilla and mandibular Bones                  | 2              | 6.5          |
| <b>Total</b>  | <b>31</b>      | <b>100.0</b> |

tracheostomy 12 (48%), blind nasal 6 (24%) and fiberoptic laryngoscopy 7 [28%] (Table 3).

Table 4 shows the various surgical procedures employed in the treatment of 31 joint ankylosis in 25 patients; the single congenital case in this study was not operated on. Gap arthroplasty was done in 20 joints while 11 joints had interposition arthroplasty. Interposition materials used were seven pterygomasseteric slings, three auricular cartilage and

Table 3: Mode of intubation of 25 patients

|              | No        | %          |
|--------------|-----------|------------|
| Blind        | 6         | 24         |
| Fibre-optic  | 12        | 48         |
| Tracheostomy | 7         | 28         |
| <b>Total</b> | <b>26</b> | <b>100</b> |

Table 4: Surgical procedures on 31 joints

| Surgical procedure                                      | Number    |
|---|-----------|
| Bilateral condylectomy                                  | 4         |
| Condylectomy + angle ostectomy                          | 8         |
| Condylectomy  | 4         |
| Condylectomy + excision of bone<br>In the sigmoid notch | 3         |
| Angle ostectomy   | 10        |
| Body ostectomy + excision of fibrous band               | 2         |
| <b>Total</b>  | <b>31</b> |

one skin. Postoperatively, there were seven anterior open bites, three facial nerve weakness, three infections and recurrence in two patients.

## DISCUSSION

Because of the advances in the management of condylar fractures and infective conditions in the developed world, the incidence of ankylosis is declining and now is limited to only case reports or series (8, 17, 18). This study showed 33 joint ankylosis from 26 patients within a period of nine years. The most common causes of temporomandibular joint ankylosis are trauma (4, 9, 19, 20), infection (9, 21) and rarely congenital (6–8). In line with global reports (4, 16), this study found trauma to be the leading causative factor. The aetiologies in this study contrast with those documented by Topazian (20) who found that 43% were due to infection, 38.6% followed trauma and only 2.6% was due to “congenital factors”. The high incidence resulting from trauma is attributable to poor management of condylar fractures, while most of the infective conditions were due to cancrum oris. Otitis media (2.7%) occurring in children is usually as a result of spread of infection from the middle ear canal to the adjacent glenoid fossa/condylar region coupled with poor management of the initial condition. Some authors (17) have also reported similar incidence of otitis media, as an aetiology of temporomandibular ankylosis, in children in the developed country with no documentation of cancrum oris. Congenital ankylosis should be differentiated from ankylosis following birth trauma or forceps delivery (7, 22). As at 2008, Ajike *et al* (22) acknowledged the report of only 29 cases of congenital ankylosis in the English literature. Ankylosis following forceps delivery could not be elicited

from any patient in the present study; they were probably recorded under trauma, if any.

The reported age distribution in some studies ranges from 2 to 63 years (8, 23) with the majority being in the 2<sup>nd</sup> decade of life (16, 23). The youngest patient in the present study was two days old while the oldest was 31 years old. However, the age at onset is usually lower than the age at presentation as in most cases ankylosis develops over a period of time. The age range in this report is in line with the global report but contrasts with a previous report from this centre by Adekeye (16). The majority were in the 2<sup>nd</sup> decade of life which is the most active period during which the patients are most susceptible to trauma; particularly, falls from heights which was the most common aetiology in this study.

Airway management of ankylotic patients is a major challenge to the anaesthesiologists particularly in the African third world setting because of lack of skilled personnel and modern anaesthetic facility like the fiberoptic laryngoscope. Various ways of securing the airway include transtracheal ventilation (16, 24), blind nasal intubation (6, 16, 25), illuminator wand (26), retrograde intubation (27), binasopharyngeal airway system (27, 28) and tracheostomy (4). A more recent and advanced technique is the use of fibre-optic laryngoscope (17, 29, 30). All these procedures have their own advantages and disadvantages (25); however the guided fibre-optic laryngoscope offers the safest method of securing the airway (29). Despite the availability of the fibre-optic laryngoscope in our centre since 1995, the majority (46.2%) of our patients were tracheostomized, following failure at intubation with the use of the fibre-optic laryngoscope. It is our practice to close the stoma immediately after the surgical procedure. We have found tracheostomy to be safe in our environment. In an earlier report from this centre by Adekeye (16), the mode of anaesthesia was by blind and transtracheal ventilation whereas Ugboko *et al* (4) reported 30% with tracheostomy.

The surgical objectives (31) of treatment of temporomandibular joint ankylosis are a) establishment of joint movements and functions, b) prevention of relapse, c) restoration of appearance and occlusion and d) achievement of normal growth. To actualize these objectives, Kaban *et al* (11) proposed a protocol of treatment modalities which are a) aggressive resection of ankylotic segment, b) ipsilateral coronoidectomy, c) contralateral coronoidectomy when necessary, d) lining of the joint with temporalis fascia or cartilage, e) reconstruction of the ramus with costochondral graft, f) rigid fixation of the graft, and g) early mobilization with aggressive physiotherapy. While Laskin (32) believes that early surgery, maintenance of ramus height, institution of early postoperative jaw exercise and prevention of recurrence reduces the severity of facial deformity. In our study, the protocol was surgical resection of ankylotic bone and ipsilateral coronoidectomy when necessary, with early,

aggressive immobilization of the created joint for 24-hours postoperatively.

The type and stage of the ankylosis (Table 2) influenced the surgical modality employed in this study. Fibrous ankylosis had simple excision of fibrous band and body ostectomy, while the fibro-osseous – bony ankylosis had various surgical modalities (Table 4). Ankylosis extending to the sigmoid notch, zygomatic bone, were wide and very extensive. Surgical procedures employed are either the gap or interposition arthroplasty with no general consensus. While some authors (33) believe that gap arthroplasty is of limited value in the treatment of ankylosis, our experience has found this to be very useful with good outcome reduction in the surgical duration and less risk of blood transfusion. Ugboko *et al* (4) and Adekeye (16) have also reported a very good outcome following gap arthroplasty. Some authors (14, 21) have documented a high incidence of re-ankylosis following gap arthroplasty in comparison to interposition arthroplasty. Topazian (14) found 53% incidence of ankylosis following gap arthroplasty while Popescu and Vasiliu (21) recorded a 1000%. Several factors implicated in re-ankylosis include inadequate gap, inadequate mobilization postoperatively, infection and trauma. Some authors (9) agree that interposition arthroplasty reduces the rate of re-ankylosis, however, opinion differs on the exact tissue type to be used while some investigators (11) believe that irrespective of the extent or surgical technique employed, re-ankylosis is the most common complication. In our study, there were 2 (0.08%) patients with recurrent ankylosis, all following gap arthroplasty in young children. This is probably as a result of the extent of ostectomy done/bone removed combined with the use of mouth screw exercise 24 hours postoperatively. The reason for the recurrence of ankylosis in this study particularly in children was due to poor compliance with jaw exercise because of pain. There is controversy about the minimal width of the gap. In this study, the gap was between 2.5 to 3.0 cm with the commencement of active jaw exercise 24 hours postoperatively in accordance with the recommendation of gaps of 1.5 to 2.5 cm by Topazian (14), Silver *et al* (34) and Roychoudury (35), with active jaw opening exercise. In our centre, the minimal gap we strived to achieve was 2.5 cm, because of the non-compliance with jaw exercises postoperatively and particularly in young patients where the osteogenetic potentials are high postoperatively. According to Kaban (11), the advantages of gap arthroplasty are its simplicity and short operating time while its disadvantages are the creation of a pseudoarticulation, failure to remove all bony pathologies, increased risk of ankylosis and the reduction of ramus height. In this study, gap arthroplasty was the most common surgical procedure. This was also the most common procedure recorded by Ugboko *et al* (4).

Interposition materials used include: the autogenous/biologic materials, muscles, cartilage, dermal grafts (30), fascia lata, and costochondral graft (8, 12, 16, 17, 21, 23, 36,

37, 38, 39, 40, 41) and alloplastic/non-biologic materials: titanium foil and plate, vitallium plate, gold plate, oxycel, gutta-percha, silicones and teflon sheets (15, 42, 43, 44, 45). The non-biocompatibility of the alloplastic materials, risk of infection and extrusion, foreign body reaction limits its use (42). Most authors (11, 17, 23, 36, 38) have favoured the costochondral graft, apart from its biologic activity and similarity to the mandibular condyle, the graft provides a growth potential while also maintaining the ramus height in children and in adults, it prevents jaw deviation and open bite in bilateral cases, however it provides a second surgical site for the patient. In this study, autogenous (pterygomasseteric sling, auricular cartilage and skin) materials were used. More recently, distraction osteogenesis (46, 47) is employed to correct mandibular or facial asymmetry.

The nearer the site of surgery to the original joint the better the function, however, the greater the likelihood of recurrence (31). These materials are believed to prevent re-ankylosis. Regardless of the surgical technique, the principles of treatment are as outlined.

Anterior open bite, seven (28%) of the 25 operated patients, was the most common complication encountered in this study. This resulted from bilateral condylectomy. Following condylectomy there is usually loss of height in the vertical ramus and a change of fulcrum from the ramus to the most posterior part of the mandible (9), shift in the position of the posterior teeth and also the change in the lever action of the mandible from class 3 to a class 1 type (48, 49). Rowe (31) believes that this is because the muscle function is limited to the pterygomasseteric sling and the depressor group of muscles. The interposition of materials usually reduce the anterior open bite (11, 31, 32), we have tried to practice a combination of condylectomy and angle ostectomy to reduce anterior open bite with little or no success. Complication of facial nerve weakness which follows excessive retraction of the soft tissues intra-operatively usually resolve with the administration of steroids (2). In our series, three (12%) of the 25 operated patients who experienced this complication were managed with neurobion followed with complete resolution within three months postoperatively.

In conclusion, ankylosis remains a challenge to the maxillofacial surgeons in the developing world because of poor management of condylar fractures, infections, lack of anaesthesiologists and modern method of intubation.

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