

## ANKYLOSIS OF THE MANDIBLE: ANALYSIS OF 35 CASES SEEN AT KORLE BU TEACHING HOSPITAL

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### SUMMARY

A study of ankylosis of the mandible in 35 Ghanaians is presented. The aetiology, clinical features, radiographic findings, anaesthesia techniques surgical method of treatment, complications and results are discussed. Trauma, especially to the chin, was directly responsible for most of the cases, constituting 62.8 percent of the patients studied. The need for early referral and proper management including supervised jaw exercise to patients suffering trauma to the chin in order to prevent this condition is emphasized. The difficulties encountered in securing the airway are also highlighted. Surgical treatment was required in 30 of the 35 patients while conservative treatment sufficed in 5 patients. The surgical technique used in each case to achieve release depended on the site, extent and type of ankylosis encountered. Of the 21 patients followed up over a six-month period, 14 or (66.6%) of them maintained the inter-incisal distance (IID) achieved at surgery, two (9.5%) of them showed mild but acceptable reductions in the IID. In the remaining five (23.8%) patients, mandibular ankylosis recurred and warranted further surgery.

**Keywords:** Ankylosis, trauma, temporo-mandibular joint, jaw exercise, Korle Bu Teaching Hospital.

### INTRODUCTION

Ankylosis of the mandible is a serious and very disabling condition. It can and often results in disastrous consequences such as complete inability to open the mouth, difficulty to masticate, impairment of speech, poor oral hygiene, fetor oris, facial asymmetry, and mandibular micrognathia. These signs often contribute to the resultant serious physical disability and adverse psychological effect especially on children afflicted with this condition.

The aetiology of temporo-mandibular joint ankylosis stems from several factors. These include inflammatory diseases, trauma, neoplasia, infection, radiation and systemic disease<sup>1</sup>. A few cases of true congenital fusion of the mandible and the maxilla have also been reported in the literature, while the cause of loss of mandibular movement in some cases has so far not yet been identified<sup>2</sup>.

Since the earlier review of 212 cases of ankylosis of the mandible by Blair<sup>3</sup> in 1914, the incidence of the disease in Europe and North America has decreased considerably. This decrease, according to Kennett<sup>4</sup>, is attributable to better understanding and management of condylar fractures and to a decrease in the incidence of otitis media since the advent of antibiotics. However, because of the continued presence of cancrum oris according to Oluwasanmi et al<sup>5</sup>, and scarcity of facilities for the management of facial fractures according to Adekeye<sup>6</sup>, the incidence of ankylosis remains very high in Nigeria.

To the best of our knowledge, no such study has ever been carried out in Ghana. However, the purpose of this paper is to describe our experience with 35 cases of ankylosis of the mandible seen and treated at the Korle Bu Teaching Hospital (KBTH), Accra, Ghana with emphasis being placed on aetiology, clinical features and special difficulties associated with management. It is hoped that this would further increase our understanding of this condition.

### PATIENTS AND METHODS

Over a twelve-year period, from 1989 to 2000 inclusive, a total of 35 patients with ankylosis of the mandible were seen and treated by one us at the Dental department of the KBTH, Accra, Ghana. Most of these patients were studied prospectively

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and followed up over a period of at least 6 months, while the case records, anaesthetic charts and x-ray of the remaining few were reviewed. The patients in this study include all the 35 cases seen and treated over the period.

All the patients were Ghanaian Africans. With the exception of two patients referred from the Northern Region, the rest were all from the Southern part of Ghana. Among the data recorded were ages at onset of limitation in jaw movement, the time of presentation for treatment, sex, precipitating factors, clinical features, radiographic findings surgical method of treatment, complications and results.

**RESULTS**

Distribution according to sex and age

Overall, there was no particular sex predilection. As shown in Table 1, 16 or 46% of the patients were male while 19 or 54% were female, giving a male to female sex ratio of 5 : 6.

**Table 1** Age and sex distribution of the study sample at presentation

Age range (years)	Males	Fe-males	Both sexes	Percentage
0-5	3	5	8	22.9
6-10	3	4	7	20
11-20	3	5	8	22.9
21-30	4	2	6	17.1
31-40	2	2	4	11.4
41-50	1	1	2	5.6
<b>All ages</b>	<b>16</b>	<b>19</b>	<b>35</b>	<b>99.9</b>

Table 1 shows the ages at the time of presenting the disease for treatment; while table 2 shows the ages at the time of onset of ankylosis. The disease predominantly affects children. Of the 35 patients, 24 or 68.6% occurred in children ten years or below. The youngest patient was a two-year-old child who presented with the disease as a sequel to cancrum oris. The oldest patient was 47 years old.

**Table 2** Age at onset of ankylosis of the mandible

Age group in years	Number	Percentage
0-5	10	28.6
6-10	14	40
11-20	4	11.4
21-30	3	8.6
31-40	2	5.7
41-50	2	5.7
<b>Total</b>	<b>25</b>	<b>100</b>

**Precipitating factors of the ankylosis**

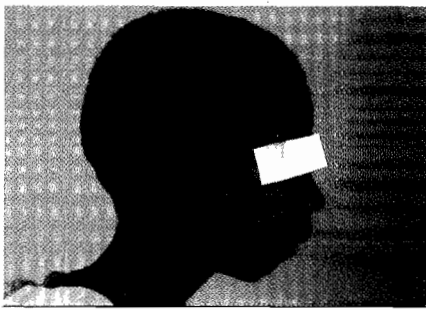
**Table 3** Causes of ankylosis of the mandible

Aetiology	Male	Female	Total	%
Trauma	8	14	22	62.8
Cancrum oris	2	3	5	14.3
Osteomyelitis	3	0	3	8.6
Burkitt's lymphoma	1	-	1	2.8
Radiation treatment	2	2	4	11.4
<b>Total</b>	<b>16</b>	<b>19</b>	<b>35</b>	<b>99.9</b>

Table 3 shows the aetiological factors recorded in this study. Trauma, especially to the chin, was directly responsible for most of the cases, constituting 62.8% of the patients studied. Even though there was only a little difference between both sexes in terms of distribution of the disease, trauma accounted for ankylosis in almost twice as many females as in males. Extra-articular lesions were more common in males while females were more frequently affected by intracapsular ankylosis. Infection constituted 22.9%. Of this 14.3% was due to cancrum oris, and 8.6% was due to osteomyelitis. Ankylosis resulting indirectly from neoplasm or effects of its treatment with radiation constituted 14.2%. Burkitt's lymphoma, occurred in one patient or 2.8% of the study sample and was least responsible for ankylosis of the mandible.

**Clinical features**

The clinical features observed, largely duplicates those found in other studies. Majority of the patients could not open their mouths at all, even though in some cases a little movement could be felt in one or both temporo-mandibular joints on palpation. The rest had varying degrees of mouth opening, though very minimal. Speech was rarely difficult for most of them. Poor oral hygiene, generalised gingivitis and periodontitis, significant presence of calculi and fetor oris were present in varying degrees in all the patients. Facial asymmetry was common in most of them. Where unilateral intracapsular ankylosis began in early childhood, there was deviation of the chin point or midline towards the affected side as a result of unilateral growth of the unaffected side and stagnation of growth of the affected side of the mandible. The typical "bird face" deformity where the mandible appeared diminutive and receded was observed in the patients in whom bilateral intracapsular ankylosis begun at an early age (Figure 1). The incisor teeth in both jaws were often splayed in these patients as result of pressure from the tongue.



**Figure 1** Profile of a patient with early onset of bilateral intracapsular ankylosis, showing the typical "Bird Face" deformity

Significantly, in almost all the patients in whom there was intracapsular ankylosis, a linear scar was observed on the chin, implying severe trauma to that region, as shown in figures 2,3, & 4.



**Figure 2** Post-operative portrait of same patient in fig. 1, showing a linear "Tell-tale" scar at the tip of the chin



**Figure 3** Photograph of a case of bilateral intracapsular ankylosis (post-operative), showing a linear keloid on the chin



**Figure 4** Photograph of a case of short-standing intracapsular ankylosis (pre-operative), showing a limited mouth opening and an obvious linear scar on the chin



**Figure 5** Profile view of a child with post-cancerum oris defect resulting in extra-articular ankylosis and gross destruction of the entire right maxilla and surrounding soft tissue.



**Figure 6** Photograph (post-operative) of a case of extra-articular ankylosis from cancerum oris, showing the typical position of fibrous scar, and destruction of the maxilla

Bone destruction by osteomyelitis leading to facial deformity was observed in some patients. Very little or no deformity was seen in some patients especially where ankylosis begun after the completion of mandibular growth (Figure 4).

**Radiographic findings**

These varied according to the nature and cause of the disease. Intracapsular cases showed varying degrees of flattening or enlargement of the heads of the affected condyles and loss or complete absence of joint space (Figure 7).



**Figure 7** Radiograph of intracapsular bony ankylosis of the mandible, due to trauma, showing flattening of the condylar head and virtual loss of joint space. The ascending ramus appears diminutive and widened

The condylar heads of the contra lateral sides, in some cases, appeared normal in size and shape mostly but with varying degrees of narrowing of the joint space. The ascending ramus appeared diminutive and widened on the affected side in unilateral intracapsular cases and exaggerated on the contra lateral side. There were varying degrees of bone destructions and fusions of both the mandible and maxilla, and in some cases the zygomatic bone and arc in extra articular cases. The joints appeared mostly normal in short standing cases of extra articular ankylosis.

**Anaesthetic techniques**

**Table 5** Anaesthetic techniques in 30 cases of ankylosis of the mandible

Anaesthetic technique	Number	Percentage
Direct intubation	4	13.3
Laryngeal mask	1	3.3
Blind intubation	3	10
Face mask	3	10
Tracheostomy	4	13.3
Fibrescope	15	50
<b>Total</b>	<b>30</b>	<b>99.9</b>

Ankylosis of the mandible, especially if complete, is considered a case of expected difficult intubation. The facial deformity and poor oral hygiene compound the problem. All the thirty patients surgically treated required general anaesthesia and the

Generally, intubation was quite difficult. Direct naso-tracheal intubation was achieved in 13.3% of patients with incomplete ankylosis because there was sufficient mouth opening to allow laryngoscopy. In one (3.3%) other case of unilateral incomplete ankylosis, a laryngeal mask was successfully used.

In many of the cases studied, where laryngoscopy was impossible, the initial method used was blind nasal intubation. This technique was employed in 7 patients and was successful in three (10%) patients, after several attempts. In three selected patients (10%) where blind intubation failed, a face mask was used to enable the surgeon to do 'a release' and achieve some degree of mouth opening before intubation was carried out. Elective tracheostomy was carried out in 4 (13.3%) patients in one of whom blind intubation was unsuccessful earlier. During the latter part of the study, intubation was assisted by the use of a fibroscope.

**Surgical treatment**

Table 6 gives a summary of the treatment modalities used. Surgery was employed in the treatment of 30 out of the 35 patients studied, while in the remaining five patients, conservative rather than surgical treatment was used. The surgical technique used in the 30 patients requiring surgery varied depending on the extent and type of ankylosis encountered.

**Table 6** Treatment employed in 35 patients with ankylosis of the mandible

Method	No	%
Condylectomy	2	5.7
Bilateral condylectomy	14	40
Block ostectomy of upper portion of horizontal ramus from maxilla and zygomatic arc	3	8.6
Combined condylectomy and coronoidectomy	2	5.7
Sectioning of horizontal ramus by block bone removal and excision of fibrous bands and scar tissue	5	14.3
Excision of fibrous band tissue attachment between mandibular angle and the buttress of zygomatic bone	2	5.7
Excision of fibrous band and insertion of deltopectoral flap	2	5.7
Conservative treatment by supervised jaw exercise	5	14.3
<b>Total</b>	<b>35</b>	<b>100</b>

anaesthesia techniques used for them are shown in Table 5.

Condylectomy, unilateral, bilateral or combined with coronoidectomy was employed in the treatment of 18 or 60 percent of the 30 patients. In

these cases, the ankylosis was bony in nature, and confined to the intracapsular region in 16 cases. Access to the temporo-mandibular joint region was gained via a pre-auricular approach. Excision of the condylar head was then carried out leaving a wide gap between the points of excision on the neck of the condyle and the glenoid fossa. Regenerated oxidised cellulose was then packed into the gap created and the wound closed in layers after achieving haemostasis. In two (2) cases where the ankylosis extended beyond the intracapsular region to involve the coronoid process or the zygoma, condylectomy was combined with coronoidectomy via the intra oral route to achieve release.

Through a pre-auricular incision, the horizontal ramus was sectioned by black bone removal and fibrous bands removed from beneath the buttress of the zygoma and the mandibular body or angle regions in five (5) cases. In two (2) cases detachment of fibrous bands linking the body and angle region of the mandible to the maxillary tuberosity region via an intra oral approach was all that was required to achieve release. In two cases of extra-articular ankylosis stemming from cancrum oris, there was gross destruction of the entire cheek on one side resulting in a large oro-facial fistula and scarification linking the mandible to the maxilla. In these cases, all the fibrous tissue was excised to achieve release and the fistula closed by direct insertion of delto-pectoral flaps.

#### **Conservative treatment**

Five of the 35 patients studied were conservatively managed by supervised jaw exercises rather than surgery. One of the five patients, a young male acquired the disease as a result of trauma to the chin from a fall. The intracapsular ankylosis ensuing was not consolidated. After a series of supervised jaw exercises using a pack of wooden spatulas, his inter-incisal distance improved from 2cm at the time of presentation, to an acceptable level of 5cm. In the other 4 cases where no surgery was employed, the disease was as a result of radiation treatment following oral malignancy. The ankylosis was extra-articular and the inter-incisal distance improved from approximately 1 cm at the time of presentation; to about 3cm following a series of supervised jaw exercises. In both patients surgery was not deemed appropriate in view of the underlying medical conditions they presented with.

#### **Complications**

No serious complications were encountered in the study. In a few cases surgery was postponed as a result of substantial nasal bleeding following at-

tempts at blind nasal intubation. Temporary facial weakness was observed in two patients post operatively but soon cleared up by the tenth day in each case. Anterior open bite was observed in one patient but spot grinding of her posterior teeth easily restored the bite. Frey's syndrome which sometimes complicates pre-auricular incisions was not observed or reported by any patient postoperatively.

#### **Results of treatment**

Acceptable inter-incisal distances of between 3cm and 5cm were achieved in all the cases surgically treated. A mouth gag was left in place to maintain the interincisal opening for 24 hours after every surgery. Active mouth-opening exercise, using either a pack of wooden spatulas or Ferguson's mouth gag, commenced thereafter at a rate of three to four times daily. The patients, or in the case of children, their parents, were then taught how to continue with the exercise, at home, using either a wooden screw or spatulas, prior to their discharge from the wards.

#### **Follow-up reviews**

All the 30 patients surgically treated reported for reviews at the outpatient department during the first two weeks following their discharge from the wards. However, 9 patients absconded thereafter and the remaining 21 patients attended the outpatient department haphazardly over a period of at least 6 months. Recorded data of the 21 patients showed that in 14 (66.6%) of them, the inter-incisal distance achieved at surgery was either maintained or even slightly improved. About two (9.5%) of them showed mild but acceptable reductions in the surgically attained levels of inter-incisal distances. In the remaining 23.8% of patients, mandibular ankylosis recurred and warranted further surgery.

#### **DISCUSSION**

Trauma and infection according to earlier researchers are the main aetiological factors for temporo-mandibular joint ankylosis. Estimates of trauma as a cause of ankylosis by earlier researchers according to Adekeye<sup>7</sup> range from 26% to 75%, while the frequency of infection as a cause of ankylosis ranges from 44% to 68%. In a similar study to ours carried out more recently in Nigeria by Adekeye<sup>7</sup>, infection resulting in cancrum oris, osteomyelitis, and ulcerative gingivitis was directly responsible for ankylosis in 57.9%, trauma was next (30.3%), and unknown causes were responsible for 11.85% of his cases.

In this study, trauma was the principal cause of ankylosis, accounting for 62.8% of the patients studied. Infection as a cause was found in 22.9%, with neoplasm or the effects of its treatment accounting for 14.2% of the patients studied. These findings compare favourably with those of earlier researchers cited by Adekeye<sup>7</sup>, but deviate markedly from his own figures where infection rather than trauma was the principal cause of ankylosis. The remarkable revelation in this study, regarding trauma as a causative factor in mandibular ankylosis, however, is the observation that, regardless of the size, there was always a linear scar right on the chin, as shown in figures 2, 3 and 4, in almost all the trauma inflicted patients resulting in intracapsular ankylosis. The significance of this is that, the possibility of mandibular ankylosis must always be entertained in dealing with patients presenting with direct traumatic injuries to the chin. Giving this observation, early referral, and the institution of proper management, including supervised jaw exercise; in patients suffering trauma to the chin would minimize the risk of ankylosis.

Surgery to achieve release of mandibular ankylosis can be tricky and complicated if the diagnosis of the precise site and extent of the ankylosis is not carefully made. A careful history, examination and good radiographs are therefore essential prerequisites to aid effective treatment of this condition. In our experience, even when the surgical problems were well envisaged, securing an airway for anaesthesia was always a source of worry. Most of the patients were young and already disturbed by their facial deformities. Adding a scar by way of tracheostomy to the neck was not thought desirable. More importantly, complications such as tracheal stenosis<sup>8</sup>, haemorrhage, and aspiration of blood, surgical emphysema, pneumothorax, and air embolism have been associated with tracheostomy<sup>9</sup>. Therefore, there was always the need for proper consultation and planning with the anaesthetic team prior to surgery.

Earlier in this series, before the acquisition of the intubating fiberoptic, tracheostomy was used as a last resort in four cases. In three of these patients surgery was postponed several times following unsuccessful attempts at blind intubation which resulted in significant nasal bleeding. Adekeye<sup>7</sup> in a similar series in Nigeria reported three deaths as a complication of blind intubation. Fortunately, we encountered no such serious complication in our study.

Many incisions for approaching the temporomandibular joint (TMJ) have been proposed. The great difficulty is to provide adequate exposure without injuring the facial nerve and to obtain acceptable cosmetic results. The four basic surgical approaches are the preauricular, the endaural, the postauricular, and the submandibular<sup>10</sup>. In our opinion however, no single technique was capable of dealing with the various types of ankylosis encountered in the series. The choice of surgical technique depended on the site, extent and type of ankylosis. Where there was the need to approach the TMJ to effect release, the pre-auricular approach was used at all times.

To prevent recurrence of ankylosis, different materials including skin and cartilage have been interposed between the bone ends after osteotomy<sup>11,13</sup>. We used no such material in the series except the insertion of oxidised regenerated cellulose at the operation site to aid haemostasis. In a few instances however, a strip of muscle tissue from the temporalis was interposed between bone ends where the condylar head only needed a 'shave'. In our opinion, to prevent recurrence, it was more important to create wide gaps between bone ends and encourage early active mouth opening exercise. This belief necessitated in some instances, the return to the theatre of some patients in whom active exercise was neglected, after a few weeks following surgery, and passive movement carried out under general anaesthesia.

Maintenance of active exercise appears to encourage the corticalization of the raw bone ends as well as stretch the scar tissue, thus helping to maintain the inter-incisal distance<sup>7</sup>. In a few patients who adhered very well to the prescribed regime, the inter-incisal distance was found to improve beyond that obtained at surgery. Nwoku<sup>2</sup>, who observed this phenomenon earlier, attributed the increase to the relaxation of previously contracted muscles. However, inadequate exercise resulted in reduction of the IID in two patients. In our opinion, total lack of exercise, because of pain as admitted by them, was the main reason for re-ankylosis in five of the patients.

## REFERENCES

1. Topazian RG. Aetiology of ankylosis to temporomandibular joint: analyses of 44 cases. *J Oral Surg* 1974; 22: 227.
2. Nwoku et al. Congenital ankylosis of the mandible: report of a case. *J Max Fac Surg* 1968; 14: 150-152.

3. Blair VP. Operation treatment of ankylosis of the mandible. With a history of the operation and analysis of 212 cases. *Surg Gynaecol Obstet* 1914; 19: 436-451.
  4. Kennett S. Temporomandibular joint ankylosis: the rationale for grafting in the young patient. *J Oral Surg* 1973; 31: 744.
  5. Oluwasanmi JO, Lagundoye SB, Akinyemi OO. Ankylosis of the mandible from cancrum oris. *Plas Reconstr Surg* 1976; 57: 342.
  6. Adekeye EO. The pattern of fracture of the facial skeleton in Kaduna, Nigeria. *Oral Surg* 1980; 49: 491.
  7. Adekeye EO. Ankylosis of the mandible: Analysis of 76 cases. *J Oral Maxillofac Surg* 1983; 41: 442-449.
  8. Ffoulkesrabbe DKE. Some etiological causes of tracheal stenosis following tracheostomy in Nigerians. *Nigeria Med J* 1975; 5: 328.
  9. McClelland RMA. Complications of tracheostomy. *Br Med J* 1965; 2: 265.
  10. Kreutziger KL. Surgery of the temporomandibular joint. 1. Surgical anatomy and surgical incisions. Paper presented before the American Academy of Facial Plastic and Reconstructive Surgery, New Orleans, La, Sept 19, 1981 and at the 34<sup>th</sup> Annual meeting of the South Eastern Society of Oral and Maxillofacial Surgeons, Palm Beach, Fla., May 1 1983.
  11. Chossgross C et al. Comparison of different materials for interposition arthroplasty in treatment of temporomandibular joint ankylosis surgery: long-term follow-up in 25 cases. *Br J Oral and Maxillofac Surg* 1997; 35: 157-160.
  12. Nwoku AL. Rehabilitating children with temporomandibular joint ankylosis. *Int J Oral Surg* 1979; 8: 271.
  13. Saeed NR, Hensher R, McLeod MH, Kent JN. Reconstruction of the temporomandibular joint autogenous compared with alloplastic. *Br J Oral and Maxillofac Surg* 2002; 40: 296-299.
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