THE SURGICAL TREATMENT OF MANDIBULAR JOINT DISORDERS

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THIS LECTURE DEALS with the surgical treatment of mandibular joint disorders of 64 patients on whom I have operated over the past nine years and it is an attempt to evaluate the symptoms and results of these patients together with their X-ray and histological features to see which are the best operations to do.

Lord Moynihan, whose painting you see on the wall in this hall, and who was President of this College in 1926, once said, 'Give me the surgeon who does the correct operation rather than the man who skilfully performs the wrong one.'

If one looks in John Hunter's casebooks[1] at case number 54 entitled 'Spina Ventosa of the lower jaw', one sees that there were diagnostic problems 200 years ago. In this case following a blow on the right side of the lower jaw 7 months previously 'Mr. Bromfield made an incision from the zygomatic process down to the lower part of the swelling, from that forwards from the body of the jaw across the genial artery. Then he scalped it, when the bone was laid bare he sawed it off with saws of a particular form . . . the wound healed but this cheek was much larger than the other and none of its muscles retained their usage . . . this is what is called Spina Ventosa in the bones of other parts which are all scrofulous.' Fortunately our operations to-day are not so hazardous as this, and Spina Ventosa or Tuberculosis has virtually disappeared.

I have divided the disorders into five groups which are:

GROUP I PAINFUL JOINT DISORDERS
GROUP II UNREDUCED LATE DISLOCATIONS
GROUP III FRACTURE DISLOCATIONS
GROUP IV CONDYLAR HYPERPLASIAS
GROUP V ANKYLOSED JOINTS

Group I: Painful joint disorders

This is where we have our largest number of patients as this is the commonest condition.

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It is interesting to consider the evolution of the joint in this connection, and in that excellent demonstration held in this College two years ago[2, 3, 4, 5], it was nicely pointed out that the temporo-mandibular joint has not yet caught up with its evolutionary development if we think of what is demanded of it. In primitive mammals it has a simple hinge movement but in man it has developed into a more complex apparatus with the appearance of an eminentia (which incidentally only occurs in man) so that the protrusive movement and the simultaneous opening and closing can more easily be performed and this is further complicated by the fact that side-to-side movements are also needed. This may be associated with the adoption of an upright posture in man and the forward flexion of the head on the trunk, thus restricting the space available for the mandible to move. The abnormal forces which throw this mechanism out may first be seen in adolescence or even earlier with the loss of permanent teeth and the tilting of others. Unnatural occlusions are found as a result of this, and with the loss of all teeth and the mastery of full dentures further strains are added. It is thus hardly surprising that it suffers from degenerative joint disease or secondary osteoarthrosis with this weight-bearing rôle for which it is not equipped. Primary osteoarthrosis never seems to occur in the temporo-mandibular joint. Perhaps there would be more problems but for the undemanding diet which is taken in the present era.

If one compares the sterno-clavicular joint, which is of a similar structure to the temporo-mandibular joint with its articular disc, etc., matching it decade for decade, one is impressed by the cartilaginous component of the fibro-cartilage of its covering and the thickness of the former and the fibrous nature and thinness of the latter. Perhaps this makes this joint more susceptible to the loads placed on it.

If we examine the methods available for treating these painful conditions there is firstly the exhaustive and meticulous rehabilitation which have been stressed by many authors over the years[6, 7, 8]. Next, rest and protection by wise advice about over-opening, bruxism, etc., is essential. After this, exercises to improve the strength of the muscles are helpful. Analgesics are only a supportive treatment for true degenerative joint disease. The small proportion who are resistant to these measures seems unable to have the process halted and may require surgery. The main rôle of surgery in this condition is to relieve the pain. It would seem that the first warning of a joint under undue stress is pain and trismus which in most cases corrects itself by natural means. The pain may come from the capsule, the bones themselves or the muscles which supply the joints, but the mechanism is not entirely known. The persistently painful joint possibly signifies more damage than is capable of repair by removal of these pressures.

The pain can be removed surgically in several ways:

1. Myotomy or tenotomy.
2. Osteotomy of the condyle, otherwise known as condylotomy[9].
3. Removal of the articular surface of the condyle or high condylectomy[10].

I have no experience of the first alternative, but it seems doubtful that, short of stripping all the muscles which act on the joint and preventing their reattachment, this would be technically feasible.

Condylotomy was the method used to relieve the pain on 12 patients in this series and in these early cases it was done by a blind approach, but our techniques were not infallibly certain to ensure that there was not too much displacement or too little. In some cases considerable displacement did occur and remoulding took place with Grade I results (Table IV). In others it was felt that it was accelerating changes in the other joint (four cases) as a natural sequence of grossly upsetting the balance of the bite. In some because the saw cut was so fine no movement took place at all.

We have therefore adopted the open approach to this operation whereby the width of the saw-cut itself can be controlled and seen and the displacement made under direct vision.

Oblique high condylectomy was used as a method of relieving this pressure in 33 cases and has the advantage of making an irrefutable diagnosis.

Technique — high condylectomy. This operation is very much as described by Henny and others[10]; the only modification which has been made is that the exposure is at a slightly higher level and the joint is entered via a posterior vertical cut in the capsule which saves much retraction.

The incision is pre-auricular, the required depth being obtained by blunt dissection against the cartilage until the zygomatic process is reached. The tissues are then retracted forwards and downwards at this depth until the capsule of the joint is exposed. It is helpful to have the jaw completely closed to bring the head of the condyle well back and to move it occasionally during the dissection to locate the right plane. Adrenalin 1 : 200,000 injected locally or hypotensive general anaesthesia help the field of vision; wide retractors should be used to prevent undue stretching of the tissues. There is seldom any need to tie vessels except for a fairly constant small vein at the root of the zygomatic process. The articular surface of the head of the condyle is excised obliquely from before backwards and downwards using a number 3 fissure burr; the depth of the cut is finished with an osteotome. The wound is packed with Surgicel if undue bleeding occurs. In our early cases a drain was used, but we now no longer find the need for this.

Technique — condylotomy. This is by the same approach as described above but the saw cut is 1.5 cm. from the articular surface posteriorly and running upwards and forwards to 1 cm. from the surface anteriorly. The capsule is repaired in this case, leaving the severed head *in situ*, and the patient is allowed full movements immediately after recovery from the anaesthetic.

Pre-operative analysis. Figure 1 shows that women are affected ten times more than men and that the fourth and fifth decades are the commonest age groups.

Table I shows the state of dentition and occlusion in these patients.

Table II shows the symptoms and signs, and here it is interesting to note that all 45 of these patients complained of pre-auricular pain and in fact for surgery to be considered this had to be consistent over a

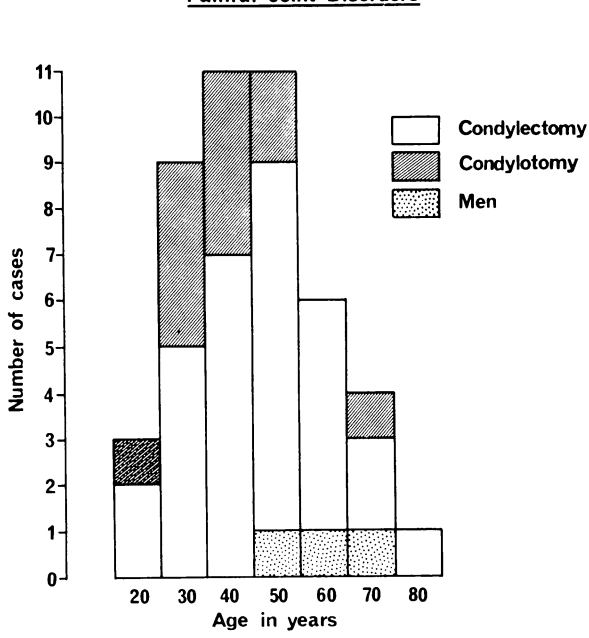


Fig. 1.

period of time. In some cases this pain was severe, in others a perpetual background ache or nagging feeling in front of the ear. There was also pain at other sites as well, for instance in the face and side of head and rarely in the neck, ear or eye. But the pre-auricular component was considered the important feature for a diagnosis of osteoarthrosis of the condylar head to be made. Other symptoms which were common but not sufficient on their own to justify surgery were clicking, locking or inability to open or close. Grating was found in five patients.

TABLE I

DENTITION AND OCCLUSION

	Patients
Loss of all teeth and full dentures	14
Loss of posterior teeth	13
Loss of individual teeth with tilting, drifting or cuspal interference ...	7
Loss of all upper teeth with standing lower teeth	2
Loss of all lower teeth with some standing upper teeth	2
All teeth present with overclosure of bite	2
Loss of teeth with partial dentures	5

Table III shows the duration of these symptoms, which in fact range from 1 to 20 years, the mode being one to 3 years. The duration and also treatment received is shown.

Post-operative results. For the purpose of this survey, all patients were sent a simple questionnaire and were then interviewed where possible. Table IV shows the results of this survey, and shows the post-operative results graded in categories. It takes account of symptoms referred to the other side and the morbidity of the operation.

In the condylotomy series there were four Grade I results and four Grade IA with symptoms referred to the other side. It is hoped that with the improved techniques of open operation the results will be improved. You will see also that three patients were no better and one was made worse. These patients were later to have condylectomies and became Grade I and Grade II results.

In the condylectomy series 19 out of 32 were Grade I (Good Results). Five had symptoms from the operation itself which were fortunately minimal, i.e. one had a mild auriculo-temporal syndrome which showed itself by occasional flushing on this side of the face, one had a residual weakness of the facial nerve, temporal branch, and three had very slightly altered bites but with good occlusion otherwise. Thus, 25 patients

TABLE II

SYMPTOMS AND SIGNS

Number of patients	*Pain*	*Clicking*	*Locking*	*Trismus*	*Deviation to affected side*
45	45	35	19	23	25

*(5 grating) (6 sudden onset)

6 osteo-arthritis elsewhere in the body

2 rheumatoid arthritis elsewhere but not in joints

*All 5 confirmed histology abnormal.

SITE OF PAIN

Number of patients	*Preauricular*	*Face*	*Head*	*Neck*	*Ear*	*Eye*
45	45	*16	12	4	9	2

*Including 2 patients established tic douloureux

TABLE III

DURATION OF SYMPTOMS

Up to 1 year	*1–3 years*	*4–8 years*	*Over 9 years*
7	19	14	5

DURATION OF TREATMENT

Number of patients—45

Including: Exercises, heat, rest, selective grinding, prosthetic treatment (bite raising appliances etc.), injections.

Up to 1 year	*1–3 years*	*Over 4 years*
12	27	6

were relieved of their painful symptoms. Both of the patients in Group III which showed no improvement were of established tic douloureux on tegretol with deranged occlusions and pain over the head of the condyle. Perhaps it was a forlorn hope to think that their pain would be any better when section of the trigeminal nerve two years previously had not succeeded. The patient who was made worse had an unrecognized established depressive illness.

What then is the process which makes these operations succeed? It would seem that remoulding takes place in either case. In condylotomy by new cartilage being laid down and then bone on the articular surface. This is seen in this patient (Fig. 2) of 40 who had had a condylotomy three years previously with only a Grade III result which was followed by a condylectomy. This histological section is interesting because it shows very clearly the cartilage far in excess of what one would expect in a patient of this age group.

TABLE IV

POST-OPERATIVE RESULTS

GRADE		
	I	Complete loss of all pain—good function — GOOD
	II	Almost complete loss of pain — FAIR
	III	No improvement — NO BETTER
	IV	Worse — WORSE
	A	Early symptoms referred to other side
	B	Morbidity of operation

CONDYLOTOMY

12 patients—12 reviewed

I	IA	IB	II	IIA	IIB	III	IIIA	IIIB	IV	IVA	IVB
4	4	0	0	0	0	3	0	0	1	0	0

CONDYLECTOMY

33 patients—32 reviewed

I	IA	IB	II	IIA	IIB	III	IIIA	IIIB	IV	IVA	IVB
19	1	5*	4	0	0	2¶	0	0	1†	0	0

* 3 Altered bite apparent
1 Mild AT syndrome (flushing)
1 Residual weakness of the facial VIIth (temporal)

† Established depressive illness

¶ Established tic douloureux

In condylectomy it is suspected that new bone is laid down with a fibrous covering, but of course this is difficult to prove because X-rays are unreliable and as yet we have had no opportunity of examining histologically the remaining bone *in situ* in man[11]. This is obviously not the whole explanation because we do not know exactly why removal of diseased cartilage or use of osteotomies in other parts of the body relieves pain.

The régime adopted for the persistently painful joints is therefore as follows:

1. Meticulous and exhaustive rehabilitation, rest and/or exercises to achieve repair in the condylar head.

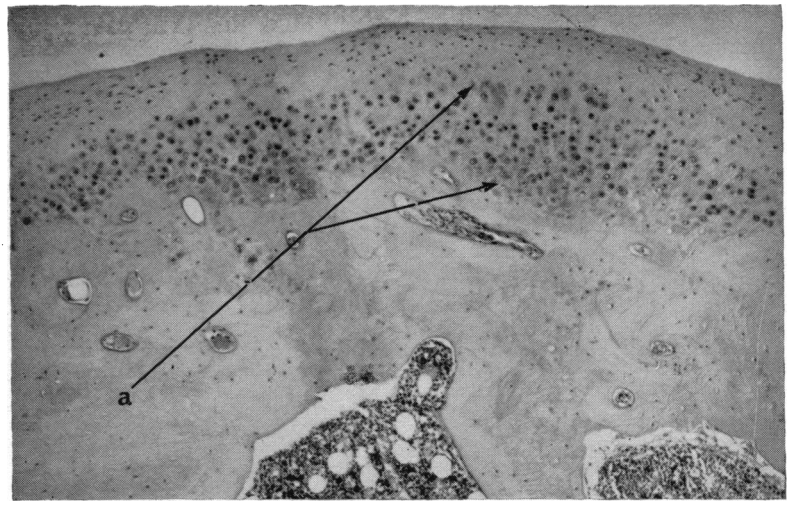


Fig. 2. (*a*) Zone of cartilage cells in a patient aged 40 who had had a previous condylotomy 3 years ago.

2. If this fails and the patient is young, condylotomy is performed to give the joint further opportunity to repair itself.

3. If the patient is over 45 or there is X-ray evidence of destruction of the condylar head or naked-eye evidence at operation, high condylectomy is performed.

One must remember that we have an enormous advantage with this joint over other joints in the body in that there is an articular disc which is always left intact and not removed.

Let us now look at the correlation between X-rays, histology and photographs. Where the X-rays are grossly abnormal (Fig. 3) one would expect the histology to be abnormal. The problem is that many X-rays are inconclusive and yet the histology is found to be abnormal (Table

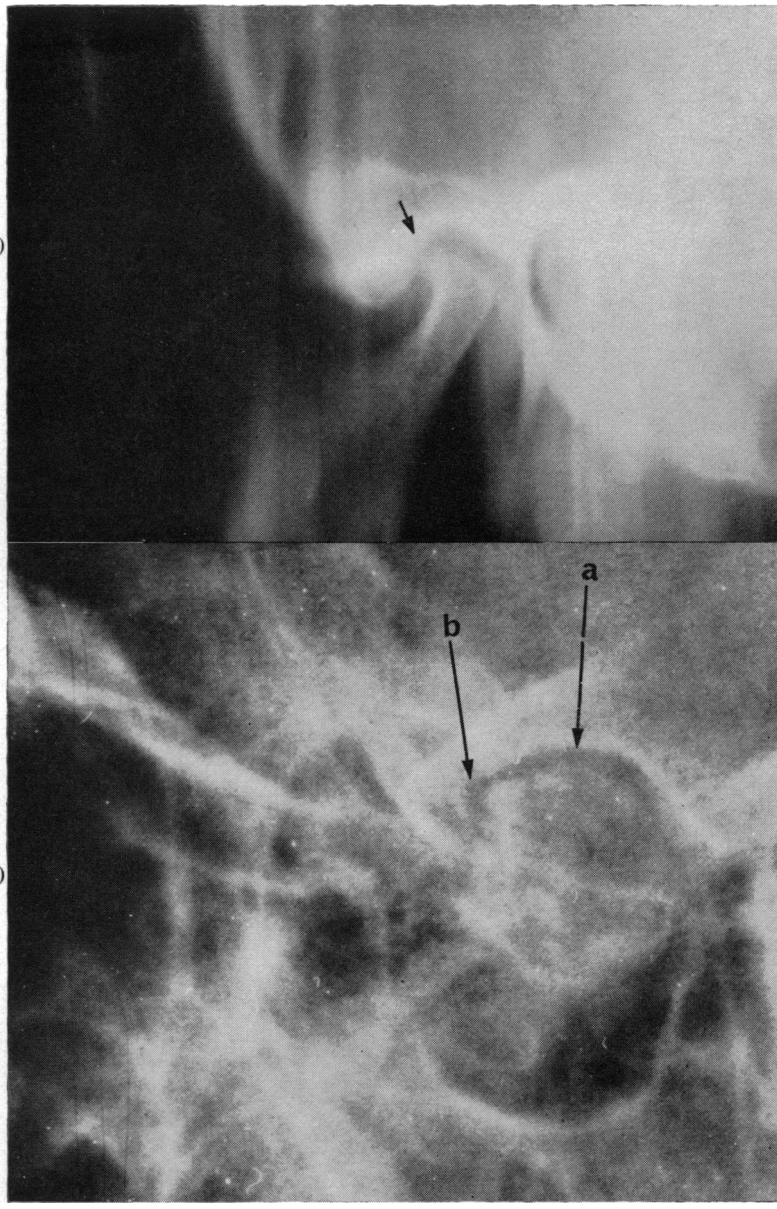


Fig. 3. Examples of X-rays of condyles; above, sharply angulated head with flattened surface; below, ill-defined head. (*a*) Loss of joint space. (*b*) Suggestion of lipping.

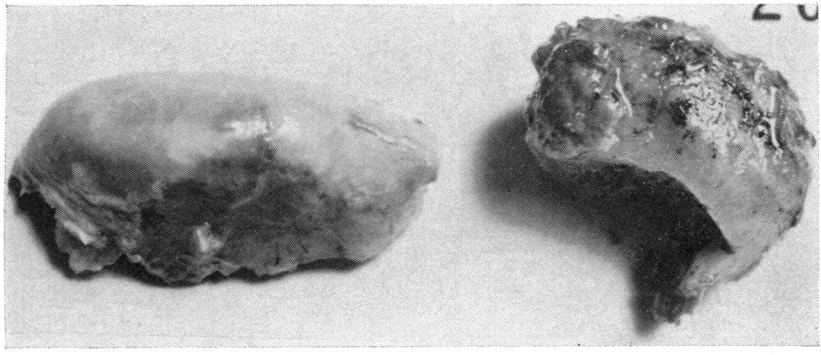
TABLE V
CORRELATION BETWEEN X-RAYS, HISTOLOGY AND PHOTOGRAPHS

		Normal	*Abnormal*	*Inconclusive*	*Post-condylotomy*
Number of X-ray examinations ...	33	2	15	12	4
Number of histological examinations ...	28	2	22	1	3
Number of photographic examinations ...	19	6	12	–	1

Of 15 abnormal X-rays	13 abnormal histology 1 normal histology
Of 12 inconclusive X-rays	9 abnormal histology 1 inconclusive histology
Of 2 normal X-rays	1 normal histology
Of 4 post-condylotomy	3 abnormal histology
Of 12 abnormal photographs	12 abnormal histology
Of 6 normal photographs	1 abnormal histology 1 inconclusive histology 2 normal histology

5 no histology
All patients with grade I results—histology abnormal

V). Photographs of the condylar heads which are enlarged and painted with Indian ink show up irregularities not seen with the naked eye (Fig. 4). The histological sections, all taken from patients in this series, show the whole range of osteoarthritis (or, as it is now called, arthrosis) described by Blackwood[12], from simple resorption of the head to gross destruction of the sub-articular bone (Fig. 5). One must remember that Blackwood's series were of post-mortem specimens, there being no record of symptoms during life, whereas these patients all had symptoms. Table V shows that of the 15 abnormal X-rays 13 showed abnormal histology and of the 12 inconclusive X-rays 9 were found to have abnormal histology. There is one significant point worth noting and that is that 22 out of 28 histological examinations were abnormal. If



(*a*) (*b*)

Fig. 4. Photograph to show heads of condyles: (*a*) normal, (*b*) painted with ink to emphasize irregularities on articular surface in osteoarthrosis.

these are compared statistically by taking the number of patients over 40 in this series with degenerative joint disease and Blackwood's statement[12] that 40% of his examinations showed osteoarthritis in patients over 40 we find that this number in this series is more than could have occurred by chance and is highly statistically significant. Another incidental finding was that of the four patients who had received hydrocortisone injections three showed very marked osteoclastic changes and

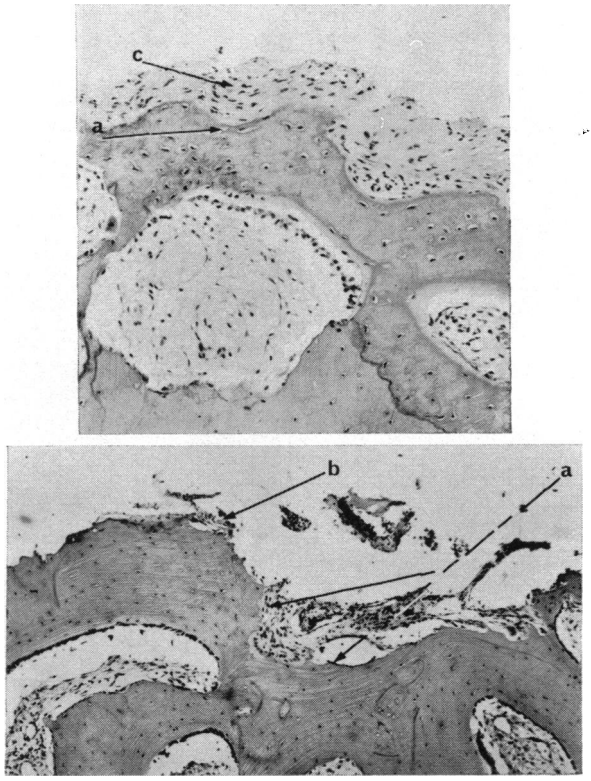


Fig. 5. Photomicrographs showing degenerative joint disease in articular surface of condyle: (*a*) subarticular bone irregularity and destruction, (*b*) loss of fibrous layer, (*c*) fibrous articular layer still present.

this would agree with Poswillo's findings in animal experiments[11] although it is not known what the features of the condyles were like before cortisone.

Group II: Unreduced late dislocations

Dislocation of the jaw either bilaterally or unilaterally is a fairly common occurrence and has been well reviewed recently[13]. It is usually recognized early and treated by simple means. Unreduced late dislocations are more unusual and this is illustrated by two case reports.

Case 1. An edentulous man of 75 who was in poor health, having had bronchitis, ischaemic heart disease and five weeks previously a cerebro-vascular accident which left him hypotensive, presented with a bilateral dislocation of his jaw which was thought to have occurred at the time of his stroke. He was considered a bad anaesthetic risk and it was thought unwise for him to have complete post-reduction fixation. Manual reduction was satisfactorily achieved under X-ray control but by the next day the jaw had redislocated, this time only on one side. During the next 10 days his health improved, but bilateral dislocation occurred twice with increasing difficulty in reduction and finally bilateral condylectomies were performed. After a further 10 days he was discharged from hospital able to wear his old dentures. Two years later he still had good function with nearly full opening of his jaw.

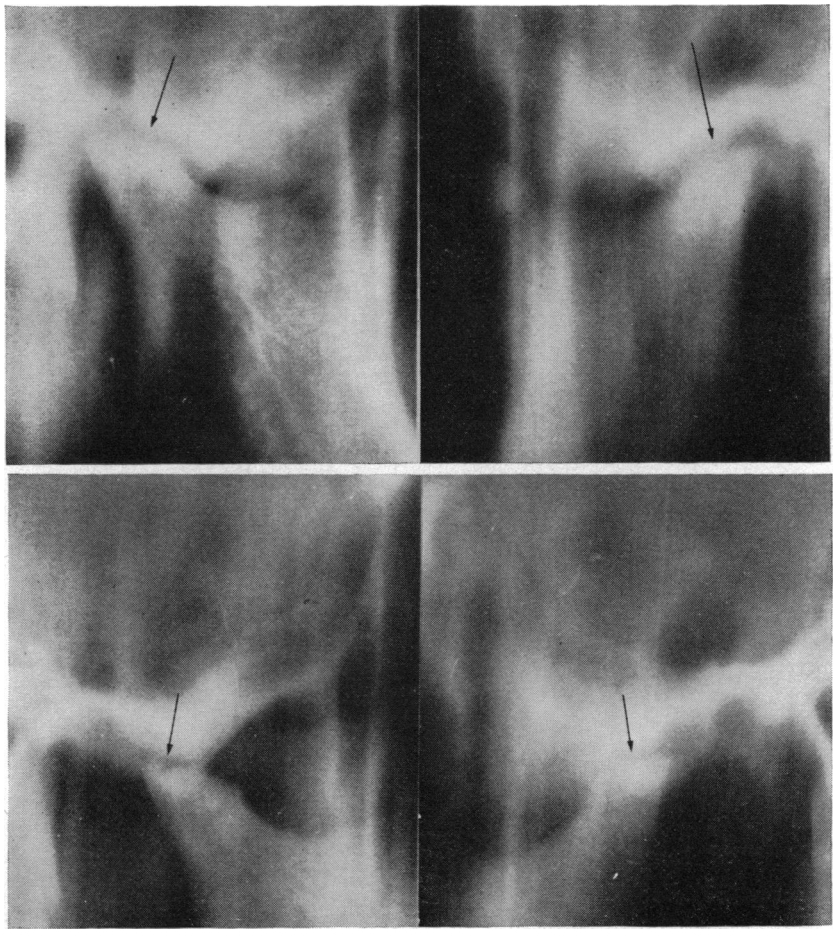


Fig. 6. Tomograms of a girl of 24 showing destruction of the articular surfaces of the condyle and erosion of the eminentia 3 years after the first episode of dislocation when the X-rays were normal.

Case 2. A girl of 24 presented with trismus following a clicking jaw for one year and was found to have a unilateral dislocation of her jaw which was reduced under a general anaesthetic and the part was rested. Within two weeks she had full movements again. Two months later it dislocated again, this time bilaterally, and the jaw was reduced without an anaesthetic under X-ray control and intermaxillary fixation was kept in place for six weeks. This patient went on to have eight dislocations altogether over a period of three years and during this time X-rays showed progressive erosion of the condylar head and the eminentia (Fig. 6). Full blood tests for suspected rheumatic disease were negative. Three years after the original symptoms had occurred, and after a particularly long episode of trismus, bilateral condylectomies were performed. Histological examination of the capsule and the head of the condyle showed dense fibrosis. By the time the patient was discharged from hospital her movements were full, and during the past three years she has been symptom free apart from one episode of transient trismus which responded to simple exercises. It was felt in this case that the episodes of unreduced dislocation led to her bony abnormalities and an early fibrous ankylosis. Sclerosing agents and steroid injections were not used in this patient in view of the trismus and her bony pathology.

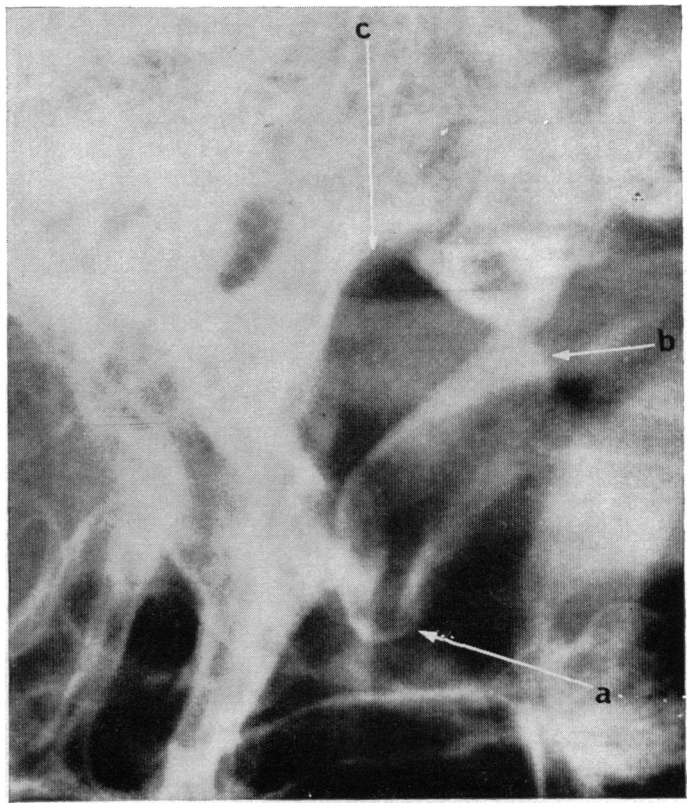


Fig. 7. Fracture dislocation of the right condyle, (*a*) tip of inverted condyle, (*b*) fractured edge, (*c*) glenoid fossa.

Group III: Fracture dislocations

These are mentioned to emphasize that surgery may rarely be needed. There are three patients in an estimated 500 condylar fractures who have had to have the condyle removed because it was giving rise to dysfunction and deformity. Figure 7 shows an X-ray of a displaced condyle of a patient of 35 who had had a fracture dislocation, the date being uncertain. She presented with deviation of her chin to the right, loss of vertical height in the occlusion on that side and 1 cm. of movement in her jaw. The jaw could not be moved to the left. This patient had a condylectomy by a pre-auricular approach with restoration of full function including the vertical height when dentures were fitted. These cases endorse MacLennan's findings in 1964[14] and it must be stressed that it is indicated only when there is a dysfunction or deformity.

Group IV: Condylar hyperplasias

This condition has been well described by Rushton[15], Ward[9], Hovell[16], Rowe[17], and its pathology is well understood whereby there is a persistence of cartilage in the growing end of the condyle (Fig. 8). In this series of eight patients (Table VI), all but one had this histological change to a greater or lesser degree and two had early changes of degenerative joint disease. Three patients had condyles which were enlarged in all dimensions (Fig. 9) and might be classified by some as unilateral macrognathia, five had long narrow condyles, two had secondary bowing, and six had deviation of the mandible to the opposite side. The average age for the change to be noticed was 18, the average age at operation was 22 and the interval of growth nearly five years. There has been an average time of follow-up of five years. The treatment of this condition has changed with the development of improved operations for the correction of facial deformities, and these may be necessary with the gross ones. Some distinguished oral surgeons now believe that a condylar shave operation should be done on the affected side to prevent growth together with other osteotomy techniques. Some do an osteotomy on the other side as well to prevent twisting of the condyle. In this series we have not found the need to do this and have had excellent results with the more simple operation of condylectomy (Fig. 10). Usually the occlusal deformities and bowing tend to correct themselves (six cases) after a short time. Where this does not happen (two cases), the trimming of the shelf of bone on the lower border of the mandible via a submandibular incision, with careful dislodging of the neurovascular bundle within the bone prior to the removal of the excess bone, is performed.

Group V: Ankylosis of the jaw

These are the results of our experiences of six cases of ankylosis of the jaw (Table VII). The treatment of this condition has been well documented from as long ago as 1913 by Blair[18] to more recent papers

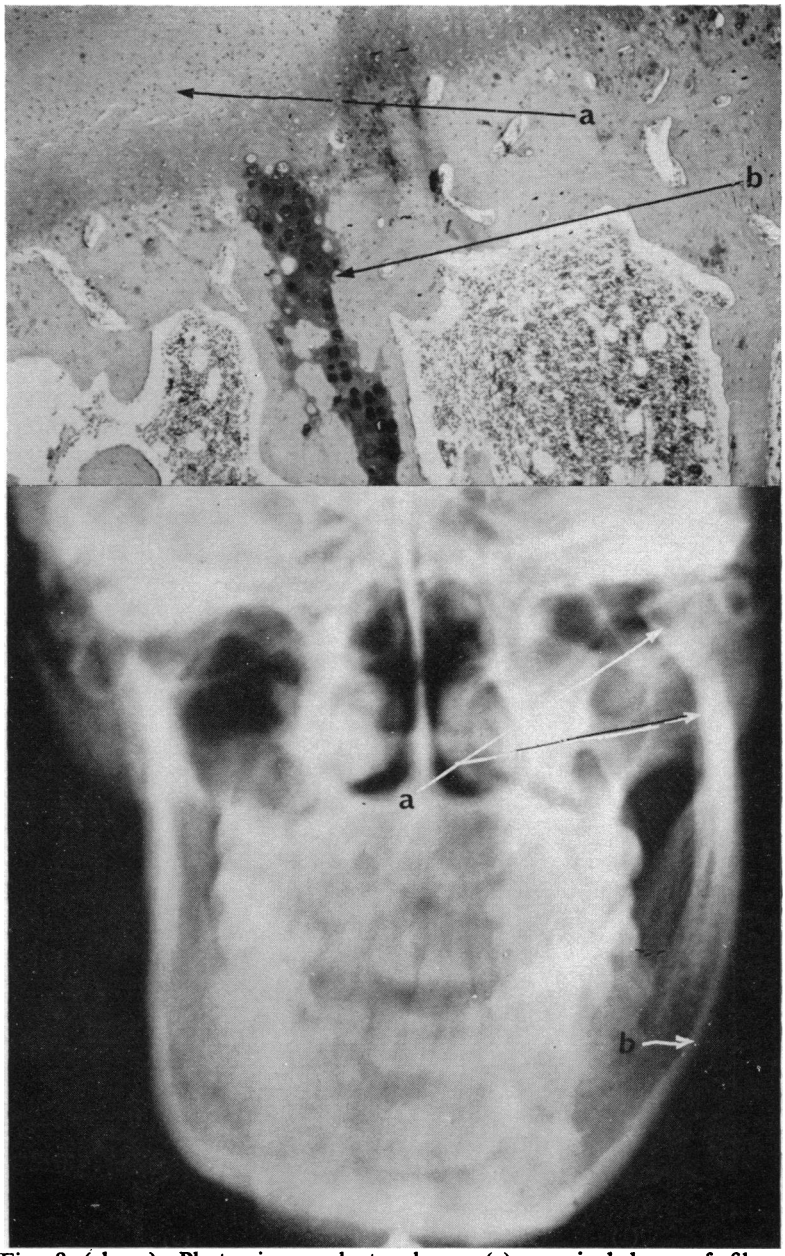


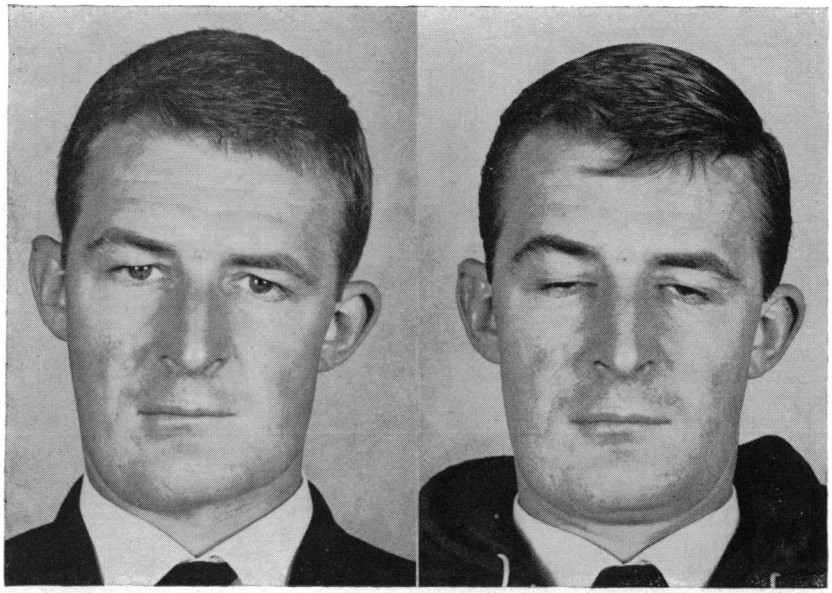
Fig. 8 (above). Photomicrograph to show: (*a*) germinal layer of fibrocartilage; (*b*) islands of cartilaginous material deep to sub-articular layer.
Fig. 9 (below). X-rays showing unilateral condylar hyperplasia, (*a*) enlarged head of left condyle, (*b*) bowing of lower border of mandible.

TABLE VI

CONDYLAR HYPERPLASIAS

	1	2	3	4	5	6	7	8	Average
Patients									
Age of change	14	16	27	–	24	15½	16	14	18
Operation	16½	21	30	19	27	16	22	28	22
Present age	18	24	35	26	33	20	29	32	27
Interval of growth	2	5	3	–	3	6/12	6	14	5
Time since operation	2	3	5	7	6	4	7	4	5
Pre-operative deviation ...	4 mm.	3 mm.	7 mm.	–	3 mm.	3 mm.	3 mm.	–	4
Post-operative deviation ...	0	0	2 mm.	–	0	0	0	0	

Type of abnormality:	Nos. 1, 4, 5, 6, 7 ...	Long and narrow
	Nos. 2, 3, 8	Enlarged in all dimension
	Nos. 2 and 8	Secondary bowing
	Nos. 2 and 3	Cross bite
Incidental findings:	Nos. 5 and 8	Had X-ray therapy



(*a*) (*b*)

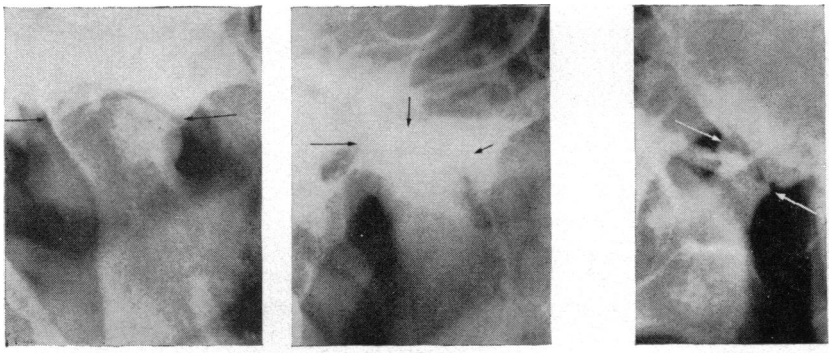
Fig. 10. Unilateral condylar hyperplasia. Note bowing of lower border of the mandible on the right side, (*a*) before, (*b*) after operation.

TABLE VII
ANKYLOSIS OF THE JAW

Patients	1	2	3	4	5	6	Average
Age of damage	8	1	25	24	31	17	18
Unilateral	*	*	*	–	–	–	
Bilateral	–	–	–	*	*	*	
Age at operation	45	22	48	35	46	39	35
Previous operations ...	21	15–22	–	–	–	–	
Method	Bovine cartilage	Bovine cartilage	Bovine cartilage	Condylectomy	Condylectomy	Bovine cartilage	
Present age	45	24	50	37	50	41	42
Period of disability ...	13	15	23	11	15	22	16
Time since operation ...	months	2-9/12	2	2	5	1	2
Pre-operative opening ...	3–4 mm.	2 mm.	2 mm.	7 mm.	8 mm.	3 mm.	5 mm.
Post-operative opening ...	20 mm.	30 mm.	25 mm.	20 mm.	20 mm.	30 mm.	24 mm.

by Young and Allen[19] and others in 1963. In this small series one was caused by neonatal illness, one by a previous extraction of wisdom teeth followed by multiple abscess formation and one by a maxillo-facial injury. The remaining three were from rheumatoid arthritis, ankylosing spondylitis and psoriatic arthritis. All had changes in the head of the condyle which was bilateral in those of arthritic origin and unilateral in the others, apart from secondary changes on the other side. A plane of cleavage could be seen on the X-rays in some (Fig. 11*c*). In the case of psoriatic arthritis there was dense sclerosis (Fig. 11*b*) and mushrooming of the head of the condyle (Fig. 11*a*) could be seen in the patient with old Still's disease (rheumatoid arthritis).

The patient with an early onset of the disease showed a lack of development of the jaw with symmetrical retrusion and a large antigonal notch, but this effect was probably due in part to previous operations at



(*a*) (*b*) (*c*)

Fig. 11. X-ray appearance of ankylosed condyles, (*a*) old Still's disease (rheumatoid arthritis) with mushrooming of heads of condyle; (*b*) psoriatic arthritis with dense sclerosis; (*c*) fibrous ankylosis following infection showing line of cleavage.

six and seven years to both condyles. The patient with a traumatic origin also had symmetrical retrusion again from previous operations on both sides. There was no asymmetry or retrusion in those patients with ankylosis of rheumatic origin.

Treatment. Osteo-arthrotomy with bovine cartilage grafts to maintain the vertical height were done by Braithwaite's[20] and Sundell's[21] methods via a sub-mandibular approach on four patients and condylectomy was performed on two patients with early fibrous ankylosis. All operations were bilateral. Exercisors attached to cap splints were used in all cases within 12 hours of operation.

Morbidity. One patient had a transient paralysis of the temporal branch of the facial nerve, and one had a paraesthesia of the inferior dental nerve on one side. The patient with full dentures had a 2–3 mm. loss of vertical height and two others had a slight change in occlusion.

Results—range of movements. This was good in those of non-rheumatic causes and was 20, 30 and 25 mm. from previous 2–3 mm. openings in each case. In those with rheumatic disease, the openings were 20, 20 and 30 mm. from previous 7, 8 and 3 mm. in each case. Lateral movements were restricted post-operatively in all cases. The

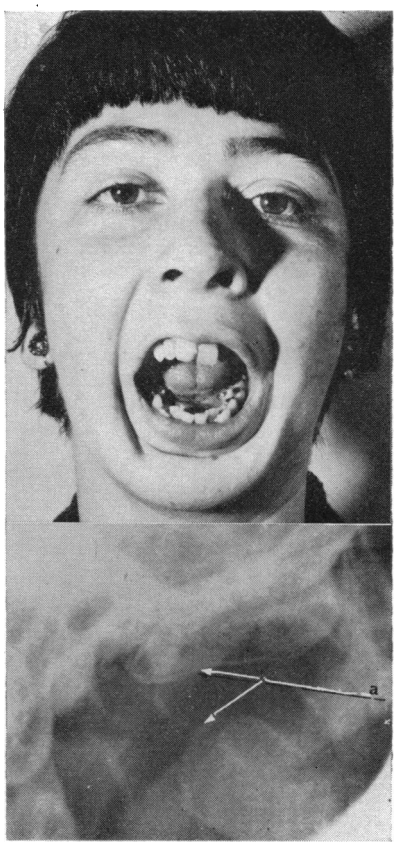


Fig. 12. To show gape of 24-year-old girl 2 years 9 months after operation from a previous 2–3 mm. opening.

Fig. 13. (*a*) Denotes space taken up by bone graft. Note rounded ramus of mandible 3 years after grafting.

follow-up period was from 6 months to 5 years, the average being 2 years.

Figure 12 shows a 24-year-old girl who had had six previous operations before she moved into our area. The opening here is 30 mm. from a previous 2 mm. gape 2 years 9 months after the operation. Figure 13 shows the interesting effect of the bovine cartilage grafts causing rounding of the ascending ramus.

Summary and conclusions

Group I.—Painful joint disorders—45 patients. The operations of condylotomy and condylectomy and the indications for doing these on patients with painful joint disorders are discussed. It is seen that these procedures carry a low morbidity. Tranquillizers and analgesics should not be resorted to indefinitely when there is an effective surgical cure for genuine degenerative joint disease. It is important to distinguish these cases by a critical analysis of the symptoms.

Group II.—Unreduced late dislocation—two patients. The ill effects of these and their treatment by surgery have been discussed.

Group III.—Fracture dislocations—three patients. The need for surgical treatment on rare occasions is described.

Group IV.—Condylar hyperplasias—eight patients. These affect people at a critical age so that their deformity makes them self-conscious. It is important to deal with these early as operations are easier and the deformity less.

Group V.—Ankylosis—six patients. Those from a rheumatic cause are hard to deal with, and surgery is but a palliative for medical treatment. The analyses in the literature of all the results in this field give little indication of the number of repeated operations needed, one suspects quite a few, as ankylosis anywhere else in the skeleton has a propensity to ossify. It cannot be beyond our ingenuity to devise better operations for this condition.

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