is certain to become inoperable. It is in this stage that diagnosis is difficult. W. J. Mayo⁸³ states that "gastric cancer itself does not give rise to diagnostic symptoms during the curable stage." The other lesions are, however, not only so intractable to any other form of treatment and are so readily relieved by surgical measures, but if left are so likely to be associated later with severe or fatal complications that valuable time should not be lost. I would regard, then, the indications for operative treatment as follows:

1. Any case where the symptoms are such that one of the above lesions can be diagnosed with tolerable certainty.

2. Any case commencing after the age of 35, which is not markedly relieved by a few weeks' adequate medical treatment.

3. Any case where symptoms have recurred after previous attacks relieved by medical treatment, especially if the symptoms have changed from those typical of a chronic gastric ulcer.

4. Any case in which the stomach shows definite evidence of distension, whether the symptoms are those of ulcer or carcinoma.

5. Any case in which a tumour is present suggesting any of the above conditions.

6. Any case with repeated haemorrhage.

I would lay special stress upon the fact that if rapid progress is not made with adequate medical treatment operation should early be resorted to. With our present knowledge it affords the only certain method of diagnosis and cure, and if undertaken early many of the more hopeless complications can be entirely prevented. Also in cases of this nature no operation must be considered complete unless the stomach, duodenum, gall bladder, and appendix have all been examined.

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A CONGENITAL DEFORMITY OF THE FOREARM AND ITS OPERATIVE TREATMENT.

BY

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DERBY.

THE deformity which is the subject of this article has never, as far as I am aware, been described in any English textbook or journal; indeed it is doubtful whether the condition has ever received recognition at the hands of modern surgeons. I have, however, been told that it has been described in America, but I have not been able, so far, to obtain any more exact information concerning it. I think, therefore, that the case which has come under my care should be reported as fully as possible, together with a description of the operative treatment which has been followed out.

The patient is a lady, aged about 33, and the deformity a congenital one, consisting of fixation of the forearms in a position of complete pronation with some slight bowing of the radius in its lower third, the convexity of the bow being backwards and outwards (presuming the limb to be in the correct anatomical position, palms to the front and thumbs out). The condition affects both arms equally, causing very great limitation to the usefulness of the arms and hands. The carpal bones are unusually movable one upon the other, and the ligamentous attachments uniting them are very lax, this allowing of a certain amount of rotation of the hand on the forearm, much more than is normally the case, and is doubtless due to constant efforts at supination acting on the only part of the limb capable of any rotatory movement. The deformity is not very noticeable when anything is taken in the hands, and no effort at supination is attempted; but if an effort is made to hold anything with the palm turned uppermost, a most awkward exposure of the deformity results, the elbow being pressed firmly to the side, and the hand rotated into an almost spiral attitude. A younger brother is also the subject of the same deformity, both right and left arms being perfectly fixed in the position of pronation, with even more marked bowing of the radius and more laxity of the inter-carpal ligaments, and their maternal grandmother also suffered from the same condition, although it was not supposed to be so extreme, thus showing the strong hereditary tendency such bony deformities have. Some radiographs here reproduced as engravings show the fixation to be due to bony union between the radius and ulna extending from the elbow downwards along the shafts for about 2½ in.; the two bones are quite free below at the inferior radio-ulnar articulation, the space between them being seen quite distinctly on the fluorescent screen, though the bones were very close together and the joint cavity very small. The head of the radius, instead of being the normal mushroom shape, was rounded off and laterally fused with the ulna. On considering operative treatment the question naturally arose that, supposing the bones were completely separated, could the movements of supination and pronation be effected by means of the usual supinating and pronating muscles? The biceps flexor cubiti was the only supinating muscle that had hitherto been functionally active, the others might have become completely atrophied owing to their never having been used. On careful examination the supinator longus and pronator radii teres muscles could be made out, though they appeared much smaller and thinner than normal, and during the operations which followed this was found to be the case, the former being very poorly developed, both the muscle and tendon thin and weak. The pronator radii teres was also very weak and its tendinous insertion into the radius was as thin as paper.

Treatment and Progress.

However, operation was decided upon, and the first step was to remove the bridge of bone uniting radius to ulna; this was done through a curved incision at the back of the arm just below the elbow, the attachments of the extensor muscles being separated as far as the posterior border of the ulna. No

trace of supinator brevis muscle was seen, in fact, the place normally occupied by this muscle was completely filled with bone, neither was anything seen of the posterior interosseous nerve, which normally pierces the supinator brevis between its humeral and ulnar heads of origin; it was probably pushed aside with the mass of extensor muscles arising from the external condyle of the humerus. The bridge of bone removed with hammer and chisel was about $2\frac{1}{2}$ in. long, $\frac{1}{2}$ in. thick, and $\frac{3}{8}$ in. deep. The head of the radius was very irregular in shape and two or three bosses of bone were removed. Forcible rotatory movements were made, and some tendinous attachments or adhesions snapped in the region of the wrist, the hand moving round towards supination through some 70° - 90° . A piece of muscle was stitched in between the raw bony surfaces, the capsular ligaments and deep fascia drawn together with a purse-string suture of catgut, and the wound closed.

Numbness of the hand was complained of, but it passed off in three or four days. Passive movements were made from the fourth day, slight at first but increasing daily, and at the end of a month considerable improvement had taken place from the original condition, and it was possible to rotate the radius on the ulna through about 25° . The

Fig. 1.

Fig. 2.

Figs. 1 and 2.—Right arm, showing bony union at upper ends of radius and ulna.

movement, however, came to a sudden stop, as if some tight ligamentous band was put on the stretch. This was thought to be at the inferior radio-ulnar joint. The anterior and posterior ligaments comprising the greater part of the capsular ligament are normally very lax and sufficiently long to allow of extended movement of the radius round the outer aspect of the head of the ulna; this movement never having taken place it was thought the ligaments had become contracted and tight.

The second operation (four weeks after the first) consisted of freeing the head of the ulna through a curved incision on the dorsum of the wrist, cutting all the ligamentous attachments and removing two or three small redundant bosses of bone. This operation, however, afforded little or no improvement, and following it a considerable amount of oedema of the hand developed, owing, no doubt, to the cutting of subcutaneous lymph channels when the skin incision was made. This took two or three weeks to clear up. Troublesome stiffness of the fingers also followed, but massage, fango mud baths, radiant heat baths, elastic compression, passive movements, and breaking of adhesions under chloroform has gradually restored them to an almost normal condition. The same treatment has also been applied to the forearm,

and some stiffness in the elbow-joint soon got quite right again.

The third operation (eleven months after the second) consisted of division of the interosseous membrane and oblique ligament from top to bottom through a straight incision down the flexor surface of the forearm. The interosseous membrane was not very definite, and consisted of isolated bands of fibrous tissue strongest near the top and bottom. This was followed by some further improvement, the total amount of true rotation being about 30° . It was then decided to excise the head of the radius, and three months after the previous operation the arm was attacked through an incision just below the elbow as in the first operation. It was found then that some slight bony reunion had taken place between the cut surfaces of radius and ulna where the original bridge of bone had been removed (see Fig. 4). The head was separated from the ulna and surrounding soft tissues, drawn out of the wound and sawn off obliquely from above downwards and inwards, leaving behind the greater part of the tuberosity, so as to save the insertion of the biceps muscle. A good-sized piece of muscular tissue was interposed between the bones and

Fig. 3.

Fig. 4.

Figs. 3 and 4.—Left arm. Condition after the second operation.

fixed there with catgut sutures, the deep fascia united with catgut, and the wound closed.

This operation was very successful and increased the amount of rotation by quite 60 degrees so that after a further two or three months' exercises, massage, and passive movements the hand could be almost completely supinated with the help of some rotation at the shoulder-joint and adduction of the arm. The patient, however, was still not satisfied as the hand could not be made quite flat with palm uppermost owing to the bowing of the radius throwing the radial side of the wrist forwards, and urged me to consider still further treatment. The only thing that appeared feasible was to perform an osteotomy of the radius and rotate the lower fragment on the upper one. This was done in November last, an incision being made 7 in. long over the inner border of the supinator longus muscle; this was defined and separated out and the insertion of the pronator quadratus and all other muscular and ligamentous attachments separated from the lower two-thirds of the radius excepting the insertion of the pronator radii teres, the tendon of which was very thin and lax and did not in any way limit free movement. The bone was then sawn through transversely at the junction of the middle and lower thirds, the

lower fragment rotated through about 40 degrees and secured in position by means of a plate and screws. The arm was put up supinated and kept in splints for a month, and the result at the date of writing has quite justified the procedure adopted. Supination can now be easily accomplished, and though the movement is somewhat cramped, it should improve greatly as the muscles strengthen and adhesions still further disappear. Massage, passive and active movements, are being continued, together with such exercises as screw-driving, digging in the garden, and piano playing. It is probable that the right arm will be treated in due course, when, in view of the experience gained in operating on the left, the time of treatment will be considerably shortened, the first and fourth operations will be done together, the third and fifth together and the second only done at the last if the result demands it. One lesson to be learnt is to do too much, rather than too little, since the parts contract up, just as in ordinary joint excisions.

ON THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON THE DEVELOPMENT OF TRYPANOSOMA RHODESIENSE IN GLOSSINA MORSITANS.

BY

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NGOA, NORTHERN RHODESIA.

(Fifth Interim Report of the Luangwa Sleeping Sickness Commission of the British South Africa Company.)

In a former report¹ attention was drawn to certain points which seemed to indicate that meteorological conditions in the Luangwa Valley had a considerable influence on the development of *Trypanosoma rhodesiense* in *Glossina morsitans*. As, however, the experiments were few in number, and were carried out during only a single dry and wet season, no definite conclusions could be drawn. Since the Commission established its head quarters on the Congo-Zambesi watershed, evidence has accumulated which indicates decisively that such conditions, more particularly the temperature, exert a very pronounced influence on the development of the trypanosome in *Glossina morsitans*.

At Nawalia eight transmission experiments were made—four with laboratory-bred and four with "wild" *Glossina morsitans*. At Ngoa five experiments have been carried out to date—four with "wild" and one with bred flies. It is unfortunate that the bred flies are not more numerous, but owing to the low temperature the majority of the flies did not emerge from the puparia, and many of those which did were malformed and quickly died. In all the experiments in which "wild" flies were used, however, the possibility that they were already infected with the

trypanosome was excluded by first feeding them on healthy monkeys.

TABLE I.—*Meteorological Observations at Nawalia, N. Rhodesia, 12° 25' S., 32° 2' E., Altitude 2,100 ft. (approximately).*

1911-12.	External Shade Temperature: Mean.	Absolute Maximum.	Absolute Minimum.	Laboratory Temperature: Mean.	Relative Humidity: Per Cent.	Rainfall in Inches.	Days on which Rain Fell.
June ...	67.2	89.0	44.3	—	48.6	0	
July ...	68.7	91.0	44.6	67.4	45.7	0	
August ...	73.3	96.8	51.2	71.2	35.8	0	
September ...	77.5	103.3	54.0	71.5	31.5	0	
October ...	85.1	107.6	62.3	81.5	31.8	0.26	2
November ...	87.1	107.8	67.9	84.6	41.1	1.61	8
December ...	82.3	101.7	67.8	79.6	69.1	8.54	20
January ...	80.6	101.1	67.0	78.4	77.7	14.97	16
February ...	79.2	96.0	65.1	77.1	73.8	5.55	16
March ...	79.0	97.6	61.0	72.0	52.5	5.42	6
April (to 9th) ...	79.5	97.9	59.8	77.2	58.0	0.01	1
					56.04		63

TABLE II.—*Meteorological Observations at Ngoa, N. Rhodesia, 11° 40' S., 31° 30' E., Altitude 4,400 ft. (approximately).*

1912.	External Shade Temperature: Mean.	Absolute Maximum.	Absolute Minimum.	Laboratory Temperature: Mean.	Relative Humidity: Per Cent.	Rainfall in Inches.	Days on which Rain Fell.
April (20-30) ...	72.0	89.7	54.1	68.0	53.7	0	
May ...	63.0	90.5	45.1	66.2	51.3	0	
June ...	61.5	85.5	34.3	60.5	53.0	0.01	1
July ...	62.4	83.0	42.3	60.9	53.0	0	
					0.01		1

The details of the Nawalia experiments have already been published,² while those of the Ngoa series will appear in a later report. For the purposes of the present paper synopses of the two series will suffice, and will be found in Tables III and IV.

TABLE III.—*Synopsis of Transmission Experiments with Trypanosoma rhodesiense and Glossina morsitans, carried out at Nawalia, Northern Rhodesia.*

No.	Date on which Started.	Season.	Number of Flies Used.	Variety of Flies Used.	Result.	Duration of Developmental Cycle: Days.	Mean Temperature during Developmental Cycle.*	Absolute Maximum during Developmental Cycle.	Absolute Minimum during Developmental Cycle.	Relative Humidity* per Cent.
1	Aug. 20, 1911	Dry	26	Bred	Infection	13	75.1	90.0	60.5	35.0
2	Nov. 14, 1911	Com-mence-ment of rains	16	"	"	15	83.5	93.5	74.5	44.8
3	Nov. 14, 1911	"	57	Wild	"	11	83.8	93.5	74.5	44.8
4	Dec. 29, 1911	Rainy	20	Bred	Negative	—	78.2	87.1	72.8	74.5
5	Jan. 12, 1912	"	42	Wild	"	—	78.0	85.7	72.8	74.2
6	Jan. 12, 1912	"	42	"	"	—	78.0	85.7	72.8	74.2
7	Jan. 12, 1912	"	23	Bred	Infection	19	77.9	85.7	72.8	75.4
8	Feb. 13, 1912	"	104	Wild	"	25	77.3	86.0	71.0	66.5

*In the case of the unsuccessful experiments the mean temperature and the relative humidity have been calculated for the first thirty days only.