Mortality.

The mortality in 200 cases observed during three months was 2 per cent.; these four cases died of bronchopneumonia, and two of them terminated in severe convulsions.

Diagnosis.

In the earliest stage, before the cough is paroxysmal or the whoop or vomit appears, the diagnosis is extremely difficult. A fretful, peevish child aged 1 to 3 years, with a short hacking cough, possibly laryngitis, slight unexplained pyrexia, and usually a girdle of fine crepitations at the level of the diaphragm, should make one suspect the onset of this disease. Briefly the clinical picture is that of an ill child; the physical signs are comparatively slight.

In the later stages the diagnosis becomes less difficult. The characteristic expiratory paroxysms with whoop and vomit, the slightly puffy face, the subconjunctival ecchymosis, the occasional epistaxis, and the presence of a sublingual ulcer, all point towards pertussis.

We have unfortunately occasionally observed this sublingual ulcer in children of the same age in which it commonly occurs in whooping-cough (1 to 3 years), and in these cases there could be no question of whooping-cough playing a part in its formation. We agree that these ulcers are formed by the tongue striking on the sharp lower incisors during the forcible expiratory spasms of coughing.

In our opinion the whoop is not necessary for diagnosis. In eight families where several children were suffering from undoubted whooping-cough one child was observed to have typical cough without the whoop. On the other hand, a typical paroxysmal cough with a vomit and a whoop may be found in cases of tuberculosis with caseous mediastinal glands. The presence of tuberculosis in other parts of the body and the length of the history may help to clear up the diagnosis. A foreign body in the trachea may also closely simulate pertussis in this respect.

Treatment.

The number of patients treated with vaccine and followed to their recovery was 64. Of these, 6 were given bi-weekly injections and treated as in-patients, while the remaining 58 were given weekly injections while attending the out-patient department.

Dosage of Vaccines.—The vaccine was supplied by a well-known London laboratory, and the dosage we employed was as follows:

Initial injection:			
Bordet's bacillus	...	...	500 million.
Influenza bacillus (Pfeiffer)	...	...	125 "
Pneumococci	...	...	25 "
Second injection:			
Bordet's bacillus	...	...	1,000 million.
Influenza bacillus	...	...	250 "
Pneumococci	...	...	50 "
Third and subsequent injections:			
Bordet's bacillus	...	...	2,000 million.
Influenza bacillus	...	...	500 "
Pneumococci	...	...	100 "

For the purposes of this paper the length of the disease was defined as from the onset of the cough to the termination of the whoop.

*RESULTS.**A. Vaccinated Cases.*

1. In 58 of the out-patient cases treated with weekly injections the average duration was 7 weeks; those treated within the first week of the onset showed an average duration of 5.7 weeks; those in the second week of the disease an average duration of 5.9 weeks; those in the third week an average duration of 7.2 weeks; in the fourth week an average duration of 7.6 weeks; in the fifth week an average duration of 9 weeks.

2. In the 6 cases treated with bi-weekly injections as in-patients the average duration was 6.6 weeks.

B. Non-vaccinated Cases.

The average duration of the disease in 42 control cases that were not treated with vaccine was 6.4 weeks.

Did the vaccine shorten the duration or severity of the whoop?

In the vaccine-treated cases the average duration of the whoop was 4.8 weeks; in the non-vaccinated cases 4.4 weeks. Even in the vaccinated cases treated in the first or second week, and occasionally before the whoop developed, the

shortening of the duration of the disease would appear to be negligible. In several cases exposed to infection and seen early in the stage of incubation, vaccine treatment appeared to have no appreciable value as a prophylactic measure. It appeared to us that the vaccine which we used when given weekly, or bi-weekly, entirely failed to influence the duration or the severity of the disease either favourably or unfavourably.

The administration of vaccines to children presents difficulties. The injections were painful and upset the children considerably, especially the larger doses, so that they lost confidence in us. Unless whooping-cough vaccine can be shown to be of more therapeutic value than it has been in our hands, we consider that the distress to the child, and the risk of losing his confidence, does not justify its use.

We lack experience in vaccine therapy and fully realize that the wrong organism, intervals between injections, and dosage may have been used in this investigation. We are of the opinion that the following points in treatment aid in the shortening of the disease and the prevention of complications.

Hygienic.—Fresh air seemed an all-important point, and undoubtedly those children allowed to run about outside with the usual precautions against exposure did much better than those confined to the house. Even those with a moderate degree of bronchitis benefited greatly with this treatment. Where there is insomnia and exhaustion, consequent on the greater severity and frequency of the whoops at night, this can be alleviated by getting the child to rest and sleep during the day.

Dietetic.—Anorexia and vomiting being constant symptoms, wasting was a constant sequel; it was often found necessary to vary the diet frequently, children taking and retaining cow's milk or some of the proprietary foods best during the acute stage. The all-important point seemed to be to prevent this wasting and to keep the child in as good physical condition as possible. The feeds were given in small amounts and at frequent intervals, and when possible immediately following on a paroxysm of coughing and vomiting.

Medicinal.—We found cod-liver oil and malt a most useful remedy. Children on this treatment actually seemed to put on weight, and during the stage of recovery from the disease a preparation of iron was added to the cod-liver oil with great benefit. To cases of bronchitis with numerous moist sounds in the chest the following mixture could be given with great benefit to a child aged 1 year, and in suitable doses to older children, every four hours:

Tincture of belladonna	...	...	...	mij
Potassium bromide	...	...	...	gr. iij
Glycerin	...	...	...	mx
Water	...	...	...	to 3j

All our cases, both vaccinated and non-vaccinated, were given cod-liver oil and malt in suitable doses, with a liniment for the chest.

Our thanks are due to Miss Marian A. Lawson, of the Royal Free Hospital, for her very valuable assistance in administering the vaccines.

AN ARTERIO-VEINUS ANEURYSM TREATED BY LIGATION OF THE LEFT SUBCLAVIAN ARTERY.

BY

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LIGATION of the first part of the left subclavian artery is so rarely done that I think the following case may be worthy of record.

History.

A man, aged 24, was admitted to the Norfolk and Norwich Hospital on June 6th, 1921, complaining of swelling of the left upper extremity. He stated that while serving in France he was wounded in the region of the left clavicle on May 17th, 1917. After receiving treatment in various hospitals he was discharged from the army in November, 1917, on account of pain and weakness of the left arm. At the time of his discharge from the army the arm was not swollen, but at the end of 1918 he began to notice gradual increase in size of the whole of the left upper extremity, and a pulsating swelling appeared in the region of the left clavicle. The size of the arm continued to increase until there was very little use in it, and he had to carry it about in a sling. Dilated veins appeared on the surface of the axilla, arm, and forearm, and the skin of the left upper extremity assumed a dull livid colour. A superficial ulcer appeared on the flexor surface of the forearm in June, 1921, and rapidly increased in size.

Condition on Admission.

In regard to his general condition, the patient was a fairly healthy-looking, but somewhat pale man. His temperature was 98°, pulse rate 80, respirations 20; tongue clean, teeth fair. With reference to the local condition the left supraclavicular fossa was obliterated by a well-marked pulsating swelling. Pulsation was also visible below the clavicle, but was less well marked than above it. There were numerous dilated and tortuous veins running over the left upper extremity, especially well marked in the axilla. The whole of the arm and forearm was a dull livid colour; the arm was much swollen, the circumference of the upper arm 4 inches below the acromion process measuring 17 inches. There was a superficial ulcer situated on the flexor surface of the forearm, having all the characteristics of a varicose ulcer. The movements of the thumb and fingers were normal; there was no loss of sensation in the hand. The pulsation in the region of the left clavicle was felt to be expansile and diffuse, extending above and below the bone. A well-marked bruit could be heard over the whole of the left side of the chest, especially well marked over the pulsating swelling above and below the clavicle. The left radial pulse was less easily felt than the right. Heart and lung normal.

X-ray Examination.—There was a small foreign body situated behind the centre of the left clavicle.

A diagnosis was made of arterio-venous aneurysm between the second part of the left subclavian artery and the left subclavian vein. Rest, careful bandaging, and elevation of the arm improved the condition slightly, but considerable swelling persisted in spite of these measures. The varicose ulceration of the forearm continued to increase; operative treatment was therefore decided upon.

Operation: Ligation of the First Part of the Left Subclavian Artery.

On September 25th, 1921, an anaesthetic (chloroform and ether) having been administered, the patient was placed in the dorsal position, the shoulders slightly raised, and the head turned towards the right side. An incision was then made from the centre of the anterior border of the left sterno-mastoid muscle extending downwards to a point just internal and below the left sterno-clavicular joint. A second incision was then made from this point extending outwards parallel with and half an inch below the left clavicle. A triangular flap of skin and superficial fascia was then raised, exposing the left border of the manubrium sterni and the inner two-thirds of the left clavicle; the attachments of the sterno-mastoid muscle to the clavicle were then defined. The muscular attachments to the superficial surface of the clavicle were next divided; the periosteum covering the superficial aspect of the clavicle was divided and separated from the bone; the clavicle was then divided at its centre and the inner half removed subperiosteally. The left half of the manubrium sterni was next cut away. The base of the wound now consisted of the periosteum, which covered the posterior surface of the manubrium sterni, the periosteum separated from the posterior surface of the clavicle, a layer of deep cervical fascia and muscular tissue consisting of part of the sterno-hyoid and sterno-thyroid muscles. The base of the wound was then enlarged by dissecting away the exposed periosteum; the sterno-hyoid and sterno-thyroid muscles were defined and retracted. The common carotid artery was then defined running along the inner aspect of the wound. The left innominate vein, formed by the left internal jugular and left subclavian veins, was now defined, and retracted outwards and downwards with some difficulty. The left subclavian artery could then be felt at the bottom of a deep wound surrounded by fatty tissue. About half an inch of the vessel was exposed, and it was found that compression of the vessel caused complete arrest of pulsation in the aneurysm. An aneurysm needle was then passed round the first part of the subclavian artery, and the vessel tied with No. 3 silk by a knot after the method of Ballance and Edmunds. This method consists of passing the separate strands of ligature material round the vessel, tying each in a simple knot in the same direction, and then by using the two strands on each side as one completing the square knot. A few bleeding points were ligatured and the wound closed; a small rubber drainage tube was retained in the wound for twenty-four hours. Dressings were applied, and the hand and limb carefully bandaged. The time taken to complete the operation was two and a half hours.

Post-operative Treatment and Progress.

On September 26th, twenty-four hours after the operation, there was considerable respiratory distress, the respirations varying from 44 to 58 a minute; the pulse rate was 120, and the temperature was 100.5°. On September 27th the pulse rate was 140, fair volume and tension; the respirations 52, and the temperature 102°. The condition appeared to be due to an attack of acute bronchitis, probably caused by the administration of an unusually long anaesthetic. The condition gradually improved, and at the end of a week the temperature, pulse, and respiration were normal. The wound healed by first intention, and the stitches were removed on the eighth day. The radial pulse after the operation could not be felt, but the arm and forearm remained warm, and there was never any loss of sensation. No decrease in the swelling of the arm was noticed until the fifth day after the operation, when the limb began to decrease in size, so that nineteen days after the operation the upper arm had decreased 5 inches in circumference, measuring 12 inches instead of 17 inches. The varicose ulceration of the forearm began to heal rapidly, and had completely healed five weeks after the operation. Massage to the

hand and forearm was started four weeks after the operation, and eight weeks from the date of the operation the patient was discharged from the hospital, when no pulsation could be felt at the site of the aneurysm, but a slight bruit could still be heard. There was excellent power in the arm, forearm, and hand.

Remarks.

This was a case of arterio-venous aneurysm between the second part of the left subclavian artery and the left subclavian vein; the condition which demanded relief was the extreme swelling of the left upper extremity, which from the size and pain which it caused completely crippled the patient. The severe varicose ulceration of the forearm, associated with the varicose condition of the veins of the arm and forearm, made the possibility of septic thrombosis a very real danger. Alleviation of the condition seemed to be possible by one of the following procedures—namely, a reconstructive operation on the blood vessels which had for its object the closure of the abnormal communication between the artery and the vein, or ligation of the first part of the left subclavian artery as near to the arterio-venous aneurysm as possible; in either case it would be necessary to expose the artery and vein on the proximal side of the aneurysmal sac. When the first part of the subclavian artery had been exposed it was found that pressure on the artery at once stopped completely the pulsation in the aneurysm. From the condition of the parts it seemed very inadvisable to attempt a dissection to separate the artery from the vein, and to attempt to expose the abnormal communication between them. It was therefore decided to be content with ligation of the first part of the left subclavian artery. The completion of the operation was followed by recovery.

Success in performing this operation would appear to depend upon the elimination of the three complications which are likely to follow—namely, haemorrhage, shock, and sepsis. Before the introduction of the antiseptic and aseptic era this operation was practically certain to result in failure. Cases of ligation of the first part of the left subclavian artery have been successfully performed and reported by Halstead of Baltimore in 1892. Dr. John C. Da Costa twice ligatured the vessel, and both patients recovered. Nassau of Philadelphia also successfully ligatured the vessel. In 1897 Curtis, and in 1899 Allingham, also reported successful cases. There have certainly been other reported and unreported cases; still the operation is rarely required and seldom done.

Haemorrhage after the operation is to be avoided by paying every attention to an aseptic technique and by careful ligation of the vessel with the most suitable material. It is probable that a ligature tied with the ordinary knot is more likely to ulcerate than one tied after the method of Ballance and Edmunds. The ligature should be tied so that the vessel is merely compressed and the coats of the artery are not divided. It has been stated that Halstead and Barling consider an absorbable material should be used for the ligature material.

It is an interesting fact that gangrene of the upper extremity rarely follows ligation of the subclavian artery; this, of course, is accounted for by the very free anastomosis which is present; still, cases have been recorded in which gangrene has followed the operation, so that it is important to take every precaution to prevent it. For the control of gangrene after operation for aneurysm two things are under the control of the surgeon provided there is no indication for immediate operation—namely, the method of operating and the time of operation. In the former the primary consideration is to save as many of the affected vessels as possible; in the latter, to allow sufficient time for the establishment of the collateral circulation. In this case the immediate result of the operation was to increase slightly the swelling of the arm, but this began to rapidly decrease five days after the operation. The radial pulse ceased on ligaturing the artery, and had not returned three months after the operation; but the collateral circulation is well maintained, the swelling of the arm is only slight, and the patient can use the hand well.

I have to thank Sir Hamilton Ballance for his advice and help in treating this case.

THE report of the school medical officers of Tokyo states that in 1921 there were 4,273 cases of scrofula, 399 of anaemia, 939 of cardiac disease, and 1,335 children with narrow chests; the cases constituted 9 per cent. of the school children of the city. According to this report nearly all children who contract tuberculous disease before the age of 14 succumb before they reach the age of 20.