Conclusion.

The consideration of the evidence suggests that an error in the metabolism of lecithin, probably in the liver, may be a causal factor in the failure of bone formation in rickets, and that this faulty metabolism may in some cases be accompanied by an increased conversion of cholin into guanidin compounds, thus explaining the association of tetany with rickets.

The theory is put forward tentatively in the hope that it may indicate lines for further work upon the nature of the disturbance in rickets.

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AMPUTATIONS AT THE SHOULDER AND AT THE HIP.*

BY

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TEN years ago, when I was President of the Leeds and West Riding Medico-Chirurgical Society, I described two new major surgical operations in my presidential address. They were: (1) interscapulo-thoracic amputation, and (2) supra-trochanteric amputation of the femur as a substitute in some cases for amputation at the hip-joint.

My friend and colleague Mr. Lawford Knaggs had already published a short account of the former (*Lancet*, May 7th, 1910), as he was afraid I might delay the publication of the new method and so not get the full credit for my work. It is from his short description that the details of the operation have found their way into the English and American textbooks. The only note of the second operation is in the short report of my presidential address, which appeared in the *BRITISH MEDICAL JOURNAL*, November 4th, 1911.

I had intended to describe these operations with fuller details, and to illustrate the description by the excellent drawings made for me by Miss E. Wright of Leeds, but I delayed doing this, and then mislaid the typescript and the illustrations; they only turned up a few weeks ago. I have lately received letters asking me where my original communications can be found, and am therefore encouraged to believe that the operations are considered to be of some value; this has decided me to place them on record, with fuller details than have yet been published.

I. INTERSCAPULO-THORACIC AMPUTATION.

The operation may be required for trauma and some cases of malignant growth of the upper end of the humerus or scapula. Some have advocated it for malignant disease of

the breast and for extensive tuberculous disease. Professor Berger's name is associated with the usual methods of performing the interscapulo-thoracic amputation. His paper, entitled "L'Amputation du membre supérieur dans la contiguité du tronc," was published in Paris in 1887. Sir Frederick Treves, Mr. Stanley Boyd, and Mr. (now Sir Gilbert) Barling in this country, and Professor Keen and Dr. La Conte in America, have made valuable suggestions.

Professor Berger was not the first surgeon to perform interscapulo-thoracic amputation, and to speak of the operation I have devised as a modification of Professor Berger's method is not correct. I do not know who was the first to perform the operation, but I remember seeing the late Mr. Christopher Heath remove the forequarter in 1882.

I submit that the operation I perform differs entirely in principle from Professor Berger's; in fact, it has nothing in common with it except the final result—that is, the fore-quarter is removed. The chief principle in Berger's operation is the ligation of the subclavian vessels as a preliminary step in the amputation; by my method the vessels are secured during the course of the operation. I have only once performed Berger's operation, but I have seen it done two or three times and noticed the difficulties the surgeons experienced in exposing and ligaturing the subclavian vessels; the whole operation took one and a half to two hours. It has sometimes to be done in two stages. I have performed my operation in twenty-five minutes, including the suturing of the flaps. The ease with which the operation can be performed reduces the time and so must be an important factor in the success of these cases.

When the second case presented itself I carefully read up the whole subject again, and, when thinking it over, it struck me that there might be a better way of removing the fore-quarter than that usually practised. I remembered when I was reading for the first examination for the diploma of F.R.C.S. that I attended a class of special dissections conducted by Professor (now Sir George Dancer) Thane at University College, London. One of the dissections was of the brachial plexus from behind. I think we tried two or three different ways; one was to turn a flap back over the scapula and to divide all the muscles attaching the vertebral border of the scapula to the spine, and I remembered that when this was done the brachial plexus could easily be

seen with the subclavian vessels. It then struck me that this would be a much easier way of doing the operation. So I planned it out on these lines and was delighted with the comparative ease with which it could be performed.

Description of the Operation.

The flaps, of course, may vary according to the exact position of the disease; there are two flaps, a cervico-scapular and a pectoro-axillary.

The patient is placed

on the sound side close to the edge of the operating table. A cervico-scapular flap is made, commencing at the clavicle near the outer margin of the sternomastoid attachment, carried along the clavicle over the prominence of the shoulder along the axillary border of the scapula to a point below the angle and backwards to about two inches from the spine (Fig. 1). A flap of skin and subcutaneous tissue is rapidly turned back; this exposes the posterior surface of the scapula, with the muscles attaching it to the spine.

The trapezius and the latissimus dorsi are then divided, next the levator anguli scapulae, the rhomboids, and, lastly, the scapular attachment of the serratus magnus and the omohyoid muscles. Three or four vessels may require ligation, branches of the suprascapular and posterior scapular arteries. The soft tissues are now separated from the clavicle, close to the sternomastoid attachment, and the bone surrounded by a Gigli's saw and divided; the subclavius can now be divided.

The whole upper extremity now falls away from the trunk,

FIG. 1.—A, Line of division of muscles. B, Line of cervico-scapular flap.

* This paper reached us a few days before Mr. Littlewood's lamented death on December 19th, 1921.

held by the subclavian vessels and the cords of the brachial plexus, which are fully on the stretch, standing out and easily seen (Fig. 2).

The cords of the brachial plexus are now divided with a pair of scissors close to the spine; an injection of cocaine into the nerve can be given before division, as has been recommended, to lessen the shock. In my three cases I have not noticed any increase of shock in division of the nerves. I have not injected cocaine.

Clips are applied to the subclavian artery, which is divided between them; the vein is then seen and treated in the same way. The advantages of securing the artery first have been pointed out by many operators, and in this operation it is the easiest plan. The vessels can now be ligatured, or this can be done after the parts have been removed. The anterior or pectoro-axillary flap is now cut and reflected as far forwards as necessary.

The last stages in the operation consist in the division of the pectoralis major and minor muscles; the position of the division depends on the extent of the muscles it may be thought necessary to remove.

After the division of these muscles the forequarter is removed. This exposes the thoracic boundaries of the axilla and the posterior triangle, so that it is now quite easy to remove any lymphatic glands which require removal (Fig. 3).

The flaps are now sutured and a firm dressing applied. I have recently used silkworm gut prepared with iodine for suturing.

II. AMPUTATION NEAR THE HIP-JOINT (SUPRATROCHANTERIC).

The other operation I wish to describe I have called the supratrochanteric amputation of the femur, and I suggest it should be performed in some cases as a substitute for amputation at the hip-joint. I have performed it several times, on the first occasion in 1897.

Amputations at the hip-joint are either done for trauma or for malignant disease of the femur, generally at the lower end, and also for tuberculous disease. The operation here described could not be done for the latter condition, as the disease is in the joint itself.

In cases of sarcoma of the lower end of the femur it is generally taught that the whole bone must be removed. It is unfortunately a very serious disease; in the majority of cases death occurs from secondary deposits in internal organs in eighteen months to two years after the onset; often at a much earlier date. In one of my cases the patient lived five years.

The disease, however, has not in my cases recurred in the stump; the recurrence has generally been in the internal organs, mostly the lung, and in one case I know the death was certified as "tuberculous disease of the lung." I found out that the patient had had several attacks of haemoptysis, due, I have no doubt, to a secondary growth.

I do not believe there is any fear of the growth recurring in the portion of the bone—just the head and neck of the

femur—that is left in the supratrochanteric operation. Now the object of my operation is to leave the hip-joint intact, and I submit there is less shock at the time of the operation, and the stump is more useful.

Description of the Operation.

The patient is brought to the edge of the operating table, resting on the sound side.

An antero-internal flap is first cut beginning just below the anterior superior spine, coming down to a level to secure an

adequate covering—that is, to one-third of the circumference of the hip-joint—then over the front of the thigh, and upwards on the inner and posterior aspect to a point near the ischial tuberosity; a postero-external flap is now cut. Any flaps that are used for an amputation at the hip-joint would be suitable for this operation. I always think the Furneaux Jordan flap is far too long and bulky, but his principle of keeping the incision away from the perineum should be followed whatever flaps are made.

The inner flap, consisting of skin and subcutaneous tissue, is now

turned up about a couple of inches, the femoral vessels are exposed, clipped with forceps, severed, and ligatured. The muscles are next divided and separated as high as the neck of the femur; the ilio-psoas is the last divided. The branches of the profunda artery are caught in clips, divided and secured by ligatures; with a good assistant the loss of blood is small. The muscles in the outer flap are now divided and separated from the bone, those attached to the great trochanter being severed last. The sciatic nerve is divided after forming this flap. The flaps are held on one side; this exposes the neck of the femur.

The anterior part of the capsule of the hip-joint is attached to the anterior intertrochanteric line, and without opening the hip-joint this must be separated from the neck of the femur upwards for about half an inch by means of a raspator; the neck of the femur is surrounded by a Gigli's saw and the bone sawn through close to the trochanter; the limb is removed, leaving, as will be seen, the hip-joint intact.

The muscles can be brought together with deep sutures and the skin secured with silkworm gut. The stump can be drained if it is thought desirable.

All will agree that it is right to amputate for trauma. Operations for malignant disease are open to criticism. My own feeling is that it is the right thing to do; the fact that one case lived five years is encouraging. Perhaps an earlier diagnosis will give us better results; so often do we wait to see whether the condition is inflammatory, when an exploratory incision would clear up the doubt. During recent years I have explored four cases of enlargements about the lower end of the femur, thinking they might be sarcomatous, and have found them to be due to traumatic periostitis, accompanied by some myositis ossificans. In addition to clearing up the doubt it is good treatment for these conditions, so there is really no reason to delay the exploration, and much time

FIG. 2.—C, Forceps on subclavian muscles. D, Brachial plexus diverted.

FIG. 3.

is gained if, unfortunately, they should turn out to be sarcomatous.

It must be remembered that scurvy rickets, the result of improper feeding of children, may produce swellings of the lower end of the femur simulating sarcoma.

In my earlier cases I tried to arrest the haemorrhage by means of one of the many methods recommended for amputation at the hip-joint—the names of their originators are not quite legion: Lister, Macewen, Jordan Lloyd, McBurnie, Wyeth, Davies, Lever, and a host of others—the supposed value of these I have delighted to explain to students. They are mainly methods by the use of tourniquets, which are often unsatisfactory; in amputation at the hip-joint some of them may slip over the stump before the vessels have been secured.

I have long given up the use of tourniquets in cases of excisions, as I found that the oozing and bleeding afterwards was considerably less when the tourniquet was not used; in amputations where there is marked arterial disease, and in amputations for gangrene, a tourniquet may do a great deal of damage to the tissues and so favour sloughing of the flaps.

The method for the arrest of haemorrhage used in these cases carries out the same principle as I adopted in the inter-scapulo-thoracic amputation—that is to say, no preliminary attempt is made to control the bleeding, but the main vessels are exposed during the ordinary course of the operation, clipped with forceps, divided, and ligatured.

In ordinary amputations I had never tried this method, until Mr. J. A. Coupland, who was helping me with a supra-trochanteric amputation of the femur, suggested that I should expose and secure the femoral vessels at the point of division in forming my flap. I was a little bit afraid at first of not using some form of tourniquet as a first line of defence against haemorrhage, but was very pleased with the result. It answered admirably, the patient only losing a small quantity of blood. I think this principle should be applied to all amputations. It is not a great deal to expect of any operating surgeon that he should remember the anatomy of the main vessels. If this method is thought worthy of following, then the tourniquet will only be used for first aid.

This method has now been practised and advocated for some time by a certain number of surgeons. I believe, however, that the large majority still rely, as I had done, on the tourniquet.

I find that in a very useful and practical book (*Amputation Stumps*, Oxford War Primers, 1918) the author, Mr. C. Martin Huggins, F.R.C.S., writes (p. 114) in favour of the supra-trochanteric operation in certain cases; the method is also commented on favourably in the *Manual of Surgery*, by Thomson and Miles, 1920, p. 539.

A Post-Graduate Lecture

ON

CLINICAL ASPECTS OF ABDOMINAL TUBERCULOSIS.*

BY

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THE great frequency with which tuberculosis attacks the abdomen in childhood, the wide variations in its manifestations, and the grave results to which it often leads, all combine to make it a disease of prime importance in the abdominal surgery of the first two or three decades of life. My purpose in the following remarks is to approach the subject from the point of view of clinical diagnosis, and to state the conclusions to which my own experience has led me on the subject of the appropriate surgical treatment.

Tuberculosis of the Intestine.

Tuberculous ulceration of the intestine in its early stages is a problem for the physician, and rarely, if ever, requires surgical intervention. A history of diarrhoea, accompanied by the passage of some blood and mucus per rectum, is not uncommon in all classes of abdominal tuberculosis, and such a feature in the history gives us evidence of some value, as suggesting earlier tuberculous ulceration of the bowel. It is

only when ulceration has gone on to cicatrization, with stenosis of the intestinal lumen, that the need for surgery arises. Tuberculous ulcers of the bowel commence, as is well known, in the lymphoid tissue of the mucosa, either in the larger collections known as Peyer's patches, or in the solitary follicles, and such ulcers are accordingly commoner in the lower end of the ileum and near the ileo-caecal valve. Two forms of intestinal stenosis are met with in these old tuberculous cases—in one the ulcer, which tends to spread in a circular direction round the lumen of the bowel, gives rise in the process of healing to an annular cicatricial diaphragm. There may be many such stenoses in the small intestine, but not uncommonly they are single. In the second form there is a massive formation of fibrous tissue, which gives rise to a gross thickening of the intestinal wall, as well as a narrowing of its lumen. I will illustrate these types by two cases:

CASE I.

A woman, aged 36, on whom I had operated eighteen months before for tuberculous wrist with a very satisfactory result, returned to hospital complaining that for the past twelve months she had suffered from intermittent attacks of acute pain in the left of the epigastrium. These attacks had occurred with increasing frequency, until they came on every week, and were accompanied by vomiting. There was no history of jaundice. On examination the upper abdomen was somewhat fuller than normal, but no palpable mass could be detected, and there was no visible peristalsis. There was no localized tenderness in any part of the abdomen, and x-ray examination was negative. In view of the nature of the attacks and the previous tuberculous lesion, the provisional diagnosis of tuberculous stricture of the intestine was made, and exploratory laparotomy undertaken. On examining the small intestine systematically a single annular, fibrous constriction was found in the jejunum some two feet below the duodeno-jejunal flexure. On the peritoneal coat of the bowel there were several small grey tubercles, and there was some enlargement of the mesenteric glands in the neighbourhood. The bowel above the stricture was somewhat hypertrophied and distended as compared with that below. Four inches of jejunum were excised, including the stricture, and lateral anastomosis performed. The patient made a rapid recovery, had no more attacks of pain, and when last heard of was in good health. Histological examination confirmed the diagnosis of tuberculous ulceration.

CASE II.

A woman, aged 29, had for five years been suffering from attacks of pain in the right iliac fossa, associated with local tenderness, vomiting, and increasing constipation. Her general health was poor, and she had lost a good deal of weight. On examination the right iliac fossa was found to contain a firm, palpable mobile mass, somewhat tender on pressure. There was no general abdominal distension. The diagnosis lay between ileo-caecal tuberculosis and carcinoma of the ileo-caecal valve. On exploring the abdomen the lower eight inches of the ileum, the ileo-caecal valve, and the caecum were found to be involved in a uniform hard and massive thickening, which strongly resembled a carcinomatous growth. On the peritoneal aspect, however, numerous small white tubercles could be made out. Lateral anastomosis between the normal ileum above and the transverse colon, combined with resection of the diseased area of bowel, brought speedy relief to her symptoms, and when seen recently, five years after the operation, she was in good health.

When such cases of hyperplastic ileo-caecal tuberculosis are met with in young children, they must be diagnosed from chronic intussusception or appendicitis with abscess formation. In chronic intussusception the attacks of pain are much more frequent and urgent, there is usually some passage of blood-stained mucus, and the illness is rarely of more than a few weeks' duration. In acute appendicitis with abscess formation there is again a much shorter history, with a typical sudden onset, and the mass is firmly fixed and not movable as in the case under discussion.

In older patients the diagnosis from carcinoma is a matter of extreme difficulty on account of the similarity of symptoms. In some cases the presence of subperitoneal tubercles will determine the diagnosis at operation, though even these may not be distinguishable from secondary carcinomatous nodules, and it may sometimes happen that the diagnosis between hypertrophic tubercle and carcinoma of the ileo-caecal valve remains in doubt until the specimen has been submitted to microscopical examination.

Tuberculosis of the Appendix.

Tuberculosis of the appendix, as an isolated lesion, is an occurrence of some rarity. The majority of recorded cases of tuberculous appendicitis have occurred in combination with hyperplastic ileo-caecal tuberculosis, and in such cases implication of the appendix in the tuberculous process must be regarded as a comparatively unimportant detail. The following case of primary tuberculosis of the appendix is the only one that has come under my care.

* Delivered at St. Mary's Hospital, Manchester.