Andrews of Chicago, which rather emphasizes the handicap of not having access to Sir Berkeley Moynihan's book on the subject of duodenal hernia. My case seems to support Dr. Andrews's theory that these cases are of congenital origin.

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THE TREATMENT OF HAEMORRHOIDS BY SUBMUCOUS INJECTIONS OF CHEMICALS.

BY

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WITH A DESCRIPTION OF THE PATHOLOGICAL CHANGE PRODUCED,

BY

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I.—By H. GRAEME ANDERSON.

THE method of treating piles by the injection of chemicals into their substance was first brought to my notice in 1907 by my teacher and friend Mr. Swinford Edwards.

Since that time I have treated by this method quite a large number of haemorrhoid cases, experimenting with various types of chemicals of varying strength, and endeavouring in many ways to improve the technique. During the same time I have collected and studied almost all the contributions published on the subject. Further, during 1923, to settle the question of the pathological changes involved, I injected a series of haemorrhoid cases and then excised the piles—with uninjected control piles from each case—at daily intervals. These specimens were submitted to Dr. Dukes for microscopical examination, and the results of his investigation are recorded below.

History of the Injection Method.

This method did not originate in America as is generally recorded, but was first carried out by Mr. Morgan in Dublin in 1869. He used a solution of iron persulphate, and so applied a method to haemorrhoids that had been used in the treatment of naevi since 1836.

William Colles, another Dublin surgeon, in 1874 injected a case of piles, using iron perchloride. He had seen Mr. Cussack treat piles by the introduction of a needle coated with silver nitrate into the centre of each. Colles thought that a better result could be obtained by hypodermic injection. In 1871 carbolic acid was first used as the injecting agent by Mitchell of Clinton, Illinois. At first his method was kept a secret, but knowledge of it soon spread. The secret was sold to various unqualified people who were known as travelling pile doctors. These itinerants began to sell the secret remedy to others, who traversed the country in all directions "till their handbills fluttered on the shores of the Pacific Ocean." Professor E. Andrews of Chicago in 1876 discovered the secret from one of the "quacks" and carried out an exhaustive investigation of the whole subject. He collected the results of 3,300 cases. Mitchell used one part of carbolic acid to two parts of olive oil. Most of the "irregulars" used strong solutions of carbolic, ranging from 27 to 95 per cent.

Once the secret was laid bare many qualified medical men—eminent and otherwise—gave the method a trial, and it took some twenty years before three definite schools of opinion on the subject were established. The first school, headed by such authorities as Allingham senior, Mathews, and the Andrews, considered the method unsafe and dangerous. The second school, the chief exponents of which were Agnew, Shuford, Adler, and the Martins, believed in injecting strong solutions of carbolic acid—that is, over 20 per cent. and ranging to 95 per cent. They aimed at

removing the piles by sloughing them off. The third school believed in using weak solutions of carbolic acid—that is, from 5 to 20 per cent., injecting small quantities, and aiming at producing mild irritative changes with ultimate fibrosis and shrinking of the tumours. This school had as its advocates Hoyt, Yount, Wright, and others. For the past thirty years the "strong" school has been dying out, and it has few advocates at the present day. On the other hand, the "weak" school with succeeding years has become more firmly established, and is the one most generally followed by those who use this method at the present time. Personally, I use very rarely any carbolic solution over 10 per cent.

Selection of Cases.

The injection method, in my opinion, is a very useful one indeed, and in quite a large proportion of cases excellent results can be obtained. External piles should on no account be injected. Internal piles, complicated by fissure, fistula, or large external skin tags, and those that are inflamed, ulcerated, or gangrenous should not be injected, but submitted to ligature or clamp and cautery operation. Similarly, where the piles are very large and numerous, of old standing, and with much fibrotic change, these cases are unsuitable for injection and speedier and better results are obtained by operation. Patients with haemorrhoids who have long anal canals, hypertrophy or spasm of the sphincters are not suitable for injection.

Uncomplicated internal piles are the only ones that should be treated by injection, and I agree with Albright, who says that "the idea of universal applicability should never have been advanced for this treatment." Pennington, in the latest edition of his book, states that "it is estimated by advocates of the injection method that not over 50 per cent. of cases in America are suitable."

Technique.

The rectum, of course, should be empty, and this is usually so in the majority of patients if the bowels have acted in the morning. If constipation is a symptom, then it is better to order a purgative to be taken two nights before the visit. Confection of senna or castor oil will be found the most suitable. Enemata are better avoided as they increase the congestion of the haemorrhoids. Glycerin suppositories act just as quickly and the local effects are less drastic.

The patient should be placed on his side lying partly over on the abdomen with the lower leg only slightly flexed and the upper leg fully flexed at hip and knee. I use a strong projection lamp, as good illumination is most essential. There is no objection to injecting the piles while they are prolapsed, but on the completion of the injection the piles must be instantly reduced and returned above the sphincters.

In the majority of cases a speculum has to be used. I use one of two types, either the ordinary 3 in. Kelly's proctoscope with a smooth metal collar, or one which I have devised—a modification of the Hirschman speculum, a little longer and with a smooth metal collar (Fig. 1). A speculum with a slide is one to be avoided, especially if it has a closed end. The piles will be found to prolapse into the lumen of the speculum and by gently and slowly withdrawing the latter for about half an inch and then pushing it gently inwards again a good idea will be obtained of the size of the piles.

The pile to be injected is then gently caught at its upper end by a long pair of angled forceps which I have devised for the purpose (Fig. 2). The instrument is allowed to hang on to the pile, and by its own weight it steadies the latter by gentle traction and renders easy the insertion of the needle. I use a special syringe with a glass barrel of fine calibre which can only hold 10 minims of the solution. The syringe is metal bound, and has thumb and finger rings. The needle is two inches long, of not too fine a calibre, and has a bulbous shoulder half an inch from the tip. This syringe is a safe one for beginners to use, as even if the total contents are injected into one pile no harm can accrue; and again, the shoulder on the needle prevents the latter from being inserted more than half an inch into the substance of the pile (Fig. 3).

The injection is made into the upper part of the pile about half an inch to an inch above the level of the anal valves or papillae. This is an important point. The rectal mucosa is insensitive to pain or light touch, and if the injection is made at the right level the patient should be entirely unconscious of it. No local anaesthetic is required. With nervous people it is as well to smear the speculum

FIG. 1.

with a lubricant containing 10 per cent. cocaine. Should the insertion of the needle or the injection of the fluid cause pain it is certain that the injection has been made at too low a level. The lining of the anal canal is extremely sensitive to pain. The injection method requires a fair amount of skill in its performance, and the beginner, before

FIG. 2.

attempting it, would be well advised to see the procedure carried out by a competent proctologist.

The injection of the fluid should be done slowly, when it will be noticed that the injected pile swells up and in some cases obscures from the view the other piles that are present. It has often been stated that as the pile swells it becomes whitish in colour. This very rarely happens, and if it does a slough is very liable to form later. On many occasions at St. Mark's Hospital, while a patient was under an anaesthetic and about to undergo an operation, I have injected 5, 10, and 20 minims of 10 per cent. carbolic solution, on

FIG. 3.

other occasions the same amounts of a 20 per cent. solution, and have demonstrated to onlookers that no such blanching occurs as a rule. On the other hand, the injected pile often becomes much deeper in colour, and this may be due to traumatism from the needle with a slight haemorrhage into the pile substance. It is interesting to note in

connexion with this fact that Mitchell, the originator of the carbolic acid injection method in America, partly abandoned the method and adopted the plan of tearing the interior of the piles to pieces by means of angular needles set in handles. An injection of 3 to 5 minims of the solution is made into smaller piles, and 5 to 7 minims into larger piles. The needle is left *in situ* for about a minute and then withdrawn. Sometimes there is a slight oozing of blood from the puncture, but the application of a little adrenaline solution on a swab soon arrests this. The pile clip is unfastened and the speculum is withdrawn. A little adrenaline and chlorotone ointment is then squeezed into the rectum to act as a protective dressing to the injected piles. Should the injected pile prolapse it is immediately replaced.

The patient can go about his ordinary business immediately the injection procedure is over. He should abstain from exercise or heavy work for two or three days. He is instructed to replace the piles immediately should they prolapse. Liquid paraffin is ordered and the bowel should be allowed to act forty-eight hours after the injection is made. As a rule I examine my patients forty-eight hours after injection to make sure that all is well. The injected pile is then felt to be swollen and firm in consistence with the induration running upwards and gradually diminishing. In a week's time the injected pile has begun to shrink, and another injection may be given into the same pile, or another pile may be then treated in a like manner. One, two, or three piles may be injected at the same time, but as a rule I only inject one or two on each occasion. The number of injections into each pile varies with the case: two to four injections are usually required. Haemorrhage is arrested like magic from the first injection, and as the shrinking proceeds the prolapse ceases or becomes much less. Although haemorrhage and prolapse may disappear after one or two injections, the piles may still be visible through a speculum, but much smaller in size. Some patients at this stage are so pleased with the result that they discontinue treatment. To obtain a good cure it is better to go on injecting each week till the piles no longer project into the speculum.

The Chemicals used in Injection.

At St. Mark's Hospital I have experimented with the following chemicals: carbolic acid, quinine and urea, iron perchloride, ergot, lead acetate, alcohol, and formalin. There is no doubt that carbolic acid is the best of all, though quinine and urea gives almost as good results. The latter should be used in 5 or 10 per cent. solutions. I was disappointed in the results when using ergot and also lead acetate. Iron perchloride gives quite good results. At one time at St. Mark's I was using alcohol, injecting it subcutaneously around the anal margin for the treatment of pruritus, and I tried it as a submucous injection in the treatment of piles. The results were disappointing as pain occurred and small sloughs formed. I was tempted to try formalin in the hope that it might aid in shrinking and hardening the pile substance. At first I used 10 per cent., which was much too strong as it produced in three cases great pain, localized sloughing, and marginal abscess, although ultimately the piles were cured by sloughing. Later I used 1/2 per cent. formalin, but even this caused pain. Then for a time I used 1/4 per cent. formalin in the 10 per cent. carbolic acid glycerin solution. For the past few years I have confined myself to the use of carbolic acid. When this was used in strength over 20 per cent. in all cases sloughs were produced and in some cases marginal abscesses; and although the piles were ultimately cured it was only at the expense of time, pain, sloughing, and abscess formation.

I am of the opinion that 10 per cent. carbolic acid in equal parts of glycerin and distilled water is the best solution to use. With this solution, injected at the proper site, the best and safest results are obtained, and no complications such as pain, haemorrhage, sloughing, ulceration, and abscess formation should occur. I am aware that a great many use 20 per cent. carbolic, but with a solution of this strength one can never be sure of avoiding sloughing. In many cases mild sloughing occurs and the ulceration produced may give rise, through imperfect drainage, to more

distress than the piles. The latter may be ultimately cured, but the healing process may be unduly prolonged. In my opinion the whole object of the injection method is defeated by using strong solutions.

Recurrence.

There is no doubt that recurrences do take place, and they usually become evident in from three to five years' time. The Martins treated by injection 4,200 cases, and estimated the recurrence rate at 15 per cent. Even if recurrence does take place, patients are quite happy to return for a further course of injections.

In treating a case of piles by the injection method it is advisable to keep a systematic record of the date, site, and amount of injection solution used at each sitting. I have a diagram stamped in my case book and record the injection made in different coloured inks.

II.—By CUTHBERT DUKES.

The pathological changes provoked by carbolic acid injections have been studied microscopically in ten patients, in each of whom one haemorrhoid was injected in the usual way, and this injected haemorrhoid, together with a control not injected, was subsequently removed by operation—in one patient in one day, in the remainder after 2, 3, 4, 5, 6, 7, 12, 14, and 21 days. The pieces of tissue were fixed, embedded in paraffin, and serial sections cut from the injected haemorrhoid and control haemorrhoid of each patient.

The haemorrhoid removed one day after injection showed the vessels dilated and engorged with blood and the surrounding tissues oedematous, containing much extravasated blood, and infiltrated with polymorphonuclear leucocytes. There was clear evidence of active emigration of these through the vessel walls into surrounding tissues. No signs of thrombosis were seen. The chief feature at this stage was the close packing of the oedematous tissues with innumerable polymorphs.

The haemorrhoid removed two days after injection showed no pathological changes to distinguish it from the uninjected control. It is probable that in this case the piece of tissue removed was not reached by the carbolic acid.

The haemorrhoid removed three days after injection did not show any noteworthy change in the vessels themselves, but the surrounding tissues were still oedematous, contained extravasated blood, masses of polymorphonuclear leucocytes, some lymphocytes, and very many large mononuclear cells. The abundance of these large mononuclear macrophages was the characteristic feature at this period. Many were actively phagocytic and had ingested red blood cells or leucocytes. They appeared to be playing the part of scavengers. Proliferation of the fixed connective tissue cells was noticed at the margin. There was no evidence of thrombosis in any of the vessels.

The haemorrhoid removed four days after injection presented much the same appearances as its predecessor, but the leucocyte infiltration was less conspicuous and the macrophages were relatively more numerous. These large mononuclear cells were arranged in clusters round the blood vessels. There was clear evidence of proliferation of fibroblasts. No sign of thrombosis was detected.

The haemorrhoid removed five days after injection showed commencing thrombosis in many vessels. No intravascular clotting was seen in the control injected haemorrhoid from the same patient. The polymorph infiltration of the surrounding tissue had almost disappeared, but large mononuclears and young connective tissue cells were plentiful.

The haemorrhoids removed six and twelve days after injection showed very little change as compared with the control.

In the haemorrhoids removed seven, fourteen, and twenty-one days after injection thrombosis was found in each case, but apart from some increase in fibrous tissue and the budding of new capillaries no other significant change was noted.

Manner of Action of Carbolic Acid.

Carbolic acid, being a powerful irritant to the tissues, initiates an aseptic inflammation, characterized by dilatation of the vessels, emigration of leucocytes, and transuda-

tion of lymph. By these means the alien liquid is diluted and removed; thereafter the inflammation quickly subsides. All the changes observed microscopically represent the effort of the tissues to repair an injury.

The curative effects of injections of carbolic acid do not depend upon any specific action of this chemical substance. The mere introduction of a needle into the haemorrhoid results in damage to many blood vessels, and in these thrombosis is likely to follow. Moreover, the cellular injury which this poison inflicts on the delicate lining cells of the capillaries is also likely to contribute to intravascular clotting. It is possible also that the contraction of newly formed fibrous tissue may constrict blood vessels or even occlude them, but little sign of this was noticed in this histological study. Perhaps, after longer periods, this would have been more evident.

The early inflammatory changes which occur in the first three days do not play any important part in the cure of haemorrhoids; it is the secondary changes, in particular the intravascular clotting, and subsequent fibrosis, to which any beneficial effect must be ascribed.

AN ATTEMPT TO VACCINATE CHILDREN AGAINST TUBERCULOSIS.

(A Preliminary Note.)

BY

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IN the BRITISH MEDICAL JOURNAL of April 23rd, 1921, I described a new tuberculosis immunizing vaccine, which I had prepared from dead cultures of tubercle bacilli that had become attenuated after continuous subculture in my laboratory for a period of fourteen years.

The immediate results of treatment of a large number of cases of all forms of tuberculosis have been very encouraging, but the final results cannot be estimated for another two years.

I am now directing my attention to the even more important problem of protecting children against infection, on much the same lines as the use of an antityphoid vaccine against typhoid fever, which was such a brilliant success during the war.

The problem of tuberculosis resolves itself into the question of immunity. The protection of the community by some safe scientific method of active immunization is the only effective way by which this preventable scourge can be eradicated.

Animal Experiments.

In the attempt to produce some active immunity in animals I have inoculated five series of rabbits and guinea-pigs, extending over a period of fourteen years.

I.

The first series of animals was inoculated with Koch's old tuberculin. Four weekly injections were given, followed in another month by a subcutaneous injection of 1/2 mg. of human tubercle bacilli of virulent culture. All these animals became infected with generalized tuberculosis and were apparently not influenced by tuberculin.

II.

The second series was given large doses subcutaneously of Koch's bovine tuberculin (bacillary emulsion). A weekly injection was given for four weeks, and after an interval of one month they were given 1/2 mg. of living bovine bacilli. All these animals developed acute generalized tuberculosis and died in four months. No protection appears to have been established against the laboratory dose of virulent bacilli.

III.

In the third series I attempted to produce active immunity in the animals by giving them subcutaneously four weekly doses of living bacilli of attenuated cultures of fourteen years' growth. These cultures, although growing luxuriantly, were non-pathogenic to animals. None of these animals developed tuberculosis, and on examination in six months showed no trace of infection.