only, but she relapsed a week later. She again responded promptly when again given the drug, and this was continued for one week without further relapse. The other case, of seven months' duration, responded promptly, and had not relapsed three months after discontinuance of the drug. Although most cases of glandular fever are relatively benign and require only symptomatic treatment, some severe ones often leave behind a state of depression and debility which may predispose to more serious illness (indeed, I have seen two cases which within a few weeks returned with a tuberculous pleural effusion), and in these cases if chloramphenicol is likely to shorten the illness it may be worth a trial.

Summary

A case of glandular fever with encephalitis is reported. The Paul-Bunnell test was positive, and the blood showed typical cell changes.

In spite of the clinical encephalitis, the cerebrospinal fluid was normal on the five occasions it was tested.

Chloramphenicol was used in treatment: its use in glandular fever is discussed.

I wish to thank Dr. C. Allan Birch, into whose ward this patient was admitted, for his interest and help in the preparation of this article.

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Korea is a highly malarious country with much of the population infected with the disease. In addition, the work of combating the anopheles mosquito has been complicated both by the innumerable breeding grounds provided in rice paddies and by the frequently harassing tactical situation. However, with the use of chloroquine, which became available throughout the entire combat area late in the summer of 1950, the incidence of malaria in Korea has been kept low compared with the second world war rates. Chloroquine is an excellent suppressant; but, like mepacrine and quinine, it is neither a preventive nor a complete cure for malaria. It was developed by the Germans in 1939 as a relative of pamaquin. Recently the U.S. Army Medical Service has concentrated much of its research on a new drug, primaquine, which appears particularly effective against the tissue phase of the disease because it attacks the stubborn parasites in the liver cells. This is chemically another close relative of pamaquin, merely differing in having a primary amine instead of a tertiary amine at the end of its side chain. A preliminary report appeared in the *Journal of the National Malaria Society*, 1950, **9**, 285.

TENOSYNOVITIS OF THE WRIST

BY

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Gray's Anatomy (1949) describes this disease in the following words: "The tendons of the abductor pollicis longus and the extensors of the thumb are liable to become strained and their sheaths inflamed (tenosynovitis) after excessive exercise, producing a sausage-shaped swelling along the course of the tendons." In three standard textbooks of surgery, tenosynovitis is described similarly as a disease of these three muscles of the thumb. One of them amplifies this description by stating that it is a disease of the "tendon sheath of the extensor ossis metacarpi pollicis (abductor pollicis longus) and of the extensores longus and brevis pollicis . . . and as the sheath surrounds not only the tendons but, as can be anatomically demonstrated, also extends some way up around the muscle bellies, movements of the affected parts are painful" (Romanis and Mitchiner, 1948).

Examination of 44 cases since the beginning of 1949 has made me very dissatisfied with this anatomical description. The disease as met with in the casualty department of the General Infirmary, Leeds, presented the following anatomical features. A sausage-shaped swelling was present on the radial side of the lower part of the dorsal surface of the forearm. This swelling was always about 1½ in. (3.8 cm.) long, and appeared to be slightly oblique to the long axis of the forearm. The lower limit of this swelling never extended distally beyond a point about 2 in. (5 cm.) from the lower articular margin of the radius. Thus, even allowing for a tendon sheath extending around the muscle bellies as described by Romanis and Mitchiner, the swelling seemed to be too high in the forearm to have any connexion with the extensors and long abductor of the thumb.

To investigate this point, therefore, a number of dissections were made on the lower forearm in the post-mortem room. My dissections all showed conclusively that the muscle bellies and tendons of the three dorsal muscles of the thumb crossed obliquely over the radius in its lower 2 in., and thus were unlikely to have any connexion with the swelling of tenosynovitis as seen clinically. Injections of water into the sheaths surrounding the tendons of these muscles did confirm the description given by Romanis and Mitchiner of the tendon sheath continuing up over the bellies of the muscles of the thumb, but the swelling produced by this distension of the sheath did not in the least resemble the shape of the swelling seen clinically, and was situated too near the wrist to correspond with the site of the swelling seen clinically. Dissections further up the forearm show that, immediately proximal to the muscles of the thumb, the tendons of the extensores carpi radialis longus and brevis are lying subcutaneously and that these tendons pass deep to the muscles of the thumb as they proceed distally to their insertion. These tendons emerge from their appropriate muscle bellies at a point about 1½ in. proximal to the upper border of the muscles of the thumb. Injections of water into the areolar tissue surrounding these tendons always produced a sausage-shaped swelling exactly similar to that seen clinically in tenosynovitis. The apparent obliquity of the swelling is shown to be produced by the oblique passage of the muscles of the thumb over the tendons. If the muscles of the thumb

are divided and retracted before the injection is made, the distension is seen to proceed downwards towards the wrist, but it is very much restricted in size. Dissection into the swelling showed a glairy shining lining typical of synovial membrane. The proximal limit of this synovial sheath is very sharply demarcated at the point of origin of the tendons from the muscles. The distal limit of the sheath is much more indefinite, but when the muscles of the thumb are in place it appears to be sharply demarcated.

It is thus clear that the description of tenosynovitis as a lesion of the muscles of the thumb is inaccurate. It is, in fact, a lesion of the sheath of the tendons of the *extensores carpi radialis*.

Cause

The disease is said to be due to a strain or excessive use of muscles. In the 44 cases which form the basis of this paper the causes of onset can be divided into main groups.

1. Direct trauma, in which there is a history of a blow directly on to the tendon sheath as it lies subcutaneously (13 cases).

2. Indirect trauma, in which the lesion follows use of the tendons. These can again be subdivided into three: (a) those following one isolated excessive muscular action (9 cases); (b) those following a series of unaccustomed movements of the wrist (19 cases), the most common type; (c) those in which no definite cause could be ascertained (3 cases), although in two of them a recent illness was a probable factor.

From an inquiry into movements preceding the cases of indirect trauma, it is postulated that the lesion occurs under the following conditions. The hand is firmly grasping some object, thus fixing thumb and rendering the three dorsal muscles of the thumb tense and hard; the tendons of the *extensores carpi radialis* are now lying in a rigid tunnel. A sudden fierce movement of hyperextension or a series of hyperextension movements of the wrist—such as might be done by a person performing unaccustomed wrist movements or with the muscles not adequately toned up, as after an illness—lifts up the tendons of the *extensores carpi radialis* like a bowstring away from the radius and against the taut thumb muscles, as the bases of the metacarpals, where these tendons are inserted, move dorsally. This trauma produces the tenosynovitis. Once the lesion is present, movements of the thumb muscles over the continuation of the sheath deep to these muscles, which I demonstrated in my dissections, will produce pain. It is possibly for this reason that attention was directed to the thumb muscles as being primarily involved and the inflammation was inaccurately located in their tendon sheaths. This inaccuracy would appear to have been copied from textbook to textbook.

Clinical Picture

The patient usually comes complaining of pain at the back of the wrist or lower forearm. With this there is sometimes weakness of the grip. On examination the sausage-shaped swelling previously described is discovered. This swelling may be hot and tender to the touch; this is usually so in the cases which follow sudden direct or indirect trauma, whereas in the other cases these signs are not so common. Crepitus over this swelling was always found to be present on movements of the wrist. The amount of crepitus varied from case to case, but I could not discover that it bore any relation to the degree of swelling. This crepitus can be palpated over the swelling, beneath the bellies of the muscles of the

thumb, and in some cases at the bases of the metacarpals, where the *extensor carpi radialis* is inserted. More than one case was sent to me by the general practitioner as a fracture because of the discovery of this well-marked crepitus. More often, however, the presence of crepitus was not discovered. As the lower part of the coat-sleeve covers the site of the swelling and crepitus, it is presumed that the sleeve had not been drawn back when the practitioner's examination was made. As previously pointed out, owing to the extension downwards of the inflamed sheath beneath the muscles of the thumb, the pain may subjectively be centred on movements of the thumb, and thus the examiner may easily be misled and omit the examination higher up the forearm.

Treatment

Many forms have been described, and these can be divided into three groups; (a) rest; (b) electrotherapy of all kinds; (c) counter-irritants.

Rest.—This is usually carried out by splintage with plaster-of-Paris or by other means. There is no doubt that immobilization of the hand and wrist in plaster-of-Paris rapidly brings about relief of the pain. Unfortunately, it has been my experience that as soon as the plaster is removed and the hand is used again, the pain recurs. Rest in a sling has been recommended, but this compromise does not give such an efficient relief of pain. Another form of treatment which might come under the category of rest is the wearing of a strapping round the wrist. The leather wristband beloved and almost the hallmark of the old-type "navy" is of the same nature. In view of the anatomy of the condition it is difficult at first sight to understand why such an appliance should give the relief that its wearers claim. It is suggested that the wristlet does not work by mere pressure over the muscles of the thumb and the extensor sheath, but, because the lower edge of the leather strap impinges on the back of the hand, it prevents hyperextension of the hand and thus the bowstring position of the *extensores carpi radialis* which is the cause of the lesion.

Electrotherapy.—Radiant heat, infra-red rays, and short-wave diathermy have all been tried with varying success, and no specific has been found among them.

Counter-irritants that I have used have been ung. iodi (B.P.) or its equivalent, and occasionally Scott's dressing.

In assessing the value and results of treatment, however, it must be borne in mind that the majority of sufferers from this complaint earn their living by their hands. Other things being equal, a form of treatment which keeps the patient away from work, such as immobilization in plaster, is undesirable. Similarly, electrotherapy, which necessitates the patient breaking work for visits to the hospital, is to be avoided if possible. Therefore simple counter-irritants which can be applied by the patient himself and do not of themselves cause stoppage of work have everything to recommend them.

The following is the routine of treatment now evolved in our casualty department. In the first place, it is explained to the patient that to stop work and immobilize the wrist in plaster-of-Paris will give a speedy relief from pain, but when the plaster is removed and the wrist is used again there is no guarantee that the pain will not recur. The patient is exhorted to continue at work and to rub ung. iodi into the swelling twice daily. The patient is assured that the pain will then slowly disappear and will not recur.

It has been found that by this means the majority of cases clear up in one to three weeks. One case, which had been treated in plaster at a hospital remote from Leeds and had a recurrence of pain when the plaster was removed after six weeks, recovered completely in two weeks by this treatment. In three cases the pain was so intense that the patient had to give up his manual work for two weeks, and recovery occurred in about six weeks. In cases in which the pain persisted although this regime was carried out, electrotherapy was added, but the patient continued at work.

Summary

Clinical observations and dissections have shown that the current description of the anatomical background of tenosynovitis of the wrist is inaccurate. It is not, in fact, a lesion of the tendons of the long muscles of the thumb, but a lesion of the tendon sheaths of extensores carpi radialis.

The mode of onset of 44 cases as seen in Leeds is described and classified. A rational anatomical background, in view of the new knowledge, is propounded for all these cases.

The clinical picture of the lesion is described.

Various methods of treatment are discussed. The routine treatment, by means of ung. iodi, as carried out in Leeds General Infirmary, cleared up most of the cases in one to three weeks.

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Medical Memorandum

Intestinal Actinomycosis Treated with Chloramphenicol and Aureomycin

Case Report

Two months after an operation for a perforated appendix a man aged 35 was readmitted to hospital with a tender mass in the right iliac fossa. Penicillin, 250,000 units intramuscularly, was given six-hourly for seven days.

At laparotomy on June 15, 1949, a sausage-shaped process of induration was seen extending along the ascending colon. Pus was not found. During the next two months abscesses were incised in the right iliac and lumbar regions. A combined course of penicillin (100,000 units intramuscularly three-hourly for 10 days) and sulphadiazine (36 g.) was given without effect. During the next four months the sinuses were twice explored and two courses of streptomycin (19 g. and 42 g.) were given. No treatment had so far affected the pyrexia, which had been present throughout, or caused any healing of the sinuses.

On February 22, 1950, following incision of an abscess, actinomycetes were found in the pus. Penicillin was then administered in larger dosage (1,000,000 units thrice daily for eight weeks), but at the end of five weeks the general condition was, if anything, worse. Investigations at this stage showed: 2,800,000 red cells per c.mm.; Hb, 48%; white cells, 23,000 per c.mm. (polymorphs 87.5%); E.S.R. (corrected Wintrobe), 31 mm. in first hour; serum albumin, 2.2 mg., and serum globulin, 3.6 mg. per 100 ml.; alkaline phosphatase, 12 units; thymol turbidity, 9 units; thymol flocculation, +++; weight, 101 lb. (45.8 kg.).

As penicillin did not seem to be affecting the course of the disease, chloramphenicol was begun on March 31, the dosage being 0.5 g. four-hourly for two days, 0.5 g. eight-hourly for three days, 0.25 g. eight-hourly for 12 days, and 0.5 g. eight-hourly thereafter. Within a week the patient

FIG. 1.—Temperature chart during chloramphenicol treatment.

reported that he felt very much better, and by the end of the second week his temperature was normal (Fig. 1). Improvement was maintained for about four weeks, during which he gained 5 lb. (2.3 kg.) in weight and the sinuses were healed.

After six weeks pyrexia recurred, and on June 2 an abscess was incised in the right iliac fossa. Actinomycetes were again demonstrated in the pus. Treatment was continued for a further week, but the temperature failed to settle and the general condition deteriorated.

"Aureomycin" was started on June 15, the dosage being 0.5 g. four-hourly for 24 hours, 0.5 g. six-hourly for five days, 0.5 g. eight-hourly for 37 days, and 0.25 g. eight-hourly for 64 days. Clinical improvement, which was quite dramatic, was apparent within the first few days (Fig. 2).

FIG. 2.—Temperature chart during aureomycin treatment.

The temperature began to settle at the end of a week and, apart from an occasional evening rise to 99° F. (37.2° C.), remained normal. He gained weight rapidly—16 lb. (7.3 kg.) in the first month. E.S.R. estimations showed progressive decrease.

Aureomycin was discontinued on September 29, when investigations were as follows: 4,700,000 red cells per c.mm.; Hb, 93%; white cells, 8,000 per c.mm. (polymorphs 76%); E.S.R. (corrected Wintrobe), 12 mm. in first hour; serum albumin, 4.7 mg.; serum globulin, 3.9 mg.; alkaline phosphatase, 6 units; thymol turbidity, 6 units; thymol flocculation, 0.

Improvement has been consolidated, and 12 months after the beginning of aureomycin treatment the patient has been working for four months, wounds and sinuses have remained healed, he feels perfectly well, and weighs 150 lb. (68 kg.).

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