2. Stillbirth associated with hydrocephalus, spina bifida, club-feet (mid-forceps).

3. 3,500 gramme foetus; death intra partum of patient with severe pregnancy toxæmia (mid-forceps); small mesatipellic type.

4. 4,059 gramme foetus, stillborn after version extraction in small brachypellic type pelvis.

5. 3,145 gramme foetus; died two hours after mid-forceps operation in very obese patient with uterine inertia.

6. 3,510 gramme foetus, stillborn following breech extraction.

It seems reasonable to assume that the first two cases have little or no association with the type of pelvis or method of delivery, and as far as this study is concerned a corrected foetal mortality should exclude these, and is then 0.88 per cent. The gross foetal mortality for the series is 1.33 per cent.

Conclusions

It seems obvious from this and other studies that we should reconstruct our views with regard to the so-called normal female pelvis as it occurs in our adult white female population. This is evidenced by the fact that in this series the oval or brachypellic pelvis occurred in but 35 per cent. of cases. The classification here proposed seems to be of real practical value in our experience.

The chief value of exact pelvimetry by roentgen methods is undoubtedly manifest in cases of suspected disproportion. In this connexion the lateral roentgenometric technique referred to is of great importance. This is particularly true in those cases where at the beginning of labour the foetal head remains high at the superior strait and in which disproportion may be suspected.

In conducting labour in the dolichopellic type of pelvis it should be remembered that the longest diameter of the superior strait is antero-posterior and that this antero-posterior lengthening in most cases extends throughout the bony birth canal. This knowledge should therefore be useful in the treatment of cases of persistent posterior position and in directing the course of the aftercoming head in breech delivery.

Finally, with such simple roentgenometric methods at our disposal their routine use in primiparous patients seems justified and likely to be of great service.

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The annual international symposium organized by the Ligue Française contre le Rhumatisme will be held on October 9, under the presidency of Professor Laignel-Lavastine, and will be devoted to the subject of radio-active treatments in rheumatology. Physicians, radiologists, hydrologists, and surgeons who are interested in this subject are invited to attend. The papers will be published in the October issue of the *Revue du Rhumatisme* and sent to all the subscribers before the meeting. Reduced railway fare and free admission to the International Exhibition will be granted to members of the symposium. A detailed programme will be sent on application to Permanence de la Journée du Rhumatisme, 23, Rue du Cherche-midi, Paris VI^o.

TREATMENT OF TENNIS ELBOW*

BY

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"Tennis elbow" occurs mainly in tennis players, but occasionally in golfers, and more rarely in metal workers and amateur gardeners who use respectively the hammer and the trowel. There is practically never a history of injury—the pain comes on gradually during or after the favourite pastime. The most prominent symptom is pain on the outer side of the elbow when gripping, and this pain is usually much worse on gripping with the forearm pronated; indeed, the grip in the supine position is often painless. The pain may come on while grasping some trifling object like a tea-cup, which may even be dropped, but most characteristically it occurs only during indulgence in the favourite game. It may be merely a nuisance and noticed only on mishitting a back-hand shot, but in some cases the patient cannot even hold a racket. On examination there is nothing to see, but there is always a tender point, either exactly over the radio-humeral joint, on the epicondyle just above, or in the extensor group of forearm muscles. It may be difficult to locate the exact spot, but the patient can nearly always find it, and pressure on it will make him wince.

Physical Signs and Treatment

Of fifty-eight cases of which I have full notes the tender point was over the joint—front, back, or side—in thirty-two, the epicondyle in twelve, and somewhere in the muscles in fourteen; but the respective points are so close together that certainty as to the exact position is not always possible. As an example of this I would quote a case which I classified as of the muscular type and thought I could feel a bursa. At a subsequent operation the bursa was found to be a protrusion of synovial membrane from the radio-humeral joint. Clearly this should have been classified as the joint type. The only other physical sign is a slight limitation of extension at the elbow-joint, more evident and often only evident with the forearm pronated; this occurred in approximately two-thirds of my cases, and is, I believe, the essential indication for manipulation. It may be very slight and no more than a springy resistance to complete extension, which is not felt in the opposite limb. It may be so slight, in fact, that it can be overlooked. On two occasions I have noted no limitation of extension, but against my general rule have for some special reason tried manipulation. In each case I obtained further extension with a definite click, and in each case there was a quick cure. Any gross limitation of extension, such as could be measured with an arthrometer, would suggest a much more serious lesion than the condition we are considering. In cases which present this typical limitation of movement the tender point is usually over the radio-humeral joint (74 per cent.), less frequently over the epicondyle (26 per cent.), and never in the muscles themselves.

Cases with muscular tenderness are of an entirely different character. My practice has been to advise manipulation only in cases in which I found limitation of movement. The technique, which I described some years ago, is very simple. Under nitrous oxide anaesthesia

* Read in opening a discussion in the Section of Orthopaedics, including Treatment of Fractures, at the Annual Meeting of the British Medical Association, Belfast, 1937.

the elbow is forced into full extension with the wrist and fingers flexed and the forearm pronated. At the same time, in epicondylar cases firm pressure is made over the tender point with the thumb of the hand which is controlling the elbow. When this movement is carried out one of five things is observed.

1. The elbow comes straight with a click, which gives one the impression of something slipping in the joint (thirteen cases).

2. It comes straight gradually, with a feeling as if adhesions were giving way (seven cases).

3. It gradually comes straight with continued effort, but neither click nor adhesions are felt (seven cases).

4. As soon as the patient is under the anaesthetic the elbow comes straight without the slightest resistance (three cases).

5. The elbow cannot be got straight (one case). This, of course, was a failure, and will be referred to later.

The routine after-treatment is simply two weeks' rest from tennis or golf, during which time the patient is instructed to maintain by daily exercises the extension that has been secured.

Results

Of thirty-three cases so treated twenty-two were cured within a fortnight; one was improved and could play tennis at once, but was not perfectly right for six months; three others took two, three, and four months respectively. Some of the cases were dramatic. One patient, for example, could not write, and on coming round from the anaesthetic he sat down and wrote me out a cheque, and naturally we were both impressed. A large number of the cases occurred in doctors and personal friends who would not hesitate to let me know if I had failed; in fact, the frequency of the condition among doctors has been a little disconcerting from the purely financial point of view. So much for the good side of the picture. Of the remaining seven cases three were apparently cured but subsequently relapsed, and these must be considered individually. One neglected his fortnight's rest and relapsed suddenly within that period; he was a medical man and insisted on a second manipulation, which cured him. One relapsed in five weeks, and the opposite elbow also became affected; this was probably an early general arthritis which I had overlooked. One relapsed in three months: he was 51 years of age, and gave up tennis.

Of the remaining four cases one has not been traced, and though the immediate result was satisfactory I should not like to call it a cure; the other three were utter and complete failures. One of these was an abnormal case, for, though there was pain in the elbow and limitation of extension, there was absolutely no pain on gripping. The diagnosis in this case was probably incorrect, but the patient came from a far Northern town and I have had no opportunity of seeing him again. The second case should have been a cure: there was limitation of extension, which corrected with a click, and when I saw the patient a month later movement was complete. However, he still had his pain, and this case I cannot explain. The third case in which I failed is more interesting; this was the one referred to above in which I did not succeed in forcing complete extension. This patient went to Blake in London, who also failed. A year later he was cured by manipulation by the trainer to one of our local football clubs. He very kindly told me all about it, and it is clear that the trainer succeeded in securing full extension, which both Blake and I had failed to do.

It appears, therefore, that, taking limitation of extension as an indication for manipulation, twenty-seven cases out of thirty-three were cured, and one other was subsequently cured by manipulation elsewhere. During the same period six cases were seen in which manipulation was advised but for some reason was not carried out by me. The ultimate fate of these cases is interesting in view of the possibility of spontaneous recovery. I have succeeded in tracing five. Three when last heard of were still unrelieved; one had the manipulation done by an osteopath and was cured, and one recovered after a few weeks' rest and massage.

Conclusions

We are justified in saying, therefore, that when the typical syndrome is present spontaneous cure is unlikely, and that manipulation gives an immediate cure in two-thirds of the cases and a slightly delayed cure in another one-sixth, making five-sixths in all.

Cases with muscular or epicondylar tenderness and no limitation of movement are in quite a different category. Some of them are suffering from what, to conceal our ignorance, we call muscular rheumatism or fibrositis, and the part which is over-used is naturally affected first. They soon show lesions in other parts of the body. I have seen three cases which started as apparent tennis elbow and subsequently developed a generalized fibrositis. Most of the muscular cases, however, are simply the result of overstrain, and a prolonged rest is the best, though far from welcome, treatment.

Pathology

I have left this to the end because it has to be deduced from the results of treatment. I believe that the common type of case with joint tenderness and limitation of extension is due to a fraying of the thin edge of the coronary ligament and the nipping of a semi-detached portion between the bones. My reasons are as follows:

- 1. The condition is frequently cured dramatically by a manipulation which produces a click.
- 2. It may relapse suddenly and be cured by a further manipulation. This happened to a medical man, referred to above.
- 3. In a case treated without anaesthesia the patient was certain that something had slipped back into place. He came to me in the middle of an important tournament and said he could not even hold a racket. A few hours after manipulation I watched him play a fine game.
- 4. On one occasion I opened the radio-humeral joint and found the thin edge of the coronary ligament frayed out as I have suggested.
- 5. The similarity to a displaced internal semilunar cartilage is very striking. Curiously enough, my manipulation for tennis elbow is exactly analogous to Sir Robert Jones's manipulation for reducing a knee cartilage.

I believe, therefore, that the dramatic cure that occurs in some cases is due to the freeing of a frayed edge of the coronary ligament which has got displaced between the bones. Cases with epicondylar tenderness are also often cured by manipulation, always provided there is limitation of movement, but I have noticed that it is seldom so dramatic as in the joint type. Patients often say that the elbow felt better from the first, but that it was a few weeks or months before it became quite right. I can only suppose that some tense bands, which were painful on being stretched, are ruptured completely by the manipulation.