and not uncomplicated. Treatment in the 12 cases reported by Hyde and Hyde extended from 15 days to 3 months, with a mean of 48 days, one patient requiring decortication of his lung after three months. Similarly in Jones and Gilbert's series (1936) treatment ranged from 10 days to 4 months. Those of Waring (1945) recovered 60 and 150 days after onset, and those of Nalls and Matthews (1949) three and five weeks and five months after onset. The recovery time following emergency thoracotomy is much shorter. The patient reported by Myers *et al.* was well in 14 days, as were the two reported here.

Management.—The problems of management are: resuscitation of the patient; removal of air, blood, and blood clot from the pleural cavity; complete re-expansion of the lung; and prevention of further episodes. From published reports already mentioned, there is no doubt that in mild cases repeated and careful aspiration of the haemopneumothorax has proved an adequate method of treatment. Blood loss is replaced by blood, and over a period of time, ranging up to three months, it is possible to achieve full re-expansion of the underlying lung, though the ultimate ventilatory function may be limited owing to parietal pleural thickening. In this group, too, there is probably a place for early use of streptokinase and streptodornase, as advocated by Sherry, Tillett, and Read (1950), to aid the liquefying of the blood clot. As pleural adhesions will certainly form during this treatment, further pneumothorax episodes are unlikely. In some patients it has not been possible to aspirate all the blood and clot from the pleural cavity, and therefore decortication of the affected lung has been performed following the methods already established in wartime for the treatment of traumatic haemothorax. Seley and Neuhof (1951) claim that the first pulmonary decortication for clotted haemothorax following idiopathic spontaneous haemopneumothorax was done by Neuhof in 1936. Three of the series reported by Ross had been successfully decorticated, and my Case 3 similarly required decortication.

Critical analysis of published cases, however, shows that an appreciable number have bled to death shortly after the onset of their spontaneous haemopneumothorax. Where, therefore, profound and continuous bleeding has occurred, as in Case 1, it is obvious that, having once restored the general condition of the patient by adequate blood transfusion, direct control of the bleeding-point is the only logical and safe procedure; and it should be advised.

Similarly, where bleeding, detected early, has continued and has been accompanied by further collapse of the lung, as in Case 2, it is wiser not to temporize, but rather to control the bleeding-point before the condition of the patient further deteriorates. It cannot be assumed that the bleeding will stop spontaneously. Even after aspiration of the blood and air the clot still remains and may thereby keep the lung partly collapsed and the bleeding-point patent.

These patients are usually fit young men. With modern endotracheal anaesthesia thoracotomy is safe, the pleural cavity is rapidly opened, the pneumothorax is released, blood and blood clot are rapidly evacuated, the bleeding-point is controlled with a hot moist pack, the lung is completely re-expanded, the causative lesion is then deliberately dealt with, recurrence of the pneumothorax is prevented by inducing an artificial pleurisy, and the chest cavity is finally closed with under-water seal drainage. The rapidity of recovery following treatment by emergency thoracotomy is remarkable.

Myers *et al.* reported the first successful early thoracotomy for the condition, occurring 60 hours after the onset of symptoms. From the right pleural space 2,500 ml. of blood was removed, of which approximately 600 ml. was clotted. The lung was totally collapsed, and in the apex of the right upper lobe was a shaggy irregularity in the visceral pleura. Blood was briskly flowing from a corresponding area on the parietal pleura in the superior sulcus. The bleeding was controlled by pressure. Ross reported a similar patient successfully treated by emergency thoracotomy by Griffen in Newcastle-upon-Tyne.

A survey of the available literature has failed to reveal further cases successfully treated by emergency thoracotomy, so that, with the two reported here, the present total is four.

Summary

Massive spontaneous haemopneumothorax is a thoracic surgical emergency which is best treated by resuscitation of the patient, early emergency thoracotomy, evacuation of the blood and blood clot, deliberate control of the bleeding-point, treatment of the causative lesion, and the induction of an artificial pleurisy to prevent recurrence. With emergency thoracotomy recovery can be rapid and complete.

The literature is reviewed: of 91 cases reported, 19 were fatal. Only four patients, including the two reported here, have so far been successfully treated by emergency thoracotomy.

I wish to thank Dr. Eyre, medical registrar, Auckland General Hospital, for his prompt diagnosis and assistance with Cases 1 and 2, and Mr. Douglas Robb for allowing me to publish Case 3.

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MANIPULATION AND ACCURATE MANUAL METHODS IN GENERAL PRACTICE

BY

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I have been in the same practice for 18 years and am thus in a good position to compare the past with the present. Only four years ago my eyes were opened to the possibilities of accurate physiotherapy. Hence 15 years' experience of the natural course and progress under traditional treatment of soft-tissue lesions provides a background against which I can contrast the benefits of these new methods. Originally, owing to lack of training—in common with all medical students—in the methods whereby an exact location could be made in these conditions, I thought little or nothing could be done. This view was strengthened when my patients were referred to various hospitals and received more or less prolonged physiotherapy but did not seem much the better for it. Patients with lumbago, treated by rest in bed for some weeks, seemed to get better at least as quickly as those treated at hospital by heat and massage. On painful shoulders, tennis-elbows, and sprained knees and ankles I could say the same.

Dissatisfied with this situation, I decided to seek special medical tuition at my old hospital. There in due course I developed enough diagnostic ability in exactly locating these lesions to be able to instruct and employ a physiotherapist trained in the accurate manual techniques for which St. Thomas's Hospital is renowned.

Cases suitable for physiotherapy are of everyday occurrence in my practice; indeed, statistics compiled over the past six months show that they comprise 17% of the total number of patients seen in my surgery, and that the proportion varies little from week to week. Since mine is a very average urban and semirural practice, there is no doubt in my mind that many patients requiring physiotherapy are seen by every general practitioner. They are curable by accurate physiotherapy, but seldom receive such treatment. The sum of avoidable invalidism is thus huge.

Difficulties

I found that even after a diagnosis was made it might be some weeks before a patient could be seen at a hospital, and when he got there he might be treated by a medical man who did not test function according to a logical method; moreover, even if my diagnosis was confirmed it was rare to find a physiotherapist acquainted with the technique of accurate manual work. If these difficulties were circumvented by reference of the patient to St. Thomas's Hospital, he had to spend the larger part of a working day and pay his fare for each attendance. I found that quite a number of my patients would put up with their disability rather than sacrifice so much time and money to its cure.

Many medical men might think that there exists a further difficulty—namely, expensive apparatus. This is not so. None is needed beyond the couch and chair that all surgeries contain. The physiotherapist's hands do the rest.

This is where the bonesetter scores: he relies on his hands alone, and thus achieves startling successes when apparatus has failed. It is absurd that patients should have to go to osteopaths for simple manipulations that we can ourselves perform. Some doctors, from lack of knowledge on the subject, even advise patients to seek treatment from such laymen. Here the fault lies with our training schools, where, with one exception, the manual treatments so commonly required in general practice are almost ignored. However, for many years the physiotherapy students at St. Thomas's have been taught manipulation and accurate use of their hands in massage, with the intention of enabling the trained auxiliary to give these treatments and to do away with the need for lay manipulators.

Examination

As so many of my patients chafed at the delays and ineffectiveness of treatment, I set out myself to examine patients with these disorders. To gain experience I attended the physical medicine department of St. Thomas's Hospital for one afternoon a week for three years, and then did a clinical assistantship there for six months. This did not interfere with the proper running of my practice. During my time there I noticed how vague other doctors were, and how readily words like "rheumatism" and "fibrositis" were used, though they clearly did not designate any clear-cut disease. My colleagues appeared to lack a method whereby to elicit the physical signs distinctive of each separate lesion. Many patients had received vague treatment elsewhere, based on a diagnosis involving a whole region—for example, painful shoulder—instead of one singling out the tissue at fault. I noted that at this hospital treatment was never begun until the lesion had been pinpointed. I was also interested to see that the method of clinical examination developed by Dr. Cyriax did not involve the use of apparatus; indeed, it was exactly the type of examination suited to general practice. The principle is simple. It is perhaps because it is so simple that its recognition in this country is so slow—it is widely adopted on the Continent—and I have met doctors and physiotherapists from France, Australia, New Zealand, South Africa, and Brazil who have come to England to learn it.

It is this. When a movement of a limb is made it involves the use of joints, ligaments, muscles, nerves, and

will-power. On examination this complex is broken up into its component parts, and the function of each is tested separately.

The joints and ligaments are tested by passive movement, so that the muscles, nerves, and will-power are not involved. The muscles are tested by the patient making them contract against a resistance so strongly applied that the joint cannot move. This eliminates the joints and ligaments from the picture. Moreover, when muscle power is being assessed the nervous system is being indirectly examined. Neurological lesions result in weakness when power is estimated, but, since the muscle is itself intact, when the patient contracts the muscle no pain results. Willingness is put to the test when the joint is actively moved. If passive movement is full and muscular power is normal and yet active movement is limited, then the willingness of the patient is at fault. When all joint movements have been tested actively, passively, and against strong resistance, articular, muscular, and neurological lesions can be separated. The type of articular lesion becomes apparent; alternatively, the affected muscle group is singled out. Moreover, psychoneurosis, so common a reason for a prolonged course of unsuccessful physiotherapy, can be identified at the patient's first attendance; for in these cases the patient's self-contradictory responses at once point to the source of the symptoms.

Pattern.—This rests on applied anatomy. Movements are tested actively and passively and against resistance, and the pattern that emerges identifies the structure at fault. For instance, the examination of the shoulder-joint is carried out thus: the arm is elevated actively, then passively as far as it will go; the joint is further tested by passive internal and external rotation; adduction, abduction, internal and external rotation are then tested against resistance. In this way the passive movements test the joint, but not the muscles, the resisted contractions test each group of muscles, but do not affect the joint. Hence a pattern emerges, showing whether the joint or the muscles are at fault, and, if the muscles, which group contains the lesion. For example, if a full range of passive movement at the joint coexists with pain on resisted external rotation, the infraspinatus muscle is affected.

Accessory Tests.—When the group of muscles at fault has been singled out, accessory tests may be performed to make the diagnosis more accurate. For example, if the adductors and internal rotators of the shoulder both hurt on contraction, the patient should be asked to hold his arms out horizontally and press his hands together; pain felt on this movement proves that the pectoralis major is damaged. Again, if the supraspinatus muscle has been shown to be strained, the occurrence of a painful arc indicates that the tender part of the muscle is pinched between the acromion process and the greater tuberosity of the humerus; this sign identifies the lesion as lying at the distal part of the tendon. When pain is elicited as the elbow is flexed against resistance, either the brachialis or the biceps muscle is damaged; if a resisted supination movement also hurts, then the biceps is incriminated.

Palpation.—If the exact site of the lesion remains uncertain, then palpation for tenderness may help, *provided that it is confined to selecting the most tender spot in the tissue already shown to contain the lesion.* Most patients are tender where they have a pain—the phenomenon described by Lewis as "referred tenderness." Hence indiscriminate palpation for tenderness has led to the discovery of tender areas, the result—not the cause—of the pain. Referred tenderness provides the tender points variously called "fibrositis," "myalgic spots," and "trigger areas." They can be shown not to signify a local lesion but to exist in a structure whose function is normal, by testing against resistance the muscle felt to be painful and found to be tender. Hence immediate palpation serves only to mislead the examiner. By contrast, if the doctor has isolated the tissue at fault he keeps his palpation within this limit, and if the structure cannot be reached by his fingers he does not waste time on palpation at all.

Local Analgesia.—If doubt still exists about the exact site of the lesion, local analgesia is induced in the suspected structure and the patient asked a few minutes later to perform again whatever movement proved the most uncomfortable. If the movement is now painless doubt no longer remains. If, on the other hand, appreciable pain still exists the diagnosis is wrong, and the question of accurate physiotherapy does not arise, since exact methods cannot be begun unless exact diagnosis has been arrived at first.

The Remedy

Physiotherapist

In nearly all disease treatment is the more efficacious the sooner it is begun; the soft-tissue disorders caused by injury or overuse are no exception. A disk lesion that is reducible to-day may increase in size and be irreducible to-morrow. My notes show that four years ago a patient with lumbago usually spent two to three weeks in bed, and that the supervision of sciatica in those who refused to go to bed was a commonplace. Traumatic arthritis of the shoulder, so easily avoided by early treatment, may after some weeks enter a subacute phase, during which all physiotherapy is useless, many months of disability ensuing. Hence time is a vital factor in many patients' response to treatment.

In an effort to help our patients my partners and I took on a St. Thomas's trained physiotherapist. Since her engagement all patients requiring physiotherapy start treatment the same day; indeed, on occasion, within the hour. Most are well in less time than it would have taken us to secure for them their first appointment at hospital.

Manipulation

Subluxations of a fragment of cervical, thoracic, or lumbar intervertebral disk are reduced by manipulation by ourselves or our physiotherapist at the stage when the displacement is small and the treatment is at its simplest and is most frequently successful. Often the patient with lumbago returns to work within the hour. This attitude avoids the supervision of subsequent root-pain in some cases and aborts the disorder in others. Once reduction has been achieved instruction in its postural maintenance follows. The manipulation is not the haphazard type so often employed under anaesthesia; it is a series of controlled movements on a conscious patient, who co-operates throughout.

For example, patients attending with an acute stiff neck, which used to be called "rheumatic torticollis," usually leave the surgery with a full and painless range of neck movements restored. Even long-standing low backache, so long a bugbear to the orthopaedic surgeon no less than to the G.P., has become a welcome symptom now; for detailed clinical examination often shows a minor disk lesion to be responsible. If that proves so, manipulative reduction is carried out.

Manipulation is often called for in cervical osteoarthritis, and is particularly successful in abolishing the disabling headache referred from the upper cervical joints. It is the only remedy for the displaced cartilaginous loose body that complicates osteoarthritis at the knee. Tennis-elbow of the teno-periosteal variety seems to be incurable except by manipulation, and in the absence of such treatment may disable heavy workers for many months. We find that in this common type cure results after five to ten treatments—that is, two to three weeks. Manipulative rupture of long-standing adhesions about a ligament at the knee or ankle is the work of an instant and requires no anaesthesia.

Massage

Muscle injuries, tendinitis, and tenosynovitis receive immediate deep massage to the site of the lesion. The speed of recovery amazes me when I compare it with my own results of four years ago, or with those secured by routine measures carried out in hospitals.

Massage is the swift cure for tendinitis of the shoulder and for tenosynovitis at the wrist and ankle, provided it is

given to the exact site of the tendinous lesion and not to the area to which pain is referred. In tenosynovitis at the wrist we expect recovery after an average of five treatments by transverse friction. Supraspinatus tendinitis requires six to ten treatments, depending on the site of the lesion and the length of history. We have even had an acromioclavicular joint strain of four weeks' standing cured in one session of 20 minutes' deep massage.

Minor muscular ruptures improve rapidly when therapeutic local analgesia is followed by accurate transverse friction, the formation of unwanted adhesions being prevented. Recent sprains of the ligaments at the knee and ankle recover far more quickly with deep massage to the site of the partial rupture than with any other treatment.

Naturally these quick successes are dependent on an adequate examination and diagnostic ability on the part of the doctor. Since medical students are asked no questions in their qualifying examinations about soft-tissue lesions in the moving parts, they do not realize the importance of this omission from their undergraduate training. Hence the informed co-operation between the interested doctor and the physiotherapist with accurate techniques at—literally—her finger-tips has not yet come into being.

Financial Considerations

The Patient's Point of View.—Before we employed a physiotherapist those of our patients requiring accurate physiotherapy had to travel to London. This was a costly business for them, as the fare was about 5s., a meal had to be bought, and usually a whole working day was lost. So the cost to the patient was in the region of 25s. a treatment. Furthermore, a patient might lose many working days awaiting the earliest hospital appointment with the specialist, before whose examination no treatment could be started. This could be any length of time up to a fortnight, during which period sickness benefit would be the only money coming into the home.

Now, with a physiotherapist at hand, there is no travelling expense, no meal out, only an hour off work, and at the most a day's wait before treatment is begun. Total cost to the patient: half a guinea a treatment. A great saving.

The Doctor's Point of View.—There is no capital outlay; for the couch and chair, which all surgeries contain, suffice. The doctor has no added expenses, since the physiotherapist uses his room when he is out on his rounds. The starting salary of a physiotherapist is about £7 a week; hence if she gives no more than three treatments a day five days a week her employer is not out of pocket. In fact, she can well deal with ten or twelve patients a day. This is far fewer, it is true, than she would be expected to treat at hospital, but accurate manual work is difficult and exacting. For this reason a proper amount of time must be allowed for it.

Bone-setters

It must not be forgotten that, sooner or later, many sufferers drift to the lay manipulator, whether their doctor likes it or not. Osteopaths and their like have been created by the public demand for a body of men to fill the gap left by doctors' neglect and physiotherapists' lack of tuition. We should fill this hiatus ourselves; for what the layman without medical knowledge can do, so can we. These manual methods are no secret; various illustrated books written by medical men exist (Burrows and Coltart, Cyriax, Mennell, Timbrell-Fisher). If we do not wish to perform this work ourselves we should support the ethical physiotherapists and ask them to carry out these manoeuvres for us. Were this routine universally followed, lay manipulators would soon become redundant and an unnecessary gap in our therapeutic armoury would be closed.

Conclusion

Manipulation and accurate manual methods have a great and urgent part to play in general practice.

Accurate diagnosis followed by equally accurate physiotherapy is applicable to 17% of our patients. It should be obtainable on the spot, and at once. Any two or three doctors clubbing together could easily afford the services of a physiotherapist and thus benefit their patients. Any doctor who follows this suggested line of training would have the satisfaction of curing most of his sufferers from "rheumatism" and "fibrositis," and rejoice in the contrast with the unhappy time when he could merely prescribe an analgesic tablet or liniment. This type of treatment is most rewarding to the patient, and keeps him out of the clutches of the lay healer. I find this new sphere of work most exhilarating, and, as a general practitioner living in this antibiotic and bureaucratic age, enjoy increasing my diagnostic powers in a fresh field. This interesting work, coupled with the services of a physiotherapist grounded in accurate manual work, transforms my day and has limitless possibilities for every practitioner.

DIAGNOSIS OF THYROTOXICOSIS BY A SIMPLE OUT-PATIENT RADIOACTIVE IODINE TECHNIQUE

BY

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The availability of radioactive iodine for use in clinical medicine has led to the development of various new diagnostic methods for assessing thyroid function. There are, however, relatively few centres at which isotope techniques can be used, and, furthermore, many of the tests are somewhat complex. They involve considerable co-operation from the patient, or they require the examination of the patient with complicated electronic apparatus. The value of the various radioactive iodine tests of thyroid function has been discussed by Myant (1952), and Goodwin, Macgregor, Miller, and Wayne (1951) have compared the relative merits of those most commonly used.

The avidity of the thyroid for iodine can be assessed either by direct measurement of the amount or rate of uptake of the isotope in the patient's neck or by measuring the amount excreted in the urine, the latter indicating the balance of the administered dose that is not utilized by the thyroid. The capacity of the gland to synthesize and discharge thyroid hormone can be measured by assaying the radioactivity present in the plasma (Ansell, Macgregor, Miller, and Wayne, 1953). This latter measurement probably represents most accurately the functional state of the gland, especially if there is a doubt regarding the presence of hyperthyroidism. Such a test has the advantage that the patient is

involved in no more inconvenience than is necessitated by a venepuncture, since the actual physical measurements do not require his presence.

For reasons discussed elsewhere (Goodwin *et al.*, 1951) we believe that the best and most comprehensive picture of a patient's thyroid status can be obtained only by a combination of several clinical and radioactive iodine tests. Nevertheless, so far as the diagnosis of thyrotoxicosis is concerned, the single measurement of the radioactivity present in the protein fraction of plasma 48 hours after a tracer dose gives information of considerable diagnostic value.

This paper briefly describes an attempt to assess the clinical usefulness of such a test when used without the supporting evidence supplied by simultaneously performed alternative tests, and when used at a hospital without full facilities for isotope work.

Method of Investigation

All patients studied were seen by two of us in Nottingham (W. S. W. and P. J. B.). An initial clinical diagnosis was made, and after the result of the radio-iodine test was known the patient was observed to determine his progress. A final clinical diagnosis was eventually reached in all cases, usually after a therapeutic test with methylthiouracil. The test has been used, therefore, in its proper context, as an additional diagnostic tool, and not as a final arbiter to supersede clinical judgment.

Measured doses of between 25 and 30 μ c. of radioactive iodine were dispensed in Sheffield and dispatched by train to Nottingham, where they were given to patients whose urine was tested by the method of Foote, Mackenzie, and MacLagan (1952) to detect the previous administration of iodine-containing compounds. Forty-eight hours after administration of the isotope 20-ml. samples of blood were withdrawn and returned to Sheffield for assay. The concentration of radioactivity in whole plasma and in the protein-bound iodine fraction was measured, the proteins being precipitated with trichloroacetic acid; this precipitate was then dissolved in caustic soda and measured as a solution (Goodwin *et al.*, 1951).

Interpretation.—On the basis of an extensive experience of the limitations and merits of this test, the results were interpreted as follows: levels of activity in excess of 0.4% per litre in the protein-bound fraction were considered to indicate definite thyrotoxicosis; values below 0.2% per litre were interpreted as excluding the presence of thyrotoxicosis. We realize that such an interpretation invariably leads to the presence of toxicity being missed in a very small number of cases, but, on the other hand, the presence of toxicity is never falsely suggested, since, in our experience, values of protein-bound plasma activity in excess of 0.4% per litre do not occur in the absence of thyrotoxicosis in the previously untreated patient. Intermediate values lying between 0.2% and 0.4% per litre were interpreted according to the proportion of the whole plasma activity that was protein-bound, proportions over 50% usually indicating thyrotoxicosis even if the absolute amount in the protein-bound fraction was below 0.4% per litre. The accuracy of measurements below this level of activity, is, however, not great.

Results

Here are given the results of the application of the test to the first 50 patients in whom subsequent progress has been followed and an eventual diagnosis decided upon.

Samples were sent from Nottingham after withdrawal from six definitely thyrotoxic patients, and in each case the interpretation of the result of the test suggested toxicity. All results for the 48-hour protein-bound plasma activity lay in the range of 0.7% to 2.8% per litre. Samples were also analysed from 22 control normal or definitely non-toxic cases, and in each case the correct interpretation