a local affection of the arteries, and is not caused by a disturbance of the vasomotor nervous system. That is a conclusion which sooner or later must influence our management of these cases.

A curious affection appearing in recent years amongst workers with tools or machines that vibrate is of much interest to this discussion.⁴ It occurs in a number of different trades, but may be illustrated by stone-masons who use a chisel driven by compressed air. These workers develop a condition in the fingers indistinguishable from Raynaud's disease; the circulation to them is lost on ordinary exposure to cold. But what is most noteworthy is that the fingers most exposed to the vibration are those that develop this abnormality first. The example is cited as an instance of Raynaud's malady arising locally and asymmetrically out of an obvious local cause.

We may safely conclude that in Raynaud's disease the fault is purely a local one and that vasomotor tone is normal during the attack. But to explain the many interesting reactions of these patients we may not neglect the factor of vasomotor tone.

ILLUSTRATIVE REACTIONS EXPLAINED BY NEW THEORY

Perhaps a clear understanding of what is in fact not a very simple matter may be aided by citing a series of examples briefly illustrating the many reactions that may take place in different circumstances that can be defined, and by showing that all these reactions are readily explained if we assume that the fault is local and the vasomotor system normal. This view of the pathology of the disease is adequate, and it is alone adequate, in interpreting the examples given. The following instances all apply to the susceptible fingers of a case of Raynaud's malady.

1. The first example is the most familiar; it is that of the usual spontaneous attack. An attack develops on simple exposure to a room temperature of 15° C. It is in part due to increase in vasomotor tone, and in part to a local response to cold. The abnormality, however, is a local abnormality, and may consist of increased susceptibility of the vessels to cold or a facilitation of closure owing to local intimal thickening.

2. The subject's body and hands are warm in a warm room (22° C.). Vasomotor tone is equal and apparently normal, and remains so in the two hands. One hand is now placed in water at 20° C.; in this, and in this only, an attack develops. Such an attack is to be ascribed to a local fault.

3. The subject while warm is taken into a cold room (15° C.) and exposed with the right hand in water at 30° C. An attack develops in the left hand only. In this instance, although vasomotor tone is raised in both hands in response to the cooling of the body, the hand that is protected from local cold is prevented from developing an attack. The increased vasomotor tone is not abnormal, and therefore fails by itself to close the vessels.

4. The subject is exposed in a cool room and the hands are protected, being kept at a temperature (about 25° C.) that is just insufficiently low to close the vessels and to induce an attack. The subject now experiences an emotional disturbance or pain; there is a rise of vasomotor tone and an attack supervenes. In this case the vessels are already abnormally narrowed, though not occluded, and an increase of vasomotor tone (a normal increase) is now sufficient, acting on these abnormally narrowed vessels, to complete the closure.

5. It is quite possible that a normal vasomotor impulse might close a digital vessel that is at a higher temperature (say 30° C.) if that digital vessel had much intimal thickening. Here again, though an increase of vasomotor tone might be the only apparent factor, the structural

alteration of the vessel would be the real cause of the attack, because it alone would be abnormal.

6. A patient is presenting an attack in a cool room, and anaesthetization of the ulnar nerve fails to abolish it. In this case removal of normal vasomotor tone is insufficient to release spasm in vessels that are closed owing to a local abnormality.

7. A patient who has lost the sympathetic nerve supply to one arm dips both hands into water at 20° C. while in a cool room. An attack develops in both hands, but is more severe on the non-sympathectomized side. In this instance both hands present an abnormal local response to cold, but on the sympathectomized side this response is counteracted to a slight extent by loss of normal sympathetic tone. If the malady is less severe the loss of sympathetic supply (by sympathectomy) on one side may even suffice to prevent the attack developing in that hand, and ulnar anaesthesia may likewise prevent the corresponding (anaesthetized) finger from becoming cyanotic. But these facts are compatible with the theory of local causation and form quite inconclusive arguments for the vasomotor view.

8. If the body of a patient upon whom cervical sympathectomy has long since been performed on one side is kept very warm while the two hands are cooled by immersion in cold water, then the attack may be confined to the sympathectomized side.⁵ This apparent paradox is due to the fact that after sympathectomy full vasodilatation is not maintained; and so, when there is a conspicuous vaso-dilatation, as from heating the body, the vessels on the intact side become wider than those on the sympathectomized side. It leads curiously to the attack, which is clearly the result of a local cause, being confined to the limb from which the sympathetic nerves have been removed.

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- ⁵ Lewis and Pickering: *Heart*, 1931, xvi, 33.

A CONSIDERATION OF BACKACHE FROM THE ORTHOPAEDIC STANDPOINT*

BY

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When a patient complains of low back pain, with or without sciatica, an eliminative diagnosis leaves us with a group of conditions which may be definitely regarded as orthopaedic in nature, the source of the difficulty lying usually in the lumbo-sacral or sacro-iliac joints. One is able to say this when physical examination reveals localized joint tenderness, muscle spasm, stiffness, and deformity referable to one or other of these articulations. In affections of the more superficial joints these features are readily discernible, but in the low back the joints are deeply seated, and a superficial examination entirely fails to bring out the salient points on which a diagnosis based upon anatomical facts and a knowledge of the statics of the body can be made.

This whole field has been a mysterious one in the past, but owing to the efforts of the Boston school of orthopaedic surgeons, headed by Dr. Joel Goldthwait, a step-by-step method of physical examination and the interpretation to be built up upon the facts elicited has

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been painstakingly formulated. So accurate can this examination be in eliciting the facts from which a diagnosis may be made that one can confidently claim that cases of low back pain and sciatica are capable of quite definite scientific analysis at the present time. To make our diagnosis more accurate we need anatomical knowledge of the statics involved, and, above all, a systematic physical examination. The clinical picture is the most valuable single aid in disproving or confirming the diagnosis made by history and examination. The group includes the numerous cases of back strain and injury.

POINTS IN AETIOLOGY AND DIAGNOSIS

These cases are full of interest and importance because of their frequency, the lack of diagnosis, and the difficulty of disproving the assertion of pain. On examining a case of low back pain and sciatica from the orthopaedic point of view it is necessary to bear in mind the following points.

1. The anatomical type of the individual concerned. The slender, small, and delicate type of individual is unsuited for heavy labour, and breaks down easily under the strain of hard work. There is a true inherent weakness in this class of individual.

2. An analysis of any series of painful backs urges a consideration of the practically universal occurrence of bad bodily mechanics. These patients usually have a lordotic spine and a forwardly-tilted pelvis. A chronic lumbo-sacral strain may thus become established from the body weight being carried through the spinal arch instead of through the spinal body. Such a position predisposes to injury of the lumbo-sacral joints by sudden hyper-extension force. In certain cases only the muscles and aponeuroses are involved. In these cases, the pelvis being tilted forward to a greater degree than is normal, the sacro-iliac joints derive less support from the shape of the bones. The muscular support of the pelvis becomes incompetent, and a chronic or acute sprain of the sacro-iliac joint may be predisposed to in these circumstances.

3. The x-ray examination is of first importance. A negative radiograph is not of sufficient significance to warrant the assumption that there is nothing the matter with the patient. Of far greater importance is a thorough physical examination. In many cases very careful x-ray examination will reveal to the trained eye slight departures from the normal structure which are of significance and indicative of strain. On the other hand, when a patient alleges trauma as the cause of his disability, the radiograph may reveal a pre-existing intrinsic lesion of the spine, such as osteo-arthritis, healed Pott's disease, or an old compression fracture. Much argument develops round the medico-legal claims of these cases. The employer claims that the accident cannot be held responsible for the symptoms; the man claims that it is the injury which has deprived him of his power to earn his living.

4. The difficult and complex question of anatomical variations in the lumbo-sacro-iliac region in relation to low back pain and alleged injuries to the back has next to be considered. The commonest variation is an enlargement of the fifth lumbar transverse process. When it becomes semi-sacralized it assumes a fish-tail shape, and sometimes forms an accessory articulation with the sacrum and ilium. Such abnormalities are to be regarded as potentially contributory in setting up low back pain and sciatica. It is unquestionable that the association of the occurrence and persistence of symptoms and the presence of these abnormalities is an intimate one.

5. From my experience of these cases I do not regard many of them as being malingerers in the true sense of the word. The man who has suffered an acute traumatic strain of the back, if treated early and completely, can,

in the majority of cases, be returned to his work without getting into the chronic stage of the compensation case. Adequate facilities for such treatment is, in my opinion, urgently required at big works and mines, together with the exercise of authority by the doctor in insisting that the man return to work when he is told to do so.

TREATMENT

A useful clinical classification of low back pain is as follows: (1) Acute traumatic strain. (2) General postural strain. (3) Lumbo-sacral strain. (4) Sacro-iliac strain. (5) Combined pelvic-joint strain.

In conditions of acute traumatic strain there is usually a tear of muscle or aponeuroses. Treatment of a torn muscle must consist of rest until healing has taken place. Most of these patients with industrial back accidents are allowed to use the muscles too soon and with insufficient protection. If there is a superadded infective focus in the body, this may be a factor in keeping up the painful muscle spasm which tends to persist. Such fixation is crippling, and manipulation under an anaesthetic offers the best chance of cure. To secure the required rest the patient should be made recumbent on a firm mattress and have the back splinted with straps of broad adhesive strapping placed transversely across it. The knees are supported on a pillow. In severe cases a plaster-of-Paris jacket should be employed, or recumbency in a plaster shell. Heat in the form of hot fomentations, massage, and exercises are begun almost immediately, and the average case should be allowed up in about three weeks.

In general postural strain the condition is one of general muscular fatigue, and ligamentous strain not confined to one joint. The patient is usually of the asthenic type. Such cases require nutritional and supportive treatment by rest, massage, postural remedial exercises, and support by a brace and corset.

In lumbo-sacral strain the pain is localized in an indefinite way over the low spine and hip. The pain is usually asymmetrical, and sciatica is a frequent symptom. This kind of backache is generally relieved by rest. The lumbar and lumbo-sacral movements are markedly limited, and there is localized tenderness on deep pressure over the lumbo-sacral articulations. This point may be best made out by examining with the patient kneeling on his hands and knees. Treatment is very largely similar to that already mentioned for acute traumatic strain. One important exercise is to teach the patient to flatten the lumbar spine, and a brace is employed to span the lumbar curve and to help the muscles to maintain its position.

In contrast to lumbo-sacral strain, which usually affects one side and is relieved by recumbency, sacro-iliac strain is commonest in the slender, viscerotonic types who use the body in poor posture. Tenderness is referred to the joint on its posterior and inferior aspects. There is hamstring spasm when the patient bends forward. Treatment of the condition is as under the previous section.

When these methods are unsuccessful, and in the more acute cases, the patient must have the joint manipulated under an anaesthetic. The assistant fixes the pelvis and opposite limb. The surgeon then flexes the affected hip with the knee straight to the right-angled position, and pushes directly downwards.

Lumbo-sacral and sacro-iliac strain may occur together owing to the faulty mechanics to which a large lumbo-sacral transverse articulation can give rise. In very severe cases of painful semi-sacralization a fusion operation to fix the lumbo-sacral region by means of a bone graft may be indicated. Prolonged fixation, however, for several months in a complete plaster spica casing has succeeded in curing a large proportion of the cases.