

South African Medical Journal

Suid-Afrikaanse Tydskrif vir Geneeskunde

P.O. Box 643, Cape Town

Posbus 643, Kaapstad

Cape Town, 28 September 1957
Weekly 2s. 6d.

Vol. 31 No. 39

Kaapstad, 28 September 1957
Weekliks 2s. 6d.

THE TREATMENT OF PAIN *

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There is perhaps no subject of greater practical importance to doctors of all kinds than the treatment of pain. Pain is a biological necessity, and those rare individuals who are born with congenital indifference to pain suffer not only from the fact that they get no warning of injuries, but also from arthropathic joints. While there must still necessarily be much that is empirical in our treatment of pain, a rational therapy must depend upon an understanding of its anatomy and physiology. Here there have been considerable changes during recent years. Until about 20 years ago it was thought that there were specific nerve-endings associated with particular forms of sensation and that pain fibres had free nerve-endings with special receptors. It was thought further that each form of sensation was conducted by its own specific nerve fibres in the peripheral nerves, there being a correlation between the size of the fibre, the rate of conduction and the quality of the sensation. Within the spinal cord there was believed to be a segregation of fibres concerned with the conduction of pain, heat and cold, together with some of the touch fibres, in separate, but overlapping, pathways in the opposite spinothalamic tract. The optic thalamus was regarded as an end-station for pain, in the appreciation of which the cerebral cortex was held to play no part except, possibly, an inhibitory one, and the frontal lobe was not known to play any part in the awareness of pain or the reaction to it.

Today doubt has been cast upon the existence of specific nerve-endings, and Lele and Weddell (1956) have shown that the cornea, which contains only free nerve-endings, is not sensitive only to pain, as had been supposed, but also to touch, heat and cold. Doubt has also been cast upon the existence in the peripheral nerves of fibres concerned with particular forms of sensation, and much evidence has accumulated that what determines the quality of a sensation that is to be experienced is the pattern in space and time made by the nerve impulses excited by the appropriate stimuli, and conducted up the peripheral nerve (Sinclair, 1955). It is probably still true, however, that pain depends especially upon

small, rapidly conducting fibres. The pattern theory of sensation has, as we shall see, one great advantage, that it offers a satisfactory explanation of various abnormal types of pain and allied sensation as distortions of the normal pattern. When we come to the spinal cord it may well be that here again patterns or rhythms of nervous impulses underlie different forms of sensation, and possibly the same fibres at different times conduct different forms of sensation. If this is so, the overlapping of the representation of pain, heat and cold in the spinothalamic tract, for example, might be due, not to the fact that the fibres separately concerned with each of these forms of sensation are intermixed, but that the same fibres take part in conducting different forms of sensibility. The importance of the optic thalamus in the pain pathway remains, but recently it has been thought that the cerebral cortex may play some part in awareness of pain. The operation of leucotomy, and the use of such drugs as chlorpromazine, have shown that the frontal lobes have an important, if not yet fully understood, part to play in our reactions to pain, a point to which I shall return later.

PAIN DUE TO LESIONS OF PERIPHERAL NERVES AND NERVE ROOTS

1. *External pressure.*

This accounts for a large group of disorders of peripheral nerve and nerve roots. It is a familiar fact that simple pressure on a peripheral nerve does not immediately cause pain. Prolonged pressure upon a nerve root, or peripheral nerve, however, causes oedema and, if unrelieved, eventually fibrosis, both conditions which cause pain and other disturbances of sensibility within the distribution of the nerve root or nerve affected.

Common examples of this pathological change resulting from pressure are (1) compression of the median nerve in the carpal tunnel, (2) meralgia paraesthetica, in which the lateral cutaneous nerve of the thigh is compressed as it passes through the fascia beneath the inguinal ligament, (3) Morton's metatarsalgia, (4) some cases of cervical rib, (5) acute compression of a cervical nerve root in an intervertebral foramen by an intervertebral disc protrusion, and

* Opening paper read at the South African Medical Congress Durban, September 1957.

(6) chronic compression of a cervical nerve root in the foramen in cervical spondylosis. (7) In 'sciatica' the compression affects the 5th lumbar or 1st sacral nerve root.

2. *Altered pain pattern resulting from nerve degeneration.*

It has been suggested that certain particularly unpleasant disorders of pain sensation may be explained as the result of nerve degeneration if a reduction in the number of pain fibres and possibly also disturbance of insulation of those that remain, causes a distortion of the pain pattern. The result may be not only spontaneous pains, but a peculiarly unpleasant sensation resulting from painful stimuli, often associated with a raised threshold for pain and some delay in conduction, a condition known as hyperpathia. Some, or all, of these features are often seen in polyneuritis, when the sole of the foot is scratched or pressure is exerted on the calf. The condition occurring after nerve injury, and called by Head 'protopathic sensibility', also shows some of these features. In causalgia the condition is probably more complex, and the sympathetic nervous system appears to be involved.

3. *Herpes zoster.*

This illustrates the complexity of the ways in which pain may be produced by a comparatively simple process. The initial reaction to the virus infection is an inflammatory oedema of the nerve root, peripheral nerves and skin in the segment or segments involved. Later this may give place to scarring. Here, then, we encounter compression of nerve fibres, and altered pattern of degeneration, and involvement of nerve-endings in the scar tissue in the skin.

PAIN DUE TO DISEASE OF THE CERVICAL INTERVERTEBRAL DISCS

4. An even more complex situation arises when a nerve root or roots are involved in disease of the spine and I will illustrate this by discussing some aspects of the pain produced by protrusion of cervical intervertebral discs. An acute protrusion of a single intervertebral disc into its corresponding foramen is a comparatively simple cause of pain. Yet even this situation is complex, since pain in part originates from the spine itself and is associated with considerable spasm of adjacent muscles, while the reference of pain not only to skin, but also to muscles and joints innervated by the affected spinal root, may sometimes give rise to diagnostic difficulties simulating, for example, myocardial infarction.

When we come to the pain produced by chronic disc protrusion in cervical spondylosis the situation is much more complex. One or more nerve roots become tethered in their intervertebral foramina and their progressive compression in this way may cause pain. But cervical nerve roots have a fairly long oblique course within the spinal canal and may therefore be compressed by a disc protrusion at a higher level than the one corresponding to the foramen by which they emerge. Moreover, narrowing of the cervical intervertebral discs shortens the neck relative to the spinal cord and this may lead to compression of nerve roots in the foramina which are not themselves narrowed. Since the pain caused by irritation of one spinal nerve root may extend in some cases more widely than its recognized distribution, and since the other factors I have mentioned may also operate, it is not always easy to correlate the distribution of the pain with changes visible in the X-rays.

Sometimes it is not easy to say why pain should suddenly develop in a patient whose cervical spondylosis, and accompanying foraminal narrowing, is undoubtedly of long standing. I think that in such cases the explanation must often be that some unnoticed trauma—frequently, perhaps, traction on the brachial plexus—sets up a pain which the pathological condition perpetuates.

In addition to the pain of root irritation there is often some degree of pain in the neck itself, and this may be referred from the ligaments, muscles and joints though, again, it is often surprising how little pain is associated with gross bony change as shown in the X-rays. Finally, referred pain may itself induce peripheral changes, particularly in muscles, which in turn give rise to fresh pain. The best example of this is the so-called 'frozen shoulder' which is not infrequently associated with cervical spondylosis.

THE FROZEN SHOULDER

The frozen shoulder again illustrates the complexity of pain production. From the physician's point of view, leaving out of account direct trauma, the chief known associations of the frozen shoulder are (1) cervical spondylosis, (2) immobilization due to nervous disease, especially hemiplegia and Parkinsonism, and (3) referred cardiac pain as in angina or after myocardial infarction. Reflex factors, referred pain and immobilization play a variable part in the production of this symptom. When a frozen shoulder is associated with cervical spondylosis the latter may also be responsible for sensory or motor symptoms referred to the hand and so give rise to one variety of the shoulder-hand syndrome, but it is worth remembering that it is not uncommon to find both cervical spondylosis and carpal tunnel compression of the median nerve in the same patient, and if such a patient also has a frozen shoulder we have to deal with a shoulder-hand syndrome of a different kind.

THE TREATMENT OF PERSISTENT PAIN

It will be clear from what has been said that the satisfactory treatment of persistent pain can be based only upon an accurate assessment of the pathological factors involved. When we are dealing with a simple oedema some form of immobilization of the affected part may allow the oedema to subside. This is plain in the benefit derived from rest, with or without mechanical immobilization, in cases of pain due to intervertebral-disc protrusion. At either end of the spine traction may sometimes help to diminish pressure upon a swollen nerve root. When the position of the nerve is such that a recurrence of pressure, and hence swelling, is likely to follow a renewal of movement, surgical decompression is likely to be called for, as in the case of compression of the median nerve in the carpal tunnel, and of the lateral cutaneous nerve of the thigh in meralgia paraesthetica, but surgery is very rarely necessary in the treatment of nerve-root pressure by an acute cervical intervertebral-disc protrusion. The value of manipulation is probably chiefly in breaking down contractures which cannot be overcome in any other way.

Post-herpetic neuralgia is best prevented by a thorough treatment of the infection in the acute stage, or by X-ray irradiation of the affected nerve roots if the pain is still troublesome a month after the onset. If the pain still persists

relief can often be obtained by applying a mechanical vibrator to the painful areas, and it is often advantageous to train the patient to use this himself. Nerve block and chordotomy should rarely be required.

Sympathetic block is of special value in the treatment of causalgia, probably because the efferent fibres of the sympathetic play a part in maintaining the pain.

The technique of Maher (1957) is a promising advance in the treatment of the pain of inoperable malignant disease. It is based upon the fact that phenol in certain concentrations has a selective effect upon the pain fibres, which he interrupts by extradural or intrathecal injection. Chordotomy is occasionally helpful for the treatment of persistent pain in the lower half of the body, for example, post-herpetic neuralgia, painful phantom lower limb, and the pain of malignant disease. The spinothalamic tract should be divided on both sides.

The operation of frontal leucotomy reveals that the sensation of pain, which appears to us a simple and single experience, is complex in its representation in the nervous system, for after leucotomy it is not the perception of pain, but the reaction to pain which is altered. A pain will still be perceived, but it will have lost its distressing effect. Pharmacologically, drugs such as morphine, pethidine and methadone appear to act on the frontoencephalic pathways—in other words, to depress those parts which are permanently interrupted in leucotomy. There is some dispute whether unilateral leucotomy is as effective in the relief of pain as the bilateral operation. In two recent series of 102 cases altogether, it was reported that the result of leucotomy for pain had been good in 46, fair in 32 and poor in 24. It appears to be of no value for psychogenic pain. It is probably justified only in the treatment of inoperable carcinoma and, as the same results can to an

increasing extent be obtained with drugs, it will probably fall into disuse.

PSYCHOGENIC PAIN

We are all familiar with patients who complain bitterly of pain for which no organic cause can be discovered. They are mostly middle-aged or elderly women and the site of the pain is usually the face, the genitalia, the bladder or the rectum, and the pain usually excites considerable emotional reaction. In view of the powerful influence of the mind both in inhibiting and enhancing pain it is likely enough that pain should sometimes be a symptom of psychological disturbance. I am sure that this happens but, in some such cases as those I have described, especially when the onset occurs in a person of previously stable personality, I have sometimes wondered whether there may not be some underlying organic disturbance of function, perhaps in the autonomic nervous system.

This is a most difficult condition to treat. The earlier treatment is begun, the more likely it is to succeed. The temptation to interrupt the pain fibres by nerve block or surgery should be resisted, since it almost invariably makes the patient worse. Everything possible should be done to raise the threshold for pain, and this includes the judicious use of drugs with care to avoid the risk of addiction. In some cases the acceptance of the situation by the patient in itself affords some relief. Simple psychotherapy may be helpful, but analytical treatment, deep enough to eliminate the symptom, will sometimes precipitate a depression.

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