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TREATMENT OF CHRONIC PAIN

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Pain is the most prominent symptom and its treatment the central problem in the management of many cases, whatever may be the underlying abnormality. However much these cases may vary on account of the diversity of the underlying pathological processes, they will show important similarities because the mechanisms by which pain is produced, appreciated, and alleviated, as well as the physical and psychological effects of pain, are to some extent independent of the underlying disease.

It is the policy of those in charge of the Department of Neurology, Oxford, to admit to hospital for assessment and treatment patients with obscure or intractable pain, since the successful handling of these cases requires not only the careful study of the reaction to nerve blocks, etc., but also an assessment of the emotional reaction of the patient to the pain when it appears.

The present study presents some personal experiences and impressions gained from handling 77 such patients during 1953 and 1954. Table I gives the types of case treated, and Table II lists some of the various measures used in studying and treating the cases.

Peripheral Nerve Blocks

Peripheral nerve blocks are useful in a wide variety of conditions, such as post-herpetic neuralgia, atypical

facial pain, sciatica, causalgia, and painful phantom limb. Blocks were commonly induced with procaine 2% and lignocaine hydrochloride 1-2% ; less frequently with absolute alcohol and "efocaine." Efocaine was used with good effect, but can no longer be recommended in view of the damage to the spinal cord reported to follow its use (Clarke *et al.*, 1955). The amount injected varied with the site—for example, 2 ml. for the supraorbital nerve, 5 ml. for an intercostal nerve, and 10 ml. for the sciatic nerve.

The question why the injection of a local anaesthetic should in many cases bring permanent relief remains unsolved. The relief may be due to altered pain sensitivity of the tissues at the site of pain or to the breaking of a vicious cycle at a more central level. Whatever the mechanism, unpredictable effects were observed.

A nursing sister, aged 67 and of stoic temperament, had had severe left-sided herpes ophthalmicus with involvement of the cornea two months previously, since when she had continuous disabling pain. The sensations of light touch and pin-prick were slightly diminished, but there was severe hyperpathia over the first division of the left trigeminal nerve. Following a left supraorbital

TABLE I

Diagnosis	Male	Female	Total	Age		
				20-40	41-60	Over 60
Painful amputation stump and phantom limb ..	9	2	11	1	8	2
Facial pain, excluding trigeminal neuralgia ..	4	4	8	3	4	1
Brachial neuritis ..	2	6	8	1	6	1
Headache not associated with gross neurological disease or hypertension ..	5	3	8	2	6	1
Sciatica ..	1	6	7	1	5	1
Post-herpetic neuralgia ..	4	3	7	4	3	
Neuralgia ..			5			
Post-traumatic ..	3	1		2	2	
After sympathectomy ..		1			1	
Causalgia ..	1	3	4		3	1
Central pain ..	1	4	5	1	3	1
Migraine ..	2	1	3		2	1
Trigeminal neuralgia ..	1	2	3			3
Pain with carcinoma ..			3			
Of rectum ..	1	1			1	2
„ cervix ..		1				
Femoral neuritis ..	1		1	1		
Thrombosis of femoral artery ..	1		1			1
Psychogenic mammary pain ..		1	1	1		
Brachial pain and sensory loss of unknown cause ..	1		1		1	
Painful neuroma ..		1	1			1
Total ..	37	40	77	13	46	18

TABLE II.—Methods Employed for Relief of Pain

- I. Physical:
 - Spinal traction
 - Manipulation
 - Immobilization
 - Active exercises
 - Supervised relaxation
 - Percusso-vibration
 - Application of heat
 - Electric convulsion therapy
 - Intermittent venous occlusion
- II. Surgical:
 - Peripheral nerve blocks, with
 - (1) Local analgesics
 - (2) Cold
 - (3) Alcohol
 - The following nerves were injected in order of frequency:
 - (a) Sciatic
 - (b) Intercostal
 - (c) Greater occipital
 - (d) Supra-orbital
 - (e) Mandibular
 - (f) Inferior dental
 - (g) Femoral
 - (h) Lateral cutaneous of the thigh
 - (i) Median
 - (j) Ulnar
 - (k) Digital nerves in the foot and the hand
 - (l) Medial plantar
 - Injection of local analgesics into
 - (1) Interspinous ligaments
 - (2) Neuromata
 - (3) Posterior occipital muscles
 - (4) Supraspinous fossae and points of local muscle tenderness
 - Sympathetic nerve blocks
 - Caudal blocks
 - Procaine ionization
 - Intrathecal alcohol
- III. Drugs:
 - Histamine
 - Vitamin B₁₂
 - Intravenous procaine
 - Tolazoline hydrochloride
 - Ergotamine tartrate
- IV. Psychotherapy:
 - Suggestion
 - Light narcosis

nerve block with procaine the pain never returned so severely, and was completely relieved by two procaine injections into the hyperpathic area of the left temple and local "freezing" of the skin with ethyl chloride spray. Six months later she was free from pain.

Not all cases of post-herpetic neuralgia were relieved by local measures, and it was impossible to predict which cases would respond satisfactorily.

An aluminium worker aged 47 had had right-sided herpes ophthalmicus 3½ years before, and had suffered from post-herpetic neuralgia ever since. There was herpetic scarring with hypoesthesia in the ophthalmic division of the right trigeminal nerve, and a right-sided ptosis. He derived only temporary improvement from right supra-orbital nerve blocks with lignocaine and from local "freezing" of the skin with ethyl chloride spray, although his pain was by no means as disabling as that of the previous patient.

In a case of causalgia the mechanism of pain and its relief were also obscure.

A woman aged 54 fractured her pelvis, right femur, and lower end of the right tibia in a car accident two years previous to admission. Immediately after the accident, and increasingly ever since, she had been unable to bear light touch or pressure on the right foot. Four months after the accident, when she started to walk again, she developed tightness of the calf muscles and a burning vice-like pain in the foot (like "iron searing") so that she could not walk 100 yards. Five months before admission a right lumbar sympathectomy had relieved her for only a few days. There were trophic changes below the right knee, the skin being smooth, shiny, and hairless, and there was osteoporosis of the right ankle and foot bones. Cutaneous sensation was unimpaired except in a skin graft over the front of the thigh, but deep pressure of the right calf caused aching of the whole limb with "pins-and-needles" in the right foot. A right sciatic nerve block with lignocaine caused immediate "burning" and tingling of the right calf muscles, followed by abolition of the previous tight feeling in the calf. Pressure on a tender adherent scar over the right pubis caused pain in the right foot similar to the spontaneous pain. Three infiltrations of this scar with 10 ml. of 2% procaine caused a hot, burning, and tingling sensation in the foot followed by numbness and disappearance of pain. The pain returned, but never so severely. Local procaine ionization was then given to the foot and calf; weight-bearing became painless, and two months later she wrote, "I am now able to do a full day's work."

Hyperpathia may be abolished in some but not in all cases by local nerve blocks.

A woman of 46 had severe hyperaesthesia and hyperalgesia in the territory of the seventh, eighth, and ninth right thoracic nerves following a right lumbo-sacral sympathectomy for hypertension three years earlier. Procaine was injected into the appropriate intercostal nerves, producing transient anaesthesia and yet permanent relief from pain.

In some of the cases in this series it was found that certain local analgesics succeeded where others had failed. This may be related to the observations of Sinclair and Hinshaw (1951), who, in normal subjects, obtained different sensory phenomena with different blocking agents—namely, compression, cold, and procaine.

A woman of 73 had causalgia of the fourth left toe for four and a half years; localized osteoporosis was present. Digital nerve block with procaine gave immediate relief, which, however, passed off with the anaesthesia a few hours later. Nevertheless she obtained lasting relief after repeated local "freezing" with ethyl chloride spray. We might possibly have obtained the same effect from repeated nerve blocks.

The fact that pain may still be present after an anatomically successful antero-lateral cordotomy is well known. It is difficult to understand how a peripheral nerve block can

abolish pain in such cases. This, however, was observed in a gardener aged 68 who had had herpes zoster affecting the fourth to the seventh thoracic nerve roots.

Injection of Interspinous Ligaments

Kellgren (1939) produced pain in segmental areas by stimulating the interspinous ligaments with 6% saline. Based on these observations on somatic pain, a local anaesthetic was injected into the interspinous ligaments. This method has been found useful where there is local muscular pain and tenderness; for example, in cases of brachial pain associated with trauma or cervical spondylosis, in cases of lumbar prolapsed intervertebral disk which have not completely responded to conservative treatment, and in some cases of muscular pain at the back of the neck and head. We injected 2–3 ml. of 2% procaine or 1–2% lignocaine into the interspinous ligament at each intervertebral space.

An intelligent woman of 36 complained of having had interscapular pain radiating to the left shoulder and upper arm for six years. During the past few months she had paraesthesiae and slight weakness of the left arm. There was radiological evidence of cervico-dorsal spondylosis. The neck had been immobilized in a leather collar with temporary benefit during the previous year. There was tenderness of the cervical and upper two thoracic vertebrae, "clicking" with lateral head movements, and marked tenderness of the trapezii and supraspinati. Following injection of lignocaine into the interspinous ligaments at C6–7, C7–T1, and T1–2 and into both supraspinous fossae, there was complete relief of pain.

In the following case interspinous ligament injection brought relief of pain, but other measures were being used concurrently.

A housewife aged 46 had fallen on her right shoulder 10 weeks before admission, and since then pain in the right shoulder girdle and upper arm had prevented her from using the limb. Her head was held tilted to the left, and lateral flexion to the right was painful. There was tenderness over the right brachial plexus and over the sixth and seventh cervical vertebrae. The position of least discomfort was with her right shoulder abducted and elbow pronated. There was weakness of muscles supplied by the first thoracic root on the right and patchy cutaneous sensory impairment in the lower cervical root zone. The injection of 10 ml. of 2% procaine into the supraspinous fossa and a procaine injection of C7–T1 interspinous ligament gave partial relief. After further injections into the supraspinous fossa and right infra-clavicular region she was free from pain. Concurrently she was being treated with reflex vasodilatation by a heat cradle applied to the lower half of the body, but this was of doubtful benefit in her case. The arm was at first rested in a sling for part of the day, and she was then given active exercises. On discharge two weeks later she was using the limb freely.

In some cases where neurosis was superimposed on an organic illness, success was achieved by a combination of physical and psychological methods.

A man of 31, who had previously been earning a high wage as a skilled operative, had been unemployed for four and a half years since his right forearm had been injured by the backfiring of a starting-handle. The injury had not occurred at work. He had immediate painful paraesthesiae in the distribution of the ulnar nerve and weakness of the fingers. During the next four and a half years both pain and weakness spread from the territory of the ulnar nerve to involve the whole hand and the right shoulder and scapular region. The right hand, and to a less extent the forearm, had remained cold, blue, and swollen so that a vascular injury was suspected, but the venogram was normal. The ulnar nerve was transplanted, the stellate ganglion blocked, and traction applied, and he received out-patient physiotherapy for three and a half years, all to no avail. There was motor and sensory loss of ulnar distribution, but the apparent

weakness of the rest of the limb was probably due to pain, and the more widespread sensory loss was thought to be hysterical. He was treated with injections of procaine into the interspinous ligaments from C7 to T5, and intercostal nerve blocks on the right from the second to the sixth thoracic nerves inclusive. Pain was relieved following these, and active exercises immediately became possible, and were then carried out for many hours a day during the next two weeks. Common-sense psychotherapy was given at the same time. The patient was discharged free from pain, and though slight motor weakness persisted he was keen and fit to resume his previous work.

Electric Convulsion Therapy (E.C.T.)

When pain is part of a depressive illness, treatment with E.C.T. may be successful in relieving it.

A woman of 60 presented with a post-herpetic neuralgia but showed a reactive depression to her organically determined symptoms. Her pain was not alleviated by local nerve blocks, but it receded into the background after a course of E.C.T.

Psychosurgery and Tractotomy

It was not found necessary in this series of 77 consecutive cases to resort to the more drastic measures of psychosurgery or tractotomy. It may be thought that this was because the pain in these cases was not severe enough to warrant it. The more likely reason is that these operations are rarely necessary, provided other treatment is energetic and thorough.

Intrathecal Alcohol Injection

In cases of incurable carcinoma pain may be relieved by intrathecal injection of absolute alcohol, causing partial destruction of posterior root ganglia; but this is potentially a dangerous procedure, and the technique must therefore be carefully studied and cautiously applied (Dogliotti, 1931; Russell, 1936; Greenhill, 1947). 1 ml. of absolute alcohol is injected intrathecally with the patient lying on the non-painful side so that the alcohol floats upwards to the ganglia. The average time for complete relief of pain in cases recently reported by Maher (1955) was four months (personal communication).

In the present series intrathecal absolute alcohol was used in two cases of rectal carcinoma, with relief for four and six months respectively.

A woman of 61 had an abdomino-perineal excision for carcinoma of the rectum two and a half years previously. During the past year she had been incapacitated and recently bedridden by left-sided sciatica, low back pain, and occasional vulval pain. Since, at a previous admission, pain had not been relieved by sciatic nerve and caudal blocks, 1 ml. of absolute alcohol was injected intrathecally at the L 4-5 interspace. There was dramatic relief of pain. Motor paralysis of the muscles supplied by L 2 to S 2 on the left largely cleared during the next few days, but the knee- and ankle-jerks were abolished. Cutaneous anaesthesia persisted in the sacral segments and hypoaesthesia in the lumbar ones on the left together with posterior-column sensory loss in the foot. The colostomy was overactive for a few days after the injection. She became ambulant again and remained pain-free for four months. She developed a trophic ulcer on the left foot, but preferred this to her former pain.

Some of the observations made in this series will be more conveniently grouped under the condition for which treatment was given.

Headache

Once other neurological disease had been excluded, the patients complaining of headache was subjected to a number of tests in order to elucidate the precipitating cause. This included oral trinitroglycerin, and injection of histamine, of ergotamine tartrate, and sometimes of sterile water. If the reaction to small doses of histamine was excessive a course of desensitization was given.

A draper aged 56 had suffered from typical attacks of migraine for the past 40 years, with teichopsia, paraesthesiae in the fingers, unilateral headache sometimes on the one side sometimes on the other, and vomiting. During the past year his attacks had occurred about once a week, and were only partially relieved by ergotamine tartrate. Migraine indistinguishable from the spontaneous attacks was reproduced by 0.25 mg. of histamine subcutaneously, and the electroencephalogram showed transient abnormalities in such an induced attack. After a course of desensitization with histamine under anti-histamine cover, injections of 1 mg. twice daily caused no reaction, and the patient reported several months later that he had remained free from attacks.

It has been demonstrated that headache may be caused by increased tension in the occipito-frontalis muscle (Wolff, 1948). Connexions of the sensory nucleus of the trigeminal nerve extend to the lower medulla and are continuous with the posterior horn of grey matter in which end the sensory fibres of the occipital and other cervical nerves (Treves, revised by Rogers, 1952). On this basis injections of local analgesic were often made into the occipital nerve and the suboccipital region for the relief of tension headache and in some cases of facial and head pains of uncertain aetiology.

A woman factory worker aged 55 had complained of attacks of pain in the right ear and right side of the head for six months. These began after an illness which may have been geniculate herpes (Ramsay Hunt's syndrome). Following a right occipital nerve block and injections of lignocaine into the interspinous ligament between C2 and 3, and into the atlanto-occipital membrane, she had complete relief. One year later she wrote that she had had no further pain.

When headache was the result of many factors, it responded to a combined therapeutic attack.

A woman of 51 had complained of having had headache for three years. There were precipitating psychological factors, but she also had suboccipital and scalp tenderness. Headache was not influenced by histamine or ergotamine tartrate, but was temporarily lessened by trinitroglycerin. She was given injections of local analgesic into the suboccipital muscles, the occipital and supraorbital nerves, and the superficial temporal branches of the auriculo-temporal nerves. In addition reflex vasodilatation was produced by a heat cradle, and she had short-wave diathermy, head and neck exercises, and psychotherapy. She went home free from pain at the end of a month.

The above case also illustrates the fact that good results are more often obtained when treatment is concentrated rather than long drawn out.

Atypical Facial Pain

There are certain cases of facial pain which are particularly resistant to treatment; many of these are of obscure aetiology and, in the meantime, are classified as "atypical." Pain may continue despite resection of the sensory root of the trigeminal nerve. The following case has many of the features described by Costen, but whether Costen's syndrome corresponds to an anatomical entity remains doubtful.

An unmarried woman aged 57 had developed pain in the right lower jaw 23 years previously. This soon spread to the maxilla and front of the right ear and had persisted in the distribution of the right auriculo-temporal nerve and inner side of the maxilla; pain was constant, aching, and boring, and was exacerbated by all movements of the jaw. It had been unaffected by trigeminal injection and root section causing permanent trigeminal anaesthesia and motor weakness, or by superior cervical plexus and stellate ganglion section. There was tenderness over the inner side of the maxilla and to a less extent over the right temporo-mandibular joint. A course of injections of lignocaine into the right temporo-mandibular joint was unsuccessful, and was followed by the administration of

phenylbutazone with no better success. Finally, a bite-raising dental appliance was fitted which also failed to relieve her pain.

Painful Stump and Phantom Limb

It is well known that peripheral factors may influence phantom limbs (Russell and Spalding, 1950), but many observations await explanation. In the following case pain was temporarily abolished by tolazoline hydrochloride, which produced a delayed but excessive elevation of skin temperature of the stump.

A middle-aged woman had a painful stump and phantom limb from an upper-arm amputation after a motor accident. The stump felt subjectively cold and its skin temperature was 75.8° F. (24.3° C.). Tolazoline, 12.5 mg., was injected intravenously into the opposite cubital vein. The phantom started to feel warmer one minute after injection, together with the rest of the body, but it warmed up more slowly. Thirty minutes after the injection it felt subjectively warmer than any other part of the body, although at the time the skin temperature of the stump was 3.4° F. (1.9° C.) lower than that of the foot. The skin temperature of the stump then rose higher than the rest of the body and remained elevated longer: it rose from 75.8 to 92.6° F. (24.3 to 33.7° C.), while at the time (83 minutes after injection) the opposite arm was only 84.2° F. (29° C.). Two and a half hours after injection the stump was still 5.5° F. (3.1° C.) warmer than the other arm. Pain was abolished throughout the time that the stump and phantom felt warm. Five minutes after injection the patient became able to move the phantom fingers, which she had not been able to do before, and this mobility lasted for 10 minutes.

Local procaine injection can first produce and then extinguish a phantom limb.

In the above patient 4.5 ml. of 2% procaine injected slowly into a painful neuroma in the tip of the stump immediately produced the phantom, not present before. The phantom grew hot, "pricking" became more complete, and within two minutes she could flex the wrist and fingers. Seven minutes after the start of the injection the phantom was abolished and the tip of the stump was numb and painless. This same patient could temporarily abolish the pain by percussion-vibration, pain disappearing suddenly after 20 minutes' percussion. The slow fading of the phantom following local procaine injection contrasts with the sudden disappearance following percussion.

Three of the patients with painful stump and phantom limb were men aged 55, 56, and 67, who had all had a mid-thigh amputation for gunshot wounds in the 1914-18 war, at least 35 years before. In each case the stump felt subjectively cold although the skin temperature was normal. One of the patients had had transient relief from a lumbar sympathectomy. All three had had their pain controlled for several years by percussion-vibration. When, however, it was no longer effective they obtained complete relief with oral tolazoline in doses of 25 mg. three times daily. Relief lasted a few months only, and pain returned during the cold of the winter.

Central Pain

Tolazoline also influenced central pain, as is shown in the following cases.

A woman aged 50 suffering from syringomyelia had had severe spontaneous pain down the right side of the body for the past six months, chiefly affecting the upper limb and trunk. Pain was precipitated or aggravated by active and passive movement; there was sensory loss with severe hyperpathia, overreaction to stimuli, poor localization, and diffuse "spread" of sensation upon stimulation. Seven minutes after the intravenous injection of 25 mg. of tolazoline movement no longer produced pain, and the overreaction to all stimuli was entirely abolished. The effect passed off after 25 minutes. This patient later was relieved of her "central" pain by aspira-

tion of a syringomyelic cyst extending from C3 to 5, but unfortunately only for a few weeks.

A woman of 32 had had pain down the entire left side of the body for 10 years and hyperpathia to all sensory modalities on that side. She was presumed to have a lesion involving the right thalamus. Within five minutes of the intravenous injection of 25 mg. of tolazoline the unpleasant sensation began to disappear; 14 minutes after injection the hyperpathia had disappeared completely and one hour later it had only returned to a minimal extent.

Our other therapeutic attempts with three further cases of central or so-called "thalamic" pain were uniformly unsuccessful. In two of these patients spontaneous pain with sensory loss was associated with a homolateral hemiparesis due to hypertensive cerebrovascular disease, and in the third case necropsy showed vascular disease of the cord with severe degeneration of the posterior columns but no microscopical lesions of the thalamus. Pain in each case was aggravated or precipitated by movement of the affected part and by extremes of temperature. Similar observations were made by Ajuriaguerra (1937) in cases of central pain. In our patients pain was unrelieved by morphine, methadone, neostigmine, nicotinic acid, tolazoline, vitamin B₁₂, faradism, procaine ionization, and percussion-vibration. In one case variable relief was produced on repeated occasions by the injection of up to 18 ml. of 2% intravenous procaine over 40 minutes.

Trigeminal Neuralgia

The effect of tolazoline was tried in three cases of tic douloureux at the suggestion of Dr. E. Poole; these form part of a larger series to be reported by him. The results were sufficiently encouraging to warrant further trial of this treatment.

Pain Perpetuated by Psychological Factors

It is important at the outset to recognize the patient who does not wish to be rid of his pain although he pays lip-service to the need for treatment. Analysis of the psychological factors leading to this paradoxical state of mind is by no means always profitable. In many cases only limited treatment of the pain is indicated, and further attempts are doomed to failure.

A pensioner aged 55 had received a gunshot wound in 1917 causing mild injury to the sciatic nerve, and he had complained of a pain at the left knee "boring like a corkscrew" ever since. In 1951 he was fitted with a drop-foot appliance, which was removed in 1954. Numerous forms of treatment were of no avail, but he finally became almost free of pain when, at his own suggestion, he wore a plaster back splint which prevented knee flexion. Pain was still brought on by warming up in bed.

This man had been pensioned for his injury and he probably required to parade evidence of his disability. His symptoms were aggravated when the drop-foot appliance was removed, although it was of no mechanical advantage to him. Its removal was therefore ill-advised. On the other hand, it is unlikely that his pain was entirely psychogenic, for it had certain well-defined features of a mild causalgia of the sciatic nerve.

Many of the cases, however, show a good response to plain speaking, often together with repeated physical treatment of a somewhat uncomfortable nature, which serves as a face-saver when improvement takes place.

Discussion

The study of pain is beset with pitfalls. Being a sensation and a subjective psychic phenomenon, pain is not open to quantitative analysis. Its nature is as protean as the personality of the sufferer, for, as Leriche wrote, "La douleur est la résultante du conflit d'un excitant et de l'individu entier." Although there are certain patterns of reaction which are sufficiently reproducible to permit generalizations, there are at least three main junctions in the study of pain at which

variation and distortion of experience may occur. The first is in the patient's interpretation of potentially painful stimuli; the second is in the description of the painful experience to the doctor; and the third is the reinterpretation or assessment of the experience by this outside observer.

As regards the patient's interpretation of stimuli, it is well known that on one day he may feel pain severely and later, with a change of mood, he feels the "same pain" less severely. Foerster claimed to have learned through prolonged practice "to influence the intensity of bodily pain to complete disappearance," and by all accounts this is also true of people practising Yoga. Whether this influence is entirely at a conscious mental level or is in part mediated through the sympatho-adrenal system remains undetermined.

We are not dealing with measurable facts, and not therefore, by definition, with scientific facts. Pain being an affective experience, it cannot be exactly reproduced either in different individuals or in the same individual. This may be related to the fact that no region of the cerebral cortex is especially concerned with the reception of pain. It is generally believed that there are no points on the cortex which give rise to pain when electrically stimulated (Adrian, 1950), although in a case described by Lewin and Phillips (1952) pain similar to that complained of spontaneously was produced by stimulation of the sensory cortex and abolished by excision of that part of the cortex. The effect of pain stimuli on the brain seems to be mainly on central regions which control the general level of cortical activity (Adrian, 1950).

The fallacies of comparison are usually remembered when pain from a similar cause is observed in two individuals, but they are frequently forgotten when pain recurs or is long-continued in the same individual. It is, however, obvious that because these pain-producing stimuli bombard an ever-changing cerebral pattern the resulting sensation is never the same. This is seen most clearly in cases of pain associated with a persistent cause. When a part of the body is injured or diseased, consciousness is immediately directed to it; the injured part "rises into consciousness." If attention continues to be directed to the part, a distortion of body-image results, with fixation on the part, and a neurosis follows almost of necessity. In disease or after injury the patient's activities are either altered or he has to adjust in order to maintain them unchanged. At an unconscious level there is autonomic imbalance, with overstimulation of the sympathetic system. At a conscious level the thoughts and activities of a person in pain are continually being interrupted by bodily sensations; he cannot avoid becoming self-centred in the strict sense of the word, and the ground is prepared for a neurosis.

Both pain and depression may in certain cases be due to underlying disequilibrium and not causally related to each other. In the premenstrual syndrome pelvic pain and an apparently causeless endogenous depression develop suddenly, and a little later disappear just as suddenly. The pain is attributed to local factors such as pelvic congestion, and the depression to hormone imbalance, or at least it may respond to hormone therapy. Headache which may also be present belongs to that borderland of symptoms caused by physico-endocrine-psychological factors. In such cases the various pathological components will influence each other and pain will be more severe as long as the depression lasts, whilst the depression will tend to be maintained by the existence of pain. Treatment of either may therefore result in cure or amelioration of the other.

A patient is often not aware of his distortion of pain when relating his experiences. Before attempting treatment it is necessary to discover whether or not there is a genuine desire to be rid of the pain, and whether the expression of pain has become a useful outlet for certain emotions. It may be playing an essential part in the patient's life either through inadequacy of personality or because of a sadomasochistic trait, and in these cases it may be wiser to aim at only partial relief of pain. Seeking for relief is part of

the illness, and whenever the patient can show that he suffers pain which no one is clever enough to influence, it acts as a prop for his self-confidence.

The assessment of the experiences of another may obviously lead to distortion. Provided the patient is not a liar, the concept that pain is either "genuine" or not "genuine" is untenable, since pain is an experience, and there can be no such thing as a not-experienced experience. Similarly, the term "imaginary pain" is meaningless; it merely denotes psychogenic pain, and this can be as painful as the pain for which there is a recognized physical cause. Sometimes the mechanism of psychogenic pain can be treated (for example, removal of the increased tension in the occipito-frontalis muscle causing headache) and sometimes the cause (for example, the worry that precipitated the increased tension), but in all events a refusal to acknowledge the experience of another can never lead to successful treatment. Baudouin (1918) noted that patients to whom it had already been suggested that their pain was of "neurotic" origin, implying that it was not "genuine," and that nothing could be done for them, were more difficult to cure.

Great caution should also be exercised in pronouncing pain "neurotic" on account of unusual and ill-understood characteristics. In conditions of disordered sensation, an almost unlimited variation of pain and dysaesthesiae may be present, and an entirely new range of sensations may be experienced such as never occur under physiological conditions. Two examples may be quoted: pin-prick on one side of the abdomen of a patient with syringomyelia produced an excruciating "electric-wire" sensation over the spine in a corresponding dermatome but without any sensation of pain at the point of stimulation. A middle-aged publican had severe proctalgia following abdomino-perineal excision of the rectum for carcinoma. He had frequently been diagnosed as "hysterical" and "neurotic" because of the "barbed wire" which was being "pushed up and twisted inside the rectum which is not there." After admission to hospital numerous measures were tried without success until he obtained immediate and dramatic relief following an injection of intrathecal alcohol.

Caution is similarly required in the interpretation of the relief of pain when unusual and at present ill-understood results are observed. In the fourteenth century Arnold of Villanova, reporting a remarkable cure obtained with the mysterious "pierre rouge," adds that no effect in nature is miraculous and that one must be very foolish to say that a thing is impossible because one does not know or understand it. The easy and at times fashionable explanation is to attribute the relief to psychological factors. Nothing is gained by such an assumption, and we must admit that the mechanisms by which pain is produced and interpreted are at present not sufficiently well understood to make possible a distinction between the cortical and somatic factors involved in any but the simplest cases.

"The emotion of pain is fear" (Hughlings Jackson, 1931) and the affective side of pain cannot be disregarded. Nearly all the patients in this series were chronic sufferers requiring an individual approach and prolonged attention; and therapeutic optimism often proved useful. The methods of suggestion and auto-suggestion are at times valuable, and it is well to remember that operations have been painlessly performed under hypnosis. Psychotherapy was often employed along with physical methods of treatment; and this combination still remains, as it has always been, the basis of good therapy in all but purely somatic diseases. It is clear from the foregoing that psychotherapy has a place in the treatment of somatically determined painful states, and this, indeed, is one of the main pillars on which the age-old success of "faith healing" and quack medicine rests; it is important that the medical profession should understand and study this phenomenon and should use it where indicated. Conversely, painful states which have a psychological basis may on occasion be influenced by physical treatment which succeeds in reducing to subthreshold levels normal stimuli that have been interpreted as painful by the patients.

We may classify the symptomatic treatment of pain into four groups: (1) analgesic drugs, with either a central or a peripheral action; (2) interruption of the pain pathways, suppressing the transmission of impulses to a conscious level; (3) psychosurgery, altering the affective interpretation of stimuli which have reached conscious level; and (4) psychotherapy, including suggestion, altering in a wider sense the interpretation of pain stimuli.

The abolition of pain in some cases after bilateral adrenalectomy (West *et al.*, 1952) is an interesting phenomenon and is not solely related to the disappearance of metastases in bone and other tissues. The mechanism of pain suppression in these cases is not yet understood. Riddoch (1938) noted that pain is "the only aspect of sensation accompanied by endocrine, autonomic, and motor reactions of a protective kind." Cannon *et al.* (1929), as the result of experiments on cats, pointed out that the reaction to pain probably depends on the state of the sympatho-adrenal system. After bilateral adrenalectomy the entire endocrine response to stress, and therefore to painful stimuli, is altered. The outpouring of adrenaline is abolished, but this may not be the only or the most important factor.

Summary

Observations were made during the treatment of 77 unselected consecutive cases of pain arising from a number of causes.

Types of pain include post-herpetic neuralgia, painful amputation stump and phantom limb, headache not associated with hypertension or gross neurological disease, brachial neuritis, causalgia, central pain, and several others.

Numerous forms of treatment are discussed, including peripheral nerve blocks, injection of local anaesthetic into interspinous ligaments, intrathecal alcohol, vasodilator drugs, and psychotherapy.

It is stressed that no complaint of pain except that of the malingerer should go untreated. The pain of the neurotic may cause as much disability, and therefore require treatment just as much, as the pain due to malignant disease.

Since pain is often of mixed origin, a combined therapy which employs both physical and psychological methods is often the most rewarding.

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PROPHYLACTIC SULPHADIMIDINE IN CHILDREN SUBJECT TO RECURRENT INFECTIONS OF UPPER RESPIRATORY TRACT

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Mass chemoprophylaxis to reduce the incidence of infections of the respiratory tract was successfully employed in the American Services during the last war, and its efficacy was conclusively demonstrated in controlled trials. With the appearance of sulphonamide-resistant streptococci, both in the armed Forces and in the civil population, chemoprophylaxis declined in popularity. The reduction of infections with group A streptococci has proved effective in preventing recurrences of rheumatic fever in susceptible subjects, and prophylactic sulphonamides and penicillin have both been used for this purpose for many years.

The problem of the child who is subject to frequent infection of the respiratory tract is constantly before the family doctor and the paediatrician. Attempts have been made to reduce the number of these infections by giving a small dose of a sulphonamide or penicillin daily to such children. Lapin (1948) reported a successful trial with oral penicillin in hospital out-patients. Siegel and Julianelle (1945) gave prophylactic sulphadiazine for 15 weeks to 30 mentally defective children in an institution, but during the trial period the number of acute infections in both treated children and controls was very low and no benefit was demonstrable from the use of the drug. Finke (1953) records the results of submitting 100 Rochester schoolchildren to different prophylactic regimes over a period of 10 months. The number of infections of the respiratory tract was 2.5 per child in treated cases and 4.3 in controls, and in a study of older children the number of days lost from school in those treated was half that in the controls.

The purpose of this paper is to describe the results of a trial of prophylactic sulphonamide therapy in a group of children awaiting tonsillectomy on account of recurrent infections of the upper respiratory tract.

Plan of Investigation

The children attended the hospital at intervals of eight weeks for a period of eight months between August, 1954, and May, 1955, and were submitted to a clinical trial on the double blind principle. Two kinds of tablet were made. Tablet A contained calcium carbonate 60% and calcium lactate 40%, and tablet B sulphadimidine 0.5 g. Both were flavoured with aniseed and were identical in appearance and very similar in taste. Each child acted as his own control. Half the group received calcium tablets for the first four months followed by sulphadimidine for four months, and the course was reversed for the other half. The identity of the tablets was not revealed to the clinical assessor until the end of the trial, so that the observations by all concerned were unprejudiced. The family doctors were fully informed of the nature and purpose of the trial and were requested to record details of the patients' illnesses treated by them on a form which was returned to the hospital by the mother at the child's next visit. The tablets were normally continued during an acute illness, but any