

M.D. THESIS.

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The TREATMENT of FIBROSITIS

by

NOVOCAIN INFILTRATION.

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## FOREWORD.

The following series of cases constitutes a clinical study of the effect of local anaesthetic injection on certain painful conditions previously not amenable to quick relief. The aim was originally merely to reduce the period of disability, while continuing more orthodox treatment, but it was found that cure frequently occurred from injection alone.

The cases treated fall into the following groups:-

- (a) chronic fibrositic affections in various situations.
- (b) sprains and minor traumata, regarded as cases of acute fibrositis.

The local anaesthetics employed were:-

- (a) novocain in various strengths dispensed in normal saline.
- (b) a proprietary preparation of 3% novocain made up in Ringer's solution.
- (c) a proprietary preparation of 2% novocain in Ringer.

Most of the cases came from:-

- (a) a part of a battalion of soldiers, originally middle-aged and elderly men, and so excellent material for the chronic fibrositic group, particularly as many of them were facing unaccustomed exposure to rigorous weather conditions and vigorous physical activity.
- (b) workers on long shifts in the cold and damp conditions of a dockyard.
- (c) patients in ordinary civilian practice.
- (d) certain Naval and Air Force personnel, and those on leave in the district.

It will thus be seen that the bulk of these are individuals who at the present time can ill be spared for long periods of rest from the occupations on which they are engaged.

The technique employed was as simple as could be arranged, in view of the demands of a fairly busy practice. Usually five or ten minutes sufficed for any one case at a time, and the injections were carried out in the consulting-room, or medical inspection room in the case of the soldiers, or in the patient's home. No special apparatus or instruments were necessary, and no elaborate sterile technique employed. In short, the method is admirably suited to the resources of either the general practitioner or the regimental medical officer.

## INTRODUCTION.

"Muscular rheumatism", "lumbago", "pleurodynia," "chronic muscle strain," "sciatica", are probably the commonest and most chronically disabling conditions that affect mankind, if the disablement is assessed on the number of man hours of work lost to society as a whole and not merely to the individual. The number of bottles of Salicylate mixture, the number of boxes of counter-irritants dispensed in the course of a year must reach astronomical figures, and the number of sufferers with barometric backs who never seek medical advice is legion. Yet in spite of the ubiquity of these disabling conditions little really scientific work has been done on the subject until recently, and comparatively little is known of the underlying pathology. In the last few years certain aspects of the problem have been studied by different workers, and although the aetiology and pathology are still obscure, it is certain that very many of these conditions have as their basis a fibrositis of various structures. This fibrositis may not be at the particular site at which pain is felt, for instance sciatic pain may be secondary to fibrositis of the gluteus medius muscle. There may be no actual compression of the nerve, yet the sciatica may be brought on by pressure on a fibrositic nodule in a non-adjacent muscle or ligament with the same segmental nerve supply as the sciatic. This was found to be the case in 74 of Steindler and Luck's cases. Similarly general diffuse muscular pain may be due to a single fibrositic nodule in the muscle. Kellgren actually produced this general pain by introducing a minute amount of irritant into the muscle, the diffuse pain remaining of exactly similar character as the fibrositic pain, until the irritant was absorbed.

The obvious step for the physician to take when confronted with any one of these painful conditions is to search for an area of fibrositis as the basic factor responsible. This is neither time-consuming nor does it require especial skill. Yet how often is it neglected. Ignorance of the pathology and effects of fibrositis and its scant mention in the text-books, are responsible for this indifference. Too often is the sufferer dismissed with an analgesic when timely attention to a fibrositic nodule would have cured him and not merely grudgingly relieved his pain. Occasionally a tender nodule, productive of the pain, can be actually palpated with the tips of the fingers, but more frequently no nodule can be felt, although deep pressure with the finger-tips over a particular spot will elicit the characteristic discomfort. When these fibrositic nodules or areas are found, the most promising form of treatment appears to be their infiltration with novocain solution. This, in many cases, not only relieves/

relieves the pain immediately, but permanently cures the condition and the patient is able to return to work straight after the injection. If only suitable cases are selected, and if the diagnosis and localization of the areas are carefully made, then a high proportion of successes will occur. Most failures in the past have been due to incorrect diagnosis, inaccurate localisation of the area or nodule, and poor technique. Care must be taken to exclude more serious underlying pathology, as for instance a pelvic neoplasm giving radiculitis, but the bulk of sufferers who first come to the physician for advice, as opposed to those who arrive at a hospital, have no such serious condition, and it is for them that this form of treatment provides a new hope of relief from aches and pains of perhaps years' duration.

The procedure is not intimidating to the patient: the technique is simple in the extreme; the apparatus is no more than a syringe and needle: the results are dramatic and immediate: and the physician and patient can be assured that even if the treatment fails, then no harm will have been done.

Sprains and strains are considered to be an acute traumatic fibrositis: their microscopic pathology is similar to non-traumatic fibrositis, and in many of the cases described they respond to the same treatment.

## The Nature of Fibrositis.

Fibrositis is a rheumatic disorder characterised by a non-suppurative, inflammatory reaction in the white fibrous connective tissue anywhere in the body, with a swelling and proliferation of the fibrous tissue in response to chilling, toxic influences (bacterial, virus and metabolic), trauma, or fatigue. Acutely tender fibrous bands or nodules frequently form in the muscles, tendons, ligaments, fasciae, periosteum, joint capsules and nerve sheaths and press on arterioles and nerve filaments, causing muscle spasm and secondary pressure effects. Hence the manifestations of this disease are really protean. However, stiffness and varying degrees of disability and pain, which is increased by active motion, are always present. Fibrositis may have an acute or a sub-acute onset, produce minimal systemic reactions and result in complete recovery; or it may have a tendency to recur and become chronic, with prolonged pain and stiffness.

This form of rheumatoid disability is often classed under the myositides or inflammations of muscle in general, or under muscular rheumatism or myalgia, but "fibrositis" is a more accurate term because the pathological changes occur primarily in the white fibrous connective tissue of the body.

The interstitial muscle tissue is involved, rather than the muscle parenchyma, and hence fibrositis should not be classed under the myositides. True myositis is relatively rare, while fibrositis has been called the commonest ailment to which human flesh is heir. "Non-articular rheumatism" has been suggested as a better term.

Incidence. Fibrositis, under which heading have been grouped various pathological conditions of doubtful origin such as lumbago, wryneck, cephalodynia and pleurodynia, has been called the commonest cause of persistent recurring pain. Certainly everyone suffers more or less disability and pain in the form of a stiff neck, backaches or sore leg muscles after unusual exercise, exertion or chilling, some time or other during his lifetime.

Fibrositis is rare in the early decades of life. The chronic form becomes increasingly frequent later in life, because one attack predisposes to another. There is a definite seasonal incidence of this disease.

According to the Ministry of Health Reports, fibrositis is found in 60% of all rheumatic patients. Unlike arthritis, fibrositis occurs more frequently among men than women, perhaps because men are more vigorous in exertion and more apt to disregard chilling after muscular activity. Stevenson found the disease common among London busmen, and it is common among soldiers and workers exposed to conditions of wet and cold not undergoing adequate exercise to keep their circulations active.

Davidson and Duthie state: "It is officially admitted that one-sixth of the total annual invalidity of insured persons in Great Britain is due to rheumatic disease in one or other of its forms. In Scotland, with a population of approximately 5 millions, 50,000 insured persons are totally incapacitated annually, for an average period of sixty days. Investigations carried out by the writers indicate that at least 300,000 new cases of rheumatic disease requiring medical treatment occur annually in Scotland, of which about 75 percent belong to the group of fibrositic diseases affecting muscles, nerves and tendons. Such figures give some indication of the enormous economic loss resulting from the ravages of this group of diseases, and of the vast amount of pain and misery entailed. They are the greatest scourge of modern civilization and have amply earned the title "Public Health Enemy No. 1".

Classification. Fibrositis is no more a disease than is arthritis, but it may be classified in two ways, either aetiologically, or anatomically. Aetiologically fibrositis may be primary or secondary. Primary fibrositis is of unknown origin and is unaccompanied by, and independent of, any other recognised disease. Secondary fibrositis is incidental to some general infection, known cause, or dominant primary condition, such as gonorrhoea, rheumatic fever, influenza, atrophic arthritis, tuberculosis, syphilis, chronic alcoholism, gout or lead poisoning, or trauma. While it has recently been experimentally produced in animals by infection with the M4 virus.



Aetiology. There is no one specific causative agent. The chief precipitating factor, however, is chilling after exposure to cold, dampness or barometric changes, especially during perspiration after overwork or over-use of muscles in exercise, sport and work. The mechanism of this may be found in the chilling setting up an autonomic capillary spasm, followed by stasis in the capillaries and subsequently in the lymph spaces. This probably explains why fibrositis is most manifest in superficial muscles, i.e. deltoid, sacrospinalis, pectoralis major.

Endocrine factor - which may give this abnormal cutaneo-sympathetic response to changes in external temperature.

Muscle strain, either by acute trauma or from lack of a proper muscle balance due to flat feet or poor posture, and prolonged over-exertion in work or certain sports may be another precipitating factor, and the acute fibrositis in tendinous and ligamentous structures following the tearing of a few fibres of the tissues in a sprain has an obvious origin in trauma. Toxic influences, either bacterial or metabolic, play an important aetiological role. Gordon suggests that a virus may be the basic factor. The dysfunctioning or irritable colon may permit accumulation of intestinal toxius. Faulty metabolism results from impaired circulation and faulty elimination. An important aetiological or predisposing factor is that of the type of individual, those subject to rheumatoid arthritis frequently being victims of lumbago or other fibrositic manifestation, namely the asthemic visceroptotic lordotic type of individuals with faulty posture, poor muscular tone, vasomotor instability, poor circulation and depressed mental outlook. Halliday indeed suggests that emotional reactions may be involved in the vasomotor imbalance, and cites illustrative cases showing how certain rheumatic symptoms have symbolic psychological connotations. An allergic factor may be operative, with sensitization of fibrous tissue to some protein toxin of metabolic or bacterial origin. Abel and his co-workers found a considerable number of patients who gave positive tests for cold sensitivity.

The Mental Factor. It was noticed that the mental effect of subjecting a patient to injection was considerable; the genuine chronic sufferer was delighted at having a new form of therapy, and among the soldiers the malingerer was usually scared away. Many sufferers from chronic fibrositis have a depressed mental outlook, and perhaps tend subconsciously to exaggerate their aches. The striking result of having pain immediately relieved by a single injection must do much to eradicate this mental factor and render them more co-operative in treatment and more ready to acknowledge success.

In some of the military cases described, there was perhaps considerable exaggeration of symptoms that normally would not have called for complaint, or even invention of symptoms that did not exist. But these cases were usually "cured" by a single injection, and did not return for more, preferring the exertions of the parade ground to the horror and mystery of "the needle". (This is not altogether relevant but is mentioned in that this form of treatment supplies the regimental medical officer with a fairly potent weapon: its rationale is more logical, and incidentally also more humane than Corrigan's button.)

Pathology. Pathological data are meagre because biopsy is rarely possible owing to patients' strenuous objection to it, and, when it is possible, the sections are often microscopically negative. The essential inflammatory lesions, when discovered, however, occur in the white fibrous connective tissue of the body, the brunt of the attack falls mainly on the covering sheaths and aponeuroses of the vessels, nerves and tendons and the essential pathology is an inflammatory hyperplasia with lymphocytic exudation, giving rise to indurated patches which may be widely distributed over the body or restricted to one or two areas. The acute stage shows microscopically an effusion with a serofibrinous, lymphocytic, localized inflammatory exudate, causing a puffy oedema of the tissue involved. There is a background of serofibrinous exudate the cells of which consist chiefly of lymphocytes and the foci are in the connective tissue surrounding the blood-vessels and nerves. All the surrounding connective tissue is swollen and inflamed, and a mass of lymphocytes may be present in the sheathing of a nerve. There may be an extravasation of red cells between the tissues, and there may be new capillaries. This picture is identical for an early non-traumatic fibrositis and for the tissues involved in a sprain. As the acute stage clears up, the sub-acute stage shows fibrocytes in active proliferation and fibrositis is now in progress, with an amorphous, serofibrinous matrix, the small blood-vessels showing distinct thickening of their coats as though they had been exposed to an irritant. As the chronic stage supervenes the inflammation spreads in the connective tissues between the bundles of muscle fibres, involving and squeezing upon the nerves and blood-vessels (hence the pain, possibly partly due not only to irritation of the nerve-endings but to ischaemia of the muscle.) In the subacute and chronic stage a swelling or nodule, smooth and regular in outline, may be felt through the skin, but this is by no means constant.

Laboratory findings. These are usually normal - B.S.R. white and red counts, Arneith-Schilling counts, protein, calcium, phosphorous proportions, culture of the nodules, and X-ray.

## MANIFESTATIONS.

Symptoms and signs. Pain is the predominant symptom. It may be sharp, stabbing and constant, or merely a dull ache, becoming severe only on movement or on assuming certain positions. Aching, soreness, stiffness, pain (which is increased by active motion) and limitation of movement often appear abruptly in any area where fibrous tissue is present but most often in muscles or around joints.

The onset and course of the disease may be acute, subacute or chronic. Patients often present as their chief complaint pain and stiffness in or about muscles and joints, particularly in the back, with no external evidence of pathology such as redness, swelling, fluid, deformity, wasting.

There are few or no objective changes except tender, palpable indurations and nodules, and muscular spasm. These nodules occur most often at the sites where chilling and strain are most frequent, e.g. in the small of the back. Frequently no actual nodules can be felt, but limited tender areas can be defined. There is some difference of opinion in the literature as to the frequency of palpable nodules, but it is possible that the tender areas, with associated muscle spasm, suggest fibrositic nodules to a receptive mind. The pain felt may be at an area distant from the site of the fibrositic lesion. For instance, a fibrositic nodule in the upper part of the buttock may give diffuse pain low in the buttock and in the back of the thigh as far as the knee; or fibrositis in an intercostal space may give a large area of pain over the front of the chest and over the back, although the lesion is no more than a few centimetres in size. Kellgren mapped out areas by experiment where a painful stimulus in muscle gave distant pain. He concluded that a painful stimulus in muscle gives a referred, diffuse pain; that this distribution appears to follow a spinal segmental pattern, but varies from individual to individual; that it is not comparable with the segmental innervation of the skin; and that the distant pain is not a skin appreciation, but is felt in the deep structures, e.g. a joint or testis. There is also deep tenderness of the distant structures in which the referred pain is felt, but this tenderness on pressure is of less severity than at the causative irritative area when subjected to pressure. Finally, if there are two or more foci, they and their referred areas of pain are not appreciated simultaneously, but in turn, so that the pain appears to flit from place to place, and is frequently described by the patient as a "shooting" pain.

## Types of Fibrositis.

Intramuscular Fibrositis. This is responsible for by far the greatest number of chronic cases seen, if in this group is included the fibrositis of the fascial and ligamentous insertions and origins of the muscles, and their fascial sheaths. The vast number of cases of fibrositic "lumbago" seen in practice, of muscular pains in the shoulder girdle, and of pain in the intercostal and extra-costal muscles, frequently simulating pleurisy, must be only a small proportion of those occurring in milder form and so not seen by the practitioner. Intramuscular fibrositis may be classified under the following heads -

(a) Diffuse Fibrositis, as in generalized muscular rheumatism,  
or

(b) Localized Fibrositis, affecting only the insertion or origin of a muscle or the fibrous sheaths surrounding the muscle bundles. The parenchyma of the muscle is not involved but only the interstitial tissue. The stiffness is due to a "jelling phenomenon" which causes whatever limitation of movement there is. Pain is localized, not at the joints but between them. This condition is often called "myalgia" or "myofascitis", both unsatisfactory terms. Localized fibrositis occurs in varying situations, as -

1. Indurative headaches (myalgia capitis):- Cephalalgia, cephalodynia, is fibrositis of the muscles and tendons of the scalp and neck.
2. Acute Wryneck (Acute Torticollis):- Stiff neck, or cervical myalgia, is a fibrositis involving the sternocleidomastoid and occasionally the trapezius muscles.
3. Pleurodynia, Intercostal Fibrositis, Intercostal Myalgia - This is a fibrositis of the chest muscles, usually the intercostals, and at times the pectorals and serratus anterior.
4. Abdominal Fibrositis - Abdominal Fibrositis with involvement of the rectus and other abdominal muscles is characterised by pain (often very severe), tenderness (even to "fingertip pressure"), and tender spots and nodules, with or single or multiple, in areas not actually affected by visceral disease.
5. Scapulodynia is a fibrositis of the scapular muscles, often limiting shoulder motion, and very common.
6. Dorsodynia is a fibrositis of the dorsal muscles of the back, also known as "myalgia dorsalis".

7. Lumbago (spinal fibrositis or myofascitis) affects the muscles of the lower back, especially the lumbar muscles. It is regarded as the most common rheumatic affection of the spine and as the commonest cause of pain low in the back, where there are so many fascial and ligamentous insertions into bone. Sydenham described lumbago as "the third variety of rheumatism". Lumbago occurs most often in male adults, with a sudden onset after chilling, or severe muscular strain involving lifting or bending.

A diagnosis of lumbago should only be made after exclusion of every other possible cause of lumbar pain by a careful history, a thorough physical examination and in cases of doubt, an X-ray study.

Periarticular Fibrositis, or capsulitis affects the fibrous tissue of the articular capsules and its surrounding ligaments.

Bursal Fibrositis is common but it must be distinguished from bursitis which is accompanied by an increase of fluid in the bursal sac. It lacks the definite limitation of movement of true bursitis. Pain is present only on extremes of motion in the shoulder, especially abduction and internal rotation are painful, and tenderness is frequently absent.

Fibrositis of the perineurium of the adjacent muscles and of the interstitial fibrous tissue of the nerve trunk may cause brachial neuralgia, trigeminal neuralgia, intercostal neuralgia and sciatica. The sciatic nerve is most often involved, in men more commonly than in women, and in the bulk of cases seen the fibrositis was of adjacent muscles giving direct irritation to the nerve, or referred pain of segmental distribution (Kellgren); or of the perineurium; and less commonly of the interstitial fibrous tissue within the nerve trunk.

Tendinous Fibrositis or Tendinitis - this is an uncommon condition which involved the fibrous tissue of the tendons, fasciae and aponeuroses. The particular fascia or aponeuroses is involved in Dupuytren's contracture in which dense fibrous bands stand out in the palm of the hand.

Panniculitis, or fibrositis of the subcutaneous fibro-areolar and adipose tissue, is characterised by a loss of the elasticity of the skin, which becomes more adherent to the underlying connective tissue.

Sprains and strains. A sprain is characterised by a tearing or stretching of some of the fibres of ligaments, of synovial membrane or capsule, or of muscle origins or insertions. A strain is the stretching or tearing of the fibres of muscle substance and inter-fibrillary connective tissue. There is usually considerable swelling and oedema, but this soon is absorbed/

absorbed and leaves a picture very similar to that of fibrositis as already described. Sprains most commonly affect the ankle, knee and shoulder joints, and strains the shoulder muscles, biceps brachii, quadriceps, hamstrings and gastrocnemii. They are characterized by effusion, which may be haemorrhagic and which may track along the fascial planes and give bruising distal to the lesion: there is intense pain on movement, and tenderness on pressure over the site of the lesion. Microscopically there is an inflammatory hyperplasia with lymphocytic exudation: the surrounding connective tissue is oedematous and hyperaemic, with extravasation of red cells. As the condition clears up there is an overgrowth of fibroblasts to repair the breach in the continuity of the damaged structure and the laying down of fibrous tissue throughout the surrounding area. This may press upon nerve fibrils and vessels and cause pain by the same mechanism as a fibrositic nodule.

## Pain-Producing Mechanism.

How, then, is it that this condition of fibrositis, so diffuse in its distribution, has been for so long disregarded as a most important contributor to the sum total of human pain? The answer lies in its protean manifestations, and in the magnitude of its remote effects compared with its own modesty in choice of unobtrusive situations. For instance, a chronically stiff, painful back, with apparently the whole of the sacrospinalis involved, may reveal to a deeply-prodding finger two small almonds of fibrositis in the substance of the muscle. If these irritative foci are infiltrated, then the muscle ceases to be stiff, painful and spastic, as the cases described will show. Or in a case of long-standing, recurrent, nagging "sciatica"; there is no underlying pelvic or orthopedic pathology; the condition is not one of parenchymatous neuritis; yet on deep pressure into the substance of gluteus medius there is discerned an area of fibrositis. This is not causing pressure on the nerve directly, nor is it adherent to or irritating the nerve by its contiguity. The pain is referred along the nerve, or to the distal structures, as "deep sensibility", according to the segmental distribution. Yet infiltration of the fibrositis will relieve the sciatic pain.

The reason is to be found in the segmental pattern of diffuse pain arising from a muscle. This is not to be confused with the segmental nerve supply of the skin, as worked out by Head in 1893 and Foerster in 1933, as the distribution of segmental nerves to deep structures does not correspond with these classical areas. Kellgren, as already described, plotted out the segmental pattern of deep somatic pain. He used two methods, the first of which simulates the effect of fibrositis almost perfectly. This was to select a muscle which was believed to have a nerve supply from a single nerve root, as for example flexor carpi ulnaris, from C6: into this muscle he injected strong saline solution and thence plotted out the area over which pain was felt. This was in all cases not necessarily at the site of the injection, but remotely, and over a much wider area. The pain disappeared, as the saline was diluted and absorbed.

Later he found that by injecting saline into the interspinous ligament a purely segmental area of pain and tenderness was produced: thus saline injected between the sixth and seventh cervical vertebrae produced deep tenderness in the distribution of the sixth cervical segments, a pain in fact very similar to that produced by injecting flexor carpi ulnaris. By using these methods the whole of the body was mapped out into areas from the first cervical segment to the second sacral: for example C5 is represented over the deltoid region, C6 along the outside/



outside of the arm and forearm, C7 over the back of the arm and forearm, C8 along the inner aspect of the forearm and T1 the deep structures on the inner aspect of the arm. In the lower limb L4 and L5 are referred to the outer side of the thigh and leg and also over the front of the thigh above the knee, while S1 and S2 are represented over the back of the thigh and leg.

It will be seen thus, how many of these cases of diffuse muscular pain, assumed by the patient and physician to be due to a condition of the muscle as a whole, are due in fact to merely a small focus of pain lying within the segmental distribution of deep muscular sensibility.

Solutions used for infiltration.

The local anaesthetics employed were:-

1. Novocain in various strengths dispensed in normal saline.
2. A proprietary preparation of 3% novocain made up in Ringer's solution (Wand's" Local Anaesthetic)
3. A proprietary preparation of 2% procain in Ringer (Novutox").

Both these two latter solutions contain about 1 in 40,000 adrenalin.

It was found that there was no advantage in using large quantities of weak solutions. On the whole better results were obtained by using a small quantity of a fairly strong solution. Also, although in theory adrenalin would appear to have a vaso-constricting and spasm-producing effect, results when a solution containing adrenalin was used were as good or better than when adrenalin was absent. It appears from these two facts that (1) the infiltration does not act primarily by breaking down minute adhesions by its bulk, but by relieving pain and spasm temporarily and so allowing normal physiological movement to break down adhesions.

and (2) that the adrenalin, by prolonging the period over which the novocain remains in the affected area before it is washed away, and so allowing a longer period of activity on the part of the muscle, more than counterbalances any localized spasm it may produce.

## History & Pharmacology of Novocain.

### History.

✓ The use of local anaesthetics is a comparative innovation in therapeutics. In fact, local anaesthetics were unknown until as recently as 1884, when Koller, the Vienna oculist, recognized cocain's anaesthetizing effect on the conjunctiva. Previously, although for centuries its general stimulant effect on the system had been recognized, and made use of by the natives of Chili, Peru, and Bolivia, who chewed the leaves of coca erythroxylla to relieve fatigue and hunger, its local anaesthetic action had not been remarked upon. Indeed, even though Woehler, Niemann and Lossen isolated cocain from the leaf in 1860, this property was not discerned for over twenty years. Then, in spite of the fact that Koller and other ophthalmic surgeons used cocain regularly (and it is still the most satisfactory anaesthetic in the surgery of the eye) no further work was done on it until 1915, when novocain, procain hydrochloride, its most famous derivative, was prepared and investigated physiologically by Eggleston, Hatcher, Morian and Seifert. Since then, on account of its safety (it is several hundred times less toxic than cocain), its reliability, its solubility and its stability, it has been used more and more as the anaesthetic of choice in major and minor surgery, and has also been the precursor of a long list of similar preparations. It is only very recently that its value in the treatment of the type of cases about to be described has been recognized, and its value as a diagnostic aid in certain nervous conditions appreciated.

### Pharmacology.

Novocain, aminobenzoyl-diethyl-amino-ethanol-hydrochloride, is a derivative of cocain, the methylbenzoyl ester of ecgonin. It is a solid, crystallizing in colourless needles, soluble in equal quantities by weight of water, and one in thirty in ethyl alcohol.

Its acts pharmacologically by paralysing the sensory nerve fibrils on direct application, and is selective, not paralysing the motor fibrils except in strong concentration. It has no lasting effect on nervous tissue, the latter recovering its normal conductivity as soon as the drug is removed, unless it has been in contact with high concentrations for a prolonged period, when the nervous tissue fails to recover. Novocain is 150 - 300 times less toxic than cocain, slightly less irritant and less anaesthetic, and has no vaso-constrictor effect like cocain. When used alone novocain anaesthetizes for a period of 10 - 30 minutes, but/

but if mixed with a little adrenalin it lasts for several hours, since it is not so easily washed away in the circulation owing to the vaso-constrictive effect of the adrenalin. According to experiments by Leser, the effective anaesthetic value of novocain is not increased appreciably by making solutions above 1 - 2%, and the effective vaso-constricting action of the admixed adrenalin is sufficient in strengths of as little as 1 in 200,000.

Its toxic effects are seldom seen. Its toxicity increases in geometric proportion with its concentration. For instance 200cc. of  $\frac{1}{2}\%$  solution of novocain can be used with safety, 80cc. of 1%, 20cc. of 2% and only 5cc. of 4%. Preston (1938) records a case where a 10% solution of novocain, which had been kept for three months, produced on injection drowsiness, inability to keep the limbs still, unconsciousness and stertorous breathing, with slow recovery after some hours. He concluded that the effect was partly due to some unknown toxic breakdown product of the novocain, which deteriorates when kept for long periods. In one of the cases recorded below a local painful reaction was experienced, although here again the novocain had been kept in solution for some weeks. In the solution used in many of the following cases, namely that of novocain with added adrenalin, any toxic effects that might have occurred could have been also due to the admixed adrenalin, but in point of fact none was seen. For instance there may be systemic disturbance in vasolabile or hyperthyroid subjects, or in normal subjects in whom the injection has been accidentally made intravenously. There have also been seen cases of localized ischaemic gangrene, as of the fingers. (Leser, 1938).

## Anatomy.

A detailed anatomical knowledge of the areas to be infiltrated is not essential, but a broad appreciation of their structure and nerve supply is necessary for intelligent diagnosis and treatment.

The lumbar region, the commonest site of complaint, has a powerful and complex muscular and ligamentous structure, constantly functioning in maintenance of postural control. Evolution (in allowing Man to adopt the upright posture) has thrust upon these muscles and structures a heavy burden, under which they are apt to show signs of stress. The post-vertebral muscles are chiefly concerned in the following cases, and they consist of a powerful fleshy column extending from the base of the skull to the pelvis, forming the muscular mass at the back of the neck, spreading out over the shoulders and back, and becoming the thick cylindrical structure alongside the vertebrae in the loin. They arise from the skull, the vertebral column, the ribs and pelvis. They may be conveniently divided from the topographical point of view into two groups, a superficial and a deep. The superficial group consists of two layers,

- (1) Trapezius and latissimus dorsi.
- (2) Levator scapulae and the rhomboidei.

1(a). Trapezius shows well the extensive origins and insertions of all the muscles of this area, with consequent relatively large amount of connective tissue, most prone of all the tissues to fibrositis.

It is a large triangular muscle, covering the upper part of the back and the back of the neck, and arises by tendinous fibres from the superior nuchal line of the occiput, the external occipital protuberance, the ligamentum nuchae, the spines of the 7th cervical and all the thoracic vertebrae and the intervening supraspinous ligaments. It is inserted into the lateral third of the clavicle, the acromion and the spine of the scapula.

Its nerve supply is from the spinal accessory, which communicates with the anterior primary rami of the 3rd and 4th cervical. It is hence possible that afferent impulses carried from the muscle may be referred as pain anywhere in this distribution, i.e. over the shoulder, the front of the neck or the back of the head.

(b) Latissimus Dorsi is a wide triangular muscle in the lower part of the back, arising by tendinous slips from the spines of the six lower thoracic vertebrae, and from the spines of the lumbar and sacral vertebrae and the iliac crest. It receives slips from the lower three ribs and the inferior angle of the scapula and is inserted into the floor of the bicipital groove of the humerus.

Its nerve supply is through the thoracodorsal, hence pain may be referred from a fibrositic nodule in the muscle to any of the distributions of the 6th, 7th and 8th cervical roots.

2 (a) Levator Scapulae arises from the first three or four cervical vertebrae, and is inserted into the medial margin of the scapula. Its nerve supply is through the 3rd, 4th and 5th cervicals.

(b) The Rhomboidei lie deep to the trapezius and arise from the ligamentum nuchae, the second to fifth thoracic spines, and corresponding supraspinous ligaments, and are inserted into the medial border of the scapula.

Their nerve supply is through the dorsalis scapulae, through the 4th, 5th and 6th cervical anterior rami.

The Deep Muscles consists of three groups:-

(a) Splenius capitis, and splenius cervicis, lying deep to the trapezius and sternomastoid, and arising from the ligamentum nuchae and the upper six thoracic vertebrae to be inserted into the temporal bone, the nuchal line and the transverse processes of the upper 3 cervical vertebrae.

(b) Sacro-spinalis, which goes from the sacrum to the skull, has a complex arrangement and much fibrous and tendinous tissue going to make up its origins and insertions. It arises from the posterior layer of lumbar fascia, the posterior sacro-iliac, sacro-tuberous and sacro-coccygeal ligaments, from the iliac crest and posterior superior iliac spine, the dorsum of the sacrum and the sacral and lumbar spines. It will be seen that it is in the substance of sacro-spinalis that fibrositic changes give rise to many of the cases of "lumbago". It is inserted into the ribs, the lumbar, thoracic and cervical spines, and into the skull. It is mostly tendinous at the surface, but in the loin it becomes fleshy and forms the thick cylindrical mass, previously mentioned.

(2) (a) Semi-spinalis, going from the loin to the skull, and lying deep to the splenius. It arises from the transverse processes of the vertebrae and is inserted at a higher level into their spines.

(b) Multifidus arises in the sacrum deep to the sacrospinalis tendon, from the posterior sacro-iliac ligaments, from the transverse processes of the lumbar vertebrae, thoracic vertebrae and cervical vertebrae, and is inserted into their spines at a higher level.

(3) The third group consists of a number of small, deeply-placed muscles, the Interspinales, Intertransversales, and the Suboccipitals, lying between and having their origins/

origins and insertions from the transverse processes and spines of the vertebrae, and from the atlas and occipital bone.

The nerve supply of all the deep muscles of the back is through the posterior primary rami of the spinal nerves according to their level. Hence a small irritative focus in the muscle substance may give diffuse pain throughout the distribution of the corresponding segment.

All these muscles of the back act upon the vertebral column, head, ribs and pelvis, producing according to circumstances flexion, extension, lateral bending, and rotation. It is of special importance, in connection with the many disabilities that arise from faulty posture, injuries to the back, "muscular strains," fibrositis, etc., to remember that they are in constant action against gravity in maintaining the erect and sitting postures. Like all other muscles they pass readily into reflex contraction to prevent painful movements; and as they are concerned in practically all movements of the trunk and limbs, it is obvious why difficulty is experienced in performing any muscular action efficiently when the muscles of the back are thus in rigid contraction.

Fascia. In addition to the considerable amount of connective tissue in the tendinous slips of origin and insertion of the muscles in this region there are also the thick strong posterior, middle and anterior layers of the lumbar fascia.

## The Shoulder Region.

This is a common site of fibrositis: the muscles concerned are Deltoid, Supraspinati and Infraspinati, Teres minor and major and Subscapularis.

Deltoid arises from the clavicle, the acromion and the spine of the scapula, and is inserted into the deltoid tuberosity of the humerus. It is superficial in its whole extent and forms the prominence of the shoulder. Its nerve supply is through the circumflex, from the anterior primary rami of the fifth and sixth cervical nerves.

Supraspinatus arises from the walls of the supraspinous fossa and is inserted into the greater tuberosity of the humerus by a tendinous slip.

Infraspinatus arises from the infraspinous fossa and is inserted by tendon into the greater tuberosity. The nerve supply of both these muscles is from the supra-scapular nerve, from the upper trunk of the brachial plexus.

Teres minor and major arise from the dorsal surface of the scapula and are inserted respectively into the greater tuberosity and the medial lip of the bicipital groove.

Their nerve supply is from the posterior cord of the brachial plexus, the teres minor through the circumflex, the teres major through the lower subscapular.

Subscapularis arises from the subscapular fossa and is inserted by tendon into the lesser tuberosity. Its nerve supply is by the two subscapular nerves, from the posterior cord of the plexus.

Of these muscles deltoid is the one that is most commonly the seat of fibrositis: possibly because of its superficial character, where it is readily subjected to chilling: or because of the mechanical disadvantage under which the muscle acts, and because its action is usually exerted against the force of gravity.



## The Pectoral Region.

These muscles are Pectoralis major and minor, Subclavius, and Serratus Anterior.

Pectoralis Major arises from the clavicle, sternum, ribs, costal cartilages and the aponeurosis of obliquus externus, and is inserted into the lateral lip of the bicipital groove. It is superficial throughout the whole of its extent. Its nerve supply is through the lateral pectoral nerve from the lateral cord of the brachial plexus (C5, 6 & 7).

Pectoralis Minor arises from the 3rd, 4th and 5th ribs and their intercostal fascia, and is inserted into the coracoid process. Its nerve is the medial pectoral nerve, from the medial cord of the plexus (C8, T1).

Subclavius arises from the first rib and cartilage and is inserted into the lower surface of the clavicle. Its nerve supply is from the upper trunk of the brachial plexus (C5 and 6).

Serratus Anterior arises from the upper eight ribs and is inserted into the costal surface of the scapula. It is partly superficial. Its nerve supply is from the anterior primary rami of the 5th, 6th and 7th cervical nerves.

## The Forearm.

Here there are only three muscles of interest in the present series - brachio-radialis, supinator and pronator teres, which are the muscles concerned in boiler-makers' and tennis elbow.

Brachio-radialis arises from the lateral supracondylar ridge and the intermuscular septum of the humerus, and is inserted into the lower end of the radius. It lies superficial throughout the whole of its length. It is a semi-pronator and semi-supinator of the forearm, and a flexor of the elbow joint. It is supplied by the radial nerve from C5 and 6.

Supinator arises from the lateral epicondyle, from the elbow joint and annular ligament, and from supinator crest and fossa of the ulna. It is inserted into the radius. It is supplied by the posterior interosseous nerve (c5 and 6). It is chiefly near its periosteal attachment that it is involved in fibrositic conditions.

Pronator Teres arises from the medial supracondylar ridge and the medial epicondyle and the adjacent fascial structures: its ulnar head arises from the coronoid process of the ulna. It is inserted into the shaft of the radius. Its nerve is the median, from C6. It is chiefly near to <sup>r</sup>ulnar origin that fibrositic changes occur.

## The Ankle.

In most sprains of the ankle the structures affected are those connecting the tibia and fibula with the tarsus, with probably also the retinacula superficial to the extensor tendons. These structures are subjected to a sudden strain due to forcible passive over-movement at the joint, with consequent stretching or tearing of their component fibres. They are commonly:-

(1) On the lateral side of the foot, the calcaneo-fibular, the posterior talo-fibular, and the anterior talo-fibular ligaments, with superficially the superior and inferior peroneal retinacula.

(2) On the medial side of the foot, the strong triangular deltoid ligament, from the tibia to the calcaneus, talus and navicular, and superficially the flexor retinaculum.

## The Sciatic Nerve.

A knowledge of the anatomy and relations of the sciatic nerve is necessary in order to appreciate the many causes of sciatic pain and to treat them rationally.

It is derived from the fourth and fifth lumbar roots, and the first, second and third sacral, and forms a thick band about half an inch in breadth. It enters the gluteal region through the greater sciatic foramen between the pyriformis and the superior gemellus. It lies in the hollow between the greater trochanter and the ischial tuberosity, accompanied by a vein and an artery. It is in apposition posteriorly with the gluteus maximus, and is in relation anteriorly with the following structures, from above downwards:-

- (1) the ischium and the nerve to quadratus femoris.
- (2) superior gemellus.
- (3) obturator internus.
- (4) inferior gemellus, and
- (5) quadratus femoris.

In the thigh it lies between (1) gluteus maximus and the hamstrings (2) adductor magnus and biceps femoris. It terminates by dividing into the medial and lateral popliteal nerves.

It supplies the hamstrings, semitendinosus, semimembranosus, adductor magnus, biceps femoris, tibialis anterior and posterior, the extensors of the foot and the peronei, the small muscles of the foot, gastrocnemii, popliteus, and the flexors of the foot; articular branches to the knee and ankle-joints; and the skin over most of the lower limb distal to the knee-joint, and an area proximal and anterior to the knee.

From its roots arise the superior and inferior gluteal nerves, to supply the glutei muscles, and the nerves to obturator internus and quadratus femoris. These origins explain the occurrence of sciatic pain in fibrositic affections of these muscles.

Similarly fibrositis or adhesions with the muscles with which it is in relation may give pressure or traction on the nerve and cause sciatic pain: and the numerous pathological conditions within the pelvis and in the vertebral column will do likewise.

## Technique.

The technique employed was simple in the extreme. The apparatus necessary was usually a 2 cc syringe, occasionally 10 cc. and a series of needles. These were always as fine as possible, and usually a number 18 hypodermic needle was sufficient: occasionally a longer needle was necessary, and a fine intramuscular needle was used. In an obese person in order to reach the sciatic nerve a four-inch intramuscular needle, as fine as could be obtained, was used. The syringes and needles were kept in spirit, and the syringes boiled every few days. Before use, the syringe and needle were washed with water, as even a small quantity of spirit finding its way into a muscle may give rise to a very painful condition.

Before injection, the site for injection was carefully palpated and marked with ink. Usually deep pressure was necessary with the tip of the finger, and if an actual nodule was not felt, then there was a small area of maximum tenderness. The skin was sterilized with spirit, and anaesthetized by raising a weal by intradermal injection of .1 - .2 cc of novocain. The needle was introduced through this weal into the deeper tissues. Novocain was slowly injected as the needle advanced, and larger quantities injected as grating or creaking was felt at the needle-point or pain was experienced by the patient. Steindler & Luck (1938) laid down five desiderata in the technique of injection -

- (1) Contact with the needle aggravates the local tenderness.
- (2) (In sciatica) contact with the needle elicits or aggravates the radiation down the leg.
- (3) Novocain infiltration suppresses the local tenderness.
- (4) (In sciatica) Novocain infiltration suppresses the radiation.
- (5) (In sciatica) the positive leg signs such as Lassegne's or Ober's sign have disappeared after injection.

In the cases described it was not found necessary to cause pain on contact with the needle; several successful cases are given where no such pain was felt. It was found rather that a more important desideratum was to feel the needle-point grate on fascia or tendon or fibrositic nodule. A fibrositic area gave a much denser feeling in these tissues, with almost a creaking feeling, as though the needle were being pushed through cork. It is possible that this pain produced at the needle-point was not remarked often in these cases on account of the facts that (1) a very fine needle was used and (2) Novocain was injected in advance of the needle-point. In a case of fibrositis, for instance of the sacrospinalis muscle, injection was usually continued in several directions once the site had been found, the needle being partly withdrawn three or four times/

times, until the syringe was empty. The needle was then withdrawn completely, the area pressed upon with the ball of the finger, and the patient asked to say if it was painful. Sometimes the pain had gone completely, more often it merely felt easier, in which case the area that had received the injection was massaged deeply to diffuse the novocain through the tissues. Frequently after this kneading it was found that the pain had disappeared altogether, in which case no further injection was made. Often the pain was still there, but less severe, in which case the infiltration was repeated, several times if necessary, until the pain disappeared. After all the areas mapped out had been treated thus, the rest of the area under consideration was gone over by applying deep pressure with the ball of the finger, and it was often found that a fresh site of tenderness or fibrositic nodule was found that had previously been masked by muscle spasm. When all had been dealt with the patient was made to exercise and to put the muscle through its full range of movement, particularly passively stretching it. This he was usually able to do, and was instructed to perform a few simple prescribed exercises every half-hour or so. He was told to report the following morning; in a few cases the pain had returned, but usually in less degree, and a second injection was given, with similar instructions; in many cases the relief had been complete.

In the cases of sciatica, the diagnosis was usually possible on clinical grounds, and where the condition was due to fibrositis of the glutei the injection was made into the offending nodules exactly according to the manner described. Where no tenderness or nodules could be made out in the muscles, it was likely that the sciatica was due to a fibrositis of the actual sheath of the nerve, or of its interstitial fibrous tissue. The needle was introduced through an anaesthetized weal of skin midway between the tuber ischii and the greater trochanter, or over the spot of maximum tenderness, or where pressure produced a maximum of radiated pain down the leg; and novocain was liberally injected when the pain was elicited by the point of the needle. It was believed desirable in these cases to introduce the novocain inside the nerve sheath instead of around it, and the needle-point is known to be inside the sheath by the greater resistance of the plunger as it expresses the novocain into the fairly tense tissues of the nerve cord. However in only a few cases could the nerve-sheath be entered, but injecting in its neighbourhood as close to it as possible gave good results. It is now however believed that to inject into the nerve itself is not desirable, but injection should be made around the sheath and not into its substance (Burt, 1940).

In the case of sprains, certain sprains were treated immediately they occurred, and gave good results. Others were not helped appreciably, and one or two appeared/

appeared to have been caused more pain by the injection. The technique was usually to exclude first of all the possibility of fracture, e.g. of the tip of the fibula in a lateral sprain of the ankle. The point of maximum tenderness to pressure was then found, and novocain was injected into it until pain on pressure had disappeared. It was then often possible to find other areas less tender, which were dealt with similarly. The injection was made deeply, infiltrating through all the tissues, down to the bone. In a successful case all pain had disappeared, and the patient was able to walk comfortably at the end of the injection. The other alternative to immediate injection was to wait until the acute effusion and oedema had passed, strapping the ankle and resting it for a day or two, and then injecting into the tender areas.

Burt (1940) states that "in many cases (of fibrositis) immediately after the injection it appears to be successful: the pain disappears and palpation of the tender areas produces no symptoms, yet in a few hours all the pain returns. In other cases, the pain disappears never to return. The question arises whether there is any way of knowing at the time of the injection whether the right place has really been attacked. It appears to us that when the correct place has been located, the resistance of the fibrositic area is felt as the needle advances, and the pain is relieved immediately the novocain is injected. If there is a latent period between the injection of the novocain and the relief of pain, or if the pain is only partially relieved, then it is likely that the correct place has not been found. Often information can be obtained from the patient's own words. In a partially successful case the patient may say, "That is better, the pain seems to be going off," whereas in a really successful case he will exclaim, "Why, the pain has gone!"

There is frequently a complaint of "deadness," "numbness" and aching after an injection. Indeed, the aching may be quite severe and persist for twenty-four to thirty-six hours in even a completely successful case. Whereas in an unsuccessful case, as in certain sprains described, the aching may markedly aggravate the original pain of the lesion. It is always well to warn the patient that this aching may occur.

In certain cases, at the time of the consultation, no pain is complained of and no tender spot can be found on palpation. It is often possible to find out by questioning what sort of activity brings on the pain, and then to stimulate the production of the pain by making the patient go through the offending movements. Frequently a tender spot in the muscle can then be found.

Occasionally, spasm of the whole muscle renders it board-like and the recognition of tender areas and nodules/

nodules is made extremely difficult. In these cases, a few minutes under a radiant heat lamp followed by massage will relax the muscle and render diagnosis easy. It is found that the patient's own localization of pain is much more accurate after a recent injury than after an old one, and in these latter cases too much reliance should not be placed upon the patients own word, but search made for definite areas which cause the patient to wince when they are heavily pressed upon.

Finally, it is as well to allay apprehension by assuring the patient that whatever happens, the injection will not be painful, and even if unsuccessful, will not do him harm. Frequently the type of person who suffers from fibrositis is of the asthenic, apprehensive type, who will make palpation and injection more difficult by holding his muscles rigid if his fear is not previously allayed. He can be told afterwards that there may be some aching for some hours after the injection.

It should not be necessary to remark that, before injection is performed, obvious septic foci, likely cause of fibrositis, should be sought for and eradicated.



## Cases Described.

The cases which follow are described in detail because it was thought that actual illustration would give a better idea of the types of case suitable and of the method used. Only cases which it was thought would be likely to benefit by injection were treated thus, and this usually implied the finding of fibrositic palpable nodules or acutely tender areas, or of acutely tender points to pressure in the case of sprains. Cases that came for "injections" for their lumbago were not given this treatment if the necessary indications were lacking: many cases seen had not fibrositis as the basis for their symptoms at all, but gynaecological conditions, sacro-iliac strain and faulty posture, osteo-arthritis of the lumbar spine and other non-fibrositic conditions. These cases are not mentioned in this series. An attempt has been made to classify the cases according to their pathology, but fibrositis shows so many degrees of acuteness and chronicity, the one merging imperceptibly into the other, that any rigid classification is impossible.

(1) The cases described under "Acute exacerbation of Chronic Fibrositis" are typically those of the chronic lumbago syndrome with intermittent, incapacitating severe attacks. The victim, frequently of a particular type -- asthenic, visceroptotic, melancholic, and often with septic foci -- constantly complains of a stiff, aching back, painful on standing up after sitting for a while, or on getting up in the morning, worse in wet weather or in changing weather; the least chill or wetting, or an extra strain, will precipitate an acute attack when all movement, even turning in bed, is acutely painful, and getting up and going to work impossible. These people usually expect to lose one to three weeks' work at each of these attacks, and as they may have several in the year the loss to themselves and society is considerable. In this type of patient novocain infiltration is particularly useful in that, even if infiltration needs to be repeated several times during the one attack, and at each similar attack, it does enable the patient to return to work immediately, and so saves many working hours for himself and the state.

(2) The cases of "Acute and Subacute Fibrositis" include all those that were newly arisen in a previously healthy person, and usually brought on by a sudden strain, by hard unaccustomed exercise, or a chilling, often after violent exercise, or a wetting. These patients may possibly have had a tendency to fibrositic affections, but not obviously so, as they were of all physical types, usually healthy without septic foci or apparent metabolic disturbance. Whether the cases might ~~have~~ have developed into chronic types, owing to the resultant spasm of the muscle with stasis and the fibrosis that results from localized stasis, cannot be said. But in many cases the pain/

pain and symptoms were relieved by infiltration, and no further trouble was experienced.

(3) The "Chronic Fibrositic" cases are similar to those described in (1), but were seen and treated during a period of remission, and not during an acute incapacitating attack.

(4) The cases of "Fibrositis giving symptoms of sciatica" are of various kinds, usually of a fibrositis of the gluteal muscles giving either pain referred to the distribution of the sciatic nerve, or pain due to direct pressure and irritation of the nerve. In some of these cases, presumably owing to the deep situation, the desiderata usually required before injection, namely the finding of painful nodules or very sensitive areas, were not insisted on: it was also impossible to decide whether the case was one of an inflammation or fibrositis of the interstitium, or of the nerve sheath, or of adjacent muscular and fibrous tissue. In any case, the treatment was identical, and exact diagnosis was not essential.

(5) The cases described under "Acute traumatic fibrositis" are interesting in that they illustrate a method of treatment previously but little used. The cases are subdivided into two:- (a) fibrositis occurring after trauma in muscles and fascia, as the common sharp, immobilizing pain in the back often with a consciousness of the tearing of the muscular and fascial fibres, which occurs during a heavy lift, or on rising after stooping. (b) The common sprain, which has a similar aetiology and pathology, but here involves the more sturdy ligaments surrounding a joint, which are stretched and a few of the fibres torn. There is usually intense pain on pressure at the site of the tearing, which is relieved by novocain. Function is frequently restored, and is often permanent, the pain not returning when the novocain is washed away, as would be expected. The mechanism by which this occurs is obscure, but it was thought to be due to the relief of pain abolishing muscle spasm, giving normal movement and more physiological conditions within the joint, permitting better healing and not allowing adhesions with adjacent structures to take place which would tend to perpetuate the pain and muscle spasm.

ACUTE  
EXACERBATION  
of  
CHRONIC  
FIBROSITIS.

J. D. aged 67.      Aerodrome Worker.

This patient, an aerodrome groundsman, complained of a very stiff and painful back. He often had had it before, the last attack being 4 months previously, when it had been of similar severity and he had been given an embrocation which had put the pain and stiffness away in several days.

Examination of his back revealed a mobile, very tender nodule one and a half inches from the midline opposite the last inch of the sacrum, in the lumbar fascia. This was infiltrated with 3% novutox, 4 cc. of the solution being used.

After the injection the patient was able to bend and straighten his back with much greater freedom. Previously he had walked in with his back semiflexed, and supporting his trunk with his hand on his hip. He was delighted, and though he was warned that the pain might recur and if so to come back again, he failed to re-appear.

A. B. aged 55. Quarry Worker.

This patient, a chronic sufferer from "lumbago", which he reckoned kept him off work for at least a fortnight every winter, was seen during a typical attack. He was a muscular, well-built man, with carious teeth but no other evidence of septic foci. He stated that his back was often stiff and painful on movement in the morning until it "loosened off", especially in the winter and wet weather. The present attack had started the previous morning, and he had gone to work thinking he could work it off, but when he woke on the morning he was seen he had scarcely been able to get out of bed and had known he was in for one of his typical attacks.

The back was held rigid, but the lumbar muscles could be palpated without pain, except high in the substance of sacrospinalis in the lumbar region. On the right side, at this tender area, a fibrositic nodule was detected, but on the left, although there was similar tenderness, no nodule could be made out. 2% novutox was injected into and around the nodule, and into the tender area on the left, until tenderness on kneading had disappeared. A further tender spot was then detected in the substance of the muscle on the right side, and this was similarly infiltrated. A total of about 2 cc of the solution was used. After the injection he was able to move with freedom, and got out of bed and walked up and down the room. He was made to do exercises and told to continue them at intervals through the day. He wished to return to work, but was told that probably the back would ache and be stiff again the next morning. Next day he stated that the back was not much worse than it frequently was, and asked to return to work. He was surprised at the speed of his recovery: a similar attack normally, treated with heat, rest and counter-irritants, would have taken him at least a week to get over. He was told to get his septic teeth removed and allowed to return to work, after having been absent for only two days.

W. S. aged 70. Retired Quarry Worker.

This patient complained of pain and stiffness in his back which had prevented him getting out of bed that morning. He frequently took "lumbago" and had done so for most of his working life. His work had been strenuous and he used to be frequently exposed to chills and wettings. "Lumbago" was a common complaint in the quarry and he usually treated himself with "rubs" and heat when he had an attack. Since he had stopped working he had been fairly free of it, but the day before this attack he had been stooping a good deal chopping and stacking a pile of firewood.

On examination, he pointed out the pain as being low down the back over the sacrum and on the right side over the ilium and iliac crest. Palpation revealed no nodules, but two very tender areas over the sacrum, one over the ilium on the right side, and one in the lumbar fascia at its attachment to the posterior superior iliac crest. These were infiltrated with 3% novotox, the needle being pushed down as far as the bone, and the whole of the thickness of the tissues from skin to bone infiltrated. After the injection, about 10cc of the solution having been used, all the areas could be palpated painlessly, and the patient was able to get up and move about with comfort. Next day there was some return of pain and stiffness, but the area could still be palpated painlessly. His activities were not interfered with by it, and he stated that he felt "champion". He was told to apply heat and massage as he was accustomed to do, and in a day or two the back felt quite well again.

P. M. aged 48. Aerodrome Worker.

This patient was an old sufferer from lumbago. His attacks usually kept him off work for a week to a fortnight. This time he complained of a typical attack, in a similar situation and of the same severity as usual.

When seen he was lying in bed and found all movements, even turning over for examination, very painful. He was a thin, depressed, asthenic individual. He had no obvious septic foci, and all his teeth were artificial.

He had a rather poker-like spine, with the normal hollow of the back at the lumbar spine almost absent. All movements were very limited. Pressure on the muscles and ligaments in the lumbar area, all of which had felt uniformly painful, revealed three spots particularly sensitive on deep pressure. Two were in the fascia covering sacro-spinalis at about the level of the last rib, the other was over the posterior crest of the ilium, all three on the right side. Definite mobile fibrositic nodules could be felt over the muscle, sliding from side to side under the pressure of the examining finger, and about the size of a large pea.

3% "Novutox" was injected according to the usual technique, a total of 8cc. being used. Pain disappeared completely over the ilium on pressure, but it could not be made to go completely over the muscle, although relieved considerably. A fine subcutaneous needle only was used, as it was thought that frequently the larger intramuscular needles, even if comparatively fine, caused tissue trauma that was painful the next day. The needle was introduced as far as the hilt to reach the deeper tissues, as it was only about 2" long.

After the injections the areas were kneaded heavily with the tip of the finger, and the patient was given the usual instructions about stretching and exercising. I was about to give him a certificate excusing him from work for a few days, as it was not thought the injection had been very successful, there still being some pain on pressure. However the patient would not have it and assured me that his back was quite without pain, though still a bit stiff, and would be perfectly fit for work. He was to see me the next morning if the pain recurred, but did not appear.

L/cpl. O. C. aged 43.

This N.C.O., a cook, had complained on two or three occasions of lumbago. Septic teeth had been removed and other sources of sepsis excluded. He had been given radiant heat and massage, which had given him relief for a few days, but the pain had always recurred. His work involved much standing and bending over pans and stoves, which he said he felt was a strain on his back muscles. The atmosphere of the cook-house was hot and steamy, he frequently became moist with perspiration and then became chilled as he cooled down doing some job out in the open afterwards. He had had this backache with acute attacks for some months, but before that had always been quite fit. He was a man of medium size, rather thin but of strong and wiry build. He was given advice such as to sit rather than to stand leaning over a pan, to do his out-of-door jobs before he did work indoors that he knew would overheat him, and for some weeks he remained free from attacks of acute pain, although his back frequently ached and was stiff.

He then complained of a different kind of pain, in the right buttock, down the back of the corresponding thigh, down the calf and into the heel. The pain was a constant gnawing ache, like the toothache, with sudden sharp lancinating attacks shooting down the leg. It had been worse at night, and in spite of aspirin his sleep had been disturbed for some time.

On examination there was pain on pressure over the sciatic nerve in the buttock, and flexion of the hip with the knee extended and the foot dorsiflexed brought on the pain. There were no palpable nodules in either the back or the buttock, although deep pressure was painful over certain areas on the sacrum and adjacent parts of the iliac crests, as well as in the line of the sciatic nerve. There was no apparent abnormality of the spine, it was straight and mobile. Rectal examination revealed no pathological condition inside the pelvis that would explain the sciatica.

The skin was anaesthetized with 2% "Wand's" local anaesthetic, in the line of the sciatic nerve midway between the ischial tuberosity and the greater trochanter. One part of the solution was then diluted with three parts of normal saline, drawn into a 10cc. syringe, and the injection was made through a fine long intramuscular needle. The nerve was sought for by withdrawing and pushing forward the needle, the patient being asked to say when he felt pain. The nerve was difficult to find, but eventually the patient complained of pain shooting down the leg. The plunger of syringe was depressed easily, so it was concluded that/



that the sheath of the nerve had not been entered; the needle was pushed down in slightly different directions several times, but each time the solution was easily expressed from the syringe, although the patient experienced some pain as the needle was reintroduced in different situations. Eventually the effort to enter the nerve-sheath was abandoned, and the solution was injected at different depths and in different directions around the nerve. After the injection the nerve no longer gave pain on pressure, but stretching the nerve was still productive of discomfort. The patient was warned that another injection would probably be necessary.

The next day he said that he had felt an ache all down the leg, but had not had the severe shooting pain, and had slept well. The buttock felt sore and stiff at the site of the injection, which was probably due to the tissue trauma inflicted during efforts to get the needle-point into the nerve sheath. He was told to return in three days for a further injection if it seemed necessary, but at the end of that time he felt much better and had been sleeping well so nothing was done and he was told to return should his pain come back.

He was seen again weekly for some time, but he stated that he was keeping free of pain, and was taking care to avoid getting wet or chilled. He was kept for some weeks on vitamin B1. He never went sick again the whole time he was with the unit, a matter of about nine months.

This man complained of severe pain and stiffness in the small of the back. It was so severe as to make it necessary to help him on to the examination couch. It was not the first time he had had the pain, though usually it was not so severe, and it had been brought on before by strain or over-exercise, although he gave the interesting history that indigestion brought on the pain, that he often had it at the same time as stomach trouble or after he had eaten something that did not agree with him, and that he frequently had heartburn and waterbrash at the same time. He was not able to state definitely whether the stomach pain or the back-ache came on first, but he thought that it was the stomach that first gave symptoms at the onset of an attack. He had been a miner in civil life, but had been obliged to give up his work for lighter employment in a linoleum factory, on account of the frequent attacks of pain.

He was well-developed, muscular man. Examination revealed no obvious septic foci, and he was edentulous. There was no epigastric tenderness, rigidity or hyperaesthesia, or other evidence of gastric or duodenal ulcer; the pain, however, he stated, was in the epigastrium and seemed to travel right through to the back. Examination of the back revealed tender, ill-defined nodules lying in the substance of the muscles of the buttocks on either side. 2% "Wand's" local anaesthetic, diluted to  $\frac{1}{2}\%$  with normal saline, was used to infiltrate each tender area, according to the usual method. About 8cc. were injected on either side. Pain was experienced as the needle advanced, in two or three directions, presumably as it entered tender fibrositic patches. At the end of the injection the patient was able to climb off the examination couch with ease. However he could not flex his back without pain, carefully "climbing down" his thighs. When asked where the pain was, he now pointed to the left posterior iliac crest. Further injections were made along this line, the needle-point going as far as the bone and then being slightly withdrawn before the injection was made. This time he was able to bend with much more comfort, although the back still felt stiff. He was handed over to the medical orderly for twenty minutes' exposure to a portable infra-red lamp to be followed by massage and exercises.

He was deliberately given no medicaments or instructions for the gastric symptoms, but next day stated that his stomach was quite well again, although his back was still stiff and rather sore. However, movement was fairly good and there were no tender areas except at the actual point of injection, and it was thought that probably the soreness was accounted for by tissue trauma by the long intramuscular needle used. He was instructed to report sick if the pain or gastric symptoms recurred, but he had no further trouble during the following eight/

eight months.

It was possible that the gastric symptoms were consequent upon the intense discomfort of the patient when his attacks of lumbago came on, for when he next complained, at the end of this period, the weather had been cold and wet for several days and he had a mild attack of his usual lumbago, as well as dyspepsia and waterbrash. He was given more novocain into the tender areas, and again his backache and his dyspepsia was relieved simultaneously. He has not reported sick since, although he is a full duty man and still with the unit.

A C U T E

&

S U B A C U T E

F I B R O S I T I S .

Mrs. J. K. aged 51. Housewife.

This patient complained of a painful stiff neck which had come on several days previously following a chill. She had been massaging it with hot olive oil and applying heat, but the condition had not improved. There was spasm of the sternomastoid, which was tender near its insertion.

The tenderness was not well localized and no nodule could be palpated. However, it was decided to try infiltration, and 2% novutox was injected into the tender area. This gave some relief, and movement was a little freer and less painful. It was thought that if there had been previously massage and heat to relieve the muscular spasm, the area of tenderness could have been better defined.

The patient was told to apply heat and massage before coming up the next day, and to wear a thick scarf. There was then still pain and stiffness, but it was of less severity. Tenderness was still present, but could not be more clearly defined. A further injection was made, and it was tried to manipulate the neck, but without much success on account of the spasm. She was told to use antiphlogistine. No further injections were given as they did not appear to have helped her much, and the pain and stiffness gradually disappeared in the course of the week.

It was thought that this case was not altogether successful on account of the muscular spasm concealing the area of fibrositis for exact localization and infiltration. If a masseur and radiant heat apparatus had been available it would have perhaps been easy to find the small patch of fibrositis in the muscle responsible for the symptoms.

J. D. aged 32. Dockyard worker.

This patient complained of pain in the elbow when he used a shovel. He had been doing much digging, picking and shovelling in clay soil. Examination revealed tenderness at the site where the pain was located, distal and anterior to the medial epicondyle. The tenderness was localized, and the area small, only evident on heavy pressure.

Injection of 5% novutox was made into it, until the tenderness ceased to be elicited, about 1.5cc. being used. He returned to work, and stated a few days later that he had not been troubled again with the pain, although he had managed to secure a change of job so that he was no longer using a shovel. Tenderness could not be elicited now, and the pain could not be elicited by making him go through full pronation, supination and flexion of the elbow whilst holding a heavy weight.

Pte. D. C. aged 44.

This man had been sent into an E. M. S. hospital in my absence, on account of a complaint of severe pain in his back. He had been detained there for four days and given massage and local heat and sent out with a diagnosis of lumbago. I saw him on the morning he returned to duty, and he said that although the pain was better than it had been, his back was still sore and he thought he had been discharged too soon.

He was a thin, undersized, asthenic type of individual, with bad teeth and a history of chronic alcoholism and attacks of gastritis. Examination revealed inability or unwillingness to flex the spine fully, and pressure with the ball of the thumb over the sacrum brought winces and groans from the patient. They were overdone, and knowledge of his character led one to doubt their genuineness. However four consistently tender areas were made out over the sacrum and sacroiliac joints, and in one of them a fibrositic nodule was defined.

2% "Wand's" local anaesthetic was used intradermally to anaesthetize the skin over each of these tender areas, and then the same preparation, diluted with three parts of normal saline, was used for the injection into the areas of fibrositis. Knowing the patient's penchant for malingering, it was explained that the injection was given until all pain disappeared; he was no exception to the rule that most soldiers dislike injections, and was anxious to agree that pain had disappeared at the end. He was returned to duty, and did not demur. Although he was told to return if pain recurred, he did not report sick again.

It was difficult to assess the real value of the injections as the amount of real pain suffered was problematical. It is likely that there was a degree of genuine pain that was being exaggerated, and that the injection relieved it to a certain extent; but possibly, had the treatment been other than by injection, with its unpleasant associations, the man would have continued to try to dodge duty and to make a pest of himself to the medical officer, instead of becoming immediately a reasonably efficient soldier again.

Mrs. M. D. aged 53. Housewife.

This patient, who suffered from amyotrophic lateral sclerosis involving considerable muscular wasting particularly of the left hand and arm, complained of pain and stiffness in the right shoulder, which was also giving her a stiff neck. She thought it was perhaps the strain of too much knitting, she having been advised to knit as much as possible in order to preserve the function of her muscle as long as possible. Examination revealed tenderness of the upper border of the trapezius, at the root of the neck, and although no fibrositic nodules could be palpated, there was an indefinite resistance in the body of the muscle at the site of maximum pain. This area was infiltrated with 3% novutox, a total of about 2cc. being used. Although the area was not now tender to pressure, and the pain had disappeared, she stated that the neck was still stiff and attempts to move it were painful. Further search was made for tender areas in the substance of the muscle, and of sternomastoid, but none were detected. She was instructed to apply heat and massage to the side of the neck and shoulder. Next day she stated that the pain was still absent, but that although she could turn the neck more freely, there was still pain on movement beyond a certain limit. Palpation revealed no more than before, and she was instructed to continue as she had been doing. Movement in the neck gradually returned and she was quite recovered in five or six days.



P. P. aged 62. Munitions Worker.

This man complained of pain and stiffness in his back, found on examination to be in the substance of sacrospinalis on the left side. It had come on three days previously, when he thought he had had a "chill". Pain was elicited on pressure three inches from the midline just below the level of the twelfth rib. In this definite area of tenderness could be felt a hard nodule at first thought to be the end of the twelfth rib.

2% novutox was injected into the nodule. Pain was experienced as the needle entered the nodule, and grating was felt at the needle-point. About 5cc. of the solution were used. On withdrawing the needle the part could be massaged without much pain. Two more adjacent tender spots one inch away were similarly infiltrated, a further 2cc. of Novutox being used. No pain was felt on deep pressure, the part could be massaged vigorously, and the patient was able to straighten his back and to move without any discomfort at all.

He was told to report back if there was recurrence, but did not do so.

Mrs. M. J. aged 40. Housewife.

This patient complained of severe pain all over the small of the back and in the right side of her chest. Three nights previously she had spent several hours in an uncomfortable position in a wet air-raided shelter. She was unable to turn over in bed without assistance, and then only with severe pain. On examination, she indicated the whole of the lumbar region as being painful, as like a severe toothache all over the back. The sacrospinalis, particularly on the right side, was hard and spastic. Wherever the finger was pressed into the muscle, she complained that it was painful, but at one spot it appeared to be much more tender and the patient actually winced as though, when enduring the pain of a dentist's drill, the pulp is suddenly touched. This area was carefully palpated and a small tender nodule, about the size of an almond, was defined in the substance of the muscle. A similar area of acute tenderness was also defined in the left sacrospinalis, with a palpable nodule, not quite so tender, and at a higher level. 3% Novutox was injected into each of these nodules, a temporary exacerbation of pain occurring as the needle was felt to grate on entering the nodule. A 2cc. syringe was used and not more than a total of 6 cc. of the solution was used. Immediate relief from pain was experienced, and the patient was able to turn over without assistance and to sit up. She was asked to touch her toes, which she was almost able to do. There was still some pain in the chest on certain movements, and after search a tender fibrositic nodule was detected over a rib on the right side. This could not be injected as there was no local anaesthetic left.

Next day the back was still free and comfortable, although she stated she had had some stiffness and throbbing in it during the night. The chest was not injected as it did not appear to be worrying her very much. She was able to get about and do her household duties.

- C. aged 56. Dockyard Worker.

This patient had come home from work on account of a painful stiff back. He did not know what had brought it on, but he had had a similar attack about a year previously, when it had kept him away from work for a week. His work involved much lifting and stooping, but he had not been doing anything more strenuous than usual; a few days before his foot had slipped and he had spun round, feeling that he had strained his back, but it gave him no pain, until the day before he had to stay off work.

On examination he indicated the whole of the sacrospinalis muscle, from the sacrum up to the scapulae, as being painful and stiff. He had difficulty in turning in bed. Palpation of the muscle was not tender, but the whole of the muscle on both sides was palpated using heavy pressure with the tip of the finger. At about the level of the 10th rib on the right side the patient winced and exclaimed "That's a sore bit!" A small, mobile, very tender nodule could be felt sliding about between the finger and the underlying ribs. This was marked with ink and on the other side, at a slightly lower level, a similar nodule was felt. These were both injected with 3% novutox, a total of 6cc. being used. At the end of it the patient said the pain was very much better, but as he sat up he winced and pointed out a further painful area over the left sacro-iliac joint. This was carefully palpated but no nodules could be detected, although there was a spot of maximum tenderness just over the joint. A further 4cc. of Novutox was injected here, till pain on heavy pressure had disappeared. The patient was no able to sit up in bed and said that his pain was very much better and that he felt fit to return to work. He was told he could do so the next morning if the back was still well, but to come for more injections if the pain had returned. He was not seen again.

Mrs. M. M. aged 32. Housewife.

This patient complained of pain and stiffness in the back. It had come on two days previously and had been very bad for twenty-four hours. The pain was there as a constant nagging ache, with a sharp, tearing pain on certain movements. She had hardly been able to get out of bed that morning, and any attempt at stooping was quite agonising.

She had had a similar attack a year previously, which had been treated by strapping with elastoplast and had gradually passed off in about ten days. Her general health had been good; she had had a baby three months previously, with a normal puerperium and there was no retroversion or other gynaecological cause for backache. She was a plump, cheerful young woman; she showed evidence of anaemia, for which she was already taking iron. There were four septic teeth, lower incisors, with pyorrhoea alveolaris; she was already awaiting treatment for these. There was no other evidence of septic foci.

She was asked to stoop, but was afraid to flex her back more than a few degrees, on account of the pain. She was made to lie prone and the back was examined. She indicated that most pain was on the left side, but that the right side also ached; she pressed her fingers into sacro-spinalis as the seat of the pain, which was not concentrated at any one spot but was diffusely situated along the muscle. Pressure was made with the tip of the forefinger over the sacrum, the posterior crests of the ilia, and the sacro-spinalis muscle in an endeavour to demonstrate tender areas or nodules. At first nothing could be made out, and as the pain was diffuse and ill-defined it was thought that the case was not suitable for injection, and the previous treatment by strapping indicated. However, high in the substance of sacro-spinalis, at the level of the last interspace, a nodule, mobile and the size of an almond, was felt. Pressure on it was very painful. The skin was marked over it, and the surrounding area searched for similar nodules, but none could be found.

A solution of 3% "Novutox" was used. The skin was anaesthetized and a fine needle introduced through the weal. Solution was slowly injected as the needle advanced, and when it was felt to grate on fibrous tissue or fascia solution was more liberally injected. The needle was partially withdrawn and re-introduced at a slightly different angle three times, a total of 2cc. of the 3% solution being used. At the end of the injection no pain was felt on heavy pressure, although the nodule was still there; it was well massaged with the tip of the finger and the patient was made to stretch the muscle by flexing the spine. This she was able to do, much to her gratification and surprise; all pain had gone, she stated. She was at first afraid to/

to bend in case it brought on the pain again; however she was soon reassured by experiment. She was instructed to extend and flex the spine frequently, and given a few simple exercises to perform. It was doubtful if she did these, she mistrusted them and was afraid that they might bring on the pain once more, in spite of reassurances to the contrary.

It appeared that pain, diffusely situated over a wide area, and felt also on the other side, was caused by a single patch of fibrositis. The pain on both sides was immediately completely relieved by a single injection into the one small nodule of fibrositis. It was interesting that the nodule itself was not especially painful until compressed, the worst pain being felt lower down in the muscle, and actually on the opposite side. Most likely the pain on the opposite side was due to spasm, in sympathy with the muscle of the affected side, in an effort to ensure immobility.

G. M. aged 24.      Aircraft Fitter.

This man complained of pain and stiffness in his back which he thought was due to "a chill on the kidneys" as it had come on a week previously after a wetting. His back ached all the time he worked, and was very painful when he bent or stooped, and was worst in the mornings.

He was a well-built but rather thin young man, and had previously enjoyed good health and had never had a stiff back before. His carriage was good and there was no obvious postural defect. His teeth and throat were healthy, and there were no other indications of septic foci. His urine was normal.

On examination there was revealed tenderness over the sacrum, the sacro-iliac joint on the right side, and over the right iliac crest. In all there were six areas of considerable tenderness on deep pressure, two of which were palpable as fibrositic nodules.

It was suggested that an injection would probably help, but the patient was unwilling to submit himself to it and said that he thought a rub would be sufficient to give him relief. He was told to take hot baths, use massage and embrocation, and if the pain was not improved and he changed his mind about injections, to return in two days.

He did return, the back was still painful and the same areas of tenderness were evident. These were marked, and injection proceeded with in the usual way.  $\frac{1}{2}\%$  novocain in normal saline was used, injected in several directions in each tender spot, the needle being pushed right down to the bone. All the injections were made into ligamentous tissue, the muscle not having been affected. After each injection the area, previously tender, was kneaded with the tips of the fingers to diffuse the solution and to break down the fibrositic nodules. This was accomplished painlessly. When no tender areas remained the patient was made to perform exercises to stretch the ligaments and fascia of the affected area. The pain and stiffness had completely gone. He was sent away with instructions to continue with the exercises and to return if his backache came back.

He has had no further trouble in twelve months.

Pte. C. H. aged 49.

This man complained of pain on the right side of his chest, of about one week's duration. The pain was brought on by coughing, deep breathing, and by certain movements. There was no history of previous similar pain, no history of cough, chill or wetting.

The patient was of fairly strong build, thin but muscular. He looked quite well and there appeared to be no systemic upset. His teeth were bad, merely broken stumps, and his tongue was furred; his breath was offensive. He had no increase of temperature or pulse-rate. Examination of the chest revealed no abnormality of the lungs by palpation, percussion and auscultation. At the site of the pain complained of, pain was elicited on pressure in the fifth interspace, but there was no painful nodule to be felt, and no eruption of herpes. There was no bruising and no history of injury. However as the man frequently was drunk, the history of absence of injury was not very reliable and it was concluded that there was a strain or tear of an intercostal ligament or muscle.

The affected side of the chest was tightly strapped with elastoplast, and the pain was relieved somewhat. However the man reported sick for five successive mornings, although he was not excused duty. He was an unsatisfactory soldier, frequently in trouble and anxious to escape duty, known to be a methylated spirit drinker, and with various police charges against him during the period he had been in civil life; it was thought that he was perhaps malingering in this instance, but he was given the benefit of the doubt, although he was not excused any duties. On the fifth day the elastoplast was removed, as he did not seem to be improving, and three days' radiant heat and massage tried. A portable radiant heat lamp was used by the orderly on him thrice daily for fifteen minutes, followed by five minutes' massage. This did not appear to benefit him at all, and he continued to come up to the sick-bay for aspirin to relieve his pain.

It was decided to try injection, and two to three cc. of  $\frac{1}{2}\%$  novocain were injected into the painful area in different directions through an anaesthetized spot of skin, until all tenderness on pressure had disappeared. Most of the novocain was injected about  $\frac{1}{3}$ " below the surface of the skin, in the intercostal space, but there was a point of tenderness over the fifth rib itself, and here the needle was introduced right down to the bone, withdrawn about  $\frac{1}{8}$ " and the novocain injected at this level in four different directions. It may be mentioned that the patient showed some apprehension at the thought of injection, and was very anxious for them to be finished quickly, so perhaps too much credence should not be placed on his stout assertion that all pain had disappeared. However/

However he was willing to take a deep breath, cough, and throw back his shoulders, and as he did not return with further complaints the injection performed its object of rendering him fit for his military duties, whether his previous condition was one of fibrositis or malingering, or more likely the former exaggerated by the latter.

He remained with the unit for some further months, but he had no recurrence of the complaint.



Pte. G. F. aged 24.

This man complained of pain in his shoulder on certain movements. The pain was not very severe, and as he had been playing football a good deal it was thought that he had probably bruised or strained it in a charge, and he was recommended for a daily rub with linimentum terebinthi. He was not examined very carefully at the time, but it was evident that there was no gross pathological change.

A few days later he again appeared, complaining that although the pain was much easier, there was still pain in front of the shoulder. Examination revealed a tender, mobile nodule about the size of an almond kernel in the substance of pectoralis major, 3% Novutox was injected through an anaesthetized weal of skin into the nodule. The needle was felt to grate as it entered the nodule, and it was partially withdrawn and re-introduced in different directions until the area had been well infiltrated. All discomfort on pressure had now disappeared, and full movements were made without pain. Before he left he was examined for septic foci, but none could be found.

The pain remained away and he had no further trouble with the shoulder.

Pte. J. F. aged 36.

This man complained of pain and stiffness in his right shoulder. It had come on gradually about a week before and was now so severe as to make handling a rifle almost impossible, was very painful on certain movements, and when he coughed. He had never had similar pain before, and normally enjoyed good health.

He was a man of poor physique, thin and of an asthenic type, nervous and with a tremor of the face and a bad stutter when excited. There was nothing else of note on general examination, no evidence of septic foci.

The pain in the shoulder was over the scapular spine and in the supraspinous fossa, lateral and extending to the shoulder joint. There was no evidence of disease of the shoulder joint, no grating, and though active movements were limited, there was no limitation of passive movement. Pressure over the painful area was productive of the same kind of pain, and there was a point of maximum tenderness but no palpable fibrositic nodule.

This was injected according to the usual technique, using 2% "Wand's" local anaesthetic diluted to  $\frac{1}{2}$ % with normal saline. When pain had been abolished at the one point, a further tender area was felt, and this was similarly injected.

The patient was now able to cough and to put his arm and shoulder through a full range of movement without pain, and was returned to duty with instructions to report if there was further pain. He was able to do full rifle drill, and there was no further complaint.

H. K. aged 60. Quarry Worker.

This man sustained a fall, fracturing his skull and necessitating decompression and a long stay in hospital. When he returned home he suffered from severe pain in the back of his head and the muscles of his neck; the neck was stiff, the pain was described as gnawing in character with occasional shooting pains, particularly around the operation area.

Several mobile tender nodules could be felt in the muscles at the back of the neck, and into these  $\frac{1}{2}\%$  novocain was injected. Relief of pain and stiffness was almost complete, but he was told to continue with massage and embrocation for a week. At the end of this time the pain and stiffness were still absent, but he still had the shooting pain occasionally. This may have been due to small scar neuromata, but as the pain was not really troublesome, the scar area was not infiltrated.

He remained quite well for several months and the shooting pain gradually passed off.

C H R O N I C  
F I B R O S I T I S .

Pte. C. M. aged 40.

This man, a cook, complained of pain in the arm when he attempted to lift a heavy pan or a bucket of water. The pain had come on gradually and had been present for about six weeks.

He was a stout, strongly-built individual, in good general health, he had two carious teeth, but otherwise had no obvious septic foci. There was no evidence or history of trauma to the arm, or of a previous fibrositis or rheumatism. Pain was felt on flexion of the wrist and fore-arm, and on pronation of the fore-arm, in the fleshy belly of the extensors, about two inches distal to the epicondyle. On pressure over this spot sharp pain was felt identical in nature to that experienced on the movements described.  $\frac{1}{2}\%$  novocain was injected into this area in all directions until all pain on pressure had disappeared, a total of about 3cc. being used. The affected part was deeply massaged for a few minutes, and he was instructed to "work" the muscle with his thumb, and to use the arm for the actions that had previously caused pain.

The result at that time appeared good, but five days later he reported sick, saying that the pain was as bad as ever, although it had been much improved for the first two or three days after injection. The tenderness was still there, but more diffuse. A second injection of novocain was given, and again relief was obtained and tenderness disappeared. It was thought that probably the second injection would have a permanent effect, but after a further ten days the patient again reported sick on account of the pain, which had begun again three or four days after the last injection and had steadily become worse. It was desirable to try the effect of a third injection, particularly as each injection seemed to have a progressively more lasting effect, but the patient, feeling that he had not benefited ultimately by the injections, asked to be excused any more. He was anxious not to be made to rest or to be excused duty as he had a job he was eager to keep. His arm was strapped with elastoplast, and he was put on light duty and temporarily given an assistant to do lifting and heavy work. After a fortnight, he was still having pain, and the tenderness to deep pressure was still there. The elastoplast was removed, and a course of hot bathing, radiant heat and (semi-skilled) massage was started. This did not do much good, and after about a month was discontinued when he went on leave. Some time after his return, in the course of a routine inspection he was found to be suffering from infected scabies, and was sent to hospital. Whilst in hospital he complained of his arm, and he was given massage and radiant heat; his two bad teeth were extracted in addition. When he returned to his unit he stated that his/

his arm was feeling much better as a result of the rest and treatment, but still tenderness on pressure over the extensors. He was seen weekly for some months for inspection, and enquiry always met with the same reply, that the arm was much the same.

The question was whether it was the rest in hospital, the massage and radiant heat, or the extraction of the teeth that had been responsible for the considerable and permanent improvement in his condition, or the combination of all three factors. It is likely that they were all important, but the decisive one was probably the removal of the septic focus, since he had had some degree of the other two lines of treatment while with his unit, but without noticeable improvement. It was regretted that removal of the teeth had not been insisted upon originally, before other lines of treatment were instituted.

This girl complained of pain and stiffness in the back, worse in the morning and particularly on bending or stooping; she had had it for two or three years, and had been given radiant heat and massage, with only temporary benefit. She had found that exercise, particularly cycling, seemed to loosen off her muscles and give her more relief than anything.

She was a tall, well-built girl, with a good carriage and no obvious postural defect. Her general health was good, and she had no evidence of septic foci in the mouth, throat or alimentary tract. Examination of the back revealed slight tenderness in the substance of sacrospinalis on both sides. There was no tenderness over the sacrum or ilia, and all the pain appeared to be in muscle and not in the ligaments. There was some limitation of movement on flexion of the trunk, pain being felt in the small of the back where the muscle was tender.

$\frac{1}{2}\%$  novocain in normal saline was injected into each tender area. These areas were difficult to define, and no nodules could be detected; there were three on the left side and two on the right. The needle was pushed well into the muscle substance, and a total of about 20cc. of the solution used. She was made to bend and stretch, and was shown a few exercises involving touching the toes and flexing and hyperextending the trunk and advised to do them in the morning, when the pain was usually most severe.

At the next consultation, a week later, she expressed satisfaction with her progress and stated that she had had no pain or stiffness on the left side but was anxious for further injections on the right side, which still felt stiff and painful in the mornings, although not as bad as it had been before. She said that she had felt some soreness for some time after the previous injection, but this had disappeared within twenty-four hours. On examination there was still one tender area on the left side, at a lower level than the site of the previous ones. On the right side two very tender spots were felt, difficult to define on account of the substantial layer of subcutaneous adipose tissue, but it was thought that two mobile nodules, in the centre of each tender patch, could be made out. In each case  $\frac{1}{2}\%$  novocain was injected through a long fine needle, pushed straight down into the centre of the patch. In one case grating was felt, and the patient experienced pain, as the needle advanced; here novocain was injected freely. The points where injection had been made were firmly kneaded with the ball of the thumb, and the patient made to do more exercises. She was advised to do them regularly, and to begin cycling again. She did not keep her appointment the following week, but was seen some months later, when she said that she had almost forgotten about her back; it was often stiff on rising in the morning, but it was on the whole very much improved. She was very glad that she had submitted to the injection.

Aircraftman W. A. aged 41.

This man consulted me during a period of leave. For the previous five months he had been having attacks of "lumbago." These had consisted of pain in the small of the back on movement, worse in the mornings, when there was also much stiffness. Any flexion of the trunk produced pain, and he had been obliged to give up duty on some days, although he was keen on his job and avoided going sick if possible.

He could recall no injury or strain coinciding with the onset of his pain, nor was there any history of wetting or exposure. He had been treated at the sick bay at his station by heat, rubbing, unguentum capsici and embrocation, which had afforded him some temporary relief, but the pain and stiffness consistently recurred and any activity was a misery. He said that he "felt an old man before his time."

He was a well-built, cheerful, active-looking man, Examination revealed no obvious septic foci; his teeth, tonsils, ears were healthy and there was no catarrh, or gastro-intestinal symptoms; no haemorrhoids or urinary symptoms.

The patient was made to lie relaxed in the prone position. Inspection revealed no abnormality of the vertebral column, pelvic bones or soft tissues. Palpation however revealed several tender nodules in the post-vertebral muscles and ligaments in the lumbar region, and in the ligaments overlying the sacrum. The position of each of these was marked on the skin with indelible pencil, and...  $\frac{1}{2}\%$  novocain in normal saline was injected through anaesthetized skin according to the technique described: a total of 15cc. was used for the entire area. At the end of the operation, deep pressure at any one of the previously tender spots failed to elicit any pain, although there was a complaint of "deadness". The patient was instructed to stand upright, and then to bend over as though to touch his toes. Much to his surprise he was able to do so, and he was made to repeat the exercise several times while the instruments were being packed up. He was given other exercises, viz. bending the spine laterally by trying to touch the ankle with the corresponding hand while keeping the back flat against a wall, and rotating the vertebrae by bending forward until the trunk was parallel with the ground and then swinging the arms to point in turn to the floor and ceiling, turning the head and shoulders as far as possible each time. These exercises he was told to do every two hours for ten minutes for the next two days, and then to do as a "daily dozen" night and morning afterwards. He was to rejoin his unit in two days' time, but was told to come back in the morning if the pain and stiffness had recurred. He left the surgery very grateful for the relief, and did not appear the next day.

Six weeks later I received a note from him to tell me that his pain had not returned and that at P.T. he "made the young men look clumsy."

About a year later he was again on leave and came to see me, complaining that for the previous three weeks he had had a return of the pain slightly, following a strain whilst winding a winch. Examination revealed three areas tender to deep pressure, in the substance of the post-vertebral muscles. These were dealt with as before, with equally good results. The patient has not been seen since.



J. N. aged 52. Railway Worker.  
January, 1941.

This patient, a heavily built, muscular man, complained of severe pain and stiffness in lumbar region and thought it was his kidneys as his urine was often cloudy. His urine however showed no abnormality beyond a heavy deposit of phosphates. His work involved much stooping and working in a bent position: he frequently worked in wet clothes, and was often thoroughly chilled at his work. He quite often had a stiff back but it had not been as bad as this before, nor as painful.

Examination revealed considerable tenderness of the right sacrospinalis muscle. He had a thick layer of subcutaneous fat, and no tender palpable nodules could be made out, although there was one area of maximum tenderness. 2% novocain was injected into the tender area, several directions being taken through the same skin puncture, and the needle being pushed well into the muscle substance. Four skin punctures were used and about 18cc. novocain used. A further tender area was found in the lumbar fascia over the iliac crest, on the right side, posteriorly about  $3\frac{1}{2}$ " from the midline, and this also was injected. The patient did not notice much improvement in the stiffness, but said the pain was somewhat easier. He was instructed to stretch the muscles by bending forwards in bed, and was given some unguicapsici with which to massage his back.

The next day, he stated that the back was less painful, but still stiff. He stated that the massage and hot water bottles had helped it. The muscle was still tender, and as he showed a disinclination for further injection, he was told to continue the massage, and to soak in very hot baths. The back gradually became less tender and after a further 5 - 6 days the pain was gone although it remained stiff for some time, and was indeed still stiff when he returned to work after a total of 15 days incapacity.

March, 1941. Complained again of very severe pain in same area. A further injection of novocain was given,  $\frac{1}{2}$ % this time, after some persuasion had been necessary. Some little relief from the pain was experienced, but the stiffness was as bad and the next day he stated that the back was just as painful when he attempted to move, although palpation did not evoke the same pain. Further novocain injection was allowed, and this time a long slender needle was pushed well into the muscular tissue and the novocain slowly released. Considerable relief from pain followed, but the stiffness persisted: he grudgingly admitted that the novocain had helped him this time. It was thought that probably the stiffness was due to an arthritic condition of the spine, but he was unwilling to bother going for X-ray. Activity was resumed and he returned to work after being absent for ten days. The stiffness of his back troubled him still when last seen.

It was thought that the failure of more complete relief was due to (1) not having been able to define and inject into a definite nodule or fibrositic area and (2) possible osteo-arthritic changes in the spine itself accentuating the pain and limitation of movement.

L/Cpl. A. P. aged 47.

This N. C. O. complained of pain, stiffness and a feeling of weight in the right shoulder, and pain in his right chest. He had had the pain for some time, and the wearing of heavy equipment for any lengthy period left him completely exhausted, as he tried to keep the weight off the affected shoulder.

Examination revealed tenderness in the substance of the trapezius muscle in the triangle made by it above the spine of the scapula and its upper border. Three fibrositic nodules were felt. 2% Wand's local anaesthetic was injected into each of these and into the fascia covering the muscle. There was immediate relief from pain.

A similar area of pain was felt in the post-axillary line in the substance of serratus anterior. This was dealt with similarly, and there was equally complete relief from pain, and the area could be heavily kneaded with the ball of the thumb. The patient was told to return if there was recurrence of pain.

Next day he stated that there had been some aching, and the whole shoulder felt rather stiff, but the real pain had gone. He was encouraged to perform exercises, and told to return if the shoulder became painful again. He was seen some time later and said that he had used the shoulder much more freely, and could now wear full equipment comfortably.

G. B. aged 42. Dockyard Worker.

This man stated that he had suffered from lumbago on and off since he was a young man. The pain was gnawing, in character, was brought on by stooping, heavy lifting, and frequently simply by cold and damp weather, or cycling to work against a high wind.

On examination there were several tender spots over the sacrum and sacro-iliac joints, and over the crest of the ilium on either side, medial to the posterior superior iliac crest. At several of these points small movable tender nodules could be defined.

After anaesthetizing the skin, 2% novocain was injected into every tender area and nodule that could be found, infiltration being persisted with until the patient was certain he felt no pain on pressure. About 12 of these spots were found and dealt with, about 15cc. of the anaesthetic being used. The patient was then instructed to stand upright, and bend and straighten his back. He was able to do this with comparative freedom from pain. He was made to perform these movements to the limit of his tolerance for a matter of five minutes. Before he left he stated that although his back felt numb, it was easier than it had been for some time, but still felt as though the trouble was still there. He did not report for further treatment, although some weeks later a workmate stated that "it was not much better."

He was seen again some months later, and stated that the injections had certainly put away that attack, but that he still quite frequently had a stiff and sore back, which came and went and was usually worse in a morning. He promised to return if he should have another acute attack, but was not seen again.

FIBROSITIS  
GIVING SYMPTOMS  
of  
SCIATICA.

C. S. aged 45. Dockyard Worker.

This patient complained of "sciatica" which had come on following a wet cycle-ride to work where he had finished his shift in a cold net-making room still wearing his wet clothes. Examination failed to reveal pain down the leg, pain over the sciatic nerve, or Lassegue's sign. The pain was located in the right buttock, and he was unable to state exactly where it was, but said it felt like a "gnawing toothache" over the whole of the lower part of the buttock. On palpation the muscle was tender, and at the upper part of the muscle, at a higher level than where the pain had been complained of, deep pressure was productive of exquisite tenderness which was felt to radiate over the whole of the lower part of the buttock, "as though a nerve had been touched." There was a large well-defined nodule in the muscle substance, mobile and about the size of a walnut. 3% novutox was injected into it, the extra resistance of the nodule was felt at the needle-point, which was productive of a sharp radiating pain. A total of 8cc. of the solution was used, until all pain had disappeared and the nodule could be kneaded with the ball of the thumb without pain. The patient was instructed to massage the muscle deeply, and to touch his toes at intervals through the day. When he reported next morning he stated that the pain was completely gone, leaving only a vague ache, and he was allowed to resume work.

Pte. A. C. aged 49.

This soldier complained of "sciatica;" from which he said he was a chronic sufferer. The pain came on if he got a wetting, or sometimes for no apparent reason, and remained as a rule as a dull gnawing ache down his leg. He often had a similar vague ache when the weather changed, but of less severity, or if he sat on a hard bench for long. The present attack had come on a day or two previously, and had gradually become more painful, having kept him awake most of the previous night.

Examination failed to reveal Lassegue's sign, but deep pressure over the sciatic nerve was productive of a dull pain down the back of the thigh and lateral border of the leg. On comparison with the other side the muscle of the buttock overlying the nerve felt thicker and more resistant. It was thought that he had a gluteal fibrositis with pressure on the sciatic nerve, rather than a perineural fibrositis, as Lassegue's sign was negative.

2% Wand's local anaesthetic was injected into the tissues through a long fine intramuscular needle. The whole of the area was infiltrated, using a 10cc. syringe, a total of about 20cc. being used, and although the nerve trunk was not actually injected, several times sharp pain was felt to travel down the leg as the needle advanced. At the end of the injection pressure could be made over the nerve without pain, and the gnawing pain had disappeared from the leg. The next day, he stated that during the night the pain had returned, but after taking aspirin he had been able to get to sleep, and the pain was now much better. Palpation revealed some tenderness with pain referred down the nerve on heavy pressure, but this did not appear to be of great severity and no further injection was made. He stated that usually his acute attacks lasted several days and cost him several nights' loss of sleep, and that he would come up for a further injection next time he felt an attack coming on. Unfortunately he was not able to keep his promise as shortly afterwards he was transferred to another detachment.

R. McQ. aged 50. Dockyard Worker.

This man complained of severe, shooting pain in the back of his buttock and down his leg into the foot. Even in the periods of quiescence the whole region ached like an aching tooth. The pain had been present for two days, its onset having coincided with a wetting. He had had twinges of a similar pain before, but never anything of like intensity.

On examination the patient was lying in bed on the affected hip, with the hip and knee flexed, and a hot water bottle to the affected buttock. He stated that heat had helped to relieve the pain. Pressure, over the course of the sciatic nerve in the hip elicited acute pain all down the leg. Flexion of the hip, with extension of the knee and dorsiflexion of the foot could not be tolerated. The case appeared to be an acute interstitial sciatica.

2% novocain was injected through an anaesthetized spot of skin by means of a long fine I. M. needle into and around the sciatic nerve. A spot midway between the greater trochanter and the ischial tuberosity was selected, where pain was elicited on vertical pressure with the first finger. Although on reaching the sciatic nerve, as demonstrated by a spasm of pain experienced by the patient, novocain was freely injected, it was not thought that the needle was ever actually inside the sheath, as on no occasion was it any more difficult to depress the plunger of the syringe. Several attempts were made across the nerve to enter the sheath, but without success. A total of 10cc. of novocain (2%) was used. Immediate relief was experienced by the patient. Next morning he was able to report at the surgery. Pain was still experienced, but it was not incapacitating, and the patient was able to walk about quite comfortably. No further injection was made, but the patient was told to use a capicum - methyl salicylate ointment as a counter-irritant and to rest the leg. He was given a high-vitamin B1 diet.

He returned to work in a few days. Since then he has had a few twinges of pain in the leg but not sufficiently severe to incapacitate him. He has not been seen for several months now.

As the novocain was injected around, and not into the nerve, and as recovery was so rapid, it is more likely that the condition was one of perineural fibrositis, or fibrositis of the interstitial fibrous elements, rather than parenchymatous neuritis, where there is systemic upset and prolonged pain and loss of function owing to destruction of nerve elements.

L/cpl. J. P. aged 50.

This man, a cook, complained of sciatica. He was frequently troubled by it, particularly in the winter, and usually spent several days in bed at each attack. He was otherwise a strong healthy man, with no obvious septic foci, but with a history of alcoholism.

On examination there was pain on pressure over the sciatic nerve, and stretching the nerve gave the typical pain shooting down the back of the leg into the foot.

2% "Wand's" local anaesthetic diluted to  $\frac{1}{2}\%$  with normal saline was injected into the buttock around the nerve, midway along the line joining the greater trochanter and the tuber ischii. It was not found possible to introduce the needle into the nerve sheath, although that would have been preferable. A total of 9cc. of the solution was used. Pain had disappeared, and the nerve could be stretched without complaint.

He was told to report back if the pain recurred, but failed to do so. He was seen a month later, and declared that he had remained free of pain in the interval. He stated that he had never had such a short attack for years.

It was concluded that this was a case of fibrositis of the sciatic nerve sheath.



ACUTE  
TRAUMATIC  
FIBROSITIS.

(1) In Muscle and Fascia.

J. T. W. aged 46. Goods yard Foreman.

Impatient with his men's handling of a coil of heavy cable, this man brushed them aside and picked up the coil which he was about to fling into the waggon when he was seized with an excruciating pain low in his back which caused him to drop the coil and to remain on all fours until the not unamused workmen picked him up and sent him home in the lorry. He was a muscular, strong-looking man of medium build.

When I saw him, so tender was a particular area lateral to the lumbar spine that I thought there might be a fracture of the transverse process. I had him X-rayed, but this was negative.

Novocain injected into this area gave much relief from pain, and he was able to move about in bed with a reasonable degree of comfort. Movement was still restricted, but it was deemed of no use to give more novocain since tenderness on pressure was almost absent. He was given analgesics for his pain, and contrary to usual procedure, told to rest. Next day there was still much pain on movement. Novocain was again given, as much of the tenderness had returned. This time there was a considerable relief from pain, and the patient was able to move with much greater freedom. Movement designed to stretch the ligaments were tried, but these were painful so rest was again advised. Next day further injection of novocain was given, and in spite of protests active movements were insisted upon, which were accomplished relatively easily, to the patient's surprise. He was instructed to stretch his back as much as he could and next day was much better. Two days later he was able to walk, and though still having some stiffness in the morning this wore off after half an hour or so, He was able to return to work in ten days.

W. W. aged 38.      Aerodrome Worker.

This patient, a muscular, powerful man, and a brother of the previous patient, had a similar history. While stooping to pick up a box he was seized with a sharp pain in his back. He was unable to lift the box, but continued with his shift although his back was very painful. Next morning the back felt very much worse and he dare scarcely move in bed.

There were two points of maximum tenderness in the lumbar fascia over the sacrum which were injected until all tenderness had disappeared. The effect was immediate and he was able to walk about and wanted to go to work. He was kept at home that day but told to walk about and to stoop and stretch his back by touching his toes. He reported next morning at the surgery stating that his back was rather painful again. More novocain was injected, and the pain and stiffness relieved. He returned to work next day and had no more trouble with his back, although he was warned to avoid stooping and heavy lifting for a while.

G. C. aged 51. Farm Worker.

This man had been lifting a heavy sack of corn two days previously, and had felt a severe pain in his back. He had not been able to stand upright without assistance. He went to bed, and his wife had since then been applying hot bags, liniments, etc. without improvement. Two areas of tenderness were found in the lumbar fascia over the sacrum, about  $1\frac{1}{2}$ " on either side of the midline. Novocain was injected into each of the tender spots until all tenderness on pressure had disappeared. The patient was able to stand upright and bend and stretch without pain. When seen the next morning all disability had disappeared, he complained only of pain in the skin at the point of injection. This was where the skin had previously been burnt by the hot bags etc. A strapping of elastoplast was applied and he returned to work the next day. There was no recurrence.

J. P. aged 54. Dockyard Worker.

This man was stooping to tie up his shoelaces one morning when he felt an acute pain in the small of his back. He was unable to rise and had to crawl on his hands and knees to the door, by which he was able to pull himself to his feet. He went straight to bed and any movement in bed was painful.

He had strained his back some years before and had been in bed for a fortnight, and had had similar attacks to the present one on several occasions since. Two spots of tenderness were found in the lumbar fascia along the iliac crests about  $2\frac{1}{2}$ " from the midline on the right, and  $3\frac{1}{2}$ " from the midline on the left.

2% Novutox injected till all tenderness had disappeared. The patient was then made to stand up. He was able to do so without pain, but was not able to bend freely. No other area of tenderness to pressure could be found, but the patient was able to put his thumb on the spot where he felt the pain, about  $1\frac{1}{2}$ " on the right below the original area infiltrated. Novocain was injected into this area and the patient was then able to bend without pain. He was instructed to stay out of bed, and to touch his toes several times during the day. His wife was told to run a hot domestic iron over the back over thick brown paper, and to rub with my capsici and methyl sal. Next day he stated that the pain and stiffness had stayed away all day, but had returned that morning, although it was less severe than on the previous day. More Novutox was injected into the original areas which were again tender. Pain and stiffness again disappeared, and the same instructions were again given. The next day the pain was still absent, and did not recur subsequently. He returned to work three days later, the back not having given any more trouble.

R. M. aged 52. Dockyard Worker.

This man fell on his back bruising an area over the coccyx. When seen he was lying in bed and had considerable pain on turning over for examination; an area about 2" in diameter was found over the coccyx and lower part of the sacrum, very tender to pressure.

$\frac{1}{2}\%$  novocain was injected into this area, a total of 5cc. being used, and the solution being liberated wherever the resistance of ligamentous tissue was felt. The tenderness on pressure had practically disappeared, and on movement the patient felt quite all right except for a feeling of numbness. He was made to touch his toes, and given some stretching and bending exercises to do.

He reported the next morning, he felt quite well, and returned to work immediately.

Mrs. H. G. aged 34. Housewife.

This patient, a thin, asthenic woman, felt a sudden sharp pain in the back while dressing one morning. She tried to do her housework but had to return to bed. She remained there all day, applying heat, but the pain persisted and the next day she sent for medical assistance.

There was difficulty in turning in bed for examination, and she had to be helped over. The skin was reddened and inflamed, owing to the use of hot bottles. General tenderness was felt over the sacro-spinalis muscle in the lumbar region, in the upper part of which were three acutely tender spots. No nodules could be detected.

2% novutox was injected into each of these three areas, until tenderness on pressure had disappeared: a total of 20cc. of the solution was used. The patient was surprised at the freedom with which she was able to turn on to her back again. She was made to bend forward in bed and touch her toes and instructed to do so every half hour. Next day the pain was gone but the back was very stiff. Two of the points of tenderness were still sensitive to pressure, and these were re-injected, giving relief again. She was told to touch the toes occasionally through the day, and to soak in a very hot bath.

Next day the pain was gone except for a vague ache and stiffness and she was able to do her housework with comfort. The pain did not recur.

Cpl. J. R. aged 47.

This N. C. O., a canteen attendant, felt pain in his back after handling barrels of beer. There was pain, not well localized, in the substance of serratus anterior below and lateral to the scapula. Pressure revealed a very tender area to the medial side of this, and pressure on this spot was productive of more intense pain throughout the diffuse area. 2% "Wand's" local anaesthetic was injected into this small area, until all tenderness to pressure had disappeared. The diffuse pain was relieved, and all movements were made with freedom. Next day he stated that there had been some aching, and that there was still some slight pain, but it was not incapacitating and did not trouble him much. No further injection was made and the shoulder was quite normal in a few days.



Mrs. A. B. aged 52.

This patient complained of severe pain in the left sacro-iliac region which came on suddenly as she was stooping to light a fire. She stated that she felt a sudden "snap" as though something had given way, and was not able to stand upright but had to crawl on her hands and knees to bed. On examination there was an intensely tender area over the left sacro-iliac joint and some tenderness surrounding this spot, and diffuse pain and tenderness down the upper part of the buttock.

2% Novutox was injected into the tender area, at all levels from the skin down to the bone, and in several directions through the same puncture, using a long fine I. M. needle. Immediate relief was obtained, the pain disappearing at the spot injected and also in the area of its reference in the buttock. The patient was made to get up and bend as much as she could, There was still some pain on movement, but as most of the pain had disappeared on pressure, no further injection was given that day but the patient was told to soak in a really hot bath and to get her husband to massage the tender area with a counter-irritant ointment. Next day she was walking about, although she said that if her son had not been coming home on leave that day she would have stayed in bed, as the back had been very painful in the morning, and had been so stiff that she could scarcely straighten it. Although any flexion and subsequent straightening of the back had been extremely painful, it had not been as painful as on the previous day, before the injection, and the area of referred pain in the buttock was much better. A further similar injection was made into the same spot. Again much relief was felt and the patient was able to bend and straighten fairly freely. Similar instructions re hot baths and massage were given, and next day the back was very much better, although it had still been very stiff and painful first thing in the morning. On examination there was no very marked tenderness over the sacrum or ilium, the area where pain on movement occurred was vague, and no further injection was given. Treatment by baths, massage, and active movement was continued, and within a week all symptoms had disappeared and movement was free.

Dr. D. L. aged 27.

This colleague complained of a "crick in the neck" following a hard game of tennis the previous evening. Acute pain was felt on turning the head to the right, and on certain movements of the right arm. She had attempted to work it off by playing tennis again on the evening on which she was examined, but had been obliged to stop because any back-hand stroke was excruciatingly painful. She had never had a stiff neck before. She was a well-nourished and very healthy young woman.

Examination revealed an area in the substance of trapezius at its upper border above the mid-point of the clavicle, that was tender on pressure. The area was oval in shape, about one inch by half an inch, and could be defined, not as a raised lump, but rather as a hard substance in the muscle. Although this was the only place that was tender on pressure, it was higher in the substance of the muscle that the pain had been felt, with no pain at the site of elicited tenderness. In fact, she had thought that she had torn some of the slips of origin from the occipital bone and the ligamentum nuchae.

Injection of  $\frac{1}{2}\%$  novocain in normal saline was made into the tender area by means of the usual technique, through a weal of anaesthetized skin. The needle was felt to grate on the muscle fascia, and novocain was liberally injected there, and then the needle was pushed in slowly for about 2", novocain being injected all the time. The needle was almost fully withdrawn, and the procedure repeated in a different direction, and then after refilling the 2cc. syringe again in two different directions, till it was thought that the whole of the tender hard patch had been infiltrated. As the needle went deeply in one direction, the subject complained sharply of a sudden pain in the upper part of the muscle, identical with the pain previously complained of. She said it felt like a nerve pain, and it was concluded that a small sensory nerve was included in the fibrositic nodule, and certain movements had been either stretching it or compressing it, and giving the pain complained of. Possibly the sudden pain was caused by the point of the needle touching the nerve.

A total of about 4cc. of novocain was used, and then the tender area was deeply kneaded with the ball of the thumb. This was still quite painful, but not quite so bad as it had been. Ordinarily, a further injection would have been made until the pain on pressure disappeared, but as it happened the only needle I had with me was rather big, and not too sharp, so it was decided not to traumatize the tissues any more but to make another injection the next day. Although pain was still present on pressure, the patient was able to move her head much more freely and there was marked functional improvement. She moved/

moved her head to and fro several times in an effort to secure a maximum range of movement and to break down adhesions while the novocain still acted.

Next day the area injected was still very tender on pressure, and looked slightly red and angry. This was thought to be simply due to trauma and was strapped with elastoplast. Pain on movement had practically disappeared, and almost full function had returned. It was evident that no further injection was required, and indeed the patient played a successful game of tennis the same day with no pain.

T. C. aged 19. Dockyard Worker.

This boy had played football the previous day, and in the morning found his leg and ankle very painful. Dorsiflexion of the ankle was very painful, most of the pain being felt on the front of the ankle distal to the transverse ligament, although there was some pain half-way down the shin in the substance of Tibialis Anterior. Pressure over the extensor tendons revealed no tenderness nor over the transverse ligament, but pressure over the belly of tibialis anterior produced marked pain, not only at the spot pressed upon, but down in the ankle where the pain had originally been complained of.

Injection of 2% novutox was made into the painful area in the belly of the muscle, which not only relieved the local pain and tenderness, but also the remote pain lower down in the tendon. The patient was able to return to work the next day, and played in the next Dockyard cup tie a few days later.

It was concluded that this was an instance of deep pain referred distally in the same segment from an irritable focus higher up in the muscle. He had probably torn a few fibres of the tibialis anterior during the game, had returned to work afterwards unconscious of injury, and it was only during the night that organization and fibrositis took place in the traumatized area, giving the local interference with nerve-endings of deep sensibility, with the pain when he woke up in the morning.

Pte. J. McG. aged 22.

This soldier complained that he had had an aching pain in his shoulder for several days, which was worst when he was doing rifle-drill or wearing full equipment. He said he thought he had strained his shoulder at the rifle-range a day or two before the pain came on.

He was a small, poorly-developed, asthenic type, with a pale face and cold moist skin. There were two carious teeth and his left tonsil was large but not obviously septic. He indicated muscles over the supraspinous fossa of the scapula and up into the back of the neck. Pain was elicited on pressure over the supraspinous fossa, and this caused the pain to be radiated over the top of the shoulder into the neck. A small, resistant nodule was felt fairly deeply, in the substance of trapezius, at the site of maximum tenderness. Injection of "Wand's" local anaesthetic was made into this area, and grating was felt as the needle was pushed forward, novocain being slowly infiltrated in several directions. It appeared that pain was felt as the needle entered the fibrous area, but this was difficult to assess as the patient was nervous and tended to wince irrespective of where the needle was. The area could be heavily kneaded without pain, and movements were now free. He was instructed to use the arm and shoulder as much as possible, and to do "press-ups" and to stretch his arms above his head. When seen the next day he stated that his pain had disappeared, and he had been wearing full equipment that morning without discomfort.

Pte. C. L. aged 27.

This man complained of pain in his chest, following a "wrench" two days previously while stacking sandbags. Examination revealed a small, tender, localized nodule near the origin of pectoralis major just lateral to the sternum at the level of the fourth rib. Pain on movement of the arm was localized to this area.

"Wand's" local anaesthetic was infiltrated through it, until all discomfort had disappeared. Full movements of the arm were made with complete freedom. The patient returned to duty, wearing full equipment. He had no further pain.

J. S. aged 50. aero engine fitter.

This man had slipped while running to catch a train, and sprained his ankle. He volunteered the information that he was the worse for drink at the time and had not noticed the pain then, but next morning the pain had been excruciating. It happened to be a Sunday, so he was able to rest it all day, and next day hobbled to his work in spite of the pain and swelling. He came up to see me in the course of the day; the ankle was puffy on its anterior aspect, and tender to pressure over most of the swollen part. He had an important job and was anxious to carry on, which he was allowed to do as he would be able to rest his ankle fairly well though working. Before he returned to work a crepe bandage was bound firmly on his ankle.

Two days later he reappeared saying that although he could scarcely be spared in the workshop, he had really felt he could not continue with the ankle hurting as it was, in spite of aspirin, hot and cold compresses, and the tight bandage. The swelling was by now rather less, and as three fairly definite areas of tenderness could be made out on pressure, it was thought that an injection of novocain might help him. A solution of  $\frac{1}{2}\%$  novocain in normal saline was injected into each tender area, which were probably torn or stretched fibres of the anterior annular ligament. Pain on pressure disappeared, and the patient was able to stand and walk with much greater comfort. There was still some pain, but it seemed to be situated diffusely along the extensor tendons, and no further injection was made.

The next day he stated that about five hours after the injection he had had the most agonizing pain at the site of the injections, much worse than any of his previous pain. He had taken four aspirins and a stiff whiskey and had then been able to get to sleep. He stated that about three hours after the injection the ankle had begun to throb, it felt tense and was extremely painful when at rest, while the slight movement of stretching the toes was intolerable. The pain became steadily worse for about two hours, when he took the analgesic measures described. He said that it felt worse than a poisoned hand he had once had. However when he saw me in the morning the pain had eased off considerably and he was able to walk fairly well. The swelling was still there, and against his wishes he was advised to remain off work for the day and to rest with the foot elevated. The following day the swelling was considerably reduced, and the ankle although still uncomfortable could be made use of, and the patient was allowed to return to work.

The ankle gave him some discomfort and remained swollen for some time, but gradually recovered.

The pain and tenseness a few hours following the injection were thought to be due to sterile effusion, possibly an idiosyncrasy on the part of the patient to novocain. A similar reaction was noted in the case of one other patient (Pte. K. S.) but this latter was a much less reliable witness and not so clear a picture was obtained.

Mrs. J. M. aged 65. Housewife.

This patient sprained her ankle, the pain and swelling being limited to the lateral side of the foot distal to the malleolus. There was obviously no fracture on examination, and  $\frac{1}{2}\%$  novocain was injected into the area, until all pain on pressure had disappeared. The patient was asked to put her weight on the foot and walk, but she still complained that there was considerable pain, although she appeared to be walking better. No more tender spots could be made out, and the patient was advised to use her foot, and to put the ankle through its full range of movements.

She was seen the next day and complained bitterly that the ankle had throbbed all night, and was much worse. Examination still revealed only slight tenderness over the previously painful area, but it was still very puffy. She was unwilling to walk on it and said that the pain of walking was very severe. It was not thought that further novocain injection would be welcomed or advisable, and cold compresses and rest were suggested. She was seen two days later, the pain was still severe when the foot bore any weight, but was much easier when she rested. An elastoplast strapping was applied and the patient advised to rest the ankle as much as possible. Her husband called a few days later to say that he had called in a friend of his, a bonesetter, to see his wife's ankle, and he had found five bones out of position, which he had replaced. However it appeared that the ankle gradually got better as a simple sprain in spite of this, although she was not examined again.

In this case the infiltration with novocain appeared to be of no value, in fact to increase the pain after a few hours. Function was not restored any more quickly, and the progress of the condition did not seem to be affected at all. No explanation could be found for this failure, but the fact that the patient was considerably overweight with perhaps faulty mechanics of the foot, and that she was in poor general condition, with not the same powers of recovery in her ligaments and synovia as a younger person, may have been relevant factors.



Mrs. E. T. aged 32. Housewife.

This woman had slipped and sprained her ankle the previous day. The area below the lateral malleolus was swollen and painful, and she could scarcely put her foot to the ground.

The whole of the area between the lateral malleolus and the head of the fifth metatarsal was tender, and most of the lateral border of the foot was swollen and puffy. It was concluded that there was no bony injury, but that the fibres of the inferior peroneal retinaculum, and probably of the tendons of insertion of peroneus longus and peroneus tertius, were torn and stretched.

$\frac{1}{2}\%$  novocain was injected according to the usual technique, into the tender area, the needle being inserted down to the bone, and a total of 3cc. of the solution being used.

After the injection the patient was surprised at the lack of pain, and was able to walk quite comfortably. She was told to let me see it again should the pain recur. I saw her a week or two later, when she said that the ankle had felt very comfortable for some hours and had then become very painful again; she had not bothered to send for me as she had not thought that another injection would help it much, as the first one had not done so. She had simply rested it and it had gradually got better as a simple sprain would.

It was thought that, had she had further injection treatment, her pain would have been kept away and her recovery of function would have been more rapid. She should have been warned at the time of injection that the pain would probably recur and that she would need further injections.

ACUTE  
TRAUMATIC  
FIBROSITIS.

(2) In Ligaments.

J. T. aged 26. Miner.

Whilst I was visiting a friend, a miner came up to his surgery, limping badly. He had sprained his ankle at work, and the pain was so severe that he carried his boot in his hand and limped in his stockinged foot rather than bear its pressure on his ankle.

Examination revealed tenderness but only slight swelling over the lateral surface of the calcaneus. There were no other areas of tenderness, and pain was experienced at this point on movement of the ankle, particularly on inversion. It appeared that the calcaneo-navicular and posterior talo-fibular ligament and other slips making up the lateral side of the transverse tarsal joint were stretched and possibly torn.

My friend was willing to let me use novocain, and a 2% solution of "Novutox" was injected. A weal of skin was anaesthetized first, and small quantities were injected by means of a 2 cc. syringe through a fine needle in all directions throughout the tender area. The needle was pushed right down to the bone before it was withdrawn each time. Only small quantities were infiltrated, and a total of not more than 2cc. of the novutox was used. It was sufficient, however, to cause all pain on pressure over the tender spot to disappear. Some pain was now felt lower down the calcaneus, at the junction of the side of the foot with the ball of the heel. The syringe was re-charged and a small quantity injected there; difficulty was experienced on account of the tenseness of the tissues here, and considerable pressure had to be made on the plunger of the syringe. About half a cc. was sufficient to cause the tenderness on pressure to disappear from this spot.

The patient was then instructed to put his weight on the foot, which he was able to do without pain. He was able to walk round the surgery in comfort, much to his own astonishment. He finally put his boot on and walked away. He returned to work next day, and had no trouble afterward. He was very grateful, as he thought that his sprain was going to keep him off work for several days, as indeed it probably would have done but for the novocain.

Pte. K. S. aged 43.

This man twisted his ankle and was only able to limp on account of the pain.

Examination revealed no swelling but tenderness below the lateral malleolus. The tenderness was felt in a small area about  $\frac{1}{2}$ " below the malleolus, but it was not thought to be severe in spite of the man's protestation of intense pain, as the wincing was not consistent, and the patient was an old offender. However it was decided to give him an injection.

2cc. of  $\frac{1}{2}\%$  novocain in normal saline was used, and injected down to the bone in several directions over the tender spot. The man did not wish to have an injection and only took it under protest, and was anxious to say that the pain had disappeared, being quite willing to return to duty.

Four hours later the man complained of intense pain at the site of the injection. Again the reaction to pressure was inconsistent, and it was thought that although the ankle might not be quite comfortable there was not ground for the complaint of intense pain. However he was excused duty for the night. I had the satisfaction of seeing him walking quite normally and without a limp into the local public house later in the evening. He did not trouble to attend the sick parade the following morning.

Pte. J. R. aged 27.

This man sprained his ankle while playing football. There was pain on movement, giving a limp, and tenderness on pressure over the lateral border of the calcaneus. It appeared that the calcaneo-fibular ligament had been sprained.

3% Novutox was injected into the centre of the area of maximum tenderness, being slowly diffused through the tissues until the bone was encountered. About 2cc. of the solution was used. Pain had disappeared, he was able to put on his army boot and walk away without a limp. The next day there was no pain, but there was some bruising round the lower border of the heel. There was no further complaint and he played football again the following Saturday.

Cpl. J. R. aged 50.

This patient slipped and sprained his ankle while hurrying for a train. There was tenderness and swelling over the anterior talo-fibular ligament, into which 2% "Wand's" local anaesthetic was injected. Only a small quantity, about 1 cc. was used, but the pain and tenderness disappeared. The ankle was strapped and the patient was able to continue his duties with comfort,

Sgt. J. McM. aged 49.

This N. C. O., a muscular, overweight man, twisted his foot in the inverted position. Next morning anterior and inferior to the lateral malleolus was puffy and tender to pressure. There was, however, no tenderness or swelling over the fibula itself, and it was concluded that the fibula was intact and that there was simply a sprain of the calcaneo-fibular and anterior talo-fibular ligament.

"Wand's" local anaesthetic was infiltrated into the area. Tenderness immediately disappeared, but the patient said that the ankle still hurt on walking. The ankle was strapped and he was told to use it gently. Next day the ankle was still fairly painful, but the patient was able to do his duties without undue discomfort, he refused a few days' rest. The ankle continued to be rather painful and stiff for about a week, gradually improving. It still occasionally gives him pain when walking over rough ground or on sudden inversion.

Pte. J. M. aged 29.

This patient received a kick on the medial side of his ankle whilst playing football. There was pain on movement, and the ankle was swollen. It appeared that the deltoid ligament, and the flexor retinaculum, had been bruised and strained. "Wand's" local anaesthetic was injected into the area, and the tenderness disappeared, although there was still some pain. However his limp had disappeared and he was able to go on guard later in the day. Next day the ankle was comfortable, although slightly puffy. It was strapped, and the patient did not make any further complaint.



Lieut. I. H. aged 45.

This officer fell and sprained his ankle. There was considerable swelling and tenderness over and distal to the lateral malleolus. The ankle was X-rayed which failed to reveal a fracture of the fibula.

3% Novutox was injected into the site of maximum tenderness, until the needle-point encountered bone. Much relief was felt, most of the tenderness disappeared, and after strapping he was able to walk comfortably and resume his duties. There was no further complaint beyond some aching and throbbing for a few days.

V A R I O U S

O T H E R

T Y P E S .

Pte. J. W. aged 50.

This case is recorded merely as an illustration of the psychological effect of injection treatment on the malingerer.

I was called at two o'clock one morning to see this man, who was writhing in apparent agony in the sick-bay. I knew this man of old, he was a chronic grumbler and dodger of duty, who had a grievance and was anxious to be out of the army; why he should have chosen 2 a.m. as the time to try it is a mystery known only to himself. He had taken in the medical orderly, however. I made the latter strip the patient and then made an examination. The complaint was of severe pain in the back, but nothing positive could be found, although he winced and groaned wherever he was touched.

I produced a syringe and a bottle of novutox, which I flourished ostentatiously before him. He did not wait for more but rapidly began to recover, seized his trousers and fled. He never went sick again while he was with the unit.

This case is out of place in this series, but serves to illustrate the usefulness of the method in army work, apart from its genuine curative value.

## Summary & Conclusions.

A simple method for the quick relief of certain painful and disabling conditions has been described, and a series of cases so treated written up. Most of the cases fall into the class of the chronic rheumatic diseases, and although such cases of fibrositis have hitherto been occasionally dealt with by injection, this has usually been reserved till last and used only after more orthodox methods had failed. Here the injection method was used at once in all cases, provided that examination showed the case to be one of fibrositis with detectable nodules or areas of localized pain on pressure, with neighbouring muscular spasm and immobility. Injection was refused if these conditions were not present. It was essential that these small foci of fibrositis should be defined and infiltrated, otherwise failure or only partial success occurred. In many cases the effect was dramatic; in many relief was considerable; there were a few failures, but on the whole the method resulted in a far shorter period of disability on the part of the patient than otherwise would have occurred.

The other group of cases, that of the injection of minor traumata by injection, has not been commonly used, but deserves wider trial. Torn fascial attachments of muscle and torn and stretched ligaments in the back and ankle have hitherto almost always required a period of rest, or at least a period of reduced activity. When treated by this method, the patient was frequently able to return to full activities, with function completely restored. As many of these cases are in young and active people, particularly those undergoing unaccustomed exertion, the value of the method in treating such common conditions as sprains and strains by the regimental medical officer without the necessity of sending the man back with resultant waste of transport and time is obvious.

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