CAUSALGIA

Diagnosis and Treatment

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This paper is based on a study of twenty-four patients in whom the major symptom was persistent pain after injury to one or more peripheral nerves. It is sometimes a matter of difficulty to distinguish the persistent pain of true causalgia from the pain of other post-traumatic conditions, particularly since few clinicians have the opportunity of studying large series of such cases. Paget (1864) and Weir Mitchell (1872) gave classical descriptions, but it was not till the first Great War that any extensive series was reported. In a publication of the Medical Research Council (1920) the pain was described as being: spontaneous in onset; hot and burning in character; intense, diffuse, persistent, and subject to exacerbation; excited by stimulation which did not necessarily produce physical effect on the limb; usually aggravated by emotional excitement which brought on a paroxysm; and responsible for profound changes in the emotional state of the patient. More recently it has been suggested that another characteristic of the pain is that it is relieved by sympathetic block (Doupe, Cullen, and Chance 1944).

In the group of cases now reported these descriptions appear to be much too rigid. Whereas all patients agree that the onset of pain is spontaneous, the quality is variable and often bizarre. One patient described it as severe and burning during the first six weeks, later changing to intense "shooting pain like toothache." Others, in describing it, made use of such expressions as: "trickling pieces of broken glass"; "skin tightly stretched over a bone"; "crushed as in a vice"; and "nails being torn off the fingers." In five patients pain began on the day of injury. In the others it was first observed at varying periods up to forty days after injury. These figures, however, are uncertain, because many of the victims were unconscious for a period, or were subject to the strain of long evacuation from dangerous areas while in very poor general state.

CLINICAL FEATURES OF CAUSALGIA

The site of pain is well defined in some cases. Two patients described it as limited to the outer three and a half fingers; one referred it to the ring finger alone. Persistent pain is usually situated in the foot or hand. In four cases only was there spread to the forearm or leg. It may be felt superficially, but not infrequently it involves the deeper tissues and even the bones.

Factors precipitating pain—Patients are in general agreement as to the factors which precipitate pain, namely: loud noises, sudden jarring of the bed, psychical causes such as seeing other patients slip or fall, and excitement associated with the watching of thrilling pictures. Overheating and intense cold both cause severe pain, as does dry contact with any part of the body. It is relieved by moist cloths, usually applied to the affected limb and occasionally to another limb. Weir Mitchell refers to patients who filled their boots with water in order to gain relief.

Sympathetic block—Blocking the stellate ganglion with novocaine often gives valuable information despite the fact that the test is largely subjective and that it is dependent upon the interpretation of the patient. When there is injury of the median or internal popliteal nerves, relief is immediate and complete for the duration of the injection: it is usually volunteered that the pain has gone, that the limb can be handled, and that the patient is no longer under the domination of loud noises and other stimuli.

Of seventeen patients who had sympathetic block on one or more occasions, thirteen were immediately relieved. One was distressed by the injection, and interpretation of the result was vitiated by his general condition. Three others were incompletely relieved, and it is noteworthy that in these cases the lesion was a complete tear of the brachial plexus at the level of the roots. It is possible that in such circumstances a more extensive block is indicated, including the middle and superior cervical ganglia, or the thoracic ganglia as low as the sixth. (Leriche 1939.)

After a trial of anterior approach to the ganglion this method was abandoned because: 1) it is uncertain in its results; 2) it is painful; 3) the lower cord of the plexus is likely to be involved; 4) the patient is more aware of the surgeon's activities when he works from the front—a very real objection in the case of individuals who are liable to emotional disturbance; 5) the vessels may be damaged.

FIG. 1

Case 22. Median and ulnar nerve lesion right hand, with causalgic pain in the tips of the fingers. Temperature records of the fingers of both hands show that the right fifth finger (R.F. 5) was persistently cold despite alterations in room temperature and even despite sympathetic block.

Technique of sympathetic block—upper limb—The patient sits astride a chair with the forearms supported so that the shoulders droop. After anaesthetising the skin, two Pitkin needles, without stylettes, are introduced one and a half inches lateral to the spinous processes of the first and second thoracic vertebrae; they are directed medially at an angle of forty-five degrees to the sagittal plane so as to hit the first and second ribs. The needles slip under the ribs and are felt to perforate the intercostal membrane. The points are then in the extra-pleural space in front of the necks of the ribs. Three or four cubic centimetres of 2 per cent. novocaine are introduced into the loose areolar tissue outside the pleura. If the needles are correctly placed Horner's syndrome appears within a few minutes; the skin of the arm becomes dry.

Technique of sympathetic block—lower limb—This is a more difficult and uncertain procedure. The classical method of paravertebral block is used, according to the technique of Kappi. Two needles are introduced through intradermal wheals, seven centimetres lateral to the first and second lumbar spines. They are directed medially, at an angle of forty-five degrees to the sagittal plane, until they strike the sides of the vertebral bodies. Each needle is then withdrawn slightly and manipulated past the side of the body for a distance of one to two centimetres. Five to ten cubic centimetres of nococaine are injected. Loss of sweating of the limb is a reliable test of a successful block.

Objective findings—The objective findings have been described accurately on many occasions (Paget 1864, Weir Mitchell 1872, Leriche 1939, etc.). The glossy skin, spindle fingers, and clawed stained nails are well recognised. Macerated skin and the bullous lesions which are sometimes encountered are the result of reluctance to allow frequent cleansing,

FIG. 2

Case 3. Internal and external popliteal nerve lesion with causalgia of foot. Severe "glassy atrophy" in the causalgic limb twelve months after injury. The normal foot is on the left.

or the constant use by the patient of moist applications. Hyperhydrosis is not a constant feature and has often been noted when there are nerve lesions without pain. Vascular dilatation is not always present. In the patients of this series the temperature of the limb was colder than normal in three, variable in five, warmer than normal in thirteen, and normal in one; in two there was no record. These variations are probably related to local conditions of temperature, or they are referable to the time and degree of coincident nerve injury. Severe vascular damage is not always associated with a cold limb. (Vascular changes after nerve injury, local trauma, and sympathectomy have been studied extensively by Lewis and Pickering 1931, and Doupe *et al.* 1944.) During the first three weeks after injury the blood flow in the digits is increased, but at a later stage it returns to normal, or there may even be vasoconstriction due to sensitisation of the vessels to adrenaline (Freeman, Smithwick, and White 1934).

Bone changes are not specific. They may take the form of true Sudeck's atrophy or they may be of the more generalised glassy type (Fig. 2). The former variety tends to merge into

the latter as weeks go by. These changes have been recorded in patients without pain. Conversely, in one patient with relatively severe pain, they were minimal.

FIG. 3
One month.

FIG. 4
Two months.

FIG. 5
Six months.

FIG. 6
Twenty-four months.

Case 6. Median, ulnar, and radial nerve lesions with causalgia of the hand. Radiographs of the hand at various intervals after injury showing the development of bone changes.

Psychical assessment of patients who are in great pain is difficult but, in this series, examination was undertaken and an opinion expressed at a time when pain was not severe. Two patients were definitely abnormal; one was aggressive and impulsive; and one had a mild anxiety state. The inference which was drawn was that one was highly strung and the other of low intelligence. Too much attention has formerly been paid to personality changes. They are the result of pain. Once the pain is relieved they disappear.

Nerves involved—In this series of twenty-four cases the median nerve was involved in fifteen (median nerve alone, two; median and ulnar nerves, six; median, ulnar, and radial nerves,

Case 3. External popliteal nerve lesion (left) with causalgia of the outer side of the foot.

Case 6. Right median, ulnar, and radial nerve lesions with causalgia of hand.

Case 1. Right median and ulnar nerve lesion with causalgia of fingers and thumb.

FIG. 7

Sweat tests in three cases of nerve lesions with causalgia showing anhydrosis in the distribution of the affected nerves, marked soft tissue atrophy, and contractures.

four; median and internal cutaneous nerves, one; median, radial, and musculo-cutaneous nerves, one; median, ulnar, radial, and internal cutaneous nerves, one). There was supra-clavicular injury to the brachial plexus in four cases. Nerves of the lower limb were involved in five cases (internal and external popliteal nerves, four; posterior tibial nerve, one).

Cause of nerve injury—In twenty-one patients the injury was due to high velocity projectiles; in three the injury was a traction lesion of the brachial plexus. It is of interest to

note that the two nerves, injury of which is most likely to give rise to causalgia, carry in close proximity or actually in their substance the old axial artery of the limb, and that they have a high proportion of non-medullated nerve fibres (Leriche 1939).

Site of nerve injury—In upper limb cases the site of injury was: supraclavicular, four; axilla and upper third of the arm, thirteen; mid-third of the arm, one; lower third of the arm and elbow, one. In lower limb cases the site of injury was: buttock, two; upper third of the thigh, one; mid third of the thigh, one; and calf and ankle, one. In only two patients was the injury situated in the peripheral part of the limb. (Cases 10 and 17, Table I.) In these the pain was atypical, being actuated more by physical than by emotional factors, and being intermittent rather than continuous. Similarly, in patients with brachial plexus lesions, considerable periods of freedom from pain are usual and the common precipitating factors do not always initiate a paroxysm.

Vascular injury—In the upper limb most cases were associated with lesions at the level of the anterior axillary fold and the upper third of the arm and they were associated not infrequently with major vascular damage. Arterial injury was proved at operation in eight cases; there was arterial injury requiring ligation in three cases; and venectomy was necessary in one case. In the lower limb, vascular damage was unusual. In only one patient was vascular deficiency, as determined by clinical estimation, of severe degree.

Bone injury and infection—Coincident infection and bone injury appeared to play little part in the syndrome. Three of the most severe cases had relatively superficial wounds which healed rapidly; patients with fractures showed no relief when the bones united; and patients with moderate sepsis did not improve when the infection became quiescent.

TREATMENT OF CAUSALGIA

Every case of severe causalgia calls urgently for treatment, not only to relieve pain and suffering but also to prevent crippling deformities, especially in the hand, which result from voluntary immobilisation for a long period. Weir Mitchell (1872) reported success after blistering. The injection of novocaine and alcohol has been used with doubtful results. Two patients in this series noticed relief after an attack of malaria. This prompted a trial of artificial pyrexia, which, however, was abandoned as worthless after using it in three cases.

Neurolysis—Resection, suture, and neurolysis have been reported upon favourably by Platt (1921). In this series neurolysis was performed on nine occasions. In every case slight relief was obtained for a short period. Unfortunately, however, the maximal period of relief was no more than three weeks. Leriche (1939) favoured peri-arterial sympathectomy and arterectomy. These operations were performed in this series on five occasions without permanent benefit.

Radiotherapy—Eleven patients were treated by radiotherapy. Interpretation of the results was difficult, largely because the treatment was experimental and because it was applied only in cases which were thought to be unsuitable for sympathectomy.

Technique—The technique used was that recommended by Mumford (1938). One hundred and fifty "r" units were given with a superficial therapy tube at 70 K.V. once weekly for four weeks. In a few patients this treatment was repeated after a short interval, and in two patients a single dose of 800 "r" units was also given directly to the site of the nerve lesion. It is of interest to note that when there was relief it occurred approximately at the time that an X-ray reaction would be expected—about three weeks after exposure.

Of the eleven patients so treated, four subsequently required sympathectomy. Of the other seven patients, six were convinced that improvement began two or three weeks after treatment and that it was progressive after that date. The improvement was both subjective

and objective. Pain was relieved and the general appearance of the hand was improved; it could be handled without severe lancinating pain. One patient was not improved and has since had a tractotomy.

Three patients who gained relief were suffering from traction lesions of the brachial plexus. This is a point of considerable importance since in this group of patients relief by sympathetic block is by no means the rule, and neurectomy, tractotomy, and radicotomy have not solved the problem (Leriche 1939).

Illustrative Case No. 8 (Tables I and II)—Three days before admission was accidentally shot through the right axilla. Immediate operation disclosed that the axillary vein was divided; it was ligatured. The artery was intact. The condition of the nerves was not determined. On admission, he complained of throbbing pain in the wound. There appeared to be a complete block of the median, ulnar, and musculospiral nerves. One week after injury he began to have aching pain down the ulnar side of the forearm extending into the palm of the hand. This was fairly constant but at times it disappeared for a few minutes. It was so severe as to prevent more than two or three hours sleep. The pain disappeared in the course of two or three weeks. Six weeks after injury sensation began to return to the median and musculospiral areas, with concomitant return of muscle power. No function was regained in the distribution of the ulnar nerve. At this time the patient began to complain of burning, searing pain in the part of the hand to which sensation had returned. This was very severe, and its depressing effect was apparent on the face of the patient which became haggard and careworn. The pain was aggravated by any attempt to move the hand or wrist, and by even the lightest touch over the median nerve. It was relieved when the patient avoided excitement and kept as quiet as possible. When asked about the cinema he reported that he had to close his eyes during "action scenes" in order to lessen the pain. There was slight hyperhydrosis of the hand in the area of distribution of the median nerve, and because of the fixed position the skin was macerated and did not present the appearance of "glossy fingers." There was oedema and limitation of movement at all joints. Radiographs showed evidence of Sudeck's atrophy.

At the third month after injury, there being no sign of improvement in pain, nor return of function to the ulnar nerve, the brachial plexus was explored by Mr Roland Barnes. The median nerve appeared normal and was involved only in the thinnest scar tissue. The ulnar nerve was found to be divided; it required suture. The axillary vein was represented by a fibrosed cord. The axillary artery appeared normal. Peri-arterial sympathectomy was performed by stripping the adventitia from the vessel over a distance of five centimetres. After operation pain was partly relieved for about one week. It then returned to its former intensity, still being felt only in the median area.

The sympathetic chain was blocked twice in the fifth month with good, but only temporary, relief. Block of the median nerve at the level of the wrist abolished all pain in the hand.

In the sixth month radiotherapy was given to the hand and about seven to ten days later he began to improve. In the next two weeks further improvement occurred so that, although not free from pain, he looked less careworn; the limb could be handled much more freely. Improvement thereafter was continuous though slow. There was much pain on attempting to move the stiff joints. After twelve months he was sufficiently recovered to be able to return to work as a shoemaker, but emotional excitement still caused some pain. When last seen at the twenty-fourth month, all muscles innervated by the ulnar nerve were contracting; there was only a vestige of pain; joint movement was still limited; radiographs showed recalcification of the porotic bones.

Sympathectomy—Sympathectomy was performed in eight patients—lumbar ganglionectomy in two, and stellate ganglionectomy in six. In the two patients with causalgia of the lower limb relief was complete after excision of the third and fourth lumbar ganglia. The stellate ganglion was excised by the anterior approach in six patients. Pain was completely relieved in five. One patient continued to complain of burning pain in the ring finger, but the rest of the hand was free of pain.

The advantages of the White and Smithwick operation are recognised, but stellate ganglionectomy is preferred. The objection to removing the ganglion in vascular disorders is in large part due to the late sensitisation of small vessels in the limb and to early regeneration of the sympathetic fibres. This objection does not hold in causalgia when the only desideratum is relief of pain. Horner's syndrome is not a serious disability and few patients complain of it. In an early case, the second and third dorsal ganglia were decentralised from

TABLE I—CLINICAL FEATURES OF TWENTY-FOUR CASES OF CAUSALGIA

Case No.	Nerves involved (See Note 1)	Site of injury	Time of onset of pain	Distribution	Main vessels	Temperature of hand or foot
1	Median Ulnar	Axilla	1 month	All fingers and thumb	Artery thrombosed	Colder
2	Median Ulnar*	Axilla	1 day	Median area of hand	Artery lacerated (ligated)	Colder
4	Median	Axilla	2 weeks	Hand (vague)	No injury	Warmer
5	Median Ulnar Radial	Upper third arm	1 day	Palm, fingers, and nails	No evidence of injury	Warmer
6	Median Ulnar Radial	Upper third arm	1 day	Tip of thumb, index and middle fingers, median area palm	No record	Warmer
8	Median, Ulnar Radial Int. cutaneous	Axilla	20 days	Palm, second, third, and fourth fingers	Artery intact, vein ligated	Warmer
10	Median Int. cutaneous	Elbow	$\frac{1}{2}$ hour	All fingers, hand, forearm	No injury	Equal
12	Median, Radial Musculo-cutaneous	Axilla	5 days	Outer three and a half fingers, hand, elbow	No record	Warmer
13	Median, Ulnar* Radial*	Axilla	7 weeks	Palm and fingers	Artery ruptured (ligated)	Warmer
14	Median Ulnar	Axilla	?	Median area of palm	Artery ruptured (sealed by clot)	Warmer
18	Median	Mid third arm	2 days	Middle and ring fingers, palm	Artery ruptured	Warmer
19	Median, Ulnar Radial	Ant. axillary fold	4 days	Centre of palm and metacarpals	Artery ruptured (ligated)	Normal or Warmer
21	Median Ulnar	Ant. axillary fold	1 day	All fingers and palm	Thrombosis of brachial artery	Variable
22	Median Ulnar*	Ant. axillary fold	7 days	Tips of fingers	No record	Variable
24	Median, Ulnar	Upper third arm	1 month	Palm and fingers	Rupture of artery?	Warmer
11	Brachial plexus*	Supraclavicular	3 weeks	Hand and fingers	No definite injury	Variable
16	Brachial plexus*	Supraclavicular	3 weeks	Hand and fingers	No definite injury	No record
20	Brachial plexus*	Supraclavicular	11 days	Hand and fingers	No definite injury	Variable
23	Brachial plexus (Upper cord)	Supraclavicular	24 hours	Hand (palmar surface)	No definite injury	Warmer
3	Int. popliteal Ext. popliteal*	Upper third thigh	3 days	Sole of foot (outer side)	No injury	Warmer
7	Ext. popliteal Int. popliteal	Mid third thigh	7 days	Sole of foot	No injury	Colder
9	Ext. popliteal Int. popliteal	Buttock	4 days	Toes and sole	No injury	Warmer
15	Ext. popliteal Int. popliteal	Buttock	25 days	Foot	No injury	Variable
17	Post. tibial*	Ankle	4-5 weeks	Sole	No obvious injury	No record

Note 1—Complete nerve lesions are marked thus *. All others were incomplete.

TABLE II—TREATMENT AND RESULTS IN TWENTY-FOUR CASES OF CAUSALGIA

Case No.	Novocaine block of sympathetic (see Note 1)	Result of treatment by			Follow-up	
		Neurolysis (see Note 2)	Radiotherapy	Sympathectomy	One year	Two years
1	Temporary relief (few hours)	Temporary relief (four days)	Gained relief after three weeks	—	Improved	Further improvement (working)
2	—	No immediate change	—	—	Slow improvement	Further improvement
4	—	No relief	—	Complete relief	Free of all pain	No pain
5	—	Treated by physiotherapy alone (improved)			Improved	Further improvement (drives a bus)
6	Relief duration of injection only	—	No relief	Complete relief	Free of all pain	No pain
8	—	Temporary relief (seven days)	Gained relief after three weeks	—	Improved	Steady improvement
10	Temporary relief (few hours)	Temporary relief (few days)	—	—	No permanent benefit	I.S.Q.
12	Relief duration of injection only	—	—	Complete relief	Hand aches when cold	Almost complete relief
13	Relief duration of injection only	—	—	Almost complete relief	Hand aches when cold	Relief almost complete
14	Relief duration of injection only	—	—	—	Hand aches when very hot or cold	I.S.Q.
18	Temporary relief	—	Improved	—	Free of pain	No pain
19	Temporary relief	—	Improved after three weeks	—	Much improved	Further improvement
21	Temporary relief	—	Not much relief	Immediate relief	No pain	No pain
22	Temporary relief	Temporary relief (three days)	Not much relief	Marked immediate relief	Pain in ring finger	I.S.Q.
24	Temporary relief	Temporary relief	—	—	No permanent benefit	
11	Relief duration of injection only	—	Improved	—	Still some pain	Still some pain
16	No relief	—	Not much change	—	Improved	Has had tractotomy
20	Temporary relief	—	Not much relief	—	Improved	I.S.Q.
23	No relief	Treated by physiotherapy (improved)			Much improved	Almost free of pain
3	Slight temporary relief	—	Not relieved	Complete relief	Free of pain	No pain
7	—	Treated by physiotherapy alone (slow improvement)			Pain less	Further improvement
9	Temporary relief (few hours)	—	—	Immediate relief	Foot tender on deep pressure	No pain
15	—	Treated by physiotherapy alone (relieved)			Free of pain	Free of pain
17	—	Alcohol injection at site of injuries (2 c.cs.)			Improved	Untraced

Note 1—Novocaine, 2 per cent. was used. In Cases 1, 3, 12 and 13 there were two injections; and in Case 19 three injections.

Note 2—Arterectomy was combined with neurolysis in Cases 1 and 2. Periarterial sympathectomy was combined with neurolysis in Cases 8, 10, and 24.

behind. After two or three days, pain reappeared in its original intensity. At subsequent operation the neck of the rib was exposed from in front. This necessitated positive pressure anaesthesia, because the pleura was adherent and friable. The stellate ganglion, and a small filament which joined the first root from below, were excised. After this operation the patient was relieved of all pain and has remained so for over three years. In a second patient, Horner's syndrome did not develop after operation, proving that the stellate ganglion or aberrant sympathetic fibres had not been excised completely. This man continues to complain of pain in his ring finger although the rest of the hand is now painless.

Experience of these two cases suggests that when complete sympathectomy is essential this is best achieved by the anterior approach with resection of the stellate and second ganglia and any adherent fibres which are visualised. If there is difficulty, positive pressure anaesthesia should be used with incision of the pleura.

Illustrative Case No. 13 (Tables I and II)—Admitted four months after receiving shell-wounds of the left shoulder and antecubital space, causing compound fracture of the humerus with apparent palsy of the ulnar and median nerves. One month later, after remanipulation of the left humerus, he noticed severe pain in the left hand. He described the pain as "terrific," but could not specify its quality. It was aggravated by smoking, by the noise of aeroplanes, by wireless, and by jarring his bed. He lay in bed with knees drawn up and complained of severe exacerbation when they were straightened. Stroking the feet, or other contact, made the pain almost unbearable. He was irritable, solitary, and always depressed. His manner was almost cringing. The pain was felt diffusely on the palmar aspect of the hand, including the anaesthetic ulnar area. It had progressed steadily since the injury. Analgesic drugs, even in large doses, failed to give relief. Morphine alone gave a few hours' sleep. Some relief could be gained by holding a cold wet cloth in the hand of the uninjured limb.

The arm and forearm were oedematous. Light touch increased the pain. The fingers and wrist were so stiff as to appear ankylosed. The skin on the dorsum of the hand and fingers was thin and shiny; on the palmar surface it was encrusted and macerated.

In so far as clinical examination was possible, it was evident that the patient had a complete ulnar and musculospiral palsy. There was diminished appreciation of light touch and pin-prick in the median area with paralysis of the thenar muscles, but there was still some contraction of the long finger flexors supplied by the median nerve.

At the fifth month stellate block with 2 per cent. procaine, gave almost complete though temporary relief of pain. The condition of the wounds made it necessary to defer operation until the seventh month. Stellate ganglionectomy was then performed. After this the patient had complete relief from his "terrific" pain; there remained only slight aching in the palm which the patient attributed to stiffness. The limb could then be handled without causing pain; other stimuli caused no ill-effect. He could smoke without pain and he was able to discard his damp rag. When in conversation he smiled and, in fact, he became a normal person. The fingers were, of course, still stiff, but it became possible to initiate treatment.

ANALYSIS OF THE RESULTS OF TREATMENT

Novocaine injection into ganglia—Twenty-three novocaine injections were performed in seventeen patients. Of these, eight were treated subsequently by sympathectomy and nine by radiotherapy. No permanent benefit from novocaine injection was observed.

Sympathectomy—After sympathectomy, seven patients were relieved of all pain at the end of one year; one complained of occasional pain in the ring finger. The marked improvement in these patients was maintained for two years after operation.

Radiotherapy—Radiotherapy alone was used in seven patients, three with brachial plexus lesions and four with median and other peripheral nerve lesions.

Brachial plexus—Two patients were almost free from pain after two years and suffered pain only on excitement or exposure to cold. One showed no definite improvement and has since been treated by tractotomy.

Median and other nerves—In all four patients there was steady improvement over two years. It is noteworthy that the quality of result was less satisfactory than that obtained after

sympathectomy. While these patients were able to carry on with their work (the only limiting factors being due to the physical defect caused by the nerve injury) they were still liable to mild recurrences of pain as the result of excitement, loud noises, or exposure to cold.

Other forms of treatment—The other nine patients included: one who had alcohol injection with incomplete relief; three who were treated by neurolysis with peri-arterial sympathectomy in two, and arterectomy in one, only one showing slow improvement over two years which did not appear to be related to the operation; and four mild cases who had simple physiotherapy including wax baths, galvanism, and massage. Physiotherapeutic treatment is not of course tolerated in severe cases. It is of value only for the correction of stiffness or contracture after pain has been relieved by specific treatment. These patients who had no specific therapy showed, with the passage of time, varying degrees of improvement. While not altogether free from pain, they are not incapacitated seriously.

SUMMARY

1. Twenty-four patients complaining of severe pain after nerve injuries have been considered from a diagnostic and therapeutic point of view.
2. The typical syndrome of causalgia develops only when the median or internal popliteal nerves are injured. It is doubtful whether pain associated with injury in the peripheral part of the limb, or of the brachial plexus, should be classed as causalgia.
3. The importance of novocaine block of the sympathetic ganglia as a diagnostic test is stressed, and its usefulness as a therapeutic measure is considered.
4. Sympathectomy is shown to be a reliable method of treatment in suitable cases.
5. The limited field of application of radiotherapy is also indicated.

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