

The Role of the Physiotherapist in the Treatment of Trauma

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THE purpose of this article is to present a brief reminder of some of the problems and facets of the conditions that the physiotherapist meets in treating common injuries. It presents no new or startling facts but only attempts to note some common situations in which the physiotherapist should be able to make a positive contribution to the scheme of treatment.

Consideration of the role of the physiotherapist in the treatment of Trauma to the C.N.S. has purposely been omitted as the results of such injuries present special problems which are too complex and numerous to be considered in this paper.

For the same reason details of technique of treatment and assessment have also been omitted, but an attempt has been made to assemble some of the essential principles that guide a physiotherapist in this most rewarding and important aspect of our work.

In the treatment of trauma to hard or soft tissue, physiotherapists can and should play a large part. In order to obtain the best results, it is imperative that he/she should have a clear picture and a full understanding not only of the extent and type of injury but also of the surgical side of the treatment. When in possession of these facts, if the best results are to be achieved, it is essential to have a reasonably clear idea of the type of work that the patient should be able to resume and an understanding of the temperament of the individual. In other words the whole patient and not only the injury must be treated. For those working in hospitals close contact and co-operation with surgeons, nursing staff, almoners and social workers is vital if this battery of information is to be complete. Let us be honest; time is often wasted in a Physiotherapy Department because there is no means of contacting the consultant in charge of the case or because contact with the patient in social and industrial life is limited. Once the habit of consultation has been established, I think everyone concerned will find that in the long run time will be saved.

GENERAL PRINCIPLES.

Certain fundamental principles govern the treatment of all injuries. In the early stages shock is bound to be present in some degree, its severity varying with the magnitude of the trauma and the nature and extent of surgical treatment. Time lag between the time of injury and time of receiving first aid and other necessary treatment, as well as the degree of physical or mental discomfort, will all have a bearing on the general condition. When shock is at all severe, time of treatment and demands on the patient's endurance, will be strictly limited to the bare essentials. Here one of the golden rules may well be remembered, *one movement only in each direction will prevent contracture and loss of elasticity without causing undue fatigue or local irritation, whereas repetitive movements can easily produce either or both the last two undesirable effects.*

Guiding Principles.

Reduction, fixation, and restoration of function are usually cited as the guiding principles upon which the treatment of trauma and particularly of fractures is based. Examination of the meaning of these principles shows that the ultimate aim is always restoration of function, but in order to achieve this adequate reduction and fixation are necessary. These two fundamental principles also apply in the treatment of any tissue where continuity has been lost; the detached

ends must first be approximated and then held in position until such time as adequate union has been effected by the natural repair processes. The physiotherapist is primarily concerned with restoration of function but when carrying out the more active side of the treatment he/she must appreciate and clearly understand the application and importance of the other factors.

Fixation.

Fixation must be respected and preserved, whether it be by external means such as plaster casts or by such internal means of screws, plates, or some form of suture. Every physiotherapist knows that to prevent movement at the site of fracture:—

- (1) The splint must immobilise the joints above and below the fracture site.
- (2) To effect this immobilisation the splint must extend for at least two-thirds of the length of the bones articulating proximally or distally with the joints to be immobilised.
- (3) Splints must not hamper movement of the joints not immobilised therefore the ends must be shaped to correspond with the natural joint lines.

Mutual understanding between surgeon and physiotherapist should be such that if an arm or leg plaster has not been accurately applied to conform to the natural curvature of the metacarpo- or metatarsophalangeal joints the physiotherapist should be in a position to make the necessary adjustments to enable the fingers and toes to move freely. Equally it is the physiotherapist's responsibility to note and report any defect in respect of 1 or 2.

When internal fixation is used it is often possible to move all the joints provided the surgeon is satisfied that the artificial union will remain secure until the natural union between the damaged structures is complete.

In all cases it is vital for the physiotherapist to appreciate the degree of stability of the artificial union, but here it is only the surgeon who performed the operation for reduction and applied the fixation who can give the full answer; on the other hand it is the physiotherapist's responsibility to understand how much strain, movements performed, either by the physiotherapist or the patient, will put on this relatively unstable structure. Knowledge of graded muscle effort and the effects of gravity and leverage on movements are as important in these treatments as in the re-education of paretic muscle. Our point of view on what may help can be put to the surgeon by a physiotherapist who is fully aware of the basic principles. If the argument is logical he will listen. Can we blame him for "not having time at the moment" if our discussions are verbose woolly, and unscientific? Also in reporting any increase in pain at the site of trauma or decrease in function the physiotherapist will often have located the cause, particularly if external support is proving insufficient.

Reduction.

The actual technique of reduction does not have so much bearing on the physiotherapist's work as the techniques of fixation but he/she should have sufficient knowledge of body mechanics to realise when perfect anatomical approximation is vital for the return of perfect function. Therefore some knowledge, of the basic rules regarding re-alignment of bone and other tissues, and the effects of shortened or lengthened

muscles and tendons, is obviously essential. The physiotherapist will then recognise any unavoidable mechanical limitations and will not strive unsuccessfully for a standard of function not compatible with existing conditions and consequently should be able to state when physiotherapy has achieved the best possible results.

AIMS OF PHYSIOTHERAPY.

Dispersal of Traumatic Exudate.

1. Bearing in mind the points discussed above, the first aim in the treatment of injury will be to promote the absorption of traumatic exudate. This exudate is high in fibrin-forming elements and if allowed to stagnate will organise to form fibrous tissue.

2. The resultant thickening and loss of elasticity of the tissues will of course inhibit mobility and ultimately the muscles will atrophy through lack of proper action. Whenever possible gravity is utilised to assist fluid drainage towards proximal lymph glands and active, or in the case of peripheral motor nerve damage, passive movements are always given to all free joints.

3. Unless a bone block or an insecure structure provides a mechanical reason for avoiding a particular part of the path of movement, these movements must be in full range.

4. Sometimes accessory gliding movements performed passively will help but massage is not much help at this stage as usually only bony areas such as fingers or toes are free distally; proximally free areas such as thigh or upper arm are treated more efficiently by movement of adjacent free joints.

5. Contraction and relaxation of muscles working over the immobilised joints will cause movement of the tissue fluids. In teaching this isometric muscle work or "static contractions" our knowledge of group action of muscles should be utilised, particularly when muscles work as synergic fixators. A purposeful, strong movement against resistance will produce a fuller contraction of muscles working over fixed joints than will result if local isolated contractions are attempted.

6. Breathing exercises are sometimes helpful since by the suction action of the thorax lymphatic and venous return is promoted.

7. The local application of heat, in the form of infra-red or shortwave diathermy, may also assist by changing a static congestive state to one of active hyperaemia which will increase the movement of the tissue fluids. In the past shortwave therapy through the area of a fracture site has not been advised as it was thought the heat might produce excessive hyperaemia and prolong the decalcification of adjacent bone ends, leading to delayed union. However, further investigations are needed into the local effects of shortwave therapy before this statement can be ratified.

8. If constant current is used to help to decrease congestion by its counter-irritant or its depleting effect as much skin as possible should be covered. When aiming at an anaphoretic effect the best results are achieved if a low current density is applied for at least half an hour or if possible for three quarters of an hour or even one hour.

Relaxation.

Muscle spasm is nature's attempt to immobilise the injured parts and by this spasm circulatory stasis is increased since the normal pumping action of the muscles is temporarily cut out. Attempted movement causes pain and further spasm and a vicious circle is set up. If the damaged parts are adequately immobilised local spasm should be eliminated—but very often fear creates a habit of general tension. The physiotherapist can help break this habit by giving positive instruction in relaxation.

Maintenance of Muscle Power and Co-ordinated Movement.

Period of Immobilisation.

During the period of immobilisation, habitual motions will maintain the natural group action of muscles. Therefore at this stage the physiotherapist can often contribute some-

thing, particularly at the beginning, by giving the patient confidence and simple training in purposeful movement specially designed to suit his or her occupation.

Movement Pattern.

Proprioceptive stimuli are an integral part of co-ordinated movement and it is upon these stimuli that the memory of a movement pattern is based. This being so, purposeful actions, particularly those involving the use of all afferent stimuli (sense of touch as well as kinesthetic sensation), will maintain function more efficiently than the more stereotyped movements often given in group treatments. If it is impossible for the patient to continue his or her normal work or even to follow some special occupation during the period of immobilisation a planned day's work should be organised in which both occupational therapist and physiotherapist combined; group exercises undoubtedly have a place here but they should only be a part of the full programme.

Restoration of Normal Function when Fixation is no Longer Required.

When the first step in the process has been achieved by reduction and fixation, and nature has effected some degree of repair, fixation may be discarded.

Time Factor.

Now it must be remembered that bone is not fully consolidated until at least three months after fracture and that fibrous tissue is not completely firm until about two months after injury. However, in the upper limb where stress and strain on healing tissues can be easily controlled, fixation is often not used for the full period necessary to allow for complete repair. Generally speaking the fixation period is in direct proportion to the weight that that particular tissue has to bear. For instance a finger bone or tendon may be left unprotected much sooner than the weight bearing bones of the lower limb such as the tibia or femur, or the tendon that must sometimes take the strain of the whole body weight i.e. the Tendo Achillis. These structures must be protected for the full period of time to allow perfect union to occur, or alternatively the patient's activities as regards weight-bearing must be curtailed. It is obvious however that, given average intelligence, the use of the upper limb for light activities may be allowed before the full strain of heavy lifting or prolonged effort could safely be sustained. This stage in the restoration of function can therefore be considered under two main headings:—

(1) Those cases in which the union is mechanically sound for all purposes and treatment is designed—

- (a) to mobilise joints that have had to be immobilised in order to obtain repair of damaged tissue; and
- (b) to strengthen muscles that have been unable to perform their normal work.

In this group the physiotherapist may once more play a major part in designing movements to overcome stiffness and in directing graduated muscle work against resistance to build up muscle power. Quite often at this stage an occupation, that could not be carried out in a plaster, has to be temporarily abandoned until muscle power is back to normal. But this period should be short and it is for the physiotherapist to assess the patient's muscle power and endurance in relation to that required for normal work. Methods of building up power and endurance by graduated weight-lifting should be used—but ability to maintain a specified activity for a specified time is more easily tested in an occupational therapy department.

2. Those case in which the union is not fully consolidated and where treatment must be carefully graded so that the strains imposed by exercise are not more than the healing site of injury can sustain. In this group, which usually consists of upper limb injuries, fixation may be removed for treatment before full consolidation has occurred and individual treatment is usually necessary before general class work is advisable. Soft tissue lesions such as divided tendons and some upper limb fractures, particularly of the humerus,

are in this group. Here it is vital to restore range of movement as soon as possible and this can be achieved by skilful manual assistance on the part of the physiotherapist. In this type of case the degree of stability of union must be very carefully observed. Free group work can be included in the treatment as soon as the union is strong enough to withstand the force of gravity, but resisted exercises against weights or springs must not be used until consolidation is complete. Gradual rehabilitation for full function must progress but must keep in step with the process of consolidation, and again purposeful activities and planned occupations, leading to return to full work, are an essential part of the treatment.

INJURIES NOT REQUIRING REDUCTION AND FIXATION.

So far only the type of injury has been considered where the whole routine of treatment of reduction and fixation for full restoration of function is necessary. There is, however, another group where division of structures is incomplete such as in partial tears of ligaments, or in impacted fractures where the bone ends are driven together in such a position that reduction of deformity is not necessary for ultimate restoration of function. In both cases there is some degree of continuity of the damaged structure so that absolute fixation to ensure union is not essential, but some protection against excessive strain on the unstable structure or some means of resting the traumatised and inflamed tissues will usually be necessary.

1. Partial Tears of Soft Tissue.

When only part of the muscle or ligament is torn the sound parts adjacent to the tear will act as a splint and the continuity of the main structure is virtually intact. Joints over which these tissues pass need not be immobilised but frequently movement must be limited to prevent overstretching and further tearing and separation of the damaged tissue.

In order to restrict movement a non-elastic strapping is best, but to control effusion elastic strapping or wool and bandage may be used. Muscle contraction and movement within the safe limits must start at once; it is obvious that full knowledge of the mechanical result of the movement is necessary if these movements are to be fully effective without causing further trauma.

2. Impacted Fractures in which Disimpaction and Reduction are unnecessary.

In general when there is impaction of bone ends it must be borne in mind that the joint adjacent to the impacted fracture site is more or less severely contused. Rest for the joint will therefore be necessary and this may be supplied by resting the upper limb in a sling or by a period of no weight-bearing for the lower limb. The main aims of treatment will then be as for a traumatic synovitis and at first non-irritating movements will be given once only in each direction. The site of impaction is usually firmer in the first week following injury than it is between ten days and three weeks later. This is because the bone spicules engage one another until such time as the natural process of bone repair has resulted in some absorption of these fragments, the callus still being relatively soft. If the soft tissues have been kept supple and adhesion formation has been prevented by early treatment the joint will be moving freely before this dangerous period. If this argument is followed to its logical conclusion movement is safer, from a mechanical point of view, immediately after the injury than it is ten days to three weeks later. Further, if movement is delayed and contraction and binding together of soft tissues has occurred, movement started, about three weeks after injury is likely to put much more strain on the now instable fracture site. Therefore, throughout, at whatever time treatment is started, the physiotherapist must understand both the mechanical condition and the physiological state of the damaged area and must grade and adapt movements so that no harm is done but function is maintained and restored as soon as possible.

PERIPHERAL NERVE LESIONS.

In this group the clinical condition is frequently a complex one in which a nerve lesion is added to a fracture or other

soft tissue injury. Motor and sensory disturbance may both be present and the local treatment will naturally have to be adapted to suit each case.

The three main groups of Peripheral Nerve Lesions are:—

- (1) Neurapraxia, in which contusion of surrounding tissue has resulted in lack of physiological conductivity while the anatomical continuity of the axon is intact.
- (2) Axonotmesis, in which the sheath is intact but the continuity of the axon is interrupted.
- (3) Neurotmesis, in which both sheath and axon are divided.

In the 3rd group surgical intervention will be necessary to restore the continuity of the sheath and therefore the rules relating the amount of super-imposed stress to the stability of the site of injury must be observed.

Principles of Treatment of Peripheral Nerve Lesions.

In all Peripheral Nerve Lesions provided the condition of other tissues does not inhibit the full treatment the following principles should always be borne in mind:—

- (a) All treatments must aim at keeping the limb in as good a physiological state as possible and, by making use of proprioceptive stimuli, the memory of movement patterns must be maintained.
- (b) The affected muscles must be exercised artificially each day for as long as possible.
- (c) All joints controlled by these muscles must be put through a full range of passive movement at least once each day.
- (d) As far as possible the function of the rest of the limb must be maintained by normal activity.
- (e) As soon as voluntary power returns graded re-education must be practised regularly.

Electrical Treatment.

To effect (b) some form of interrupted current is used, the shape and duration of the pulse, the frequency of repetition and the length of the rest period being modified to suit each individual case. In treating neurapraxia the axon below the lesion may be stimulated directly and therefore a current of short-duration pulses, frequently repeated (i.e. a tetanising current), modified to obtain rhythmical contraction and relaxation of the muscles, is usually effective. But in cases where the continuity of the axon is interrupted as in (b) and (c) longer-duration single pulses, less frequently repeated, will be required to stimulate the less excitable muscle tissue.

In all groups regular voluntary and electrical tests should be carried out and the current for subsequent treatments modified to ensure the best contraction of the muscles still not under voluntary control. For example if the electrical tests show P.R.D. a current to stimulate the denervated section of the muscle should be used and voluntary re-education should be practised to restore control of the re-innervated parts.

Passive Movements.

When giving passive movements the patient must be encouraged to concentrate on the movement and should try to perform the action with the physiotherapist so keeping alive the picture of that particular movement pattern.

Splintage.

Nowadays splintage for Peripheral Nerve Lesions is usually reduced to a minimum but all too often a clumsy heavy splint is retained for too long, by limiting movements that the patient should be able to perform, defeats its own end and results in impairment rather than improvement of function. The physiotherapist should have sufficient knowledge of the essential physiological principles involved and be in a position to consult with the surgeon in charge of the case and should be allowed the responsibility of making any necessary minor adjustments.

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General

Post-graduate work in U.S.A.

The American Physical Therapy Association has published a revised plan for providing for foreign trained physical therapists in gaining membership with the American Physical Therapy Association.

Professional affiliation is offered to qualified colleagues from member-countries of the World Confederation for Physical Therapy who want to come to the United States on an immigration visé. Details of requirements for obtaining membership with the American Physical Therapy Association by foreign trained physical therapists along with copies of the personal data forms which each candidate is requested to complete and have certified by their respective organisations may be obtained from—

The General Secretary, S.A.S.P.,
P.O. Box 11151,
Johannesburg.

In addition, the American Physical Therapy Association assists in planning for a post-graduate learning experience for physical therapists who wish to come to the U.S.A. for a limited time only. These therapists would be expected to enter on an exchange visitor visé and would not be considered as potential members of the American Physical Therapy Association. Also, these physical therapists will not be expected to meet licensure or registration requirements, as is required for the individual who enters on an immigration visé.

The American Physical Therapy Association wish to work with other physical therapists' societies in planning for movement of members from one country to another, either to live permanently or to gain additional experience on an observation or traineeship basis.

RESIGNATIONS from the Central Executive Committee

Mrs. Carol Cunningham (nee Baker) and Miss van Druten have tendered their resignation from the C.E.C. during the past month. It is with regret that the Committee says good-bye to these two members both of whom have given the Society invaluable support. Mrs. Cunningham leaves for "domestic reasons" and Miss van Druten to take up an appointment in Durban. Good luck to both and thank you!

In their stead Mrs. H. M. Kruger from the General Hospital, Johannesburg and Miss Bodoano from the Physiotherapy School, Pretoria, were elected.

BADGES AND FLASHES.

The Metal flashes obtainable through your Branch Secretaries are the official shoulder flashes to be worn by members of the South African Society of Physiotherapists.

Those members who care to do so can have a blue and silver badge made similar to that on the cover of the Journal, for wearing on a blazer. Any reputable Outfitter supplying blazers to clubs or schools would be prepared to do this.

ADDRESSES WANTED.

Miss I. M. A. Masters.
Miss Margaret Hynd.
Mrs. H. Kemp (nee Moira Odgers).

CHANGES OF ADDRESS

Mrs. C. Schmidt (nee Paton), 16, Queens Street, Irene, Transvaal.
Miss Nedda Bruschi, 30, Nigel Road, Selection Park, Springs.
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Mrs. Wiggill, Golden Dawn, Private Bag Thorn Park, East London.
Mrs. K. Preston, 2a, Devon Road, Vincent, East London.
Mrs. R. M. Jobson, P.O. Box 3044, Johannesburg.
Miss V. Snowden, 20, Milner Road, Nigel, Transvaal.
Miss J. M. Grace, C/o P.O. Box 102, Crown Mines, Johannesburg.
Mrs. H. B. Hope, 44b, Garden Road, Orchards, Johannesburg.
Mrs. L. J. R. Pretorius, 10, Chemay Court, Pretorius Street, Pretoria.
Mr. R. Parker, 4, Merlin Court, Prince George Avenue, Brakpan, Transvaal.
Mrs. H. Waldman, C/o Doctors' Residence, Esselen Street, Johannesburg.
Miss M. F. Humphrey, P.O. Box 3747, Johannesburg.

NEW MEMBERS

Mrs. B. L. Dove, 43 Wilds Ridge, Corner Mitchell Street and Tudhope Avenue, Berea, Johannesburg.—S. Transvaal Branch.
Mr. C. B. Stroka, 101 Westcliff Drive, Parkview, Johannesburg. S. Transvaal Branch.
Miss A. M. Bodoana, Physiotherapy School, P.O. Box 437, Pretoria. N. Transvaal Branch.
Miss A. J. Savin, Physiotherapy School, P.O. Box 437, Pretoria, N. Transvaal Branch.
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Mrs. A. L. L. Harrower, Jennings Arcade, Victoria Street, Estcourt, Natal. Natal Midlands Branch.

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Conclusion.

Rehabilitation of Patient.

In conclusion no treatment for post traumatic conditions is complete until the patient has been tested as to his ability to practise his own particular job. Therefore, in treating all types of cases, re-education must be adapted and functional activities devised with this end in view. Whenever possible the patient should be encouraged to work while treatment is still necessary. Throughout treatment, particularly at the stage when the patient's ability to return to work must be assessed, the physiotherapist should work in close co-operation with the occupational therapist. If the effects of injury are such that the individual is unable to return to his former work, the physiotherapist may be called upon to contribute to the assessment upon which this decision will be based; he/she may also be required to institute a course of treatment that will assist in such a patient's resettlement.

Generalisations are dangerous but it may safely be said that physiotherapy is an essential link in the chain of treatment which bridges the gap between the injured human being and the contented member of the community.

Acknowledgements.

I wish to thank Professor A. W. Sloan, Professor of the Department of Physiology and Pharmacology, University of Cape Town, Dr. A. Reichlin, Consultant in Physical Medicine, Groote Schuur Hospital, Cape Town, and the Staff of the Department of Physiotherapy, Groote Schuur Hospital, Cape Town, for reading the drafts and for their many helpful suggestions.