

SPECIAL ARTICLE

PHYSIOTHERAPY IN THE TREATMENT OF THE SURGICAL PATIENT *

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It is disappointing, to say the least, when skilled and successful surgery is wasted by avoidable events arising after the operation has taken place. Even in the most straightforward surgery with the fittest patient, complications may arise from sources which are common to all operations. From her knowledge of these complications : thrombosis, thrombophlebitis, phlebothrombosis; chest complications; muscle atrophy, muscle imbalance; unhealed wounds and incisional hernia, the physical therapist has a part to play in hastening a successful recovery.

Thrombosis

Though it is more usual for thrombosis to occur following an operation of the pelvic cavity, it may arise after any surgical interference, generally between the third and twenty - first postoperative day. There are two distinct types of thrombosis :

1. thrombophlebitis in which a vein, often the long saphenous, becomes inflamed, causing clotting within,
2. phlebothrombosis, the more serious type, is symptomless. The first evidence that it has occurred may be pulmonary embolism.

The cause of thrombophlebitis is probably damage to the wall of the vein. Sometimes, at the point of insertion of the intravenous drip, the vein is irritated, becomes inflamed and the blood rapidly clots. This clot adheres to the vein wall and gradually as it becomes larger, occludes the vein. Embolism is possible but unlikely. The inflammation may, however, spread to the surrounding tissue causing cellulitis.

The signs and symptoms of cellulitis are redness in the region of the vein, extreme sensitivity to touch in the area, and considerable edema. There may also be a rise in general temperature, caused often by absorption of toxic products produced by the disintegration of the

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clotted blood. If the irritant is removed, the inflammation gradually resolves and in many cases phagocytic action absorbs the clot and the vein again becomes patent.

Sometimes, however, the clotted blood becomes organized by the inclusion of fibroblasts and capillary loops from the vessel wall and the vein becomes changed into a fibrous cord; adequate venous drainage being maintained by the extensive venous collateral circulation. Thus the presence of thrombophlebitis is not dangerous to life though it may be very uncomfortable for the patient. Should the cause be an intravenous drip it can be removed and only inserted elsewhere if absolutely necessary. The treatment will then be directed toward aiding the resolution of the cellulitis and in relieving discomfort.

In this case the objects of physiotherapy are achieved mainly by the application of heat to the area of cellulitis. With the most effective agents, shortwave diathermy and inductothermy, the inflammation rapidly subsides and pain and tenderness disappear. Usually no other treatment is necessary.

There are a number of theories and possible explanations about phlebothrombosis, the cause of which is not fully understood. It is known that following an operation, the number and the cohesiveness of blood platelets increases and it has been found that the quantity of fibrinogen in the blood rises. It follows that the greater the handling of the tissues and the longer the operation, the more likelihood there is of thrombosis.

The altered speed of the blood flow is another important factor. When the circulation slows there is a greater tendency of the blood platelets to fall out of the main stream and adhere to the vessel walls. The slowing may be brought about by natural circumstances; a hitherto active person confined to bed and, following an operation, being too tense and too frightened to move freely. Or when the operation involves the thorax or abdomen the diaphragmatic excursion may be less with a consequent diminution of venous return.

Another theory is that very minor injury may cause trauma to vein walls. For example, during anesthesia, pressure on the deep veins of the calves may result in sufficient damage to allow the blood platelets to be deposited. Since phlebothrombosis is noninflammatory, symptoms are unlikely to be present and a careful watch must be kept for certain signs: tenderness on deep palpation at the site, fulness of the veins, positive Homan's sign, slight masking of the extensor tendons on the dorsum of the foot, slight edema.

In a review of the process of clotting we can see the real danger of pulmonary embolism latent in phlebothrombosis. For a variety of reasons, as we have seen, blood platelets are deposited on the vein wall. They liberate thromboplastin and fibrin is formed. The fibrin contracts and serum is squeezed out. This serum is rich in thromboplastin and as a result more platelets are deposited on the previously deposited group. The same process continues repeatedly until gradually a long, wavy tail extends back into the blood stream. The thrombus is attached to the vessel wall only at the point of original formation and parts of it are easily broken off. These fragments travel in the blood stream to the heart and pass into the pulmonary circulation. If small, the clot may block one of the two vessels and one lung may fail to receive blood. A young, fit patient may survive, and lead a tolerably active life with one lung, but when the clot fragment is big enough to lodge at the bifurcation of the pulmonary artery, it may roll up into a ball and obstruct all blood entry into the lungs. The patient will then die within a matter of seconds. The embolus may, of course, be only a small one, blocking a small bronchial branch. When this occurs the patient has a sudden severe pain in the chest, spits blood and is left with a small infarct which will gradually be converted into scar tissue.

The physical therapist's preoperative and postoperative technique is directed toward avoiding the above conditions. She will have seen the patient before the operation, instructed him in breathing, shown him leg exercises and assured him that even after the operation it is not only permissible but advisable to move about the bed freely. She has also told the patient that even before he is completely "round" from the anesthesia the therapist will come to see him and practice what she has previously shown the patient: breathing, coughing, foot and leg exercises, and general relaxation. Prepared and reassured the patient faces the operation with greater peace of mind and cooperates more fully when convalescent.

The physical therapist will watch carefully after the operation for any signs or symptoms of thrombosis or embolism which she would report instantly, since every minute matters. Instruction will have been given on how to avoid strain on the incision and should the surgeon wish leg movements delayed because of disturbance of low pelvic sutures, specialized massage of the legs may be given instead.

In case the thrombosis has already developed, active physiotherapy to the affected leg will be discontinued for one to three weeks

but breathing exercises and active work of the other leg will go on to lessen the danger of recurrence.

As soon as the surgeon or doctor in charge of the case permits, the patient is got out of bed by a special routine which the physical therapist has learned.

Chest Complications

The two main complications of the chest are bronchitis and postoperative lung collapse which may lead to bronchopneumonia, bronchiectasis or lung abscess. The predisposing factors in these complications are increased formation of secretions and decreased ability to eliminate them. Normally this elimination process is carried out by the action of the cilia and by the cough reflex. However, since the anesthetic inhibits their movement and the cough reflex is depressed by postoperative analgesics, physiotherapeutic help has to be given.

Often coughing may be repressed for fear of pain, especially if the patient is not in the sitting up position. If secretions therefore collect, they may form a plug which can block one of the bronchi or bronchioles obstructing air entry to or exit from the lobules distal to the obstruction. The air is then gradually absorbed from the alveoli and the area collapses. One of two things may then happen; either the mucus plug becomes infected and inflammation spreads to the walls of the tube, setting up bronchopneumonia, or the bronchioles just proximal to the block may dilate and a bronchiectasis result.

In the first twenty - four hours after operation, following the inevitable drop in vital capacity, the diaphragmatic movement may be only twenty per cent instead of the normal sixty per cent. This will result in the lungs, particularly the bases, being inadequately ventilated and the circulation slowed, with consequent congestion.

Collapse of part of a lung usually occurs in twenty - four to forty - eight hours after the operation and will be suspected if there is a sudden rise in temperature, in pulse and in respiratory rates, if there is dyspnea, diminished movement of the chest wall and sometimes cyanosis.

If pneumonia develops it will be a little later, perhaps four to five days, with a high temperature and a productive cough.

Physical Therapy

Our treatment, like that for thrombosis is mainly preventative, although naturally, if complications have already arisen, attention will be directed towards their cure. If the main cause of chest complications is lowered vital capacity and accumulated secretions through decreased coughing and diminished respiratory movements, the purpose of physical therapy is to raise vital capacity, stimulate coughing and encourage full use of the lungs. If elimination of mucus is difficult, assistance in its removal is given so that bronchoscopy will not be necessary.

Good breathing in all parts of the lungs is therefore taught before the operation. Emphasis is put on gaining good expiration and on the ability to perform diaphragmatic and lower costal breathing at will. The patient is also taught how to expel mucus with the most effective cough and the least strain and pain. Should the accumulated mucus, however, be more than the patient can cough away, mechanical assistance is given by the physical therapist. This consists of percussion on the sides and back of the chest to loosen mucus, and postural drainage, done by "tipping" the patient into certain elevations so that he will be assisted by gravity as well as his recently learned effective coughing. This also helps to relieve the flatulence which causes abdominal distension, a further restriction to breathing.

The patient's cooperation is enlisted to ensure that the good breathing is continued with such frequency throughout the day that it becomes the breathing habit.

Hemorrhage

Knowing that hemorrhage is most likely to occur when surgery has been necessary in a very vascular area such as, for example, the thyroid gland, the physiotherapist must watch for staining of the bandage or other evidence of bleeding. Should this occur, she will apply first aid measures until further help is obtained. All physical treatment would be stopped.

Where sepsis is present and there is a possibility of internal bleeding, the patient should be observed constantly for changes in skin and mucous membrane color, respiration (fast and often of a sighing type) and pulse rate. The physical therapist will also note when the patient is restless, feels thirsty or complains of faintness or giddiness. She will report any of these symptoms at once and later, when treatment is resumed, vigorous exercise would be avoided.

Muscle Atrophy and Muscle Imbalance

A patient's muscles are seldom in prime condition at the time of surgery. And often, if they were, they may be affected by some part of the surgical procedure. Inevitably there is a lessening of activity in the blood vessels, the venous return is lessened, the cardiac return is correspondingly reduced, and the normally freely circulating, oxygenated blood is available in smaller quantities for all the muscles. Because of these factors, their metabolism is reduced, their power and bulk decreased. Though the muscles or group of muscles has sometimes to be cut (as in thoracoplasty) deliberately, if the scar is kept supple, and the suture has been adequate, power will remain at about the former level.

Damage to the nerve supply during or after the operation is, however, another story. If relaxant drugs (such as curare) are used during the operation there is often a complete absence of tone in the muscles which then fail to protect the nerves. Or if a position is required in which there is pressure on the nerve (a tourniquet might have the same effect) then paresis may result. This neurological trauma means atrophy with diminished or absent tone and reduced or lost power according to the extent of the lesion.

Alternatively, there may be inhibition of muscle action through fear or reflex action as, for example, in operations on the spinal cord or on joints where damage of the capsule has stimulated the nerve endings resulting in reflex inhibition of movement.

Physical Therapy

The physical therapist is in this case confronted with atrophy and atonia of muscle, not only locally but generally as well. A muscle imbalance, especially in trunk muscles will produce a unilateral inequality which could lead to gross deformity. Since the muscles are the first line of defence of the joints and their inadequacy may lead to continuous minor traumata being inflicted on the joint, great and skilled care must go to the rehabilitation of the postoperative patient.

A scheme of exercises is devised for each individual beginning while still in bed, whereby the muscle groups are exercised as often, as vigorously and in as wide a range as possible with planned progression as strength builds up. Sometimes, when movement of joints is inadvisable, the physical therapist will keep up the tone of a

muscle by teaching the patient static contractions, that is, to innervate the muscle as much as possible so that it contracts without bringing about a movement of the joint. If static work is insufficient, the muscles may be toned up by the use of the faradic current, but this is only until active work can be undertaken. When the patient is allowed up, correction of postural fault or faults is taught. It might even mean reeducation of the whole postural or muscle concept for the patient and the establishment of a new habit pattern.

Unhealed Wounds and Incisional Hernia

Should a wound become infected, healing will be slow and "bursting" of the wound is possible. This infection may have been caused by bacilli from throat, nose or hands of the dresser since it is rare today for wounds to become infected in the theater.

When the area is already infected, as in empyema or a gangrenous appendix, a drainage tube is necessary which, while ensuring healing from the base of the wound upwards, acts as a further irritant, with resultant slow and difficult healing granulation and scarring. The tube is therefore removed as soon as possible.

Should scarring occur in the musculature of the walls of the abdominal or pelvic cavities there is always the possibility of a protrusion of the contents through the weakened area (incisional hernia).

Physical Therapy

Since quick healing without infection is highly desirable after operation, the physiotherapist will observe strict asepsis in dealing with wounds. She will modify the active exercises undertaken by the patient so that undue strain does not fall upon the healing incision. She will permit a certain amount of exercise since this stimulates healing. When a clean wound has become infected, she can apply infra-red or radiant heat if superficial, but if the infection is deep-seated, short-wave therapy may be used after the sutures have been cut and the wound allowed to gape so that free drainage may be established. Treatment would be given twice daily. Ultra-violet ray is also frequently of great benefit.

In the case of road accidents or in cases in which infected wounds are already present, even on limbs encased in plaster, the

physical therapist will give exercises to the affected limb to promote healing by stimulating the circulation locally.

Physiotherapy, however, would be contra-indicated in the presence of keloid formation, since it might stimulate the production of scar tissue. As soon as the wound is firmly healed and before contracture of the scar, massage, to stretch and loosen any hampering adherence to underlying tissues, will be begun.

For particularly hard scars ionization with iodine or chlorine ions may be used or, on suitable areas, paraffin wax treatment may be given.

Conclusion

This article is intended only as an outline of more or less routine physiotherapy and is not inclusive of such specialized work as that following, for example, orthopedic or brain surgery.

As Professor F. A. R. Stammers said in his forward to Joan Cash's book *Physiotherapy in Some Surgical Conditions* :

With the rapid advances that have taken place during the past ten years in anaesthesia, blood transfusion services, chemotherapy, including antibiotics, together with a better understanding of the response of the body to trauma, all surgical procedures have been rendered freer from danger or complication. At the same time, enormous progress has been made by the newer specialities of neuro-surgery, plastic surgery and thoracic surgery, the latter more recently embracing some common lesions of the heart. Therapeutically therefore, surgery has more to offer to-day than ever before, and physiotherapy has contributed greatly to these exciting developments. It has evolved special pre- and post-operative treatments and exercises, not only for these new procedures but also for the more orthodox type of operation, and in these latter has minimised the risks of post-operative chest complications and venous thrombosis.

I wish to acknowledge my indebtedness to my tutorials with Miss Joan Cash for much of the above material and to her book, *Physiotherapy in Some Surgical Conditions*.