

The Role of the Physiotherapist in Cardiac Surgery¹

Sheila Glendining, NZRP²

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The physiotherapist has a well-established place in the cardiac surgery team. The function performed is one of several equally important functions that need to be carried out post-operatively, and is neither more nor less necessary than any of the others. The emphasis in this type of unit is on team-work, with each member of the team knowing his own job and carrying it out, at the same time having a grasp of the whole situation and deciding for that moment in the patient's progress which is the most important thing to be done.

The role of the physiotherapist probably varies from hospital to hospital and from country to country, so my descriptions are of the part played by physiotherapists in the Cardiothoracic Surgical Team at Green Lane Hospital, Auckland.

This treatment has developed and changed gradually over the last 25 years. It was started in 1945 by Miss Hodson, to whom we owe a large debt for her work in pioneering post-operative cardiothoracic physiotherapy in New Zealand. Surgery has improved and encompassed new fields and we have gradually absorbed new ideas and adapted our work to suit new operations. Over the years we have had a great number of overseas senior cardiac surgeons working with the unit and have acquired ideas from many of them. We hope also that we have sent them home with some of our ideas.

However, the basic aims of the physiotherapist in cardiac surgery are still the same – to prevent pulmonary complications, such as retention of secretions, atelectasis and pneumonia, to try to prevent deep vein thrombosis, and to keep full mobility of all joints.

The methods used are the same as those used for any thoracotomy – differing in intensity with the type and severity of the operation and the state of the patient's health. These methods will not be described in detail as they are part of the basic training of a physiotherapist, but an attempt will be made to give the overall treatment of the post-operative cardiac patient.

Each patient's condition varies tremendously, from those who come into hospital for division of patent ductus arteriosus, closure of atrial septal defect or resection of co-arcuation of the aorta with practically no symptom and no heart failure, through varying degrees of those who have valve defects with moderate symptoms, to those with two or three heart valves involved, who are operated on in an advanced stage of heart failure in a last desperate measure to save their lives.

THE SIMPLER OPERATIONS

The simpler operations are given the same straightforward treatment as for any thoracotomy, with treatment continued until the patient is up and about with lung fields quite clear and lungs fully expanded, having also regained full joint mobility.

These patients are rarely very ill and their physiotherapy treatment may if necessary be quite vigorous. If, for instance, the patient has a chronic chest condition with a fair amount of secretion, any suspicion of retention of sputum, or atelectasis, postural drainage may usually be attempted quite vigorously, but I am very much against a really vigorous treatment being put into operation routinely – I feel that good physiotherapy means doing enough to keep the patient's chest clear and the lungs fully expanded, but not so much as to cause unnecessary pain. This can only be achieved by close co-operation with the medical staff and by keeping a close watch on X-rays which are taken regularly in the post-operative period.

Pain is the reason that these patients need us at all; if it were not for the pain of the incisions and the intercostal drainage tubes, they would be able to breathe normally and deeply and would not be in danger of chest complications caused by retention of secretions. If we institute unnecessarily vigorous treatment we increase the amount of pain, and therefore make deep breathing and coughing even more difficult, thus creating a vicious circle.

To get the most co-operation from our patients we should have them as comfortable as possible when we come to treat them, by making sure that they have had their prescribed pain-relief shortly before treatment. The nursing staff are always quite ready to co-operate in this. If a patient is free from pain, he will be able to breathe and cough much more effectively, and I think that in the first few days post-operative, pain relief injections should be routinely given, and not only if the patient requires them. Some patients will be very brave and say they would rather not have these injections, as they discover that if they sit still and do not breathe too deeply it does not hurt as much. This, of course, is the worst thing they could do. After all, two or three days of pethidine injections do not make an addict!

After these simple cardiac operations, the patients start to get out of bed in two or three days, and then progress very quickly to walking about and spending a longer time up each day. The stitches are removed on the 10th day, and in an uncomplicated case the patient will probably go home in about two weeks. Therefore his physiotherapy treatment progresses rapidly also, and with this early movement and early ambulation we have few problems of bad posture or muscle weakness.

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² Charge Physiotherapist, Green Lane Hospital

HEART-LUNG BY-PASS

The majority of cardiac surgery these days is done on heart-lung by-pass and this means a much bigger operation for the patient. However, six of these operations are done each week at Green Lane so even this has become a routine procedure, and in a straightforward, uncomplicated case the progress can be as rapid as in an ordinary thoracotomy.

In heart-lung by-pass, as well as having a thoracic incision – either a lateral thoracotomy scar or a sterna split – there is an abdominal wound where the blood is returned to the iliac artery and a groin wound where cannulae are inserted to record the arterial pressures inside the femoral artery.

We do not start to treat the patient until the day after surgery. This is because the patient has only just stopped bleeding when he returns to the wards, and I believe that any extra exertion or movement can cause extra oozing or start the bleeding again, thus causing extra fluid to collect in the pleural cavity and mediastinum. The lungs have been sucked clear by the anaesthetist before the endotracheal tube is removed at the end of the operation, so there should be no immediate worry about sputum or secretions inside the lungs.

When one does see these heart-lung by-pass cases next morning one wonders where to start! There is a thoracotomy wound, two underwater drainage tubes coming from the pleural cavity or mediastinum, a groin wound, an abdominal wound, a drip into one arm, and four E.C.G leads attached either to the lower limbs or across the chest wall. This presents a fairly formidable picture.

However, surprisingly enough, the patient is awake and more often than not co-operative, and we are able to get him to do deep breathing and coughing, foot and leg movements and to move his arms within the limit of the drip. Arm exercises should always be done one arm at a time as holding both arms straight up together is really quite a hard exercise and makes the heart work harder to pump the blood further up against gravity. We do not routinely lie these patients on their side for postural drainage unless there is some chest complication developing, and we do not raise the foot of the bed with a cardiac patient. Sometimes it is not possible for them to lie flat at this stage.

There is nothing complicated about the post-operative physiotherapy of these patients as far as the methods used are concerned, but, unless the physiotherapist is experienced in this work or there is an experienced physiotherapist in charge of the unit and therefore directing the treatment, there must be close co-operation with the surgeon or anaesthetist in charge of the patient to determine how vigorous the physiotherapy should be, and sometimes how often the physiotherapy should be withheld in the interests of resting the patient's heart. It is no good getting the patient's lungs clear if his heart cannot stand the treatment involved.

One situation springs to mind when physiotherapy can do more harm than good, and this is when the patient is suffering from pulmonary oedema because of left heart failure. In this case the patient has a great deal of white frothy sputum and he cannot help coughing constantly. Any attempt at making him cough harder or to do postural draining does not help to clear the sputum, but rather throws more strain on the heart and so increases the amount of white frothy exudates. The correct treatment here is rest combined with medical treatment – diuretics to release

the fluid, and a drug to help the heart failure. An over-enthusiastic physiotherapist can in this case be dangerous.

Patients whose respiratory function is bad at the end of by-pass surgery, or whose hearts are in such a bad state that even the effort of breathing is a strain, may return from the operating theatre on a respirator. At Green Lane, patient-triggered Bird respirators are used. Because patients are attached by means of a naso-tracheal tube, they are often not very comfortable, but if the respirator is going to be needed for only a day or two, it does save the patient the extra trauma of having a tracheostomy.

Sometimes a patient on a respirator has a lot of physiotherapy, but I think that here we have to stop and think why this patient is on the machine. The patient is conscious and can breathe alone, but the effort of breathing, or the poor respiratory function (this latter can be because of the size of the scar, e.g., a bilateral thoracotomy with a butterfly incision in the case of a pericardectomy), is too much of a strain on the already overloaded heart. For this reason, the patient is put on the respirator to rest the heart, while the respirator does the work of breathing, the secretions being raised if necessary by suctioning. The patient does not have to work hard to breathe and cough. Therefore, if the object is rest, it would be paradoxical for the physiotherapist to make the patient work to breathe harder or to cough.

As these patients are conscious, the cough reflex is stimulated when the suction catheter is put down the tube and so the secretions are brought in by the cough from the periphery of the lung. For the first few days, therefore, the patient benefits mostly from a careful programme of masterly inactivity, and leaving him to have his much-needed rest.

The naso-tracheal tube can be left in for two or three days, and is taken out as soon as the patient can manage off the respirator. We then have to be careful to keep the patient coughing as there are usually quite a lot of secretions after the tube has been down the trachea. For this reason, we start our usual treatments of breathing and coughing little and often (these patients should not have prolonged bouts of treatment as too much coughing all at once can be very tiring), progressing in the normal way as the patient improves.

If after two or three days it is decided that the patient cannot manage off the respirator, a tracheostomy must be performed, as the naso-tracheal tube cannot be left in any longer. As this tracheostomy will be *in situ* for two or three weeks at least, we gradually start a regime of posturing the patient on each side. The number of times this is done a day depends on the state of the patient's lungs and the amount of sputum. Here again it is necessary to keep a close watch on the regular X-rays.

It must be remembered, however, that these patients need a period of rest during the night. Regular two-hourly physiotherapy treatment going on for 24 hours over a period of several days is far too much for any conscious patient, and I think it is a very good thing that physiotherapist do go off duty at night, so that the patients get a chance to sleep.

OTHER COMPLICATIONS

In the post-operative period after cardiac surgery, other complications may be caused by cerebro-vascular accidents; these may be due to clots escaping from the left side of the heart as in mitral stenosis or after the insertion of an artificial valve, or because of air embolism in the cerebral arteries. Either may cause hemiplegia or unconsciousness.

The cerebral thrombosis causes a typical hemiplegia and the treatment used is that for any patient presenting with a hemiplegia, with, of course, a more gradual approach to exercises, because of the operation. The prognosis is the same as that of all hemiplegias.

Air embolism can cause hemiplegia, unconsciousness, or temporary mental disturbances, and the treatment is varied according to the physical symptoms produced. This latter type of patient has a good prognosis as the air usually gets absorbed and over a period of some weeks the patient usually recovers completely.

If the patient returns from the theatre unconscious and appears to be going to be in that condition for some time, he will have a tracheostomy, and then be treated as an unconscious patient with a tracheostomy – regular turning to prevent pressure areas, passive movements to all limbs, regular postural draining, turning the patient on all sides and suctioning at the end of each position to keep the chest clear.

Although we treat heart-lung by-pass as a routine today, it is very major surgery, and one of the possibilities in the post-operative period is cardiac arrest, caused by cardiac arrhythmia. This is one reason why it is essential that the patient is nursed in an intensive care unit where his heart is monitored and he can be watched by trained staff all the time; in the case of an arrest, cardiac massage can be started right away. The patients are now nursed in beds with fracture-boards under the mattress so that there is no delay such as having to get the patient onto a firm base – e.g. the floor.

If cardiac massage and defibrillation (electric shock) are successful, the patient's heart returns to normal rhythm. Our treatment in this case would not be affected – if one of the hazards of cardiac massage were not fractured ribs. There is no blame attached to anyone for this – after all, it is an all-out attempt to save the patient's life, but it does make breathing and coughing afterwards rather more difficult and painful.

The physiotherapist working in the cardio-surgical unit must know how to start cardiac massage and mouth-to-mouth breathing in case she is the only person on hand when an arrest occurs.

These complications cause much extra work for the physiotherapist, and it is work that continues over a period of some weeks, while the usual amount of surgery requiring routine post-operative treatment continues. However, patients with complications are in the minority and many go through surgery with only routine preventative physiotherapy.

We are fortunate in Auckland that there is not a great incidence of chronic bronchitis in the community – our English colleagues tell us that in their country they experience much more trouble with post-operative chest complications because so many people suffer from chronic lung disease, and thoracic surgery combined with an anaesthetic tends to make this flare up and be a trouble in the post-operative period.

If our treatment is necessary at all, it is therefore necessary regularly, so physiotherapists must be available seven days of the

week, and nursing staff should be taught how to breathe and cough the patients too, so that this can be carried out when the physiotherapists are not on duty. Usually in a unit of this kind there is quite a lot of trained nursing staff, and it does make a great deal of difference if they encourage the patients in these activities. However, there should always be a physiotherapist able to be called upon if necessary, when more intensive or experienced treatment is required.

Work in the Cardiothoracic Surgical Unit at Green Lane Hospital is varied and interesting. As well as cardiac and thoracic surgery, the unit also undertakes all the arterial surgery, so it is a very busy ward from the point of view of the Physiotherapy Department, and, although the work is demanding both in time and energy, it is certainly rewarding.

Commentary

This fascinating article from Sheila Glendining forms one of the earliest published discourses on the physiotherapy management of patients undergoing cardiac surgery in New Zealand. It forms an ideal platform from which to examine how evidence from high quality research impacts upon clinical practice and patient outcomes. Cardiac surgery was pioneered in New Zealand at Greenlane Hospital and in 1960s the hospital was seen as a world leader in the development of cardiac surgery. Physiotherapy was viewed as an essential component of the postoperative recovery of patients undergoing cardiac surgery with a clear emphasis (apparent in Glendining's article) on preventing postoperative pulmonary complications. With increasing evidence of benefit, decreasing surgical mortality rates and rapid advances in the complexity of surgeries undertaken, the demand for cardiac surgery now exceeds resources available in New Zealand (Ministry of Health, 2008). In addition, the changing patient demographic, with an increasingly elderly population often with more extensive disease and co-morbidities, necessitates that physiotherapy remains an important component of surgical care. An emphasis on evidence based practice and rapid improvements in cardiac surgical techniques and postoperative management have driven a necessity for physiotherapists to investigate their practice and there is now substantial research investigating the efficacy of routine prophylactic physiotherapy interventions (Pasquina, Tramer, & Walder, 2003). This research has led to a change in emphasis of physiotherapy practice, from the long established practice of prevention of postoperative pulmonary complications by deep breathing and coughing exercises to one of early postoperative mobilisation and rehabilitation. Today a typical postoperative length of hospital stay for an uncomplicated patient undergoing cardiac surgery is six days and the withdrawal of prophylactic postoperative respiratory physiotherapy appears not to alter patient outcomes. Physiotherapists continue to investigate the efficacy of their interventions across the spectrum of major surgical interventions, and articles such as this by Sheila Glendining offer us a unique opportunity to consider how we, as a profession continue to advance our practice alongside those of our medical colleagues.

*Julie C Reeve, PhD, MSc, Grad Dip Phys, MPNZ
Senior Lecturer in Physiotherapy
AUT University*

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