

# Managing the lower limb in coronary artery bypass grafting

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**Coronary artery bypass grafting (CABG) is often used to treat patients with heart disease. However depending on the number of coronary vessels to be bypassed, veins may be harvested from both legs leaving difficult-to-manage wounds. This article examines how one trust's programme for managing the lower limb following CABG helped to prevent surgical site infection (SSI) and improve the patient experience.**

## INTRODUCTION

This short report examines one hospital trust's plan for reducing surgical site infection (SSI) in its specialist cardio-thoracic and transplantation services for both paediatric and adult patients. The trust, which is based on two separate sites, offers complex heart and lung management, including coronary artery bypass grafts (CABG) for patients who are referred from general practitioners and other hospitals throughout the UK.

Heart disease is a lifelong condition and many of the author's patients are smokers or have diabetes mellitus, peripheral vascular disease (PVD), obesity, venous hypertension or renal failure, which predispose them to leg wound complications. Patients with coronary artery disease have a high chance of having pre-existing peripheral vascular disease, especially those with diabetes.

## BACKGROUND

Vein harvest sites in CABG patients are prone to oedema and local complications due to the systemic inflammatory response following cardiopulmonary bypass, impaired venous drainage, and extensive lymphatic and soft tissue damage.

This can lead to significant fluid accumulation in the interstitial space, poor tissue oxygenation and thus poor wound healing. Improvement in the venous and lymphatic drainage in the lower limbs, with graduated compression therapy, can reduce oedema and improve microcirculation in the cutaneous tissue[1].

By reducing oedema there is improved tissue approximation in the wounds and wound tension is decreased. In addition, with the increased lymphatic drainage there should be less tissue fluid around the wounds thus reducing the culture medium for bacterial growth and infection[2].

The national incidence of leg wound complications after CABG ranges from 1-44%[3]. The vessel of preference for the bypass procedure is the internal mammary artery because of its superior patency, however in recent times the greater saphenous vein and the radial artery have been frequently used as conduits for revascularisation.

Recent studies have shown that using the internal mammary artery can lengthen the time the patient spends on bypass, extend operation time and leads to postoperative ischaemia to the sternotomy site. This can result in delayed wound healing and a potential site for wound infection[4,5].

When the saphenous vein is harvested an incision is made along the medial aspect of the leg, which may extend from the ankle to the knee or even the mid-thigh region. Depending on the number of coronary vessels to be bypassed, veins may be harvested from both legs[6].

With the trend in healthcare moving towards decreased length of inpatient stay, clinicians must be actively involved in educating patients about the leg vein harvest site during their hospital stay and how to manage it following discharge. Through education patients are more likely to follow instructions on various measures including:

- Wearing intermittent pneumatic compression therapy
- Graduated compression stockings
- Exercise
- Mobilisation
- Elevation and skin care.

Encouraging patients to be compliant with these measures through education means that optimal healing is more likely to occur and complications requiring readmission will be minimised.

Since January 2003, the author's trust has participated in the Health Protection Agency's (HPA) coordinated Surgical Site Infection Surveillance Service (SSISS), which surveys all patients undergoing CABG. This is a voluntary scheme that the trust has chosen to participate in since 2003 to provide national benchmarking for CABG.

The trust managers' feel the programme is worth participating in as it is of interest to public health and has measurable outcomes. Patients who develop sternal or donor site wound infections during admission and on readmission are included in the wound infection rates calculated by the HPA.

At the beginning of 2008, SSI surveillance identified that donor SSI rates were driving the trust's overall infection rate above the national average. Forty per cent of all leg wounds in the trust demonstrated exudate of some description (not necessarily infection), therefore a wound/leg

management plan needed to be implemented to reduce these levels. At the same time endoscopic vein harvesting (EVH) was implemented on the primary site (this was performed by one surgeon).

### **PHASE 1: RECENT CHANGES**

In December 2008 a wound infection steering group was set up and included the following multidisciplinary team members:

- Director of the heart division
- Consultant cardiac surgeon
- Consultant microbiologist
- Lead clinician for clinical risk
- Theatre manager
- Modern matron for the acute surgical unit
- Modern matron for infection prevention and control
- Quality improvement nurse, paediatrics
- Tissue viability nurse
- Audit and surveillance nurse.

The aim of this steering group was to address the high levels of SSIs that were causing a major concern to trust executives. The following initiatives were agreed:

- Continued EVH surveillance (EVH was not implemented by the Steering Group; its surveillance initiative commenced in January 2008)
- Wound management guidelines
- Aseptic technique.

### **Surveillance and audit of EVH**

In January 2009, SSI rates on the primary hospital site peaked at around 18 per 100 operations. At this time, there was enough cumulative surveillance data on EVH to demonstrate that it incurred lower infection rates than traditional techniques and plans to monitor long-term patency issues were set in place.

By February 2009, EVH was used in >30% of cases requiring donor vein harvest (according to surgeons' preference) and in March 2009 the trust's SSI rates fell below national levels.

In August 2009, zero SSIs were recorded during primary admission or on readmission and by September 2009, EVH was used in >50% cases. Aseptic technique assessments were now in progress and the new wound management guidelines had been implemented in June 2009. EVH was commenced in the secondary hospital site in November 2009.

Running concurrently with this initiative was a nurse-driven recommendation that all patients should wear anti-embolic stockings after surgery until fully mobile unless contraindicated.

### **Aseptic technique**

The steering group instituted a reassessment of all the clinical staff's aseptic technique to ensure 100% compliance with the trust's aseptic non-touch policy. This was an educational initiative driven by the tissue viability nurse/support nurse and the educational practitioner (acute surgical unit).

- *The guidelines include leaving wounds intact for the first 48 hours postoperatively, removing any exudate, leaving dressings in place for seven days, and removing dressings and exposing the wound on the day of discharge*

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### **Wound management guidelines**

The steering group introduced new *Wound Management Guidelines: Healing by Primary/Secondary Intention*. These new trust guidelines were drawn up in April 2009 by a cardiac surgeon, modern matron for surgery and the tissue viability nurse. A pilot study of 25 patients was carried out with positive outcomes. The guidelines included the introduction of a semi-occlusive postoperative surgical wound dressing as recommended by the National Institute of Health and Clinical Excellence (NICE) Surgical Site Infection Guidelines. Prevention and treatment of surgical site infection[7].

The guidelines were implemented by the tissue viability nurse but were initially only introduced on the primary hospital site due to resource constraints and some resistance, which only allowed a single-site implementation to be fully supported at that time.

However, the single-site implementation did allow for practice and outcomes to be measured and compared against the secondary hospital site. The guidelines proved to be very successful and when combined with other initiatives resulted in a further reduction in SSIs leading to zero postoperative infection rates by August 2009.

The guidelines and change of practice have since been implemented throughout the trust (secondary hospital site, October 2009). The guidelines recommend the following:

- Leaving wounds intact for the first 48 hours postoperatively
- Reviewing all dressings on day two – wounds are only cleaned if there is any exudate present
- Leaving the wounds undisturbed if they are clean and dry then applying a new dressing
- Leaving the dressing in place for seven days if showering permits

- Keeping the wounds covered during the hospital stay (7-10 days)
- Removing and reapplying dressings in the clinical/treatment rooms using aseptic technique and normal saline if cleaning is required
- Removing all dressings and leaving the wounds exposed on day of discharge
- Using Opsite Post-Op Visible (Smith & Nephew), which is the chosen dressing for the trust, partly because its features include impermeability to microorganisms, a wear time of up to seven days and good exudate management qualities. (During the trial the dressing performed well. The honeycomb foam pad provided good visibility, which meant that dressings did not have to be removed each day in order to view the wounds [sternal wounds in particular]. There were also positive outcomes from a SSI, patient comfort and financial point of view.)

## **PHASE 2: THE CURRENT SITUATION**

The trust has been very successful in implementing effective measures to reduce the incidence of SSIs. However, achieving these rates is not the end of the journey for patients and clinicians.

Since the introduction of the programme, a small pilot study (n=12) was carried out over a four-week period by the tissue viability nurse. This focused on postoperative patients with evidence of venous/arterial disease. As a result one-in-five patients with venous/arterial disease had not been appropriately identified prior to saphenous vein harvesting.

It has been well documented that patients with pre-existing peripheral vascular disease require an ankle/brachial pressure index (ABPI) of >0.7. A limb with a ABPI of <0.7 requires further investigation and an ABPI of <0.5 should not be considered for saphenous vein harvesting[8].

Therefore, in addition to implementing the programme, further measures have been identified and proposed by the tissue viability nurse to be developed as a 'second phase' of the programme. These measures include formulating trust pre and postoperative lower limb management guidelines. These will include:

- Detailed preoperative assessment for patients with evidence of venous/arterial disease
- Preoperative Doppler assessment for identified patients
- Postoperative compression therapy/mobilisation/physiotherapy, elevation and diuretics
- Skin management, including basic showering, drying and application of emollient 50/50 creams to the skin before the application of thrombo-embolic deterrent (TED) stockings
- Surveillance and audit.

In the absence of specific national and local lower limb management guidelines for patients whose saphenous veins have been used for revascularisation, the tissue viability nurse adapted the Royal College of Nursing's (RCN's) clinical practice guidelines for the management of venous leg ulcers[9]. The proposed pathway for patients with venous/arterial disease undergoing CABG using the saphenous vein for revascularisation is demonstrated in [Fig 1].

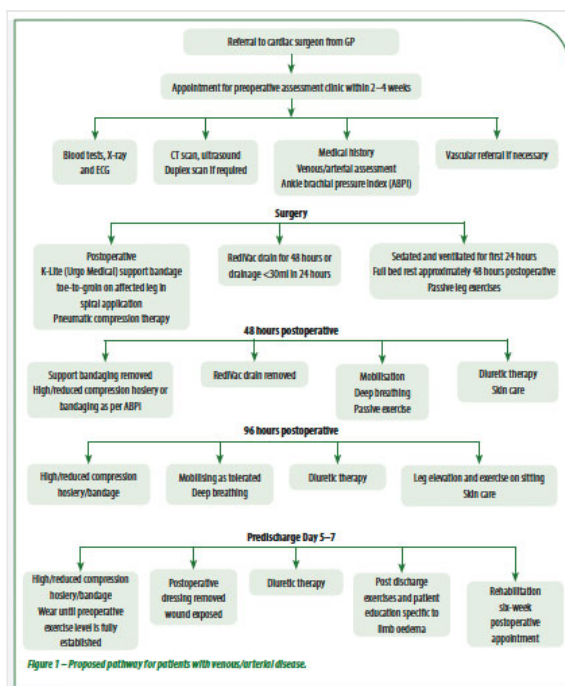


Figure 1 - Proposed pathway for patients with venous/arterial disease.

As part of the preparation of these guidelines the tissue viability nurse undertook a Strength, Weakness, Opportunity and Threat (SWOT) analysis, which examined the current situation and highlighted the opportunities that the introduction of Phase 2 of the plan could bring to the trust and also the threats and risks that stood in the way of a successful implementation.

The SWOT analysis revealed that although each element of the programme did not involve significant investment (other than the time needed for the tissue viability nurse to organise it and the clinical staff to implement it), the key risk was management at ward level being unable to identify or provide adequate resources. Therefore, Phase 2 was not identified as a clinical priority due to the success of Phase 1 and although the benefits of using compression therapy for the management of lower limb oedema following cardiac surgery was considered important, due to lack of nursing expertise it did not become a priority.

Patient safety is paramount when applying compression bandaging/hosiery, therefore educational requirements needed to be addressed. However, time restraints on the tissue viability nurse mean that although qualified she has been unable to support the application of compression bandaging and there are an insufficient number of clinicians trained in the technique.

Unfortunately, compression bandaging is not considered one of the 'cutting edge' nursing skills and needs to be placed higher on the agenda of senior cardiology practitioners.

In order to achieve positive outcomes from the programme it is important that the use of compression bandaging receives a higher profile. More emphasis needs to be placed on a multidisciplinary team approach in the management of postoperative oedema.

When it comes to the management of complex wounds nurses cannot and should not be the only participants in patient care[10]. Oedema should be managed by different members of the multidisciplinary team as this will ensure comprehensive holistic assessment, effective communication and a high standard of evidence-based care.

Operating under the assumption that clinicians can achieve a reduction in bed occupancy of a single day per patient, the programme can become self-financing within a matter of weeks.

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### **SKIN CARE**

Increased oedema leads to a higher volume of wound drainage and potential skin maceration, therefore meticulous skin care and increased vigilance are required to prevent infection. With a lack of research evidence to support the use of skin care, good clinical practice, such as the daily removal of anti-embolic stockings, washing/showering, drying the skin thoroughly and applying emollient in downward strokes and allowing it to dry before reapplying hosiery, is vital[11].

This daily care enables the patient/clinician to check for any skin changes. All patients who have leg wounds develop some degree of postoperative swelling (some more severe than others).

Good skin care is important in maintaining and improving the condition of the epidermis and dermis so that they are hydrated, supple and intact. When assessing the skin in the lower limb, details of any skin problems should be noted. Clinicians should observe the skin colour for hyperpigmentation, hyperkeratosis, cyanosis or redness and examine for the presence of any papillomatosis, ulceration, venous eczema or contact dermatitis. The skin temperature should also be assessed as heat may indicate local infection or chronic inflammation[12].

Maintenance of good skin integrity is important in avoiding infection, which could cause further swelling due to the inflammatory response.

This inflammatory response can cause fibrin and collagen to be deposited in the sub dermal tissues which can contribute to skin thickening. This thickened skin is less compliant and can further compromise lymphatic flow which can increase the tendency towards infection[13]. Assessment is paramount to maintaining good skin integrity.

## **CONCLUSION**

Although it initially appears complex, this improvement programme is time- and cost-effective. The positive outcomes from Phase 1 will result in support from senior management and a positive approach among clinicians.

It is important that this impetus is maintained, with the guidelines being further developed.



## **AUTHOR DETAILS**

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