Background

CARDIOVASCULAR disease in general and coronary artery disease in particular are major causes of morbidity, mortality and disability in Australia.

In recent years there have been several changes in the investigative and treatment strategies for these conditions. For example, use of diagnostic coronary angiography has increased by 50% in the last decade, resulting in a twofold increase in the frequency of coronary revascularisation procedures.

About 24,000 angioplasties were performed in 2002-2003, 91% of which involved stent implantation. Concomitantly there has been a modest 15% decline in the number of CABG procedures in the last decade, with 16,000 performed in the same year.

The last decade has also seen significant developments in pacemaker and automatic internal cardioverter defibrillator (AICD) technology. Greater functionality and broader indications for insertion mean that more patients are leaving coronary units with these devices implanted.

At the same time there has been tremendous pressure on public hospitals to remain cost effective, resulting in shorter cardiac admissions. The average length of stay for cardiovascular disease declined from 7.3 days in 1993-1994 to 5.6 days in 1998-1999. This obviously has an impact on GPs in terms of follow-up and monitoring for complications in patients who have been recently discharged after cardiac procedures.

This article provides an overview of the more common invasive investigations and therapies offered to cardiac patients, with an emphasis on the short-term consequences and complications of these procedures.

Complications of common cardiac procedures

The authors

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A femoral artery pseudoaneurysm is defined as a collection of blood in the femoral artery that is greater than or equal to 2 cm or painful swelling near the region of the access site. The most common local complications that GPs may encounter after diagnostic or therapeutic cardiac catheterisation (>2 cm) or painful swelling near the region of the access site. The bruising is generally of no concern unless it is accompanied by persisting pain or development of a pulsatile bruit. Doppler ultrasound or CT scan usually confirms the presence of femoral artery occlusion.

An AV fistula is an abnormal communication between the femoral artery and vein. This should only be done under local anaesthesia, as late as 12 months after placement of a drug-eluting stent.
unstented segment of coronary artery, which underscores restenosis. However, these devices are expensive and for this reason availability is restricted in public health systems in most states. Return of anginal pain after coronary intervention can also be due to progression of atherosclerosis in an untreated segment of coronary artery, which underscores the importance of secondary preventive strategies.

Figure 3: Femoral pseudoaneurysm identified by colour Doppler ultrasound. An antegrade approach to the artery is taken through the pseudoaneurysm wall, and the balloon is inflated. The balloon is then inflated for 5-7 minutes, and the stent is then deployed. The balloon is then deflated, and the stent is released. The procedure is then repeated as necessary for each lesion. The use of a stent is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone. A stent that is not deployed is associated with a lower incidence of restenosis compared to balloon angioplasty alone.

The post-CABG chest X-ray is always abnormal after CABG for several weeks. The most common findings are atelectasis in the basal lung fields and small pleural effusions. A left-sided pleural effusion is common after left internal mammary artery harvesting. Larger pleural effusions may be related to the post-cardiomyotomy syndrome (see below).

Sternotomy-related chest pain During the 1990s CABG was sometimes done with small chest-wall incisions, to avoid the trauma of splitting the sternum. However, it is now believed that this limited exposure of the operative field compromises graft patency, so most CABG procedures are performed with the sternum open and the heart fully exposed. Sternotomy-related chest pain is usually localised to the anterior chest wall and is worse on deep breathing, coughing and movement. It usually is self-limiting and responds to simple analgesia.

Pain from mammary grafts If possible the left internal mammary artery is grafted to the left anterior descending coronary artery during CABG (figure 4). Some surgeons will also mobilise the right internal mammary and graft it to the distal right or branches of the circumflex coronary artery. With mammary grafts the patient is almost always aware of a loss of sensation over the breast region. Not uncommonly, the disturbed innervation of the chest wall is associated with localised pain that does not respond to nitroglycerin and is not accompanied by ECG changes. Treatment is usually conservative with simple analgesia, which may be required for a few weeks. Occasionally, the pain can be particularly troublesome and persist for years.

Pericarditis and the postcardiotomy syndrome After bypass surgery, left sided, localised pleural chest pain, worse lying flat and relieved by sitting forward, may be due to peri-carditis; constitutional symptoms such as fever, myalgia and fatigue may also be present. This is called the postcardiomyotomy syndrome and is similar to Dressler’s syn-drome after MI. Symptoms usually develop between the first week and first month after surgery. A pericardial rub may be noted on examination and the WCC and inflammatory markers may be elevated. NSAIDs can be used short term for symptom relief. Pericarditis and the postcardiomyotomy syndrome is also an important cause of pericardial effusion and occasionally cardiac tamponade. Symptoms are usually worsening dyspnoea, orthopnoea, oedema and fatigue. Anticoagulation can contribute to this condition. Examination may reveal distended neck veins and low blood pressure. Pericardial tamponade is usually diagnosed by echocardiogra-phy and requires urgent pericardiocentesis.

Pleural effusion Small, asymptomatic pleural effusions are common after CABG and are usually treated conservatively.
They occur on the left side most often and can be due to internal mammary artery harvesting, atelectasis and postcardiotomy syndrome. Less often it can be a sign of worsening cardiac failure or pulmonary embolism.

Pleural effusions can be large enough to cause significant dyspnoea, requiring therapeutic drainage.

Pulmonary embolus

Pulmonary embolus is a relatively uncommon (about 3% incidence) but important cause of chest pain and dyspnoea after CABG. New-onset pleuritic chest pain with dyspnoea, resting tachycardia and hypoxia, particularly in a patient with a relatively complicated hospital course, should be investigated promptly with a V/Q scan or CT pulmonary angiogram.

Ischaemic chest pain

Ischaemic chest pain shortly after CABG may result from a native coronary artery not bypassed (incomplete revascularisation) or because of anatomical factors (calcified vessels or diffuse disease with distal vessels too small to support a bypass graft). It may also result from early graft failure. Closure of a saphenous vein conduit has been estimated to occur at a rate of 10-15% in the first month after CABG.

Chest pain with objective signs of ischaemia is usually investigated aggressively with cardiac catheterisation and may require percutaneous intervention or even repeat CABG. Hence these patients should be promptly referred to their primary cardiologist.

Fever and infection

Besides infection, recognised causes in this situation include phlebitis related to insertion of IV lines, DVT and post-cardiotomy syndrome. Any fever must be adequately investigated and treated if it is related to infection.

Superficial sternal wound infections

These infections do not penetrate the subcutaneous tissue. They usually present with mild erythema and discharge and are often treated by opening the subcutaneous tissue layer and packing the wound.

Deep sternal wound infections

These infections (0.4-5% of cases) include acute mediastinitis, which involves sternal dehiscence and osteomyelitis of the sternum.

Presenting features include wound discharge, fever, sternal instability, increase in wound pain and elevated WCC. Patients with these symptoms should be referred immediately to the centre that performed their procedure, as the wound may need to be reopened and debrided.

Ven-harvesting infections

Infections arising from harvesting the vein from the leg are more common than sternal infections and can usually be managed in an outpatient setting with oral antibiotics.

Unilateral leg oedema, which increases the chance of delayed wound healing, ulceration and infection, is common and should be treated with leg elevation and compression stockings.

Oedema

New bilateral leg oedema may signify impaired cardiac function, periarterial effusion or bilateral DVT. These patients should be sent to their cardiologist promptly for further investigation.

Arrhythmia

Atrial fibrillation is the most common arrhythmic complication of open cardiac surgery, with an incidence of 10-40%. It usually occurs shortly after operation, peaking at 48 hours. However, it can occur shortly after discharge and first come to the attention of the GP.

These patients should be referred to their cardiologist for consideration of anticoagulation and other cardiovascular control or their ventricular rate.

Mental health

Cognitive impairment

Up to 27% of patients complain of memory loss after CABG but about 50% show cognitive deficit on neuropsychological testing before discharge.

This early deficit has been shown to be a predictor of cognitive deterioration five years after CABG. Risk factors include preoperative peripheral and cerebrovascular disease as well as perioperative complications such as MI and hypotension.

Brain hypoperfusion during cardiopulmonary bypass and microemboli to the cerebral vasculature have been implicated as aetiologic factors.

Depression

It is estimated that 20-25% of patients experience depression preoperatively.

Seventeen percent of those who did not have depression preoperatively will have depressive symptoms after CABG. These newly diagnosed patients have been shown to have an adverse cardiovascular prognosis compared with those without depression. They will not necessarily have prominent affective features but may instead complain of functional loss and memory deficit. Hence there is significant overlap between a depressive disorder and cognitive decline after CABG.

Therapy for depression usually consists of CBT and some form of pharmacological therapy.

Antidepressants have been shown to improve quality of life. Long-term morbidity and mortality have been shown to improve as a result of intervention. SSRIs are generally well tolerated and safe in patients after CABG.

**Discharge medication and secondary preventive measures in patients with CAD**

Discharge medications typically include aspirin, clopidogrel (if stent implantation has occurred or the patient presented with an acute coronary syndrome), beta blockers, statins and ACE inhibitors.

These medications are usually started in hospital and are prognostically valuable, so it is important they are continued. If any of them are absent from the discharge medication list, the GP should actively investigate the reason, as it may represent an omission rather than a conscious decision by the discharging doctor.

The mnemonic ABCDE (aspirin and antiplatelets; beta blockers and blood pressure; cholesterol and lifestyle; diet and diabetes; education and exercise) proposed by the American College of Cardiology may be useful in reminding practitioners of the important factors in the long-term management of patients with coronary artery disease.

In the context of symptomatic coronary disease, nitrates and calcium-channel blockers can be used for symptom relief. These medications are often stopped after a patient has undergone successful revascularisation.

Sexual activity

Most doctors recommend waiting four weeks before resuming normal sexual activities. Gradual resumption, with suitable positioning and undertaking a less active role in sexual intercourse, is advisable. Libido is commonly lost immediately after CABG but is usually recovered after a few weeks.

Return to work after a coronary event

The issue of returning to work after a cardiac event is a complex one that depends not only on the cardiovascular status but also on psychological factors.

**Once weekly FOSAMAX**

[Image of FOSAMAX]

**from strength to strength**

[Image of a person with text: “good to have a break”]

[Image of a doctor with text: “DISCHARGE medications typically include aspirin, clopidogrel (if stent implantation has occurred or the patient presented with an acute coronary syndrome), beta blockers, statins and ACE inhibitors. These medications are usually started in hospital and are prognostically valuable, so it is important they are continued. If any of them are absent from the discharge medication list, the GP should actively investigate the reason, as it may represent an omission rather than a conscious decision by the discharging doctor.”]

[Image of a person with text: “In the context of symptomatic coronary disease, nitrates and calcium-channel blockers can be used for symptom relief. These medications are often stopped after a patient has undergone successful revascularisation.”]

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[Image of a person with text: “Return to work after a coronary event: The issue of returning to work after a cardiac event is a complex one that depends not only on the cardiovascular status but also on psychological factors.”]
**How to treat - complications of common cardiological procedures**

From previous page the patient’s perception of their illness, their level of anxiety or depression, employer attitudes and the nature of the occupation.

Finally, disusing all patients who have suffered AMI or undergone CABG should be encouraged to attend a cardiac rehabilitation program. Effective cardiac rehabilitation programs address the issue of returning to work, the psychological aspect of the event, and the implementation of important lifestyle issues such as smoking, weight and cholesterol reduction.

Patients with small uncomplicated MI who wish to return to work can be expected to do so in the first few weeks after discharge. They should be encouraged to increase their physical activity slowly toward normality in the first six weeks after discharge.

On the other hand, patients who have experienced large infarcts or infarcts complicated by congestive cardiac failure, cardiogenic shock or ventricular arrhythmias may well require permanent readjustment of their own expectations.

Patients contemplating returning to physically demand work such as cleaning, lifting or operating heavy machinery usually require consultation with their treating cardiologist before returning to this level of activity.

Returning to work after coronary angioplasty

The timing of returning to work or resuming normal physical activity after percutaneous coronary intervention depends on the individual indication for the procedure.

For example, patients with uncomplicated single-vein angioplasty for chronic stable angina should avoid driving in the first two days, heavy lifting or straining in the first week. Otherwise it is reasonable for this group of patient to return to work within a few days of the procedure.

If the ability of a middle-aged man who has undergone immediate (primary) angioplasty for AMI to return to work is dictated by the coronary event, not the angioplasty. Returning to work after CABG

About 70-80% of patients undergoing CABG eventually return to their previous occupation. Factors including age, severity of the coronary syndrome before operation, other comorbidities as well as the periprocedural course influence the timing of return to work.

Patients can usually return to work after two months although those who are involved with heavy manual work should probably wait at least three months to allow complete union of the sternum. In these cases, allocation of lighter duties with a gradual return to the previous workload is generally advisable.

Fitness for driving after a coronary event or cardiac procedure

Assessment fitting for a driver should consider the time of discharge. The doctor needs to find a balance between protecting the safety of the community and avoiding unnecessary restrictions to the patient. This is one area of concern for the future as we look toward an ever more mobile society. Twenty five per cent of all pacemaker- and defibrillator-related infections lead to an uncomplicated AMI. Twenty two days after discharge, survivors of cardiac arrest are not allowed to drive for six months.

Patients with an automatic internal cardiac pacemaker or defibrillator implanted are generally allowed to drive after six months of clinical stability, i.e., no defibrillator discharges. Those with a defibrillator inserted prophylactically can drive two weeks after implantation.

**Pacemaker, implantable cardioverter defibrillator and cardiac resynchronisation therapies**

The rate of pacemaker and defibrillator implantation in Australia is increasing exponentially and shows no signs of a relatively recent expansion of the indications for these devices.

An accumulating body of data suggests resynchronisation is beneficial in patients with heart failure, pacing both the right and left ventricles for heart failure, and improves symptoms and reduces mortality.

Similarly, defibrillators have been shown to reduce mortality in a wide spectrum of patients with impaired left ventricular function, independent of the documentation of ventricular dysfunction.

These devices are usually implanted with relative ease percutaneously, with thoracotomy for lead placement becoming a rare phenomenon.

Several potential complications may be encountered after implantation of these devices, including problems with software or complications related to device functioning. These may manifest as symptomatic palpitations, pre-syncope or syncope, or inappropriate discharges.

Patients with any of these symptoms after device implantation should be referred promptly to their cardiologist.

Local complications of device implantation, such as haematomas and infection, are relatively common. ‘Pocket haematoma’ is an acute complication usually apparent before hospital discharge. The source of the bleeding may be the subcutaneous pocket itself or the venous lead entry site.

Treatment is usually conservative, with observation only. Haematoma that are not resolving in size, tense or painful (about 1-2% of all pacemaker insertions) need to be evaluated by the operator who placed the device (either a cardiologist or cardiac surgeon).

Not surprisingly, anticoagulation in hospital after pacemaker insertion is a risk factor for haematoma formation.

Wound pain and infection Some degree of wound discomfort is to be expected after device implantation and this normally responds to simple analgesia. Worsening pain, in particular if persistent beyond the first 3 days, should raise the possibility of infection, which may require surgical exploration or even lead extraction.

The incidence of pacemaker and defibrillator-related systemic infection has been estimated at 1-7%. Symptoms usually involve increase in local warmth, erythema, swelling, exudate or discharge from the device pocket.

**Author’s case study**

Mr AK, 44, has a history of type-2 diabetes, essential hypertension and long-term cigarette smoking.

He presented to a tertiary hospital emergency department at 2am with a four-hour history of severe chest pain and diaphoresis. His ECG showed 4mm of ST-segment elevation in the anterior leads (figure 5).

Mr AK was given aspirin 300mg, IV heparin 4000 U and clopidogrel 300mg. A decision was made to treat this as an emergency angioplasty.

The cardiac catheterisation team (consisting of the interventional cardiologist, catheter lab nurse, cardiac technician and cardiac nurse) was called in and the patient was taken to the cardiac catheterisation laboratory.

A diagnostic angiogram showed an occluded left anterior descending artery, which was subsequently operated upon.

Mr AK was then admitted to the coronary care unit and treated with aspirin, clopidogrel, abciximab (ReoPro) 12-hour infusion as well as a statin, ACE inhibitor and beta blocker.

His baseline troponin levels were normal and a subsequent angiogram showed a patent left anterior descending artery and no significant obstructive coronary disease. He was referred for an electrophysiology study, which showed inducible monomorphic sustained ventricular tachycardia.

An AICD was implanted during the same admission and he was discharged.

**Figure 5: ECG showing ST-segment elevation.**

Mr AK complained of discomfort and persistent swelling in the right groin as well as easy bleeding, especially during shaving. He denied any symptoms of ischaemia or cardiac failure.

Medications at discharge were aspirin 150mg, clopidogrel 75mg, perindopril 4mg, simvastatin 40mg and atenolol 50mg, all taken daily.

He had read the product information on clopidogrel and asked whether this was the reason for his easy bleeding and the bruising in his groin.

Close examination of the groin showed bruising and a tender pulsating mass. His pulse pressures were normal.

A semi-urgent Doppler ultrasound confirmed a pseudonevrom of the right femoral artery, which was treated with ultrasound-guided compression.

**Comment**

Femoral pseudoaneurysm is more common with coronary intervention than with diagnostic angiography. This is usually due to the need for larger vascular access as well as aggressive use of antiplatelet agents and anti-coagulation.

Wound pain and infection Some degree of wound discomfort is to be expected after device implantation and this normally responds to simple analgesia. Worsening pain, in particular if persistent beyond the first 3 days, should raise the possibility of infection, which may require surgical exploration or even lead extraction.

After an uncomplicated AMI, patients are usually advised to drive for two weeks. Obviously patients who have recurrent ischaemia or who have experienced aborted sudden cardiac death do not fall into this category.

Patients who have undergone successful angioplasty without an MI before or after the procedure are allowed to drive after two days. Survivors of cardiac arrest are not allowed to drive for six months.

Patients with an automatic internal cardiac pacemaker or defibrillator implanted are generally allowed to drive after six months of clinical stability, i.e., no defibrillator discharges. Those with a defibrillator inserted prophylactically can drive two weeks after implantation.
Complications of common cardiac procedures

1. In which two ways has the management of ischaemic heart disease changed over the last decade?
   - a) 50% increase in diagnostic coronary angiograms
   - b) Increased use of implantable defibrillators
   - c) Stem implantation in 30% of angioplasties
   - d) 50% reduction in frequency of CABG

2. Detectable troponin is not present in which ONE condition?
   - a) Pulsatile mass
   - b) Increased use of implantable defibrillators
   - c) Tenderness in the anterior abdominal wall
   - d) Audible bruit

4. Which TWO investigations are most appropriate?
   - a) MRI
   - b) Doppler ultrasound
   - c) CT scan
   - d) Femoral angiogram

5. After discharge which ONE medication is lan unlikely to be prescribed?
   - a) Aspirin
   - b) An ACE inhibitor
   - c) Clopidigrel
   - d) A calcium-channel blocker

6. Peter, 50, survived a cardiac arrest that occurred during a hospital admission for STEMI. He is eight days post CABG. He complains of some dyspnoea, CXR demonstrates a left pleural effusion. Which TWO physical signs may be present?
   - a) Pulsatile mass
   - b) Tenderness in the flank on that side
   - c) Tenderness in the anterior abdominal wall
   - d) Audible bruit

7. Peter attends cardiac rehabilitation. Which ONE statement is correct?
   - a) He can expect to return to work as an accountant after eight weeks.
   - b) He can gradually resume his normal sexual activities four weeks after surgery.
   - c) He will be able to drive in four weeks.
   - d) He may complain of memory loss and depression

8. Des, 60, has a large MI three years ago and has impaired left ventricular function. He asks about automatic implantable cardioverter defibrillators. Which TWO statements are correct?
   - a) They are only indicated if ventricular arrhythmias have been demonstrated
   - b) Thrombectomy is always required for lead placement
   - c) They may improve life expectancy
   - d) Systemic infection can occur after implantation

9. Angela, 55, has a coronary angiogram to assess atypical chest pain. She then has a successful angioplasty using a drug-eluting stent. She has no history of MI, which information is correct in this situation?
   - a) She should not return to clerical work for two weeks
   - b) She should not drive for two weeks
   - c) The risk of in-stent restenosis is reduced because a drug-eluting stent has been used
   - d) Dual antiplatelet therapy need only be used for one month after placement of a drug-eluting stent

10. Which TWO statements about stent restenosis are correct?
    - a) It may present with gradual return of exertional angina
    - b) It will most likely present as STEMI
    - c) It usually occurs within the first 48 hours after stent implantation
    - d) It may cause a decline in exercise tolerance

HOW TO TREAT Quiz

INSTRUCTIONS
Complete this quiz to earn 2 CPD points and/or 2 PDP points by marking the correct answers.

References