How to manage acute myocardial infarction with primary percutaneous coronary intervention

Heart disease is a common cause of premature death. This article discusses the procedures for assessing and treating patients requiring PPCI

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Primary percutaneous coronary intervention (PPCI) is superior to thrombolysis in the management of ST segment elevation myocardial infarction and is recommended by Scottish Intercollegiate Guidelines Network (2007).

This article describes why PPCI is used, the procedure and the role of the nurse in observing and monitoring the patient for possible complications.

INTRODUCTION

The British Heart Foundation (2008) highlights that coronary heart disease (CHD) is the most common cause of premature death in the UK, resulting in approximately 117,000 deaths and 123,000 myocardial infarctions each year.

The death rates from CHD are highest in Scotland and the North of England and lowest in the South of England (BHF, 2008). Statistical data suggests that the premature death rate for men living in Scotland is 65% greater than in the South West of England and 112% higher for women.

USING PRIMARY PERCUTANEOUS CORONARY INTERVENTION

Acute ST segment elevation myocardial infarction (STEMI) occurs when a thrombus forms on an atheromatous plaque and occludes a coronary artery (Fig 1).

Patients who present with signs of a STEMI must be treated promptly as myocardial necrosis commences within 30 minutes and affects full myocardial thickness within six hours.

Ramrakha and Hill (2008) identified that 40% of patients who experience a STEMI die before reaching hospital.

Its clinical signs are outlined in Box 1. There are two methods used to treat STEMI: thrombolysis and primary percutaneous coronary intervention (PPCI).

Thrombolysis involves the administration of fibrinolytic drugs, such as tenecteplase, to break down the thrombus, establish recanalisation of the coronary artery and allow reperfusion of the myocardium (Thompson and Webster, 2004).

Early thrombolysis is vital – improved left ventricular function and survival are most marked when it is administered soon after the start of cardiac symptoms (Ramrakha and Hill, 2008). Quality Improvement Scotland (2010) suggests that the “call to needle time” should be 60 minutes or less for patients with STEMI who require thrombolysis.

Although thrombolysis has been shown to reduce mortality, PPCI is considered to be a more effective treatment, resulting in a greater number of patients achieving earlier reperfusion (Keeley et al, 2003). The Myocardial Infarction Audit Project (MINAP, 2005) supports this claim, and suggests that PPCI saves more lives than thrombolysis.

Using PPCI results in reduced mortality by approximately one third in the first six months, reinfarction is reduced by over a half, stroke is reduced by about two thirds and the need for coronary artery bypass grafting is reduced by approximately one third, compared with thrombolysis (Scottish Intercollegiate Guidelines Network, 2007).

PPCI PROCEDURE

A patient requiring PPCI should be transferred immediately to the cardiac catheterisation laboratory.

The ambulance service should administer antiplatelet drugs: aspirin 300mg and clopidogrel 300-600mg (unless contraindicated). In addition, an intravenous infusion of tirofiban (an antiplatelet drug) may be commenced in the cardiac catheter laboratory.

The patient is nursed in the supine position, and is fully awake during the procedure. A local anaesthetic is administered either in the groin or the wrist, and the angiogram is carried out via the radial or femoral artery, where a guiding catheter is introduced, and a contrast medium is injected to visualise the patient’s coronary arteries and left ventricle. The contrast medium allows for visualisation of the affected coronary arteries.

Once the affected coronary arteries are identified, a balloon catheter is inflated (angioplasty) at the site of the blockage, and either a bare metal or drug eluting stent is inserted. Bloomfield (2010) defines a coronary stent as a piece of coated metallic “scaffolding” which aims to maximise and maintain dilatation of a stenosed vessel (Fig 2).

Drug eluting stents are coated with immunosuppressant drugs, which are commonly used to prevent rejection in organ transplantation. A recent randomised control study found that drug eluting stents are associated with a significant reduction in

BOX 1. CLINICAL PRESENTATION OF STEMI

Patients present with a clinical history of acute coronary syndrome:

- Severe central chest pain, radiating to inside of arm, neck, jaw or shoulder blade;
- Shortness of breath, dizziness, perspiration, anxiety, nausea and vomiting and a feeling of impending doom;
- ECG changes include >1mm ST elevation on two consecutive limb leads, and >2mm in two consecutive chest leads;
- ECG shows signs of suspected new left bundle branch block or isolated ST segment depression in leads V1-V3, indicating a potential posterior infarct.

These signs should be treated as an ST segment elevation myocardial infarction and the patient should be rapidly assessed for urgent reperfusion therapy to restore circulation to the myocardium.
practice review

in-stent restenosis compared with bare metal stents (Gupta et al, 2010). To reduce the likelihood of in-stent restenosis, SIGN (2007) advocates the use of dual antiplatelet therapy of aspirin and clopidogrel.

For drug eluting stents, clopidogrel should be prescribed for one year. There is ongoing discussion regarding the time frame for its use following bare metal stent implantation.

complications

Following PPCI, patients are transferred to the coronary care unit for observation and monitoring for signs of complications.

Keeley et al (2003) suggest that the risk of complications following emergency PPCI is greater than after an elective procedure as patients are likely to be haemodynamically unstable and the procedure itself takes longer.

Thompson and Webster (2004) suggest complications associated with PPCI following acute myocardial infarction depend on the overall loss of functional myocardium as a result of ischaemia, the degree of coronary artery disease and other pathology, such as diabetes and renal disease.

Major complications following this intervention include death, stroke and cardiac tamponade (accumulation of fluid in the pericardium).

The patient needs to be carefully monitored; observations are listed in Box 2.

Arrhythmias

Approximately 90% of coronary patients will experience some form of arrhythmia, particularly in the first 24 hours after a STEMI (Swanton and Banerjee, 2008).

It is imperative that the nurse is able to identify rhythm disturbances so that prompt treatment is given. Common cardiac arrhythmias include: ventricular tachycardia; ventricular fibrillation; heart block; atrial fibrillation; and bradycardia.

Puncture site

The arterial puncture site should be assessed every 30 minutes for up to four hours (depending on hospital protocol). Heparin is administered during the procedure to prevent thrombus formation on catheters and guide wires, and increases the risk of bleeding.

Sometimes the patient returns to the coronary care unit with the sheath introducer still in place and this increases the risk of bleeding and haematoma formation.

The introducer is placed inside the patient’s arteries to help with the insertion and placement of the guiding catheter. The aim is to remove the sheath introducer as soon as possible once the anticoagulant effects of heparin have diminished (Ramrakha and Hill, 2008).

In addition to observing the site, the distal limb pulses in the limb where the surgical site is should be palpated before and after sheath removal to assess for any circulatory dysfunction in the limb. The colour, warmth, movement and sensation of the limb should also be assessed.

Monitoring vital signs

Close monitoring of vital signs is important, particularly after sheath removal, as approximately 15% of patients experience a vasovagal reaction (Ramrakha and Hill, 2008).

This fall in heart rate and blood pressure compromises the coronary perfusion pressure, which could subsequently impair the efficacy of the PPCI, and the patient may experience recurrent angina symptoms.

Pain

Patients’ level of pain should be assessed following PPCI as they may experience post procedure chest pain; this should be measured using a validated pain assessment tool.

Campbell and Torrance (2005) highlight that chest pain following PPCI can occur in up to 40% of patients, and may be caused by in-stent restenosis, new disease, or simply vasospasm or stretching of the coronary arteries.

In-stent restenosis occurs when the treated vessel becomes blocked again, and the nurse should be aware of this possibility.
complication and that it may produce symptoms very similar to those that initially brought the patient to hospital (Swanton and Banerjee, 2008).

Ramrakha and Hill (2008) warn that patients with diabetes may have fewer symptoms, or atypical and unusual symptoms, or may even be asymptomatic. In these cases, a 12 lead electrocardiogram can be used to identify any new ST changes, which may indicate in-stent restenosis or new disease, and should be reported immediately to medical staff.

Prompt treatment of chest pain includes:
- Prescribed oxygen to prevent hypoxia;
- Nitrates to alleviate acute cardiac chest pain by vasodilatation;
- Analgesics to increase the oxygen supply to the heart, reduce oxygen demand and reduce anxiety and restlessness.

The efficacy of pain relief should be assessed regularly (Johnson and Rawlings-Atkinson, 2007) and, if in-stent restenosis is a possibility, the cardiologist may suggest a repeat cardiac catheterisation.

Left ventricular failure

Left ventricular failure is another complication following STEMI and PPCI. It is a complex syndrome in which patients’ condition can change rapidly. It affects 25-50% of patients presenting with cardiac instability (Swanton and Banerjee, 2008).

Thompson and Webster (2004) suggest that LVF arises from the loss of myocardial tissue and there is an occlusion of the damaged myocardium. During the acute phase of a myocardial infarction, it is associated with a poor prognosis; there is a close relationship between the degree of left ventricular dysfunction and subsequent mortality. LVF can develop suddenly and it is important that nurses are able to recognise the classic signs outlined in Box 1.

Emergency measures should be initiated quickly and include:
- Sitting the patient up in bed to reduce pulmonary congestion;
- Administering high concentrations of oxygen or use continuous positive airway pressure (CPAP);
- Giving intravenous diuretics, which aim to lower the ventricular filling pressure and resolve pulmonary and systemic congestion;
- Administering intravenous anti-anginal drugs, such as glyceryl trinitrate, which decreases venous dilatation and venous return, and thus the preload on the heart, allowing the distended left ventricle to shrink (Johnson and Rawlings-Anderson, 2007).
- An indwelling urinary catheter may be required to measure hourly urine volumes, and the patient should be advised about the possible increase in volume and frequency of urine output while receiving diuretics.

PSYCHOLOGICAL CARE

Ongoing communication with the patient and family is essential during this acute episode. This allows the nurse to update the patient on the proposed plan of care, as well as provide opportunities for the patient and relatives to ask relevant questions (Thompson and Webster, 2004).

PROVIDING A SUCCESSFUL PPCI SERVICE

PPCI treatment was introduced in January 2009 in NHS Ayrshire and Arran as a specialist service.

REFERENCES


The West of Scotland optimal reperfusion service recommends that, where possible, patients who suffer a STEMI are treated immediately with PPCI.

Patients are triaged in the community by paramedics with telephone support from cardiologists in the tertiary centre and, if they meet STEMI criteria, they are transferred for PPCI. Those presenting in accident and emergency with confirmed STEMI are immediately transferred to the tertiary centre, without thrombolysis.

However, if patients are unlikely to receive PPCI within 90 minutes of diagnosis they receive thrombolysis (if there are no contraindication(s) and are, at a later date, transferred for urgent angiography or emergency rescue angioplasty. Statistical data from NHS Ayrshire and Arran’s managed clinical network for CHD and stroke revealed that, from January to December 2009, 130 patients were transferred for PPCI, and 11 were thrombolysed, with 10 receiving rescue PCI. From January to April 2010, 33 patients were transferred for PPCI, and two were thrombolysed.

The success of this service depends largely upon collaborative working between cardiologists, A&E departments and the Scottish ambulance service.

CONCLUSION

The benefits of PPCI are well documented. They include reductions in reinfection, in haemorrhagic complications and in the need for coronary artery bypass graft, as well as an overall reduction in mortality, compared with thrombolytic therapy.

This article has outlined possible complications which the nurse should be able to recognise in patients following PPCI for STEMI.