Patient-controlled analgesia after coronary artery bypass grafting

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Patient-controlled analgesia is a method of pain control that allows the patient to self-administer opioid medication as and when it is needed. Pain is a personal experience and one pain-relieving intervention may not be effective for all patients. This article reviews the literature on patient-controlled analgesia, particularly with reference to patients after coronary artery bypass grafting. Pain policies and education programmes need to be proactive in addressing staff and patient gaps in knowledge and misconceptions about pain assessment and management. Nurses need to appreciate the nature and importance of research in promoting a more critical approach to patient care and the development of quality nursing practice.

Analgesia following any thoracic surgery is important to reduce the risk of pulmonary and cardiovascular complications. Research shows that patients with higher pain scores have significantly higher levels of atelectasis (failure of the lungs to expand properly), cardiac ischemia and arrhythmia (Tsang and Brush, 1999; Watt-Watson and Stevens, 1998; Gravlee and Rauck, 1993), so optimal analgesia is essential.

**Patient-controlled analgesia**

The method of pain relief known as patient-controlled analgesia (PCA) enables patients to administer pain relief themselves – up to a preset limit – via a syringe driver attached to an intravenous drip or epidural catheter. It is widely used in hospitals, and appears to be an ideal approach to limiting postoperative pain (Boldt et al, 1998). However, no significant differences were found between PCA and conventional analgesic therapy following coronary artery bypass grafting (CABG) (Tsang and Brush, 1999). Munro et al (1998) suggested that anxiety, poor patient learning and a long duration of anaesthesia may explain the lack of effectiveness of PCA.

**Adjunct therapy**

**Non-steroidal anti-inflammatory drugs**

These potent analgesics are inadequate when used alone postoperatively. However, used in conjunction with opioids, non-steroidal anti-inflammatory drugs (NSAIDs) have been shown to improve pain scores and reduce opioid consumption (Rapanos et al, 1999). Hyninnen et al (2000) state that NSAIDs have a limited analgesic effect when used alone due to the ceiling effect of these drugs, but that they work well as adjuncts for opioid therapy. In a pain management audit, Taverner (2003) also observed increased postoperative pain relief when PCA was used with NSAIDs, rather than PCA alone.

Hoppens (1998) reports that NSAIDs can be given immediately after surgery and into the recovery period, clarifying that after cardiovascular surgery they are especially effective because of the inflammatory and musculoskeletal components of postoperative pain following this type of procedure. She notes that NSAIDs are excreted in the urine and may cause nephropathy in patients with chronic renal or liver damage but that they have little effect on normal renal function. Hoppens (1998) further claims that the blockade of platelet aggregation caused by NSAIDs helps prevent cerebral and cardiac thromboembolic disease, although haemorrhage may result.

Research to investigate the effects of PCA following CABG found that patients using PCA alone or in combination with NSAIDs reported a reduction in atelectasis and lower pain scores compared with a non-PCA control group (Gust et al, 1999). Moreover, there were no incidences of increased disposition for bleeding in any patient with relation to the NSAID used, and no increased incidences of pericarditis or pleuritis or frequency of atrial fibrillation.

Rapanos et al (1999) found that pain scores were consistently lower when PCA was combined with the use of two potent analgesics.
NSAIDs post cardiac surgery. In the first 18 hours after regaining consciousness, pain was 60 per cent less at rest with NSAID therapy than for the placebo group. At 24 hours postoperatively pain was still 30 per cent less with the NSAID group than with the placebo group; morphine use was also less, and lung function improved. Rapanos et al (1999) state that several other groups researching the use of NSAIDs following surgery also conclude that morphine use was reduced when combined with NSAIDs.

Also reporting that the incidence of drowsiness and need for anti-emetic therapy may be reduced due to the opioid-sparing effect of the NSAID, Rapanos et al (1999) conclude that with proper screening for renal insufficiency, previous peptic ulcers, hepatic disease, allergy or sensitivity to NSAIDs, short-term use for postoperative analgesia is appropriate. Superior analgesia using a combination of NSAIDs and opioids results in decreased heart rate and blood pressure, and therefore a reduced myocardial oxygen demand (Beatie et al, 1997).

Hynninen et al (2000) evaluated the efficacy and safety of three NSAIDs (diclofenac, ketoprofen and indometacin) for pain control post CABG. They found all three NSAIDs reduced pain scores over the placebo, with no differences among the study groups in postoperative creatinine concentrations and no increased blood loss. Of the three NSAIDs evaluated in the study, only diclofenac reduced morphine consumption.

**Patient-controlled epidural analgesia**

Gravlee and Rauk (1993) found that following thoracic surgery, patients received superior analgesia with the use of epidural fentanyl infusions, compared with those receiving bolus intravenous-PCA morphine. Both groups displayed similar incidences of sedation, nausea and vomiting, mild increases in partial pressure of arterial CO\(_2\) (PaCO\(_2\)) and a decrease in vital capacity, while the epidural group had a higher incidence of pruritus.

Chrubasik and Wiemers (1985) recommend patient-controlled epidural analgesia (PCEA), with continuous infusion plus on-demand bolus, in the treatment of postoperative pain because of the combination of constant analgesia with the possibility of individualised treatment. Welchew and Breen (1991) comment that PCEA, with continuous infusion plus on-demand bolus, in the treatment of postoperative pain because of the combination of constant analgesia with the possibility of individualised treatment. Welchew and Breen (1991) comment that PCEA provides a satisfactory alternative to intravenous patient-controlled analgesia morphine after surgery. They hypothesised that analgesia provided before surgery would reduce the pain experience and need for analgesia after surgery. No intergroup differences were found regarding pain at rest and mobilisation while running an epidural infusion of bupivacaine and morphine, so the hypothesis was not supported. However, Katz et al (1992) demonstrated significantly lower pain scores after thoracotomy with preoperatively administered epidural fentanyl and lidocaine compared with a similar treatment after skin incision.

**Conclusion**

Nurses’ assessments of pain, choices of interventions and evaluation of pain relief are critical to effective pain management and, as patients’ advocates, nurses need to challenge inadequate analgesic orders (Watt-Watson and Stevens, 1998). Effective pain therapy should minimise patient discomfort after surgery, without adverse effects such as nausea, vomiting, constipation, allergic reactions, somnolence and respiratory depression (Boldt et al, 1998). Anti-emetics, stool softeners and laxatives need to be routinely administered to help prevent some of these side-effects.

Patients need to know that they should use the PCA device when pain increases above their comfort level (Watt-Watson and Stevens, 1998). Tsang and Brush (1999) note that patients often need repeated instructions on PCA due to incomplete recovery of the cognitive function, disorientation within the environment and poor retention of preoperative learning. Once they are comfortable with the use of PCA, patients can adjust the demand before deep coughing and mobilisation (Watt-Watson and Stevens, 1998). However, continued use of PCA might hinder early mobilisation because of the need to carry the device around.

**REFERENCES**


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