SAJRA
South African Journal Of Regional Anaesthesia

Regional anaesthesia and fast track cardiac surgery

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Introduction

Having never used a regional technique in cardiac surgery my immediate response to being asked to give this talk is "who in their right mind would go sticking needles into someone who is either going to be or is fully anti-coagulated!!".

What is the point and are the risks of spinal haematoma not so great that it's not a practical option?

But having done the proverbial literature search and read up on the subject, yes there are centres which routinely use regional techniques as part of their cardiac anaesthetic techniques. There are also a fair number of studies that have looked at this topic and there is enough evidence to suggest that the advantages may outweigh the potential risks of the procedure, not to mention the potential for cost reduction which is very topical in today's economic environment. I even found one study that used a thoracic epidural as the sole method of anaesthesia in cardiac surgery with good results.

I'm going to look at this topic under the following headings

1) The rationale behind fast-tracking:

   Early extubation, ambulation, earlier discharge from ICU and hospital, etc.

2) The role of surgical technique:

   Mini-thoracotomy vs mini-sternotomy vs standard sternotomy.

   The need (or avoidance) of bypass and heparinization

3) The rationale behind regional anaesthesia in cardiac surgery:

   The various regional techniques:

   Epidural, intrathecal and paravertebral blocks

1) The rationale behind fast-tracking:

Early extubation, ambulation, earlier discharge from ICU and hospital, etc.

Cardiac surgery in the USA is estimated to cost $US 27 billion annually. The major cost drivers being post operative intensive care and the length of hospital stay. Fast tracking aims to decrease these stages.

Fast track cardiac surgery : "a perioperative process involving rapid progress from preoperative preparation through surgery and discharge from the hospital".

It's a team activity and the necessary elements are choice and titration of short acting anaesthetic drugs, standardized surgical procedures, early extubation, rewarming and sustained postop normothermia, **postop pain control**, early ambulation, alimentation and discharge and follow up after discharge. [5]

In the past, most cardiac anaesthesia consisted of using very "large buckets of fentanyl" and muscle relaxants with little else and lengthy periods of post op ventilation. Over time, high dose opioid techniques have largely been replaced by the use of combinations of low dose opioids with inhalational anaesthetics or propofol infusions. Myles et al concluded that fast track anaesthesia is safe. No significant outcome differences were found in 30 day all cause mortality, myocardial infarction, sepsis, wound infection, stroke, acute renal failure, prolonged intensive care unit stay or surgical re-exploration for bleeding. The duration of tracheal intubation and intensive care unit length of stay were shorter [6]. It therefore seems to be no compelling reason to use high dose opioid regimens in anaesthesia for elective cardiac surgery with CPB anymore.

Basic principles of cardiac anaesthesia include maintaining haemodynamic stability and minimizing myocardial ischaemia. The high dose narcotics were used in the past to obtund the nonconscious physiologic response to pain, which is a well known cause of adrenergic response that increases both myocardial and global oxygen demand. From an anaesthetic point of view it's the use of newer shorter acting anaesthetic drugs which has assisted in the fast tracking process.

The drive to effectively control post op pain, allow early extubation and decrease the risks of cardiac surgery has led to the search for a safe form of regional anaesthesia as an alternative to narcotics.

In the less invasive forms of cardiac surgery i.e. OPCABs and MIDCABS, the combined use of Remifentanyl with or without regional techniques has met with good success, enabling

very early postop (on table in some instances) extubation. However it should always be kept in mind that the cost and length of hospital stay depend on many other factors besides the choice of anaesthetic agents

Slogoff and Keats performed a prospective, randomised, blinded-analysis clinical trial of four different anaesthetics, sufentanyl (15 -30µg/kg) or fentanyl (10µg/kg) in combination with isoflurane, halothane, or enflurane, and found no difference in primary outcome of myocardial infarction (MI) or death [2]. But the study was underpowered and a very large number of patients would have to be studied to show any significance difference in anaesthetic technique in terms of death and MI outcomes. That is not to say there is no difference, there is just little chance of showing it without studying a very large number of patients. They did however find that tachycardia led to ischaemia, and ß blockers reduced tachycardia.

When deciding on anaesthetic technique, remember that controlling heart rate prevents ischaemia, preventing ischaemia prevents myocardial infarctions and deaths and the best way to prevent myocardial ischaemia is with a ß-blocker not with the choice or dose of opioids. There is no benefit from high dose opioid anaesthetic over low dose opioid with inhaled agent and the latter allows for fast track with the potential to reduce costs as well.

There is also a concern that FTCA and early tracheal extubation may lead to sub-optimal analgesia in the early postop period. We should look at multimodal analgesic techniques, using nonsteroidal anti-inflammatory analgesics, Paracetamol in correct dosages, tramadol and regional techniques, all of which would help decrease the use of parenteral opioids

Benefits of early extubation:

- Decrease in morbidity, early ambulation and a decrease in the duration of mechanical ventilation, leading to decrease in infections, anxiety and psychosis.
- Prevents complications due to prolonged immobilization (DVT's and PE's)

Another significant morbidity associated with cardiac surgery is postop myocardial ischaemia. Despite revascularization, postop ischaemia has been well documented. Intensive analgesia is essential to reduce further postop injury secondary to ischaemia but this all too often comes at a price of extended ventilation.

It has been shown that patients who are extubated in the first few hours after CPB may look good but have both functional and metabolic compromise of the myocardium. Delaying extubation to 3-4 hours after the operation minimizes not only increases the risks of cardio-respiratory instability but also those risks associated with bleeding.

2). The role of surgical technique:

In the last decade the trend in cardiac surgery has been towards minimizing patient trauma. This approach not only facilitates the fast track care plan but also reduces the incidence of periop morbidity and mortality. In CABG surgery the use of smaller surgical incisions and the avoidance of cardiopulmonary bypass are becoming routine. Advances in surgical instrumentation and improvements in surgical techniques, such as minimally invasive direct coronary artery bypass (MIDCAB) and endoscopic atraumatic coronary artery bypass grafting have helped patients recover more quickly than in the past. Limited skin incisions with mini-thoracotomy or mini-sternotomy with thoracoscopic video-assisted surgery have also been used successfully for valve replacements and CABG's. This minimally invasive approach reduces the surgical trauma to the patient, thereby decreasing the incidence of postop complications and shortening the duration of ICU and overall length of hospital stay.

Surgical technique:

In the Western world, coronary artery bypass grafting (CABG) is one of the most commonly performed cardiac procedures. In the last decade there has been renewed interest in performing CABG without cardiopulmonary bypass (CPB). Avoiding CPB eliminates aortic cannulation and cross clamping and is expected to reduce systemic inflammatory response, coagulation disorders, and multiple organ dysfunction.

Off pump CABG surgery has been developed following two different approaches.

i) Minimally invasive direct access coronary artery bypass (MIDCAB).

Consists of anastomozing the left internal mammary artery to the left anterior descending coronary artery through a small anterior left thoracotomy. This has largely been abandoned because it allows only single vessel surgery, is technically demanding, and may lead to sub optimal results. Postoperative pain is also usually more severe after thoracotomy than after sternotomy.

ii) Off pump coronary bypass surgery (OPCAB)

Usually done through a standard sternotomy, giving access to all coronary vessels and allows standard techniques of mammary artery harvesting and multi-vessel grafting without CPB

Rational for avoiding cardiopulmonary bypass (CPB)

Morbidity and mortality are decreased in patients having OPCAB **especially in high-risk patients.** By avoiding CPB one finds a reduction in transfusion requirements, in myocardial injury (as evidenced by troponin-T release), in length of

ICU and hospital stay and in global costs. Early post op course of patients is improved (confirmed by three randomised prospective studies)

The risk adjusted mortality decreased from 2.9% in conventional CABG to 2.3% for OPCABS and the complication rate down from 12% to 8%. . Neurological dysfunction and stroke were also reduced as aortic cross clamping and cannulation as well as the flow jet from CPB are eliminated in off pump surgery. However, not all studies show this, as the aorta is still side clamped and manipulated for the proximal anatomises in OPCABs.

Early outcomes and one month graft patency are comparable to on pump CABG. The rise in post op systemic inflammatory response (SIRS) markers is also decreased. The elderly and those with LV dysfunction show a greater SIRS response.

Advantages of OPCAB surgery are more likely to be found in high risk patients with significant comorbidities and an expected morbidity of 6-10%. i.e: The elderly, emergency coronary surgery, impaired coagulation disorders or impaired ventricular function (EF< 35%). OPCAB offers possible renal protection compared to CABG and can be done using sternotomy and thoracotomy. Recent improvements in the surgical techniques have resulted in the possibility of multiple-vessel grafting in all coronary territories

Contraindications:

Presence of intracavity thrombi, malignant ventricular arrhythmias, deep intramyocardial vessels, and procedures combined with valve replacements or ventricular aneurysmectomy.

Main problems with OPCAB from surgeons point of view:

i) Adequate exposure of anastomosis site with restrained cardiac motion

ii) Myocardial protection during coronary artery flow interruption.

Anaesthetic challenges:

i) Maintenance of haemodynamic stability during heart enucleation necessary for accessing each coronary artery;

ii) econdly, the management of intraoperative myocardial ischaemia when coronary flow is interrupted during grafting.

The anaesthetic technique is less important than adequate management of these two major constraints. The benefit of pharmacological preconditioning by volatile anaesthetics has been confirmed in a prospective randomised controlled clinical trial in patients undergoing OPCAB surgery. Patients receiving sevoflurane anaesthesia had less myocardial injury as evidenced by less postoperative troponin-I release compared with patients anaesthetized with propofol. Therefore volatiles should be the anaesthetic agent of choice.

One always has to be prepared for conversion to CPB (sustained VF or CVS collapse).

Anaesthesia technique

Avoiding CPB does not shorten the length of the procedure. The duration depends largely on the number of anastomoses performed and the skill of the surgical team. OPCAB, however, accelerates immediate postoperative recovery. This trend towards shorter ICU and hospital length of stay has led anaesthetists to adapt their technique to a fast-track management with early extubation (i.e. between 1 and 4 h after the end of operation). This has been proven to be safe and cost-effective.

Hypothermia, as it constitutes an independent predictor of morbid cardiac events, should be avoided by all possible means during the operation: fluid warming, a heat exchanger on the fresh gas flow, warming mattress etc. As much of the upper torso and lower limbs are exposed during surgery, forced-air heating devices are only marginally efficient; a room temperature up to 24°C is usually recommended. Maintaining normothermia is extremely challenging, as the absence of CPB also removes the opportunity to warm up the patient on bypass.

Thoracic epidural anaesthesia has been shown to increase the diameter of epicardial arteries, increase collateral blood flow, decrease myocardial oxygen demand, decrease the incidence of arrhythmias and the rate of chest infection, and provides adequate postoperative analgesia. Despite the advantages of cardiac sympatholysis for OPCAB surgery, randomised studies comparing general vs combined anaesthesia did not show significant difference in patient outcome, except for a trend towards earlier extubation. An ultra-fast technique with extubation in the operating room does not seem to be of any additional benefit to the patient or to be cost-effective. As beating-heart surgery requires less heparinization than CABG on CPB, the risk of epidural haematoma is reduced compared with conventional cardiac surgery, and should be the same as in major vascular surgery. There is a trend to keep patients on aspirin and antiplatelet drugs until surgery. Therefore, the place of regional analgesia, although very attractive in OPCAB surgery, needs to be further defined.

3) The rational behind regional anaesthesia in cardiac surgery:

Inadequate analgesia during the postop period may lead to many adverse haemodynamic (tachycardia, hypertension, vasoconstriction), respiratory (tachypnoea, decreased tidal

volume), metabolic (increased catabolism), immunologic (impaired immune response), and haemostatic (platelet activation) alterations.

Although neuraxial anaesthesia and analgesia techniques are widely used in many branches of surgery, critical care and chronic pain, they have not enjoyed great popularity in operations involving cardiopulmonary bypass, mainly because of a concern of neuraxial haematoma and spinal cord injury when large doses of heparin are used.

The recent interest in fast tracking patients has prompted a renewed interest in the use of neuraxial analgesia in cardiac surgery.

Mangano et al [8] demonstrated in adults undergoing CABG that aggressive control of pain (continuous IV sufentanyl infusion) during the immediate postop period (first 18 hours) decreased the incidence and severity of myocardial ischaemia diagnosed by ECG.

Intrathecal morphine produces intense and prolonged analgesia by stimulating opioid receptors in the substantia gelatinosa of the posterior spinal cord. The technique is simple, reliable, and produces predictable pharmacodynamic effects. Intrathecal morphine initiates dose dependent ventilatory depression which is intensified by concomitant administration of IV analgesics and sedatives

There are many potential advantages of regional analgesia in cardiac surgery:

Improved haemodynamic stability, intense analgesia, early tracheal extubation, improved ventricular function and improved metabolic profile.

Other advantages include better pulmonary management, early ambulation, shorter ICU and hospital stay and reduced costs. [3]

Those against say neuraxial blockade and high dose heparin have not been adequately studied and the possible consequences of spinal haematoma and paraplegia are too severe to justify the potential gain.

Those for argue the risk of clinically significant haematoma following CPD and heparinization are very low provided proper precautions are taken, so why deny patients the potential gain that regional anaesthesia has in cardiac surgery. There is limited evidence and experience to support the latter claim.

There have been numerous reports in the literature on the use of spinal or epidural blocks in cardiac surgery and none have reported any cases of clinically significant spinal haematoma. There are reports of spinal haematomas in patients on anticoagulation treatment following spinals or epidurals in non cardiac patients and so surely it's only a matter of time before a case is reported.

So what is the risk of a clinical significant spinal haematoma?

Chung and Ho [3] from Hong Kong looked at this and, using sophisticated formulae came up with estimates of risks for spinal and epidural blocks in cardiac surgery patients. They estimated the risks with a 95% confidence to be from 1:150,000 to 1: 1500 for epidural blockade and from 1:220,000 to 1:3,600 for spinal blockade.

Given the seriousness of spinal cord injury, perhaps a more stringent confidence level of 99% should be used. This would make the risks much higher and for epidurals it would be 1:1,000 and for spinals 1:2,400.

Remember that the above calculations are based on many assumptions which may be incorrect, ie cases of spinal haematomas that go unreported or the number of blocks performed is far higher than reported. Increased accuracy of risk prediction can only be achieved by more and accurate data collection.

Suggested Precautions to reduce occurrence of spinal injury:

1) Normalization of coagulation before instrumentation
2) Avoidance of repeated attempts
3) Postponement of surgery for 24hrs after bloody tap
4) Instrumentation ≥ 1Hr before systemic heparinization (most clinicians would insert an epidural catheter the day before surgery)
5) Optimisation of haemostasis after CPB
6) Removal of epidural catheter only after normal haemostasis has been restored postoperatively.
7) Close neurological surveillance
8) Use of midline technique
9) Administration of saline solution through the needle to distend the epidural space before insertion of the catheter
10) Neuraxial instrumentation postoperatively only after normalization of coagulation

Spinal haematomas

Spinal haematomas following neuraxial blockade can occur in both the subdural and epidural spaces. The first symptom of spinal haematoma is typically the sudden onset of severe back pain. This is followed by radicular signs such as numbness, paraesthesia, motor weakness, and loss of deep-tendon reflexes. Neurologic signs may progress to frank paraparesis, urinary retention and faecal incontinence. The onset of symptoms may be delayed for as long as 96 hours after neuraxial blockade.

The presence of local anaesthetics and opioids may mask back pain. Motor and sensory loss may be confused for local anaesthetic effect. The presence of a motor and sensory block that is unusually prolonged following the cessation of the local anaesthetic infusion may be the only sign of epidural haematoma. Patients should be informed of the expected duration of the anaesthetic and should be instructed to watch for unusual prolongation of the block. Continuous and careful neurologic monitoring, including intermittent interruption of a continuous blockade, should be considered for patients at risk.

Unfortunately, large enough trials that are able to demonstrate reduced myocardial infarction and mortality from the use of neuraxial blocks in cardiac surgery are lacking. A conservative estimate of the incidence of myocardial infarction would be approx 4%. Using some clever stats and power analysis techniques the following can be calculated. If the mortality rate of postop myocardial infarction associated with CABG surgery is estimated to be 13%, and neuraxial blockade results in an absolute reduction of 0.5% in the incidence of myocardial infarction, then one death would be avoided for every 1,540 patients.

By comparison we are 95-99% confident that there will be no more than one case of haematoma and potential paraplegia for every 1,500 and 1,000 cases respectively, of bypass surgery. Based on these estimates, neuraxial blockade is quite possibly a useful adjunct in conventional cardiac surgery and there thus may be a sufficiently acceptable risk/benefit ratio to justify a large scale study on selected patients. [3]

Most of the epidural haematomas that have been reported have been in patients who underwent thrombolytic therapy or underwent anticoagulation therapy at the time of the neuraxial procedure. A possible explanation for these observations is that heparin lacks a thrombolytic effect and that the coagulation process and clot formation is completed by the time of systemic anticoagulation during cardiac surgery.

Different regional techniques:

Epidural

Intrathecal : morphine, sufentanyl, fentanyl, clonidine

Paravertebral blocks, catheters

Thoracic epidural analgesia (TEA)

Thoracic epidural analgesia (TEA) may reduce mortality and cardiac morbidity by improving myocardial oxygen balance, reducing myocardial infarction size, and reducing perioperative stress response. Superior postop analgesia with TEA may reduce systemic opioid consumption, time to tracheal extubation, and pulmonary morbidity. Intrathecal opioids offer fewer potential mechanisms for improved outcome than TEA because of lack of effects on myocardial metabolism, lesser reduction of stress response and lesser duration of analgesia. A recent observational meta-analysis (205 000 subjects undergoing CABG surgery) determined that mortality (1.7%) and morbidity (myocardial infarction 2.4%) are relatively infrequent. [9]. No randomised controlled clinical trial large enough or powerful enough exists to show a potential significant benefit that neuraxial analgesia may have in cardiac surgery. So Spencer et all performed a meta-analysis to determine whether there is currently evidence for improved outcomes with central neuraxial analgesia in CABG patients [9]. They were unable to identify beneficial effects of TEA on risk of mortality and morbidity, possibly due to the small sizes of the studies included in the meta-analysis.

Potential mechanisms for TEA to favourably influence mortality and myocardial infarction after CABG surgery include segmental sympathetic block and analgesia. Use of local anaesthetics in TEA had been reported to reduce myocardial oxygen demand by decreasing heart rate, inotropy and systemic vascular resistance. At the same time TEA has been reported to improve myocardial oxygen supply by dilating stenotic coronary arteries. This improvement in myocardial oxygen balance has been demonstrated in humans to relieve angina and in the laboratory studies to reduce the size of myocardial infarction and to hasten recovery from myocardial stunning after ischaemia. Dysrhythmias are common after CABG surgery and TEA was associated with decreased risk of these. (AF and tachycardia). TEA with local anaesthetics reduce overall sympathetic tone and reduces stress response from surgery and cardiopulmonary bypass (CPB) and so would contribute to the decrease in dysrhythmias. TEA significantly hastened the time until tracheal extubation. The time to extubaion depends on a number of factors including analgesia and avoidance of respiratory depressant drugs. TEA was associated with reduced risk of pulmonary complications (pneumonia and atelectasis).

The majority of these benefits may be reduced or eliminated with changing cardiac anaesthesia practice using fast track techniques, use of Beta blockers or amiodarone, and nonsteroidal anti-inflammatory analgesics and cyclooxygenase – 2 inhibitors for post op analgesia.

Intrathecal Analgesia

Opioids/local anaesthetics:

The use of intrathecal injection (IT) for post op pain control is not a new concept.

IT analgesia entails a lower risk of haematoma formation than epidural access.

In a study out of Washington DC, USA, Finkel et al [4] looked at the haemodynamic changes during high spinal anaesthesia in children having open heart surgery. After an inhalational induction with Sevoflurane patients received spinal

anaesthetics with 0.5% hyperbaric tetracaine with morphine, with cephalad spread being promoted by positioning the patient in 30° Trendelenburg for 10 minutes. Maintenance was with isoflurane in 70% N_2O and at the conclusion of surgery, all patients met extubation criteria and could move all four extremities. They concluded that high spinal anaesthesia with hyperbaric tetracaine and morphine in combination with light general anaesthesia is well tolerated haemodynamically by the paediatric population studied. The main thrust of the study was looking at changes in haemodynamics as opposed to the reduction in post op analgesic requirements from the use of intrathecal opioids.

Intrathecal Opioids:

High dose intrathecal morphine (1-4mg) has been used showing a good improvement in the quality of pain relief and pulmonary function. However the use of high does of morphine may prolong extubation time. Pande et al [5] reviewed 125 patients who underwent CABG's and showed that post op pain was significantly lower in those who had received intrathecal opioids compared to traditional analgesic regimes. 78% were extubated in theatre and most within 6-8 hours post op. To reduce the risk of post op hypoventilation a smaller dose of morphine can be used combined with a shorter acting opioid such as sufentanyl (used intrathecally) or remifentanyl (used intravenously).

It becomes a balancing act to find the correct dose of intrathecal morphine along with the optimal intra operative baseline anaesthetic that will provide significant analgesia, yet not delay extubation in the immediate postop period.

Remifentanyl combined with intrathecal morphine:

Various doses of intrathecal morphine have been studied with various combinations of IV opioids and doses. White et al [7] looked at the use of Remifentanyl combined with intrathecal morphine as an alternative to sufentanyl during desflurane anaesthesia. Although remifentanyl can provide excellent haemodynamic stability during cardiac surgery, minimal residual analgesia in the postop period has discouraged its use as part of fast tracking protocols. Since the residual ventilatory depression produced by remifentanyl should be minimal, use of IT morphine should be beneficial in fast track anaesthesia where remifentanyl is used as the primary analgesic during surgery. They showed that the use of IT morphine, 8µg/kg in combination with IV remifentanyl provided superior postop analgesia (lower morphine requirements and better visual analog pain scores) when compared with IV sufentanyl alone, without interfering with the ability to fast track patients.

Sufentanyl-morphine combination:

Bettex et al from Zurich [10] compared the effect of combined intrathecal morphine (500 µg)and sufentanyl (50 µg) in 6mls normal saline, with low dose iv sufentanyl during propofol anaesthesia for fast track cardiac surgery. Their rationale: IT morphine allows intense postoperative analgesia but does not cover the operative period and may cause prolonged ventilatory depressions. IT sufentanyl provides intense and fast onset analgesia along with IT morphine. This combination could avoid deleterious effects and increase patient comfort because of their different peaks of activity. They found their technique provided more effective intraoperative and postoperative analgesia and better vital capacity than IV sufentanyl.

The low incidence of postop opioid related nausea and vomiting could be attributed to the antiemetic effect of propofol used for sedation during weaning.

Intrathecal morphine and clonidine:

Lena et al from Paris assessed analgesia in CABG surgery by combining intrathecal morphine and clonidine in a small double blind randomised study of 45 patients. [11].

They looked at three groups; placebo, intrathecal morphine (4 µg/kg) and lastly a combination of both intrathecal morphine (4 µg/kg) and clonidine (1 µg/kg).

Intrathecal clonidine not only produces analgesia but can also augment the analgesic effect of morphine. The addition of intrathecal clonidine to morphine allows the dose of morphine to be reduced and reduces the risk of respiratory depression while maintaining good analgesia. Over the first 24 hours PCA morphine consumption was significantly less in the morphine+clonidine group. They showed that by combining intrathecal clonidine and morphine, better postoperative analgesia was found than morphine alone and it allowed earlier extubation after surgery.

Previous studies showed that the analgesic effect of IT morphine depends on the time of administration. If given after surgery it is ineffective because of the slow onset of action. Given before surgery it is effective provided the dose is greater than 6 µg/kg. Such doses can prolong post op ventilation especially if combined with IV morphine as well. On the other hand smaller doses given in order to avoid respiratory depression will tend to give inadequate analgesia post CABG. Intrathecal clonidine is thought to act on specific $_2$-adrenergic receptors located on the dorsal horn of the spinal cord. It probably has a synergistic effect with morphine. Clonidine also reduces sympathetic activity and arterial blood pressure. In addition to its activity in the brainstem, intrathecal clonidine decreases the activity of presynaptic sympathetic neurones at the level of the spinal cord. Thus clonidine may blunt the hypertensive response to pain in ICU pts. Clonidine can cause sedation but this was never sufficient to delay extubation.

Paravertebral blockade:

In a descriptive study by Canto et al, they looked at the use of bilateral continuous paravertebral blockade in 111 patients undergoing cardiac surgery. [1]

Bilateral paravertebral blocks were placed after induction at T4/5, 2.5cm from the midline with the patients in the lateral position.

16G Touhy needle with loss of resistance to air were used and ~3cm of catheter left in the space: 0.2 –0.25ml/kg of ropivicaine 0.2% with fentanyl 2µg/ml down each catheter over 30 min. Remifentanyl infusion was started just before skin incision and continued throughout the operation. Maintenance was with Sevoflurane and cisatracurium infusion. Further top ups of Ropiv/fent were given if deemed necessary down the paravertebral catheters. After bypass a further 0.2-0.25ml/kgs of Ropivic/fent was given and IV ketorolac or Paracetamol. Patients were allowed to regain consciousness at the end, after the infusions were discontinued and sevoflurane stopped.

Post op analgesia was by catheter infusions but a much weaker solution of ropivicaine 0.075% and fentanyl (0.5µg/kg) at 0.15ml/kg/hr via 2 separate infusions.

Ropivicaine was used because of its low toxicity. The addition of fentanyl was justified by the fact that opioid receptors have been found in the dorsal route ganglia.

Blood vessel punctures did not have clinical consequences; another space was used if blood was aspirated readily through the catheter. Persistent somnolence was a worry and this decreased early extubations, and raises the possibility of significant systemic absorption of either fentanyl or ropivicaine.

The largest paravertebral spaces are between the first, second and third thoracic vertebral bodies which is near where the above catheters were placed. This may explain the low failure rate (1.8%). This coupled with the large volumes raises the possibility that the block extends to the epidural space, increasing the reliability of this technique.

The drop in BP, probably indicating the onset of sympathetic blockade was moderate and dopamine was only required in 3 out of 47 cases.

Post op analgesia scores were good in the majority of patients, only five patients being given parenteral opiates for escape analgesia. Times to extubation were short (86% were extubated in theatre and 90% within the first postop hour) as were ICU stays (average 38hrs).

They found the technique to be feasible, safe and reliable and provided good haemodynamic stability. It moderates the response to surgical stimuli, provides excellent analgesia and allowed early tracheal extubation.

In another study that compared continuous thoracic epidural and paravertebral blocks for postop analgesia in MIDCAB surgery, Dhole et al from New Delhi found that PVB were as effective as TEA for postop analgesia and being technically easier and safer is a viable option for this type of surgery. [12]

Summary

The acceptance of any technique into routine practice depends ultimately on evidence that its associated risks can be justified by improved outcome measures. The estimates of neuraxial haematomas and paraplegia are conservative and the true risks could be considerably lower.

For some of us however, one single case of spinal haematoma is too many and the risks given above are not low enough, especially when the benefits of neuraxial blockade in cardiac surgery have not yet been adequately substantiated. For understandable reasons we may be more tolerant of myocardial infarction, respiratory failure, or even death after cardiac surgery, than of paraplegia after an otherwise successful cardiac surgery. Fear of spinal haematoma will thus continue to discourage the use of regional techniques and thus hamper the accumulation of experience and data.

References:

1) Canto M, Sanchez M, Casas M and Bataller M: Bilateral paravertebral blockade for conventional cardiac surgery, Anaesthesia, 2003; 58, pages 365-370.

2) Slogoff S, Keats AS: Randomised trial of primary anaesthetic agents on outcome of coronary artery bypass operations. Anaesthesiology 1989; 70: 179-188

3) Ho AM, Chung DC, Joynt GM: Neuraxial Blockade and Haematoma in Cardiac Surgery. Chest, 2000: 117: 551-555

4) Finkel JC, Boltz MG, Conran AM: Haemodynamic changes during high spinal anaesthesia in children having open heart surgery. Paediatric Anaesthesia, 2003; 13 issue 1, page 48

5) Pande RU et al, Fast-Tracking Cardiac Surgery. The Heart Surgery Forum 2003, 6 (4) 244-248

6) Myles PS et al, A Systematic Review of the safety and effectiveness of fast-track cardiac anaesthesia. Anaesthesiology, 2003: 99; 982-7

7) White el al. Fast-Track Cardiac Anaesthesia: Use of Remifentanyl Combined with Intrathecal Morphine as an Alternative to Sufentanyl During Desflurane Anaesthesia. Anaesthesia and Analgesia, 2000; 91: 283-287

8) Mangano DT et al. Postoperative myocardial ischaemia: therapeutic trials using intensive analgesia following surgery. Anaesthesiology, 1992; 76: 342- 53

9) Spencer S et al. Effects of perioperative central neuraxial analgesia on outcome after coronary artery bypass surgery. Anaesthesiology, 2003; 101: 153-161

10) Bettex DA et al. Intrathecal sufentanyl-morphine shortens the duration of intubation and improves analgesia in fast-track cardiac surgery. Canadian journal of Anesthesia, 2002, 49: 711-717

11) Lena P et al, Intrathecal morphine and clonidine for coronary artery bypass grafting. British Journal of Anaesthesia, 2003, Vol 90, No 3. 300-303.

12) Dhole s et al, Comparison of continuous thoracic epidural and paravertebral blocks for postoperative analgesia after minimally invasive direct coronary artery bypass surgery. J Cardio thoracic Vascular Anesthesia. 2001 Jun; 15 (3): 279-81.

13) Chassot PG et al. Off-pump coronary artery bypass surgery: physiology and anaesthetic management. Br J Anaesth 2004; 92: 400–13