

Peripheral Nerve Blocks for Lower Limb Surgery – A Choice Anaesthetic Technique for Patients with a Recent Myocardial Infarction?

N Chia, T C Low, K H Poon

ABSTRACT

Peripheral nerve blocks are associated with minimal haemodynamic disturbance. It is perhaps ideal for high-risk surgical patients who cannot tolerate the adverse consequences of even the slightest attenuation of haemodynamic response. However, peripheral nerve blockade is often perceived to be time consuming and undependable as the sole anaesthetic. In this report, a 56-year-old man with severe sepsis and recent myocardial infarction presents for an urgent above knee amputation. We present the practical benefits of a combined sciatic-femoral nerve block on such a patient.

Keywords: Peripheral nerve block, peripheral nerve stimulator, combined sciatic-femoral nerve block, haemodynamic changes, adrenaline in local anaesthetic solution

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INTRODUCTION

Patients with recent myocardial infarctions (MI) are particularly at risk of peri-operative cardiac morbidity. The overall incidence in this high-risk population is reported to be 5.6%⁽¹⁾. Therefore, it is incumbent on us to minimise factors that may adversely contribute to outcome in this group of patients. We present a patient with recent MI coming for lower limb surgery for which the technique of peripheral nerve block (PNB) was employed.

CASE REPORT

A 56-year-old gentleman, who weighs approximately 60 kg, developed severe gangrene of his left foot after a failed Ray's amputation performed earlier in a different hospital. By the time he was seen at our hospital, an urgent above knee amputation (AKA) was deemed necessary.

Two years ago, he had undergone an elective coronary artery bypass surgery for triple vessel disease, with diabetes mellitus, hyperlipaemia and hypertension as risk factors. This admission,

a diagnosis of non-Q MI (three weeks old) was made based on symptoms of chest pain, positive Troponin T level and echocardiographic evidence. Complicating his medical condition further were atrial fibrillation (AF) with rapid ventricular response and a poor ejection fraction (EF) of 15%. His medications included lisinopril, digoxin, isosorbide dinitrate, metformin, glibenclamide and antibiotics: cloxacillin, ceftazidime and gentamycin.

The pre-operative clinical assessment of his condition revealed severe sepsis. He was febrile (T max. 38.5°C) with a raised white count ($19 \times 10^9/L$) and was in rapid AF (138 beats per minute) despite treatment with digoxin. He was not in cardiac failure and had a resting blood pressure 160/78 mm Hg. His other significant investigations were a normal renal panel and borderline coagulation profile – PT: 15.8 s, PTT: 27.6 s, INR: 1.63, platelets $470 \times 10^9/L$. To minimise any haemodynamic disturbance, a combined sciatic-femoral nerve block was planned for the surgery.

In the anaesthetic induction room, an 18G intravenous cannula was inserted in his left forearm, followed by placement of electrocardiogram, pulse oximeter and blood pressure cuff. A central venous line was then inserted in his right internal jugular vein and his left radial artery cannulated for continuous arterial pressure monitoring.

Fentanyl 50 ug was given intravenously for analgesia, after which the sciatic nerve block was performed under aseptic conditions using Labat's posterior approach⁽²⁾. Confirmation of needle placement (100 mm insulated needle; Stimuplex A; B. Braun) was easily achieved by eliciting plantar flexion with a stimulating current of as low as 0.5 mA. After careful intermittent aspiration, 10 ml of lignocaine 1.5% with adrenaline 1:200,000 and 5 ml of bupivacaine 0.5% were injected. To complete the anaesthesia above the knee, a femoral nerve block was performed as described by Khoo ST and Brown, T.C.K.⁽³⁾. A nerve stimulator (with a 50 mm insulated needle, Stimuplex A; B. Braun) was again used. Similar concentrations and volumes of local anaesthetic

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agents were injected after eliciting contractions of the quadriceps and patella. The lateral femoral cutaneous nerve was also blocked with 5 ml lignocaine 1% as described in Cousins and Bridenbaugh "Neural Blockade"⁽²⁾. The patient was comfortable during the entire procedure.

Thirty minutes later, a satisfactory level of anaesthesia was attained in the distribution of the nerves blocked. Surgery was carried out with minimal patient discomfort after a further bolus of fentanyl 50 ug. The haemodynamic parameters during the 75-minute surgery remained relatively unchanged from pre-operative baseline values – BP range: 145-165 mmHg (systolic) and 70-80 mmHg (diastolic); HR: 110-140/min (AF); CVP: 13-16 mmHg; SpO₂: 96-97% (ventimask 40% O₂). Total blood loss was 300 ml without the application of a limb tourniquet.

The patient was admitted to the intensive care unit (ICU) after surgery for monitoring of his cardiovascular status. Two weeks later, he was discharged after an uneventful post-operative course. At the outpatient review, a month, two months and eight months after his discharge, good surgical recovery was noted, with no post-MI complications.

DISCUSSION

While general anaesthesia may be a reliable alternative to any regional anaesthesia technique, a recent meta-analysis of 141 trials by Rodgers et al showed a significant reduction of peri-operative morbidity with regard to deep vein thrombosis, pulmonary embolism, transfusion requirements, pneumonia, respiratory depression, myocardial infarction and renal failure in patients who had received neuraxial blockade instead of general anaesthesia⁽¹⁶⁾. Najar et al similarly showed that combined sciatic-paravertebral nerve block for surgical hip fracture repair in elderly patients led to a lower incidence of intra-operative hypotension and need for post-operative admission to the ICU/HDU, when compared to patients receiving general anaesthesia⁽¹⁷⁾.

However, a nation-wide survey conducted in the United States in 1995 found that among the regional anaesthesia techniques, PNB and particularly PNB of the lower extremity remain under-utilised⁽¹⁸⁾. With regional anaesthesia techniques gaining favourable reports of haemodynamic stability during lower limb surgeries, perhaps greater use of these techniques should be encouraged⁽⁴⁾.

In a prospective study on 100 patients, Davies et al showed that sciatic nerve block had an acceptable success rate of 89% and is a suitable

technique for vascular surgical patients undergoing procedures distal to the knee joint⁽⁵⁾. It was found that by eliciting parasthesia or effecting a positive response to low current peripheral nerve stimulation, a good prediction of successful block outcome (92% and 93% respectively) was possible. Conversely, no successful block was observed when local anaesthesia was injected in a "blind fashion".

In a comparison of two different regional anaesthesia techniques for outpatient knee arthroscopy, Casati et al found that preparation time was slightly longer with sciatic-femoral nerve block than spinal anaesthesia while no differences were observed in the time required to achieve readiness for surgery (14 ± 5 min and 15 ± 6 min in the spinal and sciatic-femoral groups respectively). As for effectiveness of the anaesthesia, no differences were noted between the two techniques⁽⁶⁾. These findings debunk misconceptions that sciatic-femoral nerve block takes a longer time to achieve patient readiness and is inferior in intensity and distribution of its anaesthesia.

As sciatic-femoral nerve block results in a limited sympathetic blockade, its attractiveness must lie in its potential ability to minimise haemodynamic disturbance and improve regional blood flow to the limb. Fanelli et al compared the haemodynamic changes induced by combined sciatic-femoral nerve block (NB) and unilateral spinal anaesthesia (S). They found that the mean arterial pressure (MAP) did not change in patients in group NB, whereas in group S, MAP was reduced with a mean 15% reduction. Cardiac index was decreased by 15-20% in group S while no changes were observed in group NB⁽⁴⁾. Heart rate remained unchanged in both groups.

Although a low level spinal anaesthesia is frequently regarded as a safer anaesthesia technique in elderly and compromised patients, Shih et al – using bioimpedance haemodynamic monitoring – found that the decrease in cardiac output was greater than would be expected by measuring BP alone. In some patients, this decrease in cardiac output may be detrimental, and go undetected by measuring BP alone⁽¹⁹⁾.

The foregoing reviews attest to the simplicity and effectiveness of the combined sciatic-femoral nerve block. This case provides further proof of the haemodynamic stability that such a technique affords during surgery of the lower limb. While a unilateral spinal anaesthesia or general anaesthesia technique could have been performed for this patient, haemodynamic instability associated with

the two techniques may adversely influence the patient's outcome.

This favourable characteristic of the combined sciatic-femoral nerve block is due largely to the fact that, being a PNB, it has limited sympathetic blockade and produces local vasodilatation, which is smaller in distribution than that produced by unilateral spinal anaesthesia, which often also involves the viscera^(4,5). Furthermore, unlike spinal injections, PNBs are not associated with risk of developing spinal haematoma. This may be relevant in critically ill patients who may have associated coagulation abnormalities. Avoidance of cardiac depressant agents used during general anaesthesia is also beneficial to such high-risk patients.

Adrenaline was added to reduce lignocaine absorption into the circulation and reduce risks of local anaesthetic toxicity, as a fairly large volume of lignocaine was used. Careful intermittent aspiration was carried out to prevent accidental intravascular (IV) administration of the local anaesthetic et adrenaline 1:200,000 solution. IV absorption of adrenaline could have been avoided by use of an alternative local anaesthetic agent like Ropivacaine 0.75%^(8,9) where addition of adrenaline is unnecessary. If significantly absorbed, the adrenaline could have had a deleterious effect on the already rapid AF and underlying MI.

Sciatic nerve palsy may occur from direct trauma during needle placement, malposition of patient during surgery or inadvertent vasoconstriction of its nutrient vessels. The latter can occur in patients who are beta-blocked because of the unopposed alpha vasoconstrictive effect⁽¹⁰⁾. As regards to neurologic injury after PNB, the reported incidence is extremely low, ranging between 0.5 and 4.8:10,000^(11,12).

CONCLUSION

An above knee surgical procedure like AKA presents a technically challenging situation as it requires a successful block of the sciatic, femoral, lateral cutaneous and obturator nerves, especially if surgery involved a more proximal aspect of the thigh. However, with proper and newer peripheral nerve localising techniques, a successful nerve block is quite easily achieved^(5,12,20,21). A lesser volume of local anaesthetic would also be needed to produce the desired PNB. And with continuous nerve block catheters, which are available and increasingly in use in some centres, bolus supplements or infusions could always be given for inadequate blocks or for post-operative analgesia⁽²³⁾. Lastly, with the added advantages of stable haemodynamics

and improved regional blood flow, PNB should be considered more often in high-risk patients undergoing limb surgery.

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