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CASE REPORT

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Usefulness of peripheral nerve block as an aneasthetic technique in a critically ill Child– A case report

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Abstract*:* Regional anaesthesia in children is a growing field of interest in current anaesthesia practice. We report a case of brachial plexus block for a child with severe forearm necrotizing fasciitis and septicaemia. The need to avoid the multiple shortcomings of general anaesthesia in a critically ill child prompted the use of regional anaesthesia. This case is reported to highlight the prospect of regional anaesthesia for critically ill children who require surgical interventions in resource-poor settings.

Keywords: brachial plexus block, children, critical illness, septicaemia, regional anaesthesia

Introduction

The growing use of regional anaesthesia in infants, children and adolescents has increased the popularity of peripheral nerve blocks (PNB) in children. PNB is a form of regional anaesthesia which is accomplished by injecting a local anaesthetic near a nerve/nerves that controls sensation and movement to a specific part of the body.[1]This causes temporary numbness in the area. The growing use of the technique is a result of the increased confidence of anaesthetists in performing peripheral nerve blocks. PNB are typically used for surgeries of the upper and lower extremities, also for some procedures around the neck and groin.
Peripheral regional anaesthesia is of great utility in children undergoing surgeries of the upper extremities. In contrast to general anaesthesia, it avoids airway instrumentation and the use of many drugs.[1,] The peculiarities of this technique include the meticulous attention to dosing as a result of the poor development of connective tissues and the likelihood of extensive spread of locally administered drugs. Other important considerations include the risk of rapid absorption with attendant systemic toxicity, reduced duration of action and age-related anatomic variations.

The use of ultrasound guidance during axillary approach to brachial plexus blockade allows for real-time visualizaion of anatomical structures; however some anaesthetists prefer nerve stimulation to guide peripheral blockade, while some use both methods for greater accuracy and safety. However, the use of ultrasound scan and / or peripheral nerve stimulator is subject to availability. Our centre does not have the capacity for either. Complications of axillary approach include infection at the puncture site, axillary tenderness, heamatoma, intravascular injection and nerve damage[1,2]. This case report is to enumerate the prospects of blind axillary approach to peripheral brachial nerve block, in a low-resource setting, in a sick child who is not suitable for general anaesthesia.

Case report

Presentation, admission and treatment

A 9 year old presented in the children emergency ward of Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria on referral from a private hospital where he had presented with a 6 day history of fever, body pains and general malaise. He was admitted at the private hospital and given intravenous medications through the dorsum of the left arm. After three days the left arm subsequently became swollen, tender with limitations of active movements, with blister formation. These, coupled with the persistence of the symptoms necessitated his referral to the teaching hospital.

On admission he was acutely ill looking, pale and febrile (39ºC). He was in respiratory distress, tachypneic, tachycardic with a tender hepatomegaly. The left arm was swollen, tender with coalescing blisters, necrotic eschar and copious purulent exudates. The packed cell volume was 15% and chest x-ray showed evidence of pulmonary oedema. generalized widespread fluffy exudates. A diagnosis of septicaemia with focus in necrotizing fasciitis of the left upper limb, severe anaemia and congestive cardiac failure was made. He was resuscitated, commenced on parenteral antibiotics, diuretics, digitalis and blood transfusion. Bacteriological culture of pus aspirate yielded Proteus sp. He was planned for extensive wound debridement three days after admission to remove focus of sepsis.

Pre-anaesthesia Review

When he was reviewed on the morning of surgery he was still having temperature spikes despite intravenous antibiotics. Urinary output was adequate. There were no

known allergies. He had been on nil per oris for 12 hours. He was mildly pale and weighed 28kg which was appropriate for age. The respiratory and heart rates, blood pressure and precordial activities were normal. Airway assessment for ease of intubation and mask ventilation showed no abnormality. He had Mallampati 2 class with adequate mouth opening.
Abdominal examination revealed minimal ascites and hepatomegaly of 4cm below costal margin. The left elbow was in gauze and bandaged dressing. The initial laboratory findings included PCV 30%, negative retroviral screening, normal haemoglobin genotype and INR of 1.0.
Assessment was resolving septicaemia, resolving congestive cardiac failure. An American Society of Anaesthesiologist (ASA) physical status class assessment of IIIE was made.
The mother consented to the use of peripheral nerve block with sedation following adequate patient information.

Procedure In theatre

The child was placed supine. Pulse oximeter and precordial stethoscope and Non- Invasive Blood Pressure (NIBP) measurement apparatus were attached. Baseline parameters were; PR 107bpm, Bp 106/67mmHg, SpO2 was 97% at room air.
He was pre-medicated with IV hydrocortisone 100mg, sedated with IV 2.5mg midazolam with IV Paracetamol 50mg for analgesia. The injectate for the nerve block was made by mixing 5mls of 0.5% plain bupivacaine, plus 10mls of lignocaine in adrenaline and 10mls of sterile water.
A 22G hypodermic needle, first made blunt by passing it through the sterile plastic sheath, was used for the axillary block. The patient's arm was abducted to 90 degrees (Fig 1) and the palpation method was used to identify the axillary artery. Skin infiltration was done with plain lidocaine. Test aspirate was done and 20mls of the injectate was used for the axillary block and 5mls for the blockage of the musculocutanoeus nerve (Fig 2 and 3). Efficacy was confirmed with loss of pain to surgical stimulation after 10 minutes. Supplemental 100% oxygen was administered by face mask at 6l/minute flow rate.

Fig 1: Palpation method of locating the axillary artery prior to anaesthestic infiltration

Fig 2: Injection of local anaesthetic into the axillary sheath

Fig 3: Blockage of the musculo-cutaneous nerve.

The debridement lasted 15minutes, with an estimated blood loss of 50mls. He had 100mls of 4.3% dextrose in 5th saline. The pulse rate ranged between 120 and 135 beat per minutes during the procedure. There were no critical incidences or complications intra-operatively
Post operatively the arm was put in a POP back slab for support, and patient was transferred to the recovery room and later back to the ward. He made full recovery and was discharged a month later.

Discussion

Although the clinical diagnosis of septicaemia was bacteriologically confirmed, it was unresolved whether cellulitis of the arm resulted to septicaemia or the reverse occurred. The cellulitis could also have been due to drug -induced tissue injury with subsequent bacterial colonization. However the removal of pus and eschar in this patient was essential for infection control.[3] Anaesthetists are involved in the care of septic patients for resuscitation, intensive care and anaesthesia for infection source control. The latter includes drainage of abscess, debridement of necrotic tissue, removal of infected devices and foreign bodies. The anaesthesia of septicaemic patient for infection source control poses some challenges because of the gross heamodynamic instability and these risks are higher in children.

The available anaesthetic technique options include general anaesthesia or a brachial plexus block. The advantages of the use of regional anaesthesia as opposed to general anaesthesia include avoidance of the airway, reduced postoperative nausea and vomiting, improved tissue perfusion during re-implantations and the ability to provide a continuous technique for repeated procedures, and early hospital discharge.[4] Brachial plexus block was chosen in this case because a full general anaesthesia will lead to administration of anaesthetic agents that may further depress the myocardium thus worsening the heart failure. It is also important to avoid the airway and the chest due to the accompanying pulmonary oedema. Peripheral nerve blocks in septic patients cause less haemodynamic instability and less immunosuppression but also carry the risk of nerve damage, allergic reaction, intravascular injection and risk of toxicity.[3] The index case had none of these complications.

Various approaches can be used for the brachial plexus block; interscalene, supraclavicular, infraclavicular and

axillary approaches. Axillary approach is the commonest, easiest and safest approach in all age groups especially if it is done under the palpation method alone.[1,2,5] The continuous axillary block variant involves inserting a peripheral block catheter in the perineural space for intermittent injections of the local anaesthetic solutions. This improves outcomes after microvascular surgery.[5] Another safe method is the lateral infraclavicular approach which reduces the risk of pneumothorax[2]. The latter method is new in children, but gives a wider degree of blockage, and can be done with the patient's arm at the sides thus minimizing pain. Both can be made safer and easier with the use of peripheral nerve stimulator and / or ultrasound scan. [6,7.] Unfortunately, in low resource centres where peripheral nerve stimulator and an ultrasound are not routinely available, the blind technique by palpation becomes extremely useful and handy.

There are no published studies comparing general anaesthesia to upper limb regional anaestheisa[1]. There are also none comparing general anaesthesia with or without upper limb blockade. Performing a nerve block in children usually requires the use of sedation. Benzodiazepines and short acting opioids are useful in this regard. Midazolam, a short acting benzodiazepine was used in the index case. It provided sedation, hypnosis and anterograde amnesia without compromising the airway or the cardiovascular status of the patient. Paracetamol was used for pre-emptive analgesia after the effect of the nerve block must have worn off. This also avoided the respiratory depressant effect of opioids.

Conclusion

The case highlights the usefulness of peripheral nerve block, in a septic peadiatric patient undergoing infection source control surgery. It is a viable option to consider when the patient is unstable for general anaesthesia. It is safe, cost friendly and effective.

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