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Research Article

Ultrasound-guided supraclavicular versus infraclavicular brachial plexus nerve block in chronic renal failure patients undergoing arteriovenous fistula creation

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KEYWORDS

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Abstract *Background:* Most patients with chronic renal failure suffer from complications that make brachial plexus block a good choice for providing anesthesia. The use of ultrasonography increases the success rate and decreases complications. We compared the efficacy of ultrasound-guided supraclavicular and infraclavicular brachial plexus block in providing anesthesia for creation of arteriovenous fistula.

Patients and methods: Sixty adult patients with chronic renal failure, scheduled for creation of arteriovenous fistula of the distal upper extremity were randomly divided into two equal groups: **Supra G** (n = 30): ultrasonic guided supraclavicular brachial plexus block was given and **Infra G** (n = 30): ultrasonic guided infraclavicular brachial plexus block was given. For both groups we used 20–25 cm 1:1 volumes of 0.5% bupivacaine and 2% lidocaine. The measured parameters were block performance time and related pain, the degree and duration of sensory and motor block, patient discomfort, first call for analgesics, complications and the patient's satisfaction.

Results: There was no statistically significant difference between both groups as regard the block performance time, the block related pain, the degree of sensory and motor block in the areas

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supplied by the median, radial and musculocutaneous nerves at 10, 20 and 30 min. There was no statistically significant difference as regard the sensory block grade in the area supplied by the ulnar nerve at 10 min, but it was significantly higher in the Supra G than Infra G at 20 and 30 min. No statistically significant difference as regard the motor block grade in the area supplied by the ulnar nerve, the block duration, first call for analgesia, complications and patients' satisfaction.

Conclusion: Both approaches can provide satisfactory sensory and motor block, very good analgesia that extends for a long time postoperatively in patients with chronic renal failure undergoing creation of arteriovenous fistula.

1. Introduction

Patients with chronic renal failure may suffer from serious complications that represent a great challenge to the anesthesiologists. Complications like congestive heart failure, systemic hypertension, electrolyte imbalances, metabolic acidosis, coagulopathy, unpredictable intravascular fluid volume status and anemia obligate the anesthesiologist to avoid general anesthesia with its heroic risks in these patients and to think for alternative methods [1].

Brachial plexus block is often used in chronic renal failure patients to provide anesthesia for the creation or revision of arteriovenous fistula for hemodialysis access. It provides analgesia, sympathetic blockade, optimal surgical conditions and adequate duration of postoperative block that prevents arterial spasm and graft thrombosis. It provides higher blood flow in the radial artery and arteriovenous fistula than is achieved with infiltration anesthesia [2].

Many approaches can be used for brachial plexus block; axillary, supraclavicular and infraclavicular approaches. They were commonly performed by blind techniques or neurostimulation which may be associated with high failure rate and serious complications. Nowadays; the intraoperative use of ultrasonography becomes more popular and much easier. Its use in these blocks increases the success rate and decreases complications [3].

Previous studies had compared ultrasonic guided supraclavicular and infraclavicular block for upper limb surgery in normal patients [3–5]. They hypothesized that the onset in supraclavicular block is fast and the blockade is deep as the nerves are very tightly packed but pneumothorax can occur due to the proximity of the pleura. Pneumothorax can be avoided by ultrasonic visualization of the pleura and by proper technique [6].

They also hypothesized that the infraclavicular block is characterized by compact anatomical distribution of the plexus allowing single injection of local anesthetics and the decreased incidence of pneumothorax. However, it may be associated with patient discomfort and technical difficulty, which can be overcome by the use of ultrasonography [7–9].

In a previous study; ultrasonic guided infraclavicular block was compared with local infiltration anesthesia for creating vascular access for hemodialysis in patients with chronic renal failure [2]. But as far as we know; no study had compared between ultrasonic guided supraclavicular and infraclavicular brachial plexus block in this type of operation. This comparison would help if a local cause prevents the use of either of them like swelling, infection or obesity.

1.1. Aim of work

The aim of work was to compare the efficacy of ultrasound-guided supraclavicular versus infraclavicular brachial plexus block in providing anesthesia for creation of arteriovenous fistula in chronic renal failure patients.

2. Patients and methods

The Ethics Committee, Department of Anesthesiology, Faculty of Medicine, Cairo University, approved the protocol of this study. This randomized study was conducted on sixty adult patients with chronic renal failure scheduled for creation of arteriovenous fistula of the distal upper extremity. Patients enrolled in the present study were of both sexes, aged 20–60 years, and with ASA physical status III. Every patient signed an informed consent.

Exclusion criteria included the following: neurological, neuromuscular, psychiatric disorders, hepatic, respiratory, or cardiac diseases; uncontrolled seizures; coagulation disorders; infection at the block injection site; patients with a body mass index more than 30; or patients who refused the procedure.

All the patients included in the study were on chronic hemodialysis and they had a hemodialysis session one day before the block performance. Their routine preoperative laboratory investigations were within normal values especially prothrombin time (PT), partial thromboplastin time (PTT) and international normalized ratio (INR).

Patients were randomized using computer generated number and concealed using sequentially numbered, sealed opaque envelope technique to two groups of 30 patients each:

Supra G (n = 30): Ultrasonic guided supraclavicular brachial plexus block group.
Infra G (n = 30): Ultrasonic guided infraclavicular brachial plexus block group.

In both groups the block was performed using a 50 mm 20 G nerve stimulator needle model (Braun). The needle was inserted in-plane with a linear ultrasonic probe after the nervous and vascular structures were optimally visualized. A depth of 3–4 cm and a frequency of 10–12 Hz was used.

The local anesthetic solution used in both groups consisted of 1:1 volumes of 0.5% bupivacaine and 2% lidocaine (the total volume injected was from 20–25 cm). This solution was administered in increments with repeated aspiration in between and its characteristic distribution around the nerves was observed.