



Correspondence

Effectiveness of ultrasound-guided erector spinae plane block for postoperative pain control in hip replacement surgeries; A pilot study



Erector spinae plane block, a newly described technique has been demonstrated in previous studies for chronic and acute pain management showing that it is technically easy with lower risk for complications. It provides multiple dermatomal block through a single injection site. [1].

We performed this study to estimate the efficacy of the ultrasound guided ESP block for postoperative pain control in hip replacement surgeries under spinal anesthesia.

This study was performed in Cairo university hospital after obtaining approval of ethics committee (N-147-2018), anesthesia departmental scientific committee, protocol registration in was registered at clinicaltrials.gov (ID: NCT04003909) and a written informed consent from the patients. Thirty patients aged from 40 to 65 years of both sexes scheduled for hip replacement surgery under spinal anesthesia were enrolled in the study.

Patients were randomly assigned to one of 2 groups, 15 per group: ESP group (n = 15): patients had ultrasound guided ESP block before spinal anesthesia. And Control group (n = 15): patients had spinal anesthesia only. The anaesthesiologists involved in patient observation and data collection were blinded to the treatment group, as were the patients.

Upon arrival to the operating room, an 18-gauge intravenous cannula was inserted into a peripheral vein, basic monitoring as Electrocardiography, Non-invasive Blood Pressure monitor and pulse oximetry were attached.

Erector spinae plane block technique

Patients were placed in lateral position. A convex-linear array ultrasound probe (Siemens ACUSON X300 Ultrasound System) was placed in a transverse orientation at L4 level to identify the tip of the L4 transverse process. The lumbar skin region was sterilized; local anesthetic infiltration of the superficial tissues, an echogenic 22-gauge block needle was inserted in-plane to the ultrasound beam in a cranial-to-caudal direction until contact was made with the L4 transverse process. A total volume of 20 mL bupivacaine 0.25% was injected into the ESP on the affected side.

Spinal Anesthesia was then applied for both groups, local anesthesia 2 mL of lidocaine 2% was applied intradermally to the needle entrance point. 22-gauge block needle was inserted, free cerebrospinal fluid flow was observed and 20 mg of hyperbaric bupivacaine 0.5% and 10 µg of fentanyl were injected for 30s.

After the surgical procedure, patients were then transferred to post anesthesia care unit for complete recovery and monitoring.

All patients were given paracetamol 1 g IV every 8 h during first 24 h after surgery. Rescue analgesia in the form of morphine 0.05 mg/kg was given when VAS was > 3.

The demographic data of the patients regarding age, gender, ASA

and BMI did not show statistical significance. Also, the duration of the surgical procedure was comparable.

Postoperative morphine consumption in the 1st 24 h was significantly lower in ESP group (mean 1.6 ± 1.8 mg) when compared with control group (11.9 ± 3.2 mg) P value < 0.001. The duration of analgesia in hours (1st request for rescue analgesia) was longer in ESP group (17.5 ± 7.4 h) when compared to control group ($2.3 \pm (1.2)$ P value < 0.001 (Table 1).

VAS scale was significantly lower in ESP group when compared with controlled group in all time points (30 min, 2, 4, 6, 12, and 24 h post-operatively) (P values 0.029, 0.005, < 0.001, < 0.001, 0.005 respectively) (Table 1).

5 patients in the control group suffered from postoperative nausea from them only 3 patients suffered from vomiting. None of the patients in ESP group had nausea or vomiting.

There are no recorded intraoperative or postoperative complications regarding ESP block technique. Moreover, none of our patients had failed block.

We performed ESP block at lower lumbar levels (L4) because of the extension of the erector spinae muscle causing lumbosacral spread of local anesthetic. Moreover the local anesthesia spread within the musculofascial plane acting on the dorsal rami of spinal nerves as was demonstrated previously by previous studies and radiological evidence [1–3].

In our study we used 20 ml bupivacaine 0.25%. De Cassai et al. [4] demonstrated the volume needed to cover one dermatome widely varies from 2.5 mL to 6.6 mL, with a median of 3.4 mL. Furthermore, the maximum number of dermatomes reached by a single bolus in ESP was of 9 dermatomes after a 30 mL bolus [5]. Different concentrations and volumes as well as differing local anesthetics or mixtures should be investigated in future studies as well as the optimal dosing for both single-shot and continuous techniques.

Therefore, we report that Ultrasound-guided lumbar erector spinae block at L4 is safe and effective in reducing the postoperative morphine consumption and pain scores in the first 24 h after elective unilateral hip replacement surgeries.

Funding

This research was done in Cairo university hospitals using the equipment and resources available.

Availability of data and material

The data that support the findings of this study are available from Cairo university hospitals; however, they are not publicly available. Data are however available from the authors upon reasonable request after permission of Cairo university.

Table 1
Postoperative VAS scale, morphine consumption in the first 24 h and duration of analgesia.

| | ESP group (n = 15) | Control group (n = 15) | P value |
|--------------------------------|-----------------------|---------------------------|----------|
| Postoperative VAS | | | |
| 30th minutes | 1 (0) | 1.9 (1.5) | 0.029* |
| 2nd hours | 1 (0) | 2.1 (1.2) | 0.005* |
| 4th hours | 0.13 (0.52) | 2.7 (0.82) | < 0.001* |
| 6th hours | 1.7 (0.7) | 3 (0.65) | < 0.001* |
| 12th hours | 2 (0.65) | 3 (0.59) | < 0.001* |
| 24th hours | 2 (0.65) | 2.8 (0.77) | 0.005* |
| 24 h morphine consumption (mg) | 1.6 (1.8) | 11.9 (3.2) | < 0.001* |
| Duration of analgesia (h) | 17.5 (7.4) | 2.3 (1.2) | < 0.001* |

ESP: erector spinae plane block. Data is presented as mean and standard deviation (SD).

* Statistically significant at $P \leq 0.05$.

Authors' contributions

AR was responsible for the conception of the idea. AA, BA shared in design of the study, analysis of the data, and writing the manuscript. BA, MR and AA shared in data collection. BA, HZ, AA and MR shared in writing and revising the manuscript. All authors had read, revised and approved the final manuscript.

Ethics approval and consent to participate

Cairo university hospitals research committee was obtained (N-147-

2018). Written informed consents were obtained from participants before inclusion.

Declaration of competing interest

The authors have no conflicts of interest.

References

- [1] Tulgar S, Selvi O, Senturk O, Ermis MN, Cubuk R, Ozer Z. Clinical experiences of ultrasound-guided lumbar erector spinae plane block for hip joint and proximal femur surgeries. *J Clin Anesth* 2018;6(47):5–6.
- [2] Chin KJ, Adhikary S, Sarwani N, Forero M. The analgesic efficacy of pre-operative bilateral erector spinae plane (ESP) blocks in patients having ventral hernia repair. *Anaesthesia* 2017;72(4):452–8.
- [3] Singh S, Chaudhary NK. Bilateral ultrasound guided erector spinae plane block for postoperative pain management in lumbar spine surgery: a case series. *J Neurosurg Anesthesiol* 2019;31(3):354. Jul.
- [4] De Cassai A, Tonetti T. Local anesthetic spread during erector spinae plane block. *J Clin Anesth* 2018;48:60–1.
- [5] Forero M, Rajarathinam M, Adhikary S, Chin KJ. Continuous erector spinae plane block for rescue analgesia in thoracotomy after epidural failure: a case report. *A Case Rep* 2017;8(10). (254–3).

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