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Comparative study between ultrasound-guided lumbar erector spinae plane block and fascia iliaca compartment block for postoperative analgesia after total hip arthroplasty

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Abstract
Background: Optimized pain therapy following total hip arthroplasty (THA) is associated with important benefits, including more rapid rehabilitation and decreased risk of postoperative consequences. The purpose of this work was to contrast the pain-relieving effectiveness of ultrasound-guided Lumbar Erector Spinae Plane block (L-ESPB) against Fascia Iliaca Compartment Block (FICB) among individuals who were going to have THA.
Methods: This randomised controlled double-blinded work had been conducted on 75 participants aged from 30 to 75 years old, both genders, I-III physical status based on American Society of Anesthesiologists, scheduled for unilateral hip replacement surgeries utilising spinal anaesthesia. Patients were categorised into three equal groups. Patients obtained spinal anaesthesia alone in the control group plus ipsilateral L-ESPB (30 ml of bupivacaine 0. 25%) in the L-ESPB group and ipsilateral suprainguinal FICB (30 ml of bupivacaine 0. 25%) in the FICB group. Blocks had been conducted at the end of the surgeries guided by ultrasound.
Results: The time of first analgesic request revealed a significant delay in both L-ESPB group and FICB group as contrasted to the control group without significant variation among them. A significant increase in total 24-hour postoperative rescue morphine consumption and numerical rating scale in the control group had been existed contrasted to L-ESPB and FICB groups at 4hrs, 8hrs, 12hrs, 18hrs, and 24hrs ($p<0.05$) without significant variation among them. No patient in the three groups experienced any adverse effect in terms of infection, local anesthetic toxicity, or hematoma.
Conclusion: In patients undergoing THA, both L-ESPB and FICB are safe and comparable when used for postoperative analgesia.

Keywords: Fascia Iliaca compartment block, lumbar erector spinae plane block, analgesia, hip arthroplasty

Introduction
Total hip arthroplasty (THA) is a commonly employed surgical technique that is known to cause substantial pain after the operation [1]. Effective pain relief with minimal adverse effects enables patients to resume normal activities shortly following surgery, promotes optimal restoration of function, and reduces complications after surgery [2]. It is advisable to employ multiple analgesic approaches with distinct mechanisms of action to offer pain relief while minimising negative effects and adverse events in total joint arthroplasty [3]. Peripheral nerve blocks are crucial for perioperative multimodal analgesia, since they offer targeted and fast-acting pain relief at specific locations, which has been gaining more and more recognition [4].
The fascia iliaca compartment block (FICB) was initially introduced by Dalens and his colleagues in 1989. It continues to be a widely used local anaesthetic treatment for surgical interventions that include the femur and hip joint. The FICB is an anterior method used to target the lumbar plexus. It involves injecting a local anaesthetic just below the fascia iliaca to concurrently block the femoral nerve, obturator nerve, and lateral cutaneous nerve of the thigh [5].

Erector spinae plane block (ESPB) is a modern regional anaesthetic treatment that utilises ultarasound guidance. The initial description of this method was provided by Forero *et al*. in 2016, specifically for the purpose of managing chronic as well as acute thoracic pain. LA is administered by injecting it into the erector spinae muscle (ESM) and the transverse process of the vertebra. This causes the LA to extend downwards (Caudally), upwards (cephalad), and throughout the paravertebral area [5].

As far as we know, there have been no clinical studies that directly compare the efficiency of both ESPB and FICB in reducing postoperative pain following THA. Therefore, this work was performed to contrast the analgesic effectiveness of ultrasound-guided L-ESPB against FICB among individuals scheduled for THA.

Patients and Methods

This prospective randomised controlled double-blinded work had been conducted on 75 participants aged from 30 to 75 years old, both sexes, ASA physical status I-III, planned for unilateral hip replacement surgeries utilising spinal anaesthesia. The work was done from May 2022 to May 2023 following approval from the Ethics Committee Tanta University Hospitals, Tanta, Egypt (approval code: 35153/12/21) and registration of clinicaltrials.gov (ID: NCT05905510). Each participant provided well-informed written consent.

The criteria for exclusion encompassed individuals who demonstrated an inability to work cooperatively with researchers, individuals who had a documented history of allergic reactions to local anaesthesia, individuals with localised infections at the site of the blockage, individuals with coagulation disorders and bleeding, individuals with compromised renal, hepatic, or cardiac function, individuals with spinal deformities, individuals currently receiving opioids for chronic analgesic rehabilitation, and individuals with a body mass index exceeding 35 kg/m^2.

Randomization and blindness

The process of group allocation was performed by utilising software produced by computers that employed a sealed opaque envelope method for randomisation. The administration of all blocks was carried out by the same anaesthesiologist, while the measurements were recorded by another anesthesiologist who had no idea about patient allocation. Participants had been categorised at random into three groups equally: Control group: received spinal anesthesia alone, L-ESPB group: obtained spinal anesthesia and then ipsilateral L-ESPB (30 ml of bupivacaine 0. 25%) at the lumbar region level in the room of operation following the end of the surgeries and FICB group: received spinal anesthesia and then ipsilateral suprainguinal FICB (30 ml of bupivacaine 0. 25%) in the room of operation following the end of the surgeries.

Each participant had been exposed to taking of history, clinical examination and routine laboratory tests (full blood picture (CBC), clotting time, bleeding time, and liver and kidney function tests). Patients were fasting according to fasting guidelines. All patients were familiarised with the numerical rating scale (NRS) score during the pre-anesthetic assessment.

Both ultrasound block techniques were performed using a sterilized spinal needle (B-BRAUN 22 G, 88 mm), and a PHILIPS ultrasound machine (Philips CX50 Extreme Edition) was used to perform the blocks.

Intraoperative

Upon entering the operating room, a 20-gauge cannula had been employed for inserting a peripheral IV line. The participants were then subjected to normal monitoring, which included non-invasive arterial blood pressure, electrocardiogram (ECG), and pulse oximetry. Baseline mean arterial blood pressure (MAP) and heart rate (HR) measurements were documented. Spinal (Subarachnoid) anaesthesia under aseptic precaution was performed in a sitting knee-chest posture at the level of L3-L4 intervertebral space with a 25-gauge spinal needle, either median or paramedian approach. After confirming undisturbed circulation of cerebrospinal fluid, a volume of 3-4 mL of hyperbaric bupivacaine solution with a concentration of 0.5% was administered via injection. The sensory block was evaluated using spray disinfection and a pinprick test. The sensory block ought to be attained at a minimum level of T_{10}. Additionally, the motor block was assessed utilising a modified Bromage score until achieving a minimum score of 2 [6]. The patient exhibits immobility of the knee and hip joints, while retaining the capacity of moving the ankle joint. If the participant did not attain the desired degrees of motor and sensory blockage within 20 minutes, they were disqualified from the trial and instead got general anaesthesia. Once the patient's motor and sensory functions were successfully blocked, they were positioned on their side to undergo the surgical procedure. During the surgery, the participant obtained a standard amount of balanced crystalloids at a rate of 6 mL/kg/h. When bradycardia occurs (heart rate less than 60 bpm), intravenous atropine is given in divided dosages of 0.01 mg/kg, with a maximum dosage of 2 mg. If the MAP falls < 70 mmHg, intravenous ephedrine should be administered in divided doses of 5 mg, with a maximum dosage of 25 mg. At the end of the surgeries, ultrasound-guided blocks were done for both L-ESPB and FICB groups. Following the procedure, the participants stayed at the PACU and had been received monitoring for vital parameters. A multimodal analgesia protocol was commenced for all patients in all groups in the form of IV acetaminophen 1 gram / 6 hours in addition to ketorolac 30 mg / 12 hours. An intravenous dose of morphine at a rate of 0.03 mg/kg was given as needed for rescue analgesia [7].

US-guided Lumbar Erector spinae block

The blockage was conducted on the same side of the surgery with the participant in a lateral position. After the anesthesia site inspection, pre-scanning, and sterile preparations of the field, a sterile sheathed low-frequency (2-5 MHz) curvilinear ultrasound transducer was used to determine the 4th lumbar vertebral level. We started with the identification of the sacrum in the parasagittal oblique view, which appears as a flat continuous hyperechoic line. By moving cephalad from the sacrum, we have determined the lumbar intervertebral levels (L5 – S1) and (L4 - L5), we marked opposite to each identified level. Once levels were identified, we moved the probe laterally, starting from the midline to obtain the view of sagittal spinous process, the paramedian sagittal lamina view, the paramedian sagittal articular view, and the paramedian sagittal transverse processes view. The transverse processes can be identified by their crescent-shaped, highly reflective echoes and

finger-like acoustic shadows in front of them (known as the trident sign). The erector spinae muscles (ESM) are located behind the transverse processes. By employing the In-plane approach, a 22G/88-mm spinal needle had been introduced and progressed until it reaches the transverse process of L4. An injection of 0.5-1 ml of the prepared local anaesthetic solution (30 ml bupivacaine 0.25%) was given to perform hydrodissection and verify the accurate placement. The proper positioning was determined by the extent of LA spreading both cranially and caudally from the site of injection, separating the ESM and transverse processes. If resistance was encountered during the administration of local anaesthesia, the needle was adjusted by retracting it a few millimetres. LA was applied to the specific area located between the ESM and transverse processes. Following the block, the participants stayed in the PACU for about 30 minutes to fully monitor the patient's vital signs. Figure 1.

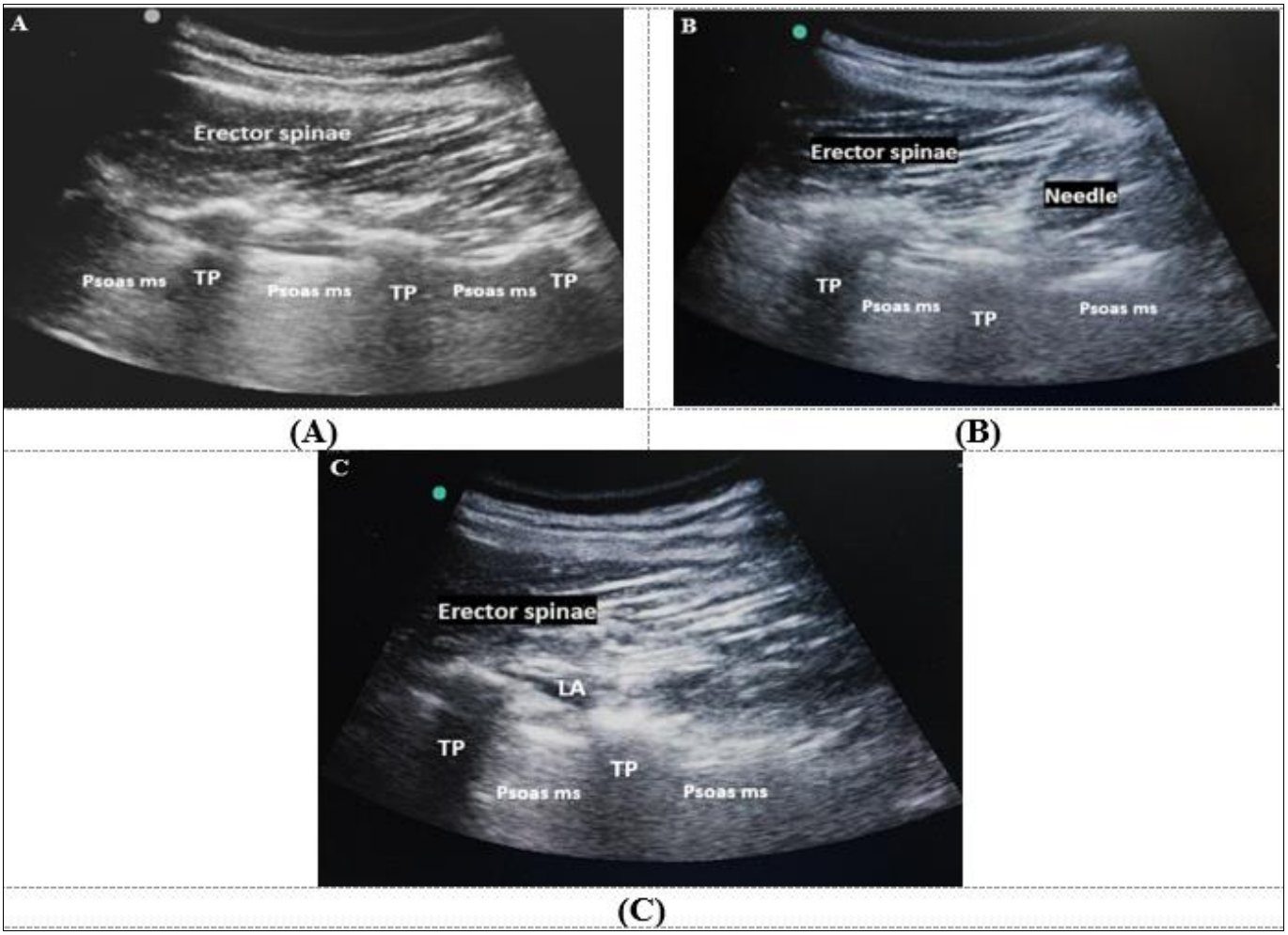

Fig 1: (A) US-guided L-ESPB: Anatomical view of L-ESPB. TP: transverse process, (B, C) US-guided L-ESPB: showing injection and spread of LA. LA: local anesthesia

US-guided Suprainguinal Fascia Iliaca Compartment block

An ultrasound-guided longitudinal supra-inguinal FICB was conducted on the same side as surgical procedure by the anaesthesiologist in the FICB group. Following the examination of the anaesthesia site, preliminary scanning, and sterilisation of the area, a clean-covered linear transducer was positioned in the sagittal plane to capture images of the anterior superior iliac spine. The fascia sartorius, iliaca, internal oblique muscles, and iliopsoas have been recognised by sliding medially from ASIS, utilising the "bow-tie sign". An 88-mm spinal needle with a gauge of 22 (G) was inserted 1 cm above the inguinal ligament utilising an in-plane technique. The fascia iliaca was detached from the iliacus muscle by administering small amounts of 0.5 – 1 ml of a prepared local anaesthetic solution. This created a gap where the needle tip could be further inserted. The deep circumflex artery was located above the fascia iliaca, elevated by injecting saline, and utilised as an indicator of effective penetration of the fascia iliaca. An injection of 30 ml of bupivacaine 0.25% was administered. The LA was supplied in 5 mL boluses with a 20-second interval, each preceded by a pre-injection aspiration to prevent injection into blood vessels. The precise positioning was determined as the extension of the LA above the point where the iliac muscle passes beneath the muscles of the abdominal wall. If the accurate distribution was not promptly observed, the injection was halted, and the needle was readjusted. Figure 2.

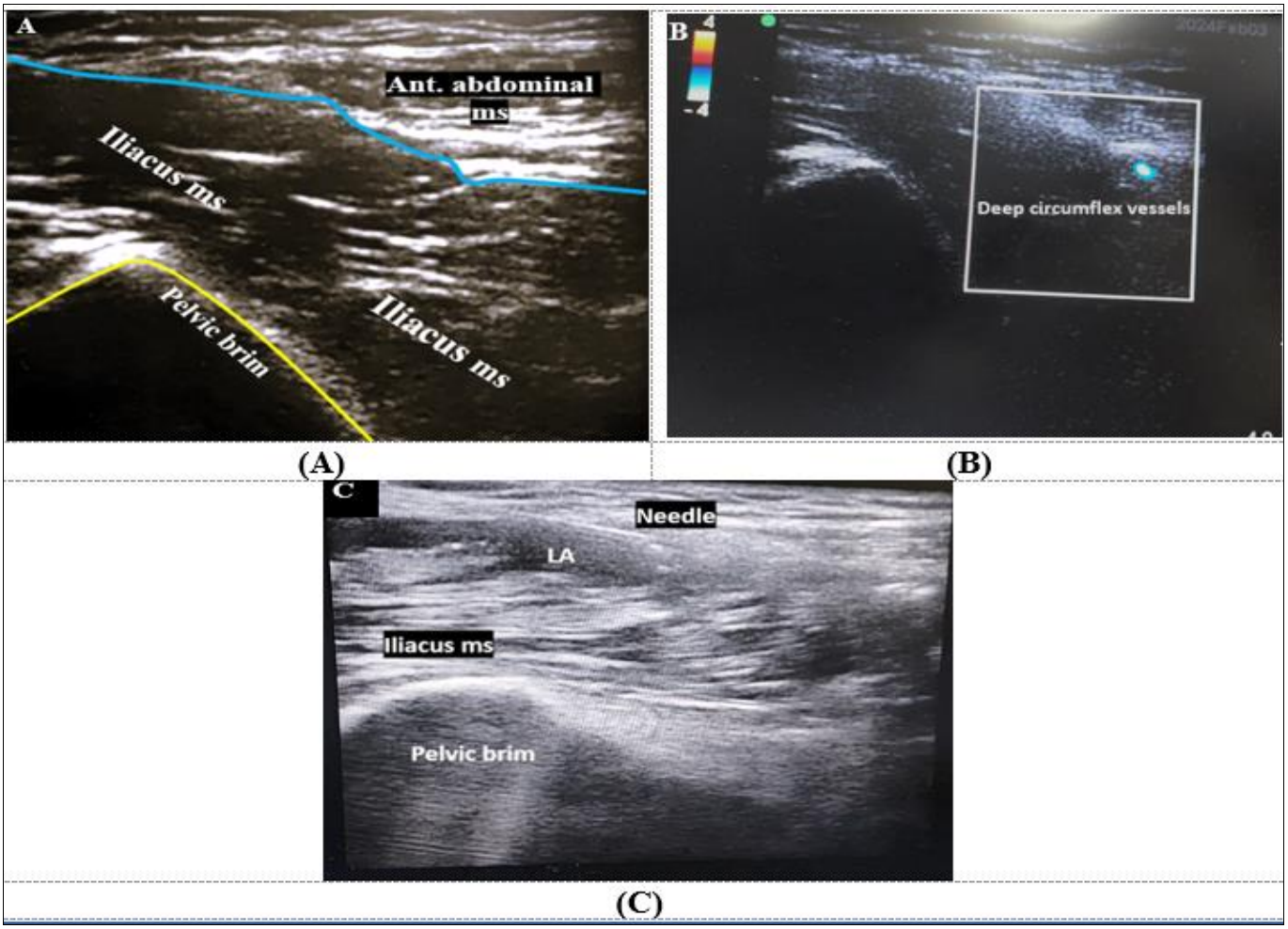

Fig 2: (A) US-guided suprainguinal FICB. Illustrated image for the anatomy of fascia iliaca; yellow line represents periosteum of the pelvic bone, and blue line represents fascia iliaca, (B) Color doppler mode showing deep circumflex vessels and (C) showing injection and spread of LA. LA: local anesthesia

Following the blockage, the patient remained in the PACU for about 30 minutes to fully monitor the patient's vital signs. Hemodynamic measurements, including HR and MAP were monitored postoperatively on arrival to PACU and at the 2nd, 4th, 8th, 12th, 18th, and 24th hour. Postoperative pain assessment was done using the NRS. NRS is a reliable and uncomplicated method for evaluating pain, where (a 0 score indicates the absence of pain and a 10 score indicates the worst pain conceivable). Postoperative pain was documented on arrival to PACU and at the 2nd, 4th, 8th, 12th, 18th, and 24th hour postoperatively. IV morphine sulfate 0.03 mg/kg was received postoperatively as a rescue analgesic if NRS is ≥ 4 [8]. The primary outcome was the assessment of postoperative pain using the NRS. The secondary outcomes were time required for the first rescue analgesia, the total postoperative rescue analgesic [morphine] requirements in the first 24 hours, hemodynamic measurements, including HR and MAP and any adverse effects from regional block or opioid use.

Sample Size Calculation

The sample size and power analysis had been computed utilising the Epi-Info software statistical tool developed by the WHO and the Centre for Disease Control and Prevention, Atlanta, Georgia, USA, version 2002. The criteria utilised for calculating the sample size had been the following: The study has a 95% confidence limit and 80% power. The anticipated rate of nerve blockage in the favourable treatment group is 95% contrasted to the least favourable treatment group, which is 60% [9]. According to the previously mentioned criteria, the sample size was found at N>23 in each group. The sample size was rised to 25 to compensate for missing data.

Statistical analysis

The statistical analysis had been performed utilising SPSS v27 (IBM©, Chicago, IL, USA). The normality of the data distribution was evaluated utilising the Shapiro-Wilks test and histograms. The quantitative parametric variables had been reported as the mean and standard deviation (SD) and went through analysis using an ANOVA (F) test with a post hoc test (Tukey). The quantitative non-parametric variables were reported as the median and interquartile range (IQR) and had been analyzed using the Kruskal-Wallis test with Post Hoc (Dunn's test) for contrasting each group. The qualitative parameters were expressed as frequencies and percentages (%) and were analysed using the Chi-square test. A two tailed P value < 0.05 was considered statistically significant.

Results

A total of 90 individuals underwent assessment to determine their eligibility, and 15 individuals were subsequently excluded; of them, ten individuals did not meet the inclusion criteria (three patients had decompensated hepatic disease, three patients had coagulation disorder, three patients were

chronic analgesic abusers, and one patient had spinal deformity) and five individuals declined to partake in the work. The remaining 75 individuals were assigned at random to three groups, with 25 participants in each group. The data of all 75 participants were collected and subjected to statistical analysis. Figure 3.

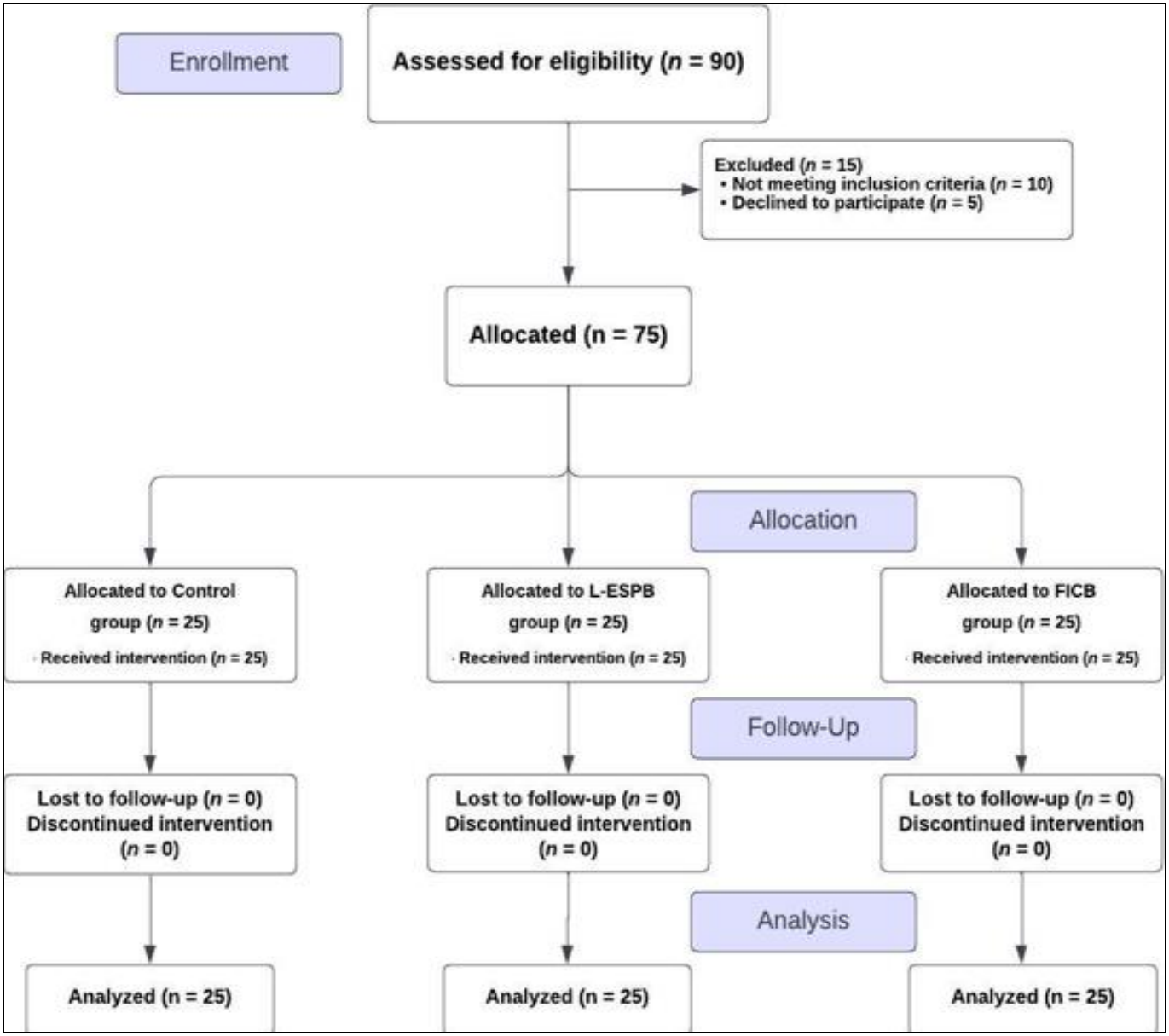

Fig 3: Consort flow chart for the studied patients

The demographic information and the duration of operation did not show any significant differences among the groups. Table 1

Table 1: Comparison between the three studied groups according to demographic data

		Control (n = 25)	L-ESPB (n = 25)	FICB (n = 25)	p
Age (years)		56.1±13.6	54.7±12.8	54.3±13.8	0.570
Sex	Male	10(40%)	12(48%)	9(36%)	0.681
	Female	15(60%)	13(52%)	16(64%)	
BMI (kg/m^2)		29 (27.3–32)	28 (26–30.2)	28 (27.4–29.9)	0.353
ASA		2 (1 – 2)	1 (1 – 2)	1 (1 – 2)	0.362
Duration of surgery (min)		151.9±20.9	156.8±21	162.4±17.2	0.164

Data are presented as mean ± SD or frequency (%) or median (IQR). L-ESPB: Lumbar Erector Spinae Plane Block, FICB: Fascia Iliaca Compartment Block, ASA: American society of anesthesiologists, BMI: Body mass index.

There was significantly greater in HR and MAP in the control group contrasted to the L-ESPB and FICB groups at 4hrs, 12hrs, and 18 hrs. (p<0.05). Figure 4

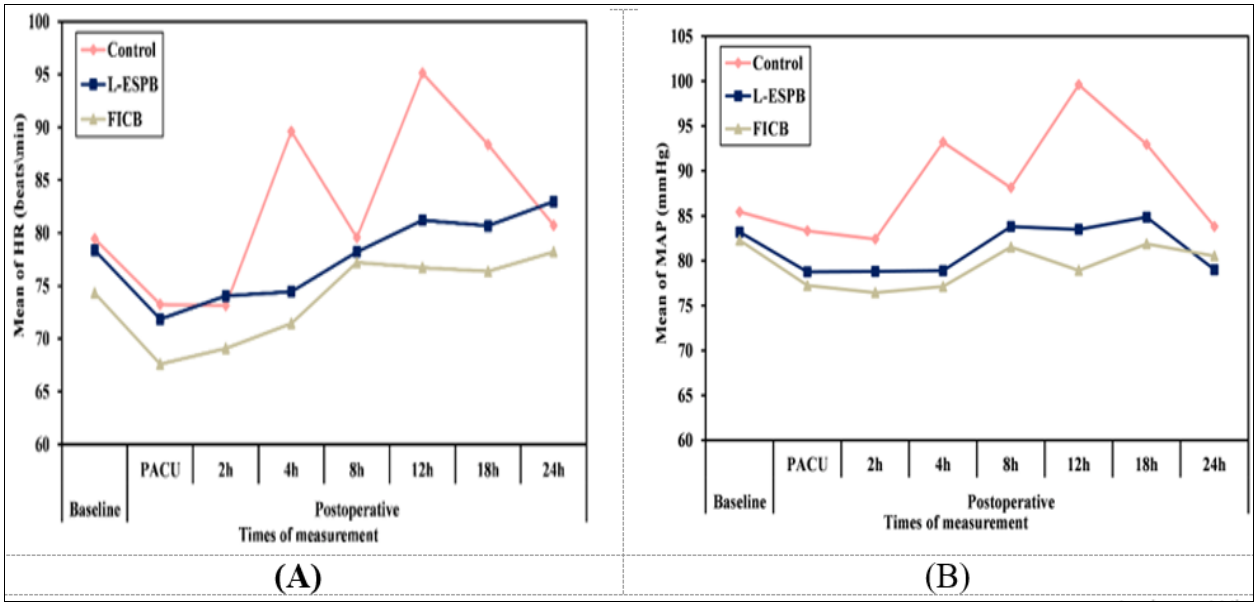

Fig 4: (A) Comparison between the three studied groups according to (A) heart rate, and (B) mean arterial blood pressure

There was significantly greater in NRS in the control group contrasted to L-ESPB and FICB groups at 4 hrs, 8 hrs, 12hrs, 18hrs, and 24hrs (p<0.05). Figure 5

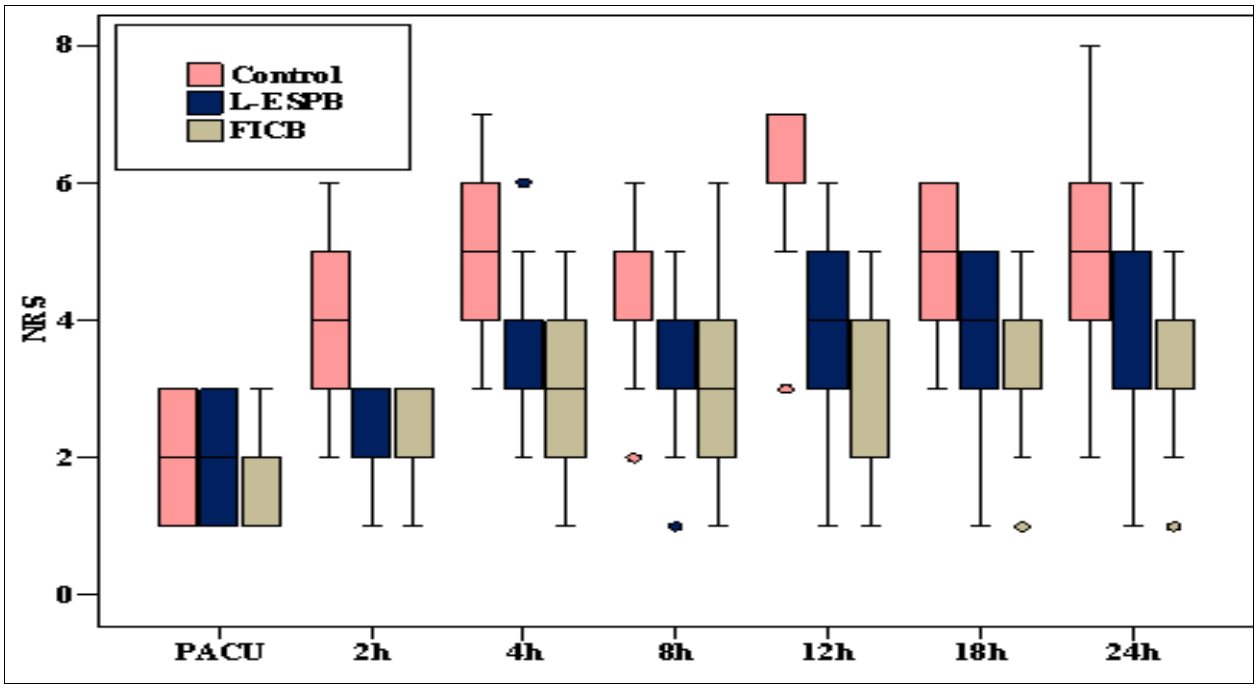

Fig 5: Box and Whisker Plot showing the distribution of median numerical rating scale scores

The time of initial request of analgesics and total 24-hour postoperative rescue morphine use showed a substantial delay in the time of first rescue of analgesics in both L-ESPB group and FICB group as compared to the control group without significant variation among L-ESPB group and FICB group. Table 2.

Table 2: Comparison between the three groups under the study based on to time of first analgesic request and total 24-hour postoperative rescue morphine consumption

	Control (n = 25)	**L-ESPB (n = 25)**	**FICB (n = 25)**	**P**
First analgesic (min.)	120 (120 – 240)	480 (240 – 720)	600(240 – 720)	<0.001*
Sig. bet. Groups	p_1<0.001*, p_2<0.001*, p_3=0.426			
Total 24-hour postoperative rescue morphine consumption (mg)	10.8±1.36	5.7±2.07	4.7±2.69	<0.001*
Sig. bet. Groups	p_1<0.001*, p_2<0.001*, p_3=0.659			

Data are presented as mean ± SD or median (IQR). *significant p value <0.05, p: p- value for comparing between the three studied groups, p1: p-value for comparing between Control and L-ESPB groups, p2: p-value for comparing between Control and FICB groups, P3: p-value for comparing between L-ESPB and FICB groups, L-ESPB: Lumbar Erector Spinae Plane Block, FICB: Fascia Iliaca Compartment Block.

No patient in the three groups experienced any adverse effect in terms of infection, LA toxicity, or hematoma.

Discussion

THA is a frequently performed surgery that is known to cause considerable pain after the operation. Effective pain relief with minimum adverse effects enables prompt movement after surgery, promotes optimal restoration of function, and reduces complications following the operation [2].

The findings of the present investigation showed that the use of L-ESPB and FICB in patients undergoing THA, compared to patients in control group, was associated with prolonged duration of analgesia as shown by lower NRS score, as well as with reduced rescue opioid consumption up to 24 hours postoperatively. Moreover, the results of the L-ESPB for hip analgesia were comparable to the FICB in all measured parameters. Furthermore, no block-related side effects were detected in our work. In line with our results, Desmet *et al.* [10] stated a decrease in pain scores within the first 4 hours after surgery and after 24 hours after surgery. The decrease in pain scores was most pronounced during the initial hours following the surgery. However, at 6, 12, and 48 hours postoperatively, no variation had been existed among the groups regarding pain scores. One possible explanation for the limited time reduction in NRS is the use of ropivacaine without adjuvants, which has a short duration of action. Our results were also supported by Gola *et al.* [11] reported lower resting NRS in the FICB group at all-time points (4, 8, 12, 24 hrs.) except for 48 h. The prolonged action of ropivacaine could be explained by adding an adjuvant (Adrenaline).

Our work revealed greater opioids consumption in the control group patients contrasted to individuals who received L-ESPB or FICB. Both groups also differed from the control group in the time to first rescue opioid dose. The duration was greater in the L-ESPB and FICB groups compared to the control group. These findings align with the meta-analysis conducted by Liu *et al.* [12] and Gao *et al.* [13]. The study discovered that FICB effectively decreased the requirement for opioids and alleviated pain severity in individuals after hip replacement surgery. Desmet *et al.* [10] reported comparable results, the effectiveness of FICB in anterior THR was evaluated. On the other hand, Townsend *et al.* [14] indicating that a specific subset of patients may benefit from the regional anesthesia technique.

To our knowledge, few studies have compared L-ESPB and FICB in total hip replacement surgeries. Flaviano *et al.* [15] concluded that Both L-ESPB and FICB have comparable advantages in reducing the need for opioids during the initial 24 hours following surgeries. Nevertheless, L-ESPB leads to less deterioration in the quadriceps motor function. The motor blockade caused by FICB is a significant issue as it is linked to a slower recuperation and delayed ability to move. Hence, L-ESPB shows potential as a viable substitute for FICB in providing pain relief following THA.

As regards hemodynamic changes, our results revealed that L-ESPB and FICB provide more hemodynamic stability after THA. This finding could be explained by better analgesic effect and reduction of pain scores in the block groups contrasted to the control group. These findings consistence with Jin *et al.* [16] revealed that patients who received pre-incision ESPB had more stable hemodynamics and improved satisfaction than those using general anesthesia alone. These results could be explained by better control of surgical stress response by preemptive analgesia. In addition, Kalashetty *et al.* [17] found a reduction in hemodynamic variables 30 minutes after the block in both groups. These changes in hemodynamic parameters can be attributed to the reduction in pain scores. Also, in a case report by Ling *et al.* [18] demonstrated that using ultrasound-guided FICB combined with general anesthesia for amputation among individual with recent myocardial infarction lead to more hemodynamic stability and alleviation of cardiovascular adverse effects due to reduction in the dosage of general anesthetic drugs needed for deepening of general anesthesia.

No block-related adverse events had been stated in this study. Direct ultrasonographic visualisation greatly enhances the effectiveness of the majority of regional anaesthesia procedures. By utilising high-resolution ultrasound, the anaesthetist is able to directly observe nerve structures that are important, resulting in enhanced accuracy of nerve blocks and prevention of problems [19]. LAST can arise from either accidental injection into a blood vessel or from the rapid absorption of local anaesthetic. Utilising ultrasound-guidance can decrease the likelihood of intravascular injections. However, the large amounts of LA administered throughout FICB may increase the risk of LAST by absorption [10]. These findings are consistent with Tulgar *et al.* [9] revealed that no patients in the L-ESPB group developed complications as there is no risk for mechanical nerve damage from the block. In addition, Desmet *et al.* [10] revealed that no patients in the ultrasound guided FICB group developed symptoms of LAST due to appropriate adjustment of LA dose.

Our results introduce L-ESPB as an efficient and secure approach for pain relief in THA, which showed near analgesic profile compared to FICB despite higher opioid requirements. The most important advantage of L-ESPB over other regional techniques is the simplicity of the technique and the employing of ultrasonographic landmarks provides clear and easily recognisable points for injection. This method also carries a low risk of serious adverse effects since the injection is targeted at a fascial plane that is far away from significant nerves and vessels. This reduces the risk of injury to the nerves, vessel harm, and accidental injection of local anaesthetic into the bloodstream [20]. Furthermore, it appears that the L-ESBP is the sole block that allows for pain relief for hip operations without any recorded impairment of the quadriceps muscle's motor function [14].

This study has some limitations including that both L-ESPB nor FICB are considered gold standard procedures for analgesics in surgeries for hips, and both are relatively recent block techniques. A more suitable approach would involve comparing both procedures to a benchmark technique, including epidural analgesia or lumbar plexus block. We didn't attempt to assess the duration of hospitalisation, satisfaction of patient, or the quality of recuperation, all crucial outcome measures for evaluating the effectiveness of a patient-focused perioperative care programme. The primary outcome was established by assessing the changes in NRS score. This might be considered a methodological issue. It would be ideal to establish the 24-hour morphine demand as the main result.

Both blocks assessed in this investigation have the capacity to induce motor weakness, the lower extremity muscle strength was not evaluated.

Conclusion

In patients undergoing THA, both L-ESPB and FICB are safe and comparable when used for postoperative analgesia. They provide good analgesic efficacy and hemodynamic stability. Furthermore, the time to first analgesic request is delayed, and the total postoperative opioid requirements are reduced after both blocks.

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Conflict of Interest: Nil

References

1. Jurewicz A, Gasiorowska A, Leźnicka K, Pawlak M, Sochacka M, Machoy-Mokrzyńska A, *et al*. Individual factors modifying postoperative pain management in elective total hip and total knee replacement surgery. Life. 2024;14:211-30.
2. Joshi GP, Kehlet H. Postoperative pain management in the era of ERAS: An overview. Best Pract Res Clin Anaesthesiol. 2019;33:259-67.
3. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. Anesthesiol. 2012;116:248-73.
4. Bugada D, Bellini V, Lorini LF, Mariano ER. Update on selective regional analgesia for hip surgery patients. Anesthesiol Clin. 2018;36:403-15.
5. O'Reilly N, Desmet M, Kearns R. Fascia iliaca compartment block. BJA Educ. 2019;19:191-7.
6. Elsharkawy RA, Messeha MM, Elgeidi AA. The influence of different degrees of temperature of intrathecal levobupivacaine on spinal block characteristics in orthopedic surgeries: A prospective randomized study. Anesth Essays Res. 2019;13:509-14.
7. Analgesic Agents. In: Butterworth Iv JF, Mackey DC, Wasnick JD, editors. Morgan &Mikhail's Clinical Anesthesiology. 13. 6th ed: McGraw-Hill Education; c2018. p. 187-98.
8. Van Dijk JF, Van Wijck AJ, Kappen TH, Peelen LM, Kalkman CJ, Schuurmans MJ. Postoperative pain assessment based on numeric ratings is not the same for patients and professionals: a cross-sectional study. Int. J Nurs Stud. 2012;49:65-71.
9. Tulgar S, Kose HC, Selvi O, Senturk O, Thomas DT, Ermis MN, *et al*. Comparison of ultrasound-guided lumbar erector spinae plane block and transmuscular quadratus lumborum block for postoperative analgesia in hip and proximal femur surgery: A prospective randomized feasibility study. Anesth Essays Res. 2018;12:825-31.
10. Desmet M, Vermeylen K, Van Herreweghe I, Carlier L, Soetens F, Lambrecht S, *et al*. A longitudinal supra-inguinal fascia iliaca compartment block reduces morphine consumption after total hip arthroplasty. Reg Anesth Pain Med. 2017;42:327-33.
11. Gola W, Bialka S, Owczarek AJ, Misiolek H. Effectiveness of fascia iliaca compartment block after elective total hip replacement: A prospective, randomized, controlled study. Int. J Environ Res Public Health. 2021;18:7-16.
12. Liu SS, Buvanendran A, Rathmell JP, Sawhney M, Bae JJ, Moric M, *et al*. Predictors for moderate to severe acute postoperative pain after total hip and knee replacement. Int. Orthop. 2012;36:2261-7.
13. Gao Y, Tan H, Sun R, Zhu J. Fascia iliaca compartment block reduces pain and opioid consumption after total hip arthroplasty: A systematic review and meta-analysis. Int. J Surg. 2019;65:70-9.
14. Townsend D, Siddique N, Kimura A, Chein Y, Kamara E, Pope J, *et al*. Lumbar erector spinae plane block for total hip arthroplasty comparing 24-hour opioid requirements: A randomized controlled study. Anesthesiol Res Pract. 2022;2022:982-50.
15. Flaviano E, Bettinelli S, Assandri M, Muhammad H, Benigni A, Cappelleri G, *et al*. Erector spinae plane versus fascia iliaca block after total hip arthroplasty: a randomized clinical trial comparing analgesic effectiveness and motor block. Korean J Anesthesiol. 2023;76:326-35.
16. Jin Y, Zhao S, Cai J, Blessing M, Sun Y, Hu S, *et al*. Efficacy of ultrasound-guided erector spinae plane block for perioperative pain control and short-term outcomes in lumbar laminoplasty. med Rxiv. 2020;46:2020-5.
17. Kalashetty MB, Channappagoudar R, Alwandikar V, Naik DL, Hulakund S, Guddad A. Comparison of pericapsular nerve group block with fascia iliaca compartment block in adult patients undergoing hip surgeries: A double-blinded randomized control study. Anesth Analg. 2022;16:397-410.
18. Ling C, Liu X-Q, Li Y-Q, Wen X-J, Hu X-D, Yang K. Ultrasound-guided fascia iliaca compartment block combined with general anesthesia for amputation in an acute myocardial infarction patient after percutaneous coronary intervention: A case report. World J Clin Cases. 2019;7:2567-76.
19. Marhofer P, Greher M, Kapral S. Ultrasound guidance in regional anaesthesia. Br J Anaesth. 2005;94:7-17.
20. Ahiskalioglu A, Tulgar S, Celik M, Ozer Z, Alici HA, Aydin ME. Lumbar erector spinae plane block as a main anesthetic method for hip surgery in high risk elderly patients: Initial experience with a magnetic resonance imaging. Eurasian J Med. 2020;52:16-20.

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