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RESEARCH ARTICLE

Fascia Iliaca Block versus Lumbar Plexus Block as Analgesia in Hip Surgeries: A Retrospective Cohort Study

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Abstract

Introduction: There is no gold standard regimen yet on regional or multimodal pain management for hip patients. However, ultrasound-guided peripheral nerve blocks such as the fascia iliaca and lumbar plexus techniques were both known to provide good analgesia to post hip surgery patients.

Objectives: The primary objective of this study was to compare the effectiveness and safety of fascia iliaca (FI) block versus lumbar plexus (LP) block for post-operative pain control of hip surgery patients.

Methods: This was a retrospective, analytical, observational, cohort type of an epidemiological study done through chart review of patients for hip surgery at Makati Medical Center. The primary endpoint was patient reported pain scores using numeric rating scale (NRS) of 1 to 10 at 0, 30, 60, 120 minutes at post-anesthesia care unit (PACU) and within 24 hours post-block and a comparison between the two groups. Additional endpoints included time and use of rescue opioid medication for pain relief within 24 hours post-operatively and occurrence of any adverse effect/s among the patients.

Results: In this study with 50 patients who underwent hip surgery, 36 and 14 patients were given ultrasound-guided FI and LP blocks, respectively. With female dominance (64%), majority of the patients were hypertensive (62%) and were classified as American Society of Anesthesiologists II (52%). The most common types of hip surgery done were partial hip arthroplasty (26%) and total hip arthroplasty (16%), with intertrochanteric (30%) and neck of the femur (26%) as the most common types of hip fractures. The clinical outcomes in terms of post-operative pain, length of stay at the PACU, and adverse events were comparable ($p > 0.05$) between the two groups. Overall, the post-operative pain score was graded as zero by the majority of patients at zero minutes up to 120 minutes, 92% and 88% respectively. A pain score of 6 to 10 (severe pain) was noted by 1 to 2 patients up to 60 minutes post-operative. There were no adverse events reported, and PACU stay was at a median of 2 hours, shortest was at 2 hours and longest was at 5 hours, which was noted in the FI group.

Conclusion: Fascia iliaca and lumbar plexus blocks were both effective and safe in providing post-operative pain control in hip surgery patients. They were comparable in terms of post-operative pain, length of stay at the PACU, and adverse events.

Introduction

Hip fractures, or one of the primary health problems in Asia, have been predicted that 50% of its cases to occur in the said continent by the next century [1]. Ethnicity, on the other hand, has a big impact on the prevalence of fragility fractures as per Center for Disease Control and Prevention data [2]. The incidence of geriatric hip fractures in Asia continues to rise dramatically due to

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the larger group of old-aged population and longer life expectancy [3].

In the Philippine Health Insurance Corporation, hip fractures placed fourth in insurance claims. Moreover, hip surgeries are one of the most common medical conditions that claim to have high readmission rates along with acute myocardial infarction, congestive heart failure, chronic obstructive pulmonary disease and knee surgeries [4].

Recent data shows that there is no gold standard regimen yet on regional or multimodal pain management for patients post total hip arthroplasty. The usual practice of anesthesiologists is using a combination of peripheral nerve blocks with adjunct pain medications/interventions such as local infiltration analgesia, gabapentinoids, systemic non-steroidal anti-inflammatory drugs and spinal (intrathecal) opioids. These pain management options aim to provide optimal and prolonged analgesia with minimal side effects and rapid recovery [5].

The fascia iliaca block provides analgesia through diffusion of local anesthetic under the iliacus fascia, which then spreads to the femoral and lateral femoral cutaneous nerves. The lumbar plexus block, on the other hand, focuses on providing anesthesia to the origins of the mentioned nerves as well as the obturator nerve. Blocking these nerves at their origin at the lumbar plexus has been tested and shown to improve relaxation and immobility of the lower extremity in hip arthroplasties, fracture repair and other procedures of hip and knee [6].

In a prospective randomized controlled trial study by Thompson, et al. 47 elderly patients were included where 23 and 24 patients were in the experimental and control groups, respectively. The experimental group was given an ultrasound-guided fascia iliaca compartment block. Results of the study showed that there was no significant difference in functional recovery between the two groups but there was a statistically significant decrease in morphine consumption and increase in patient-reported satisfaction in the experimental group [7].

In a study by Ahamed, et al. 50 patients with femoral intertrochanteric fracture were given lumbar plexus block (LPB) and subarachnoid block (SAB) thru convenient sampling. Results of this study showed that performing an LPB and the time to achieve block is longer and the time of asking for rescue analgesia was also significantly longer in the LPB group ($p < 0.001$) [8].

In post hip surgery patients, initial and effective management of pain can lead to faster recovery, ambulation and rehabilitation. This remains as a big challenge for the anesthesiologists as well as lessening the risks and overall costs/expenses of hospitalization [5].

Objectives of the Study

General objective

- To compare the effectiveness and safety of fascia iliaca block versus lumbar plexus block for post-operative pain control of hip surgery patients.

Specific objectives

- To determine patient reported pain scores using numeric rating scale (NRS) of 1 to 10 at 0, 30, 60 and 120 minutes at post-anesthesia care unit (PACU) and compare between FI and LP groups.
- To determine patient reported pain scores using numeric rating scale (NRS) of 1 to 10 within 24 hours post-block and compare between FI and LP groups.
- To determine the time and use of rescue opioid medication for pain relief within 24 hours post-operatively and compare between FI and LP groups.
- To determine any adverse effect/s (see reporting of adverse events) occurred in performing FI and LP blocks.

Review of Related Studies

Pharmacology of local anesthesia agents

Bupivacaine is an amino-amide local anesthetic agent that belongs to the family of n-alkyl substituted pipechoyl xylidines, as well as mepivacaine and ropivacaine. A four-carbon atom chain forms the alkylic substitute. These local anesthetic agents have a carbon atom connected to four different molecules hence forming a chiral center. Both bupivacaine and mepivacaine are solutions that contain a mixture of both dextro- and levorotatory enantiomers in equimolar amounts. On the other hand, levobupivacaine and ropivacaine consist of pure S(-) isomers. Table 1 shows the seemingly similar chemical and physical properties of bupivacaine, levobupivacaine and ropivacaine, except for the less lipophilic property of ropivacaine because of the substitution of pipecoloxylidine with a 3-carbon side-chain instead of a 4-carbon side-chain [9].

The mechanism of action of these agents is the same with the other local anesthetics, sodium-channel blockers in nerve fibers. As inhibitors of these voltage-gated channels, it occurs as both time and voltage dependent. Consequently, an increased threshold activates the action potential and reduces the propagation of the electric impulse along the nerve fibers with complete block of their function. However, interaction occurs with other ion channels in excitable tissues, such as the central nervous system and myocardium [9].

Clinical applications in peripheral nerve blocks

Ropivacaine, when used at same concentration and

Table 1: Chemical and physical properties of the three considered long-acting local anesthetics.

	Bupivacaine	Ropivacaine	Levobupivacaine
Molecular weight	288	274	288
pKa	8.1	8.1	8.1
Liposolubility	30	2.8	30
Partition coefficient	28	9	28
Protein binding (%)	95	94	95

dose, produces the same effect as that of the racemic bupivacaine when clinically used in nerve blocks. However, when used at concentrations 0.75% or 1%, the onset time and duration of block are shortened and prolonged, respectively.

The long-acting local anesthetics ropivacaine and levobupivacaine were developed as alternatives to the racemic bupivacaine but with a greater margin of safety due to their lesser toxic potentials [9].

A study by De Leeuw, et al. was done in 2008 to compare postoperative analgesic efficacy and the degree of sensory and motor blockade of levobupivacaine, ropivacaine, and bupivacaine to 45 patients who were given combined psoas compartment-sciatic nerve block (PCSN) for total hip arthroplasty. Motor impairment was significantly more evident in the bupivacaine group compared to that of both ropivacaine and levobupivacaine groups at 12 ($p = 0.012$) and 48 hours ($p = 0.003$). Levobupivacaine, bupivacaine and ropivacaine are equally effective for PCSNB in patients undergoing total hip arthroplasty. This study concluded that in terms of clinical efficacy, there were no major differences seen among the three local anesthetic agents probably due to the similarities in their chemical structures. Levobupivacaine is the S(-) enantiomer of bupivacaine and ropivacaine is a S(-) enantiomer of a propyl analog of bupivacaine [10].

Methodology

Study design and setting

This was a retrospective, analytical, observational, cohort type of an epidemiological study conducted at Makati Medical Center from October 2021 to June 2022 [11].

Operational definitions and procedures

Operational definitions:

1. Pain- Refers to an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [12].
2. Anesthesia- Refers to the complete or partial loss of sensation, with or without loss of consciousness, as a result of disease, injury, or administration of an anesthetic agent, usually by injection or inhalation [13].
3. Analgesia- Refers to absence of pain in response to stimulation which would normally be painful [12].
4. Opioid- A term that has been used mainly to designate substances that are not derived from opium, and in particular opioid peptides, such as natural substances that bind to opioid receptors and mimic the effect of morphine-like compounds [14].
5. Patient-controlled analgesia (PCA)- Refers to the delivery of analgesia via an infusion pump that is programmed to deliver a pre-determined bolus when triggered by the patient. The pump has a lockout period, during which time no further boluses can be administered [15].

Procedures

Fascia iliaca block

The ultrasound-guided fascia iliaca block was performed pre-operatively or post-operatively at the recovery room under minimal sedation with close monitoring. With the patient in the supine position, the linear transducer covered with a sterile dressing and the sterile drapes surrounding the pathologic hip, FIB was done by placing the transducer transversely on the inguinal crease and moving it slowly laterally or medially. The fascia iliaca was seen as a hyperechoic structure that lies superficially to the hypoechoic iliopsoas muscle. By scanning medially, the femoral nerve was visualized lying deep to the fascia and lateral to the artery. By scanning laterally, the sartorius muscle was typically seen as the triangular shaped muscle. A gauge 20 (80 mm) echogenic needle was inserted in-plane, and as the needle passes through the fascia, a “pop” was felt. After negative aspiration, about 1 to 2 ml of LA was injected to confirm location between fascia and iliopsoas muscle. LA spread was seen from medial to lateral direction. The local anesthesia (LA) used in this block was either 0.25% l-bupivacaine/bupivacaine/ropivacaine or 0.1% ropivacaine. The LA volume required to complete this block ranges from 20 to 40 ml. The LA was injected in increments of 5 ml with repeated aspirations, allowing it to spread from medial to lateral direction under the fascia iliaca but superficial to the iliacus muscle.

Lumbar plexus block

The ultrasound-guided lumbar plexus block was

performed pre-operatively or post-operatively at the recovery room under minimal sedation with close monitoring. With the patient in lateral decubitus position or operative hip up, the curvilinear transducer was covered with a sterile dressing and the sterile drapes surrounding the flank, LPB was done by using the Shamrock method and using a nerve stimulator. The probe was placed on a transverse plane on the flank of the patient cranially to the iliac crest.

The quadratus lumborum muscle was identified as medial to the aponeurosis of the transversus abdominis muscle. The quadratus lumborum muscle inserts on the apices of the transverse processes L1 to L4.

The transverse process and vertebral body of L4 were identified. With the psoas muscle anterior to the transverse process, the erector spinae muscle posterior to the transverse process and the quadratus lumborum muscle attached to the apex of the transverse process of L4, an easily recognisable pattern of a shamrock with three leaves was identified.

The transducer was shifted slightly caudal until the transverse process of L4 disappeared from the ultrasound image. The point of needle insertion was on the back of the patient, 4 cm lateral to the midline on a line representing the intersection of the ultrasound beam with the skin. A gauge 20 (100 mm) echogenic stimulation needle was advanced in-plane and in the anterior direction. Electrical nerve stimulation which starts at 2 mA of electrical stimulus, was applied to obtain a specific response or muscle twitch, in this case, a quadriceps twitch, in order to locate the lumbar plexus. A threshold below 0.2 mA indicated an intraneural needle position and requires repositioning of the needle tip. When an appropriate needle position was adjusted and confirmed, the local anesthesia will be injected slowly upon negative aspiration in aliquots. Abolishing the quadriceps twitch indicated a positive Raj test.

The local anesthesia (LA) that was used in this block is 0.25% l-bupivacaine/bupivacaine/ropivacaine if to be used for analgesia, or 0.25% l-bupivacaine/1% lidocaine if to be used for anesthesia. The LA volume used to complete this block ranges from 20 to 25 ml.

Outcomes of interest

Primary outcomes

a)

- **Outcome name:** Type of hip surgery underwent.
- **Metric/Method of Measurement:** Identify (i.e. partial hip arthroplasty, total hip arthroplasty, arthroscopic hip surgery, etc).
- **Time endpoint:** Pre-induction period.

b)

- **Outcome name:** Type of peripheral nerve block done.
- **Metric/Method of Measurement:** Indicate if FIB or LPB.
- **Time endpoint:** Induction period.

c)

- **Outcome name:** Local anesthesia used.
- **Metric/Method of Measurement:** Indicate if bupivacaine, l-bupivacaine or ropivacaine.
- **Time endpoint:** Induction period.

d)

- **Outcome name:** Total volume of local anesthesia used.
- **Metric/Method of Measurement:** Volume in milliliters (ml).
- **Time endpoint:** Induction period.

Secondary outcomes

a)

- **Outcome name:** Pain (patient-reported)
- **Metric/method of measurement:** Interval/Ratio
- **Time endpoint:** 1 to 10 at 0, 30, 60 and 120 minutes at post-anesthesia care unit (PACU)
- **Interpretation:** 1-10 (higher means worse pain)

b)

- **Outcome name:** Use of rescue medication if there is/are any (at PACU)
- **Metric/method of measurement:** Nominal
- **Time endpoint:** 1 to 10 at 0, 30, 60 and 120 minutes at post-anesthesia care unit (PACU)

c)

- **Outcome name:** Pain (patient-reported)
- **Metric/ method of measurement:** Interval/Ratio
- **Time endpoint:** 1st hr, 2nd hr, 3rd hr, ... 24th hr (from PACU discharge)
- **Interpretation:** 1-10 (higher means worse pain)

d)

- **Outcome name:** Use of rescue medication if there is/are any (from PACU discharge)
- **Metric/method of measurement:** Nominal
- **Time endpoint:** 1st hr, 2nd hr, 3rd hr, ... 24th hr (from PACU discharge)

e)

- **Outcome name:** Time of opioid rescue (if there is/are any) from the time of FI or LP blocks administration
- **Metric/ method of measurement:** Interval

- **Time endpoint:** Post-operative period

f)

- **Outcome name:** Occurrence of any adverse event related to FI or LP blocks
- **Metric/method of measurement:** Nominal
- **Time endpoint:** Post-operative period

Exposures, confounders, effect modifiers

Exposures	Confounders	Effect modifiers
▪ Hip surgery	▪ Age, sex, pain tolerance, co-morbidities, other medications	▪ Type of hip surgery

Study population

Inclusion criteria

1. Participant demographics

a. Age group (18 to 100-years-old)

b. Gender (male and female)

c. Nationality/race (any)

2. Qualifying characteristic

a. Patients with ASA Classification status I to IV for hip procedures (i.e., partial hip arthroplasty, total hip arthroplasty, hip arthroscopy, closed reduction of hip, open reduction of hip, etc) who were given fascia iliaca or lumbar plexus block either pre-operatively or post-operatively for analgesia.

3. Disease definition, stage, and severity

a. ASA Classification I: Refers to a normal healthy patient, i.e. fit, non-obese (body mass index of under 30), non smoking patient with good exercise tolerance [16].

b. ASA Classification II: Refers to a patient with a mild systemic and well-controlled disease and with no functional limitations, i.e. treated hypertension, obese (body mass index of under 35), frequent social drinker or cigarette smoker [16].

c. ASA Classification III: Refers to a patient with a severe systemic disease that is not life-threatening or with some functional limitation due to a disease, i.e. poorly treated hypertension or diabetes, morbidly obese, chronic renal failure, a bronchospastic disease with intermittent exacerbation, stable angina, implanted pacemaker [15].

d. ASA Classification IV: Refers to a patient with a severe systemic disease that is a constant threat to life or with functional limitation from severe, life-threatening disease, i.e. unstable angina, poorly controlled chornic obstructive pulmonary disease, symptomatic congestive heart failure, recent or less than three months ago myocardial infarction or stroke [16].

Exclusion criteria

1. Subjects who were pregnant and lactating.
2. Subjects who underwent hip surgeries under general anesthesia and did not receive any nerve block for analgesia.
3. Subjects who were given other peripheral nerve block/s aside from FIB and LPB (e.g., PENG block).
4. Subjects who were given local infiltration analgesia by their surgeons intraoperatively.

Data collection

Sampling method and randomization: The list of all patients who fulfilled the inclusion criteria was retrieved. This list was generated from the database of all patients who had hip surgeries from January 1, 2020 to December 31, 2021. This list splits into two: (1) Those given with FIB and (2) Those given with LPB. Each patient in their respective lists was designated with numbers 0 or 1 randomly with probability equal to 212/N where N is the total number of eligible participants on each list. Patients who had a tag of 1 were included in the sample and their patient charts were retrieved for data collection.

Sources of data

Level of Data	Source of Data	Documents to be reviewed
Medical Records	Patient charts	Age Gender Medical History Medication History
Operating Room	Monthly Census	List of patients from January 1, 2020 to December 31, 2021 who underwent any type of hip surgery
Department of Anesthesiology	Anesthesia Records	ASA Classification Type of nerve block administered for anesthesia and/ analgesia Type of hip surgery Medications given intraoperatively
Department of Nursing	Nurses' Notes	Post anesthesia care unit records Numerical Rating Scale (Pain) Medication for rescue doses (if there is/are any) Pain nurses' notes in patients who were on PCA post-operatively

Data to be collected: A master list from the census of Operating Room from January 1 2020 to December 31 2021 was obtained and used in identifying the cases that were included in the study.

A medical record review was conducted and the following data were collected from the pre-anesthesia evaluation: Age, gender, ASA Classification, medical history, medication history and allergy (if there was/were any). The type of hip surgery and peripheral nerve block used for analgesia (FI block or LP block) were obtained from anesthesia records.

Data from the Nurses' notes primarily included post anesthesia care unit (PACU) records where the PACU monitoring and medications sheets can be found.

Data management, archiving and confidentiality: The research protocol was submitted for review by the Hospital's Research Ethics Committee. A letter of approval from the Medical Records and Head of Records Section was then secured to access the charts of patients who qualified the inclusion criteria. Coding and electronic storage mechanisms were used to guarantee confidentiality of patient's data and identity. A final data collection form was constructed so that the data collection procedure was systematic and accurate.

Statistical data and plan of analysis

A large sample is needed when looking for a small effect, when the standard deviation is large, and when a greater statistical power is desired. The values presented below were based on previous literature. However, the effect size to be detected can be specified. Sample size calculations should be based on the smallest effect size that is worth detecting scientifically or clinically. Choosing the sample size requires thought. Factors to consider include terms of viability, amount of effort and time to complete the study. Ultimately, analysis can still be done even if there is a small sample, but it will not hold much power. A longer time period is suggested since this is a retrospective study.

Descriptive statistics was used to summarize the general and clinical characteristics of the participants. Frequency and proportion were used for categorical variables (nominal/ordinal), mean and standard deviation for normally distributed interval/ratio variables, and median and range for non-normally distributed interval/ratio variables. Outcomes were sub-grouped according to the type of hip surgery. Independent Sample T-test, Mann-Whitney U test and Fisher's Exact/Chi-square test will be used to determine the difference of mean, median and frequency between groups, respectively.

All valid data were included in the analysis. Missing variables were neither replaced nor estimated. Null hypothesis was rejected at 0.05 α-level of significance. STATA 15.0 was used for data analysis.

Sample size computation

A minimum of 424 patients was required for this study, based on a level of significance of 5% and a power of 80% to detect a difference in the amount of opioid intake post-op among those given fascia iliaca (FI) versus lumbar plexus (LP) blocks. The values used were based from the study of Badiola, et al., 2018 [17].

Sample size formula [18]:

$$n_1 \geq \frac{\left(\sigma_1^2 + \sigma_2^2/k\right) \times \left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2}{\left(\mu_2 - \mu_1\right)^2}; \quad n_2 \geq \frac{\left(k\sigma_1^2 + \sigma_2^2\right) \times \left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2}{\left(\mu_2 - \mu_1\right)^2}$$

Where:

$Z_{1-\alpha/2}$ = Standard normal distribution corresponding to the specified size of the critical region (5%) = 1.960.

$Z_{1-\beta}$ = Standard normal distribution corresponding to the chosen level of power (80%) = 0.842.

μ_1 = Mean PACU opioid intake of those given FI block.

μ_2 = Mean PACU opioid intake of those given LP block.

SD_1 = SD of mean PACU opioid intake of those given FI block.

SD_2 = SD of mean PACU opioid intake of those given LP block.

k = ratio (n_2/n_1) = 1

n_1 = Minimum sample size of FI block group

n_2 = Minimum sample size of LP block group

n = Total minimum sample size = $n_1 + n_2$

Since the opioid intake values were in median and interquartile range format, the values were first transformed into mean and standard deviation using the formula of Wan, 2014 [19] (Table 2).

$$\overline{x} \approx \frac{\left(q_1 + 3Median + q_3\right)^2}{3} \qquad SD \approx \frac{q_3 - q_1}{2\varphi^{-1}\left(\frac{0.75n_{ref} - 0.125}{n_{ref} + 0.25}\right)}$$

Reporting of adverse events

Adverse events based on literature were reported based on standards while the others (when applicable) were recorded in detail as an open-ended variable.

Complication rates of doing fascia iliaca blocks were low. Local hematomas may occur but very seldom. Nerve damage and/or intravascular injection of local anesthesia was also exceedingly rare due to the distance of the skin puncture from the neurovascular bundle [20].

On the other hand, lumbar plexus block complications were infrequent. A local anesthetic systemic toxicity (LAST) is always a potential complication in any nerve block as well as peripheral nerve injury. However, there were reports on spread of local anesthesia to the epidural space, usually on the contralateral side causing bilateral weakness, hypotension and micturition problems. Moreover, there were reports of intrathecal injection and subarachnoid block but rare. Retroperitoneal or psoas hematoma is a major complication of LPB, which are fortunately uncommon. Lastly, an LPB may cause renal injury such as a subcapsular hematoma [21].

Ethical considerations

The protocol of this study adhered to the ethical considerations and ethical principles set out in relevant guidelines, including the Declaration of Helsinki, WHO guidelines, International Conference on Harmonization-Good Clinical Practice, Data Privacy Act of 2012, and the National Ethics Guidelines for Health Research.

Table 2: Sample size at 5% alpha and 80% power.

Outcome	Median (IQR) (FI vs. LP)	Mean (SD) (FI vs. LP)	Effect size	n
Pain at 15-min post-block	3.4 (0-6) vs. 2.87 (2-4)	3.13 ± 4.72 vs. 2.96 ± 1.58	0.0483	13,462
PACU opioid, mg	20.8 (5.62-33.75) vs. 16.98 (5.81-22.5)	20.06 ± 22.11 vs. 15.10 ± 13.19	0.2725	424
PACU length of stay, min	139.72 (90-219) vs. 165.04 (113.5-183)	149.57 ± 100.42 vs. 153.85 ± 54.10	-0.0531	11,154
Cumulative morphine consumption at 48h, mg [4]	-	6 ± 15.5 vs. 9 ± 10.8	-0.2246	624

Conflicts of interest and funding: The authors reported no disclosures. No potential conflicts of interest have been identified. The principal investigators and co-investigators reported no disclosures. This study was fully funded by the author.

Data safety, privacy, and confidentiality: All data was retrieved in digital format. It was all stored in a shared Google Drive folder, which contained all the files on research and clinical audits, files of the subsection and of the authors of this study. Computerized study information was stored on a secured network with password access. All identifiable information and data were given a code number. A master list linking the code number and subject identity were kept separately from the research data. Only members of the research team have access to the list. Individually identifiable research data were not shared with others outside of the research and analysis team. After three years, the authors will delete (send to Recycle Bin and delete again) all the files, unless the hospital or the Department seeks to retain it for Accreditation purposes.

IRB approval and informed consent: The study only commenced upon the approval of the Institutional Review Board of Makati Medical Center. The data were collected through a chart review, for which a waiver of informed consent was requested.

Adverse events: No adverse events were anticipated, because this study was conducted retrospectively.

Discontinuation: Not applicable, because this study was conducted retrospectively.

Community consideration: The results of the study may be able to explain how fascia iliaca and lumbar plexus blocks compare, as analgesia for patients who underwent hip surgeries.

Compensation: This study was initiated and funded wholly by the principal investigator. As this was a retrospective study, no compensation was given to patients who were part of the analysis.

Vulnerability: We recognized that our subjects were particularly vulnerable, and we took extra care in the confidentiality of their identities. Moreover, this was a retrospective study.

Benefit: The results and analysis from this study have potential societal benefits, which will directly or indirectly benefit the participants through health systems delivery strengthening or improvements in implementation or policy change.

Funding: This study was fully/partially sponsored by the author.

Results

A total of 50 patients who underwent hip surgery were included in this study, 36 patients were given ultrasound-guided fascia iliaca block and the rest had ultrasound-guided lumbar plexus block (Table 3). The median age in years was 72.5 (youngest was 23 and oldest was 91) and the median weight in kilograms was 65 (range of 40-109.2), with female dominance (64% vs. 36%). A little over half of the patients (52%) were categorized as ASA Classification II, with hypertension as the most common comorbidity (62%). A few patients (8 or 16%) had allergies. Two of the most common types of hip surgery done were partial hip arthroplasty (26%) and total hip arthroplasty (16%). The most common types of fractures were intertrochanteric hip fracture (30%) and neck of the femur fracture (26%).

The clinical outcomes in terms of post-operative pain, length of stay at the PACU, and adverse events were comparable ($p > 0.05$) between fascia iliaca and lumbar plexus block (Table 4). Overall, the post-operative pain score was graded as zero by the majority of patients at zero minutes up to 120 minutes, 92% and 88% respectively. At most, 3 to 6 patients experienced mild to moderate pain (pain score of 1 to 5), from 0 to 120 mins post-operative. A pain score of 6 to 10 (severe pain) was noted in 1 to 2 patients up to 60 min post-operative. There were no adverse events reported and PACU stay was at a median of 2 hours, shortest was at 2 hours and longest was at 5 hours, which was noted in the fascia iliaca group.

In the FIB group, three patients required rescue opioid on the 1st to 8th hour post-block due to mild (NRS 1-3), moderate (NRS 4-6) and severe pain (NRS 7-10) and pain was relieved by tramadol 25 mg intravenously (IV), tramadol 50 mg IV and oxycodone 5 mg orally, respectively (data shown in Appendix A, Appendix B and Appendix C). At the 9^{th} to 16^{th} hour post-block, a patient required rescue oxycodone (5 mg orally) due to severe pain. At the 17^{th} to 24^{th} hour post-block, a patient required rescue tramadol (50 mg IV) due to severe pain.

On the other hand, in the LPB group, a patient required rescue oxycodone (2.5 mg IV) at the first 30 minutes of PACU stay due to severe pain.

Discussion

In this study with 50 patients who underwent hip surgery, 36 and 14 patients were given ultrasound-guided fascia iliaca block (FIB) and lumbar plexus block (LPB), respectively. Majority of the patients were females (64%) and hypertensive (62%), with a little over half (52%) considered as ASA Classification II. The clinical outcomes in terms of post-operative pain, length of stay at the PACU, and adverse events were comparable ($p > 0.05$) between the two groups. Overall, the post-operative pain score was graded as zero by the majority of patients at zero minutes up to 120 minutes, 92% and 88% respectively. A pain score of 6 to 10 (severe pain) was noted by 1 to 2 patients up to 60 minutes post-operative. There were no adverse events reported, and

Table 3: Demographic and clinical profile of patients (n = 50).

	Total (n = 50)	FI (n = 36)	LP (n = 14)	p-value
	Frequency (%); Median (Range)			
Age, years	72.5 (23-91)	70.5 (23-91)	77 (28-87)	0.222*
Weight, kilograms	65 (40-109.2)	65 (40-109.2)	57.6 (44-75)	0.098*
Sex				0.495†
Male	18 (36)	14 (38.89)	4 (28.57)	
Female	32 (64)	22 (61.11)	10 (71.43)	
ASA				0.772‡
I	2 (4)	2 (5.56)	0 (0)	
II	26 (52)	18 (50)	8 (57.14)	
III	20 (40)	15 (41.67)	5 (35.71)	
IV	2 (4)	1 (2.78)	1 (7.14)	
Comorbidities				
Hypertension	31 (62)	22 (61.11)	9 (64.29)	0.836†
Diabetes Mellitus	10 (20)	6 (16.67)	4 (28.57)	0.436‡
CAD	8 (16)	6 (16.67)	2 (14.29)	0.999‡
CVD	2 (4)	1 (2.78)	1 (7.14)	0.486‡
Asthma	2 (4)	0 (0)	2 (14.29)	0.074‡
CKD	4 (8)	3 (8.33)	1 (7.14)	0.999‡
Others	23 (46)	19 (52.78)	4 (28.57)	0.123†
Allergies	8 (16)	5 (13.89)	3 (21.43)	0.670‡
Type of surgery				0.149‡
Femoroplasty	1 (2)	1 (2.78)	0 (0)	
Hip arthroscopy	1 (2)	1 (2.78)	0 (0)	
Total hip arthroplasty	8 (16)	6 (16.67)	2 (14.29)	
Partial hip arthroplasty	13 (26)	8 (22.22)	5 (35.71)	
Calcar hip arthroplasty	1 (2)	1 (2.78)	0 (0)	
Closed reduction of hip	1 (2)	0 (0)	1 (7.14)	
Application of compression hip screw fixation	6 (12)	6 (16.67)	0 (0)	
Excision biopsy of femoral mass	2 (4)	2 (5.56)	0 (0)	
Hip pinning	3 (6)	2 (5.56)	1 (7.14)	
Open reduction internal fixation of hip	5 (10)	5 (13.89)	0 (0)	
Prophylactic application of intramedullary nail	6 (12)	2 (5.56)	4 (28.57)	
Hip debridement	1 (2)	1 (2.78)	0 (0)	
Proximal femoral nail antirotation, right hip	1 (2)	1 (2.78)	0 (0)	
Osteotomy of hip	1 (2)	0 (0)	1 (7.14)	
Removal of cannulated screws, hip	1 (2)	1 (2.78)	0 (0)	
Application of antibiotic beads, hip	1 (2)	0 (0)	1 (7.14)	
Type of fracture				0.977‡
Fracture, neck of femur	13 (26)	8 (22.22)	5 (35.71)	
Fracture, hip acetabulum	1 (2)	1 (2.78)	0 (0)	
Fracture, intertrochanteric hip	15 (30)	9 (25)	6 (42.86)	
Osteoarthropathy/Osteoarthritis	7 (14)	5 (13.89)	2 (14.29)	
Fracture, basicervical hip	1 (2)	1 (2.78)	0 (0)	
Pathologic fracture	1 (2)	1 (2.78)	0 (0)	
Idiopathic aseptic necrosis of the hip	1 (2)	1 (2.78)	0 (0)	
Fracture, transcervical	1 (2)	1 (2.78)	0 (0)	
Fracture, complete of the femur	2 (4)	2 (5.56)	0 (0)	

	Total (n = 50)	FI (n = 36)	LP (n = 14)	p-value
	Frequency (%); Median (Range)			
Fracture, proximal third shaft of femur	1 (2)	1 (2.78)	0 (0)	
Avascular necrosis of the hip	2 (4)	2 (5.56)	0 (0)	
Joint disorder	1 (2)	1 (2.78)	0 (0)	
Fracture, middle third shaft of femur	1 (2)	1 (2.78)	0 (0)	
Femoroacetabular impingement of the hip	1 (2)	1 (2.78)	0 (0)	
Femoral mass	1 (2)	1 (2.78)	0 (0)	
Joint infection	1 (2)	0 (0)	1 (7.14)	

FI: Fascia Iliaca; L: Lumbar Plexus; Statistical tests used: *- Mann-Whitney U test; †- Chi-square test; ‡- Fisher's Exact test;

Table 4: Outcomes of patients (n = 50).

	Total (n=50)	FI (n=36)	LP (n=14)	p-value
	Frequency (%); Mean ± SD			
Post-op pain				
At 0 min	0 (0 – 6)	0 (0 – 6)	0 (0 – 4)	0.909
0	46 (92)	33 (91.67)	13 (92.86)	
1 – 5	3 (6)	2 (5.56)	1 (7.14)	
6 – 10	1 (2)	1 (2.78)	0 (0)	
At 30 min	0 (0 – 10)	0 (0 – 6)	0 (0 – 10)	0.702
0	44 (88)	32 (88.89)	12 (85.71)	
1 – 5	4 (8)	3 (8.33)	1 (7.14)	
6 – 10	2 (4)	1 (2.78)	1 (7.14)	
At 60 min	0 (0 – 6)	0 (0 – 5)	0 (0 – 6)	0.886
0	43 (86)	31 (86.11)	12 (85.71)	
1 – 5	6 (12)	5 (13.89)	1 (7.14)	
6 – 10	1 (2)	0 (0)	1 (7.14)	
At 120 min	0 (0 – 5)	0 (0 – 5)	0 (0 – 2)	0.467
0	44 (88)	31 (86.11)	13 (92.86)	
1 – 5	6 (12)	5 (13.89)	1 (7.14)	
6 – 10	0 (0)	0 (0)	0 (0)	
PACU length of stay, hours	2 (2 – 5)	2 (2 – 5)	2 (2 – 2)	0.373
Adverse events	0 (0)	0 (0)	0 (0)	-

Statistical tests used: Mann-Whitney U test

PACU stay was at a median of 2 hours, shortest was at 2 hours and longest was at 5 hours, which was noted in the fascia iliaca group.

The results of the current study were similar to the randomized blinded study by Abdelmawgoud, et al., continuous psoas compartment (n = 18) and continuous fascia iliaca compartment (n = 19) blocks were given to ASA I and II patients, aged 30-75 years for hip surgery, and provided good analgesia and patient satisfaction for the first 24 hours post-operatively [22]. In their study, there was no significant difference between the two groups in terms of 24 hour postoperative meperidine requirements, postoperative pain scores as measured through visual analogue scale, patient satisfaction, postoperative hemodynamics, and distribution of sensory and motor block of (femoral, lateral femoral cutaneous, and obturator nerves).

The study by Wolff, et al. was done to 145 hip arthroscopy patients who received one of the three anesthetic techniques pre-operatively: General anesthesia (GA) only, GA with FIB and GA with LPB. Results of their study was different from the current study because lower mean pain scores (2.38, $P < 0.001$) at all time points (0, 30, 60, 90 and 120 minutes after arrival at the recovery room) were seen in the GA with LPB group compared to the GA with FIB (4.08, $P < 0.001$) and the GA only (3.55, $P < 0.001$) groups [6].

Moreover, in a prospective randomized controlled

trial study by Lu, et al. 208 adult patients for hip replacement were randomly assigned to receive either supine LPB/GA under laryngeal mask airway (LMA) or multi-angle multi-point FIB/GA under LMA. Results of their study showed that VAS scores at 6, 12 and 24 hours postoperatively were significantly lower in the LPB/GA group than those in the FIB/GA group ($P < 0.05$) [23].

Differences in the results may be attributed to the nature of the blocks done. In performing an ultrasound-guided LPB, local anesthesia is injected to the area surrounding the nerve while in an ultrasound-guided FIB, local anesthesia is injected into the iliac fascial space and will disperse toward the nerve. The latter then need a higher dose due to variation in drug distribution and neuroanatomical variation among patients [23].

In the current study, there were no reported adverse events in both groups. The lumbar plexus block or psoas compartment block is performed using ultrasound and peripheral nerve stimulation to decrease the occurrence of adverse events and complications [24]. Since both of the aforementioned tools were used, no untoward event/s occurred, such as a seizure episode lasting for 10 seconds which was experienced by a patient given with a LPB [6].

Hip fractures are not just known for being one of the most common causes of morbidity and mortality among the elderly population, but are also a significant cause of financial problems due to the costs of hospitalization and losses in productivity. In the Philippines, the cost of treating hip fractures includes implant procurement, medications and other miscellaneous needs [25]. Although one of the reasons for longer hospital stay and reduced health-related quality of life is poor postoperative pain control, this problem can be alleviated by giving nerve blocks to hip patients [26]. The dilemma of which hip block is better, FIB or LPB, could probably rely on the ease of performing the blocks.

We suggest doing a prospective type of study for this topic. More patients are also needed to be recruited as a sample. We also recommend including the length of hospital stay, discharge disposition and patient satisfaction scores as these were not considered in the current study.

The fascia iliaca and lumbar plexus blocks were both effective and safe in providing analgesia to post hip surgery patients. Although their clinical outcomes such as pain scores and use of rescue opioid medication/s post-operatively were comparable, FIB was easier to perform than the LPB.

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