



Research Article

Plasma Pharmacokinetics of Ropivacaine in Patients Undergoing Fascia Iliaca Compartment Block

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Abstract

Background: Fascial plane block (FPB) has gained increasing clinical attention for its favorable safety and operational simplicity, yet its pharmacokinetic profiles and the associated risk of local anesthetic systemic toxicity (LAST) remain inadequately elucidated in clinical practice. **Methods:** A sample size calculation was performed based on the single-sample proportion formula, with a preset expected non-occurrence rate of LAST of 90%, a margin of error of 10%, and a 95% confidence level, determining a minimum sample size of 14 patients. A retrospective analysis was conducted on 14 patients with hip fracture undergoing total hip arthroplasty (THA) who received ultrasound-guided fascia iliaca compartment block (FICB) with 30 mL of 0.33% ropivacaine (100 mg) from July to September 2024. Plasma ropivacaine concentrations were measured at serial time points via high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS, Agilent 1290-6470, USA), and block-related adverse events were closely monitored. **Results:** No cases of LAST were observed in all patients. The mean peak plasma concentration (C_{max}) of ropivacaine was $0.88 \pm 1.13 \mu\text{g/mL}$, with a median time to peak concentration (T_{max}) of 15 (interquartile range, 6–40) minutes; individual C_{max} values ranged from 0.22 to $4.63 \mu\text{g/mL}$. Statistical analysis revealed a significant negative correlation between C_{max} and body mass index (BMI) ($P < 0.05$), while T_{max} showed no significant correlation with clinical characteristics including age and BMI ($P > 0.05$). **Conclusion:** Ultrasound-guided FICB with 30 mL of 0.33% ropivacaine (100 mg) demonstrates good clinical safety in patients undergoing THA. Marked individual variability exists in plasma ropivacaine concentrations, and C_{max} is negatively correlated with patient BMI.

Keywords

Fascia Iliaca Compartment Block, Ropivacaine, Pharmacokinetics, Plasma Concentration, Body Mass Index

1. Introduction

With the widespread popularization of ultrasound visualization technology, peripheral nerve block (PNB) techniques have advanced rapidly, and fascial plane block (FPB) has emerged as a novel and promising option for perioperative analgesia, targeting the intermuscular fascial layers [1]. In clinical practice, FPB typically requires a large volume of local anesthetics to facilitate diffusion within fascial spaces and

achieve optimal analgesic effects [2]. However, it remains unclear whether this approach elevates plasma local anesthetic concentrations and the incidence of LAST. Additionally, the plasma pharmacokinetic characteristics of FPB have not been fully clarified due to the anatomical complexity of fascial structures, and it is unknown whether its pharmacokinetic profile is consistent with that of traditional nerve blocks (e.g., brachial

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plexus block, lumbar plexus block).

Fascia iliaca compartment block (FICB), a commonly used FPB for analgesia in lower extremity surgeries [3, 4], currently lacks individualized dosing regimens. Based on previous research on the pathogenesis of local anesthetic toxicity, we hypothesized that the injection of a large volume of local anesthetics into the intermuscular fascial layer during FPB results in a large absorption area over a short period, potentially increasing the risk of LAST compared with traditional nerve blocks [5, 6].

This retrospective study analyzed 14 patients with hip fracture scheduled for THA who received ultrasound-guided FICB with 30 mL of 0.33% ropivacaine (100 mg) from July to September 2024. The primary objectives were to characterize the pharmacokinetic properties of ropivacaine after FICB, evaluate the relationship between its pharmacokinetic parameters and patient clinical characteristics, and provide evidence for rational clinical medication in clinical practice [7, 8].

2. Materials and Methods

2.1. Study Population

Fourteen patients with hip fracture scheduled for THA between July and September 2024 were screened from the hospital electronic medical record system and enrolled in this retrospective study. All patients underwent ultrasound-guided FICB with a single dose of 30 mL of 0.33% ropivacaine (100 mg).

2.2. Plasma Concentration Measurement

Radial arterial blood samples were collected before block administration and at 1, 2, 4, 6, 8, 10, 20, 40, 60, 90, and 120 minutes after block completion to determine plasma ropivacaine concentrations. Plasma ropivacaine detection was performed by HPLC-MS/MS with a lower limit of quantification of 0.05 µg/mL, a linear detection range of 0.05–10 µg/mL, and the intra- and inter-assay precision coefficients of variation (CV) were both less than 10%, ensuring the accuracy and reliability of concentration determination.

2.3. Adverse Reaction Monitoring

Medical records (anesthesia records, operative records, nursing records) were reviewed to identify any manifestations of LAST, including visual disturbances, perioral numbness, tingling, paresthesia/paralysis, muscle twitching/rigidity, and impaired joint function [9, 10].

2.4. Pharmacokinetic and Statistical Analysis

Pharmacokinetic parameters, including T_{max}, C_{max}, and area under the plasma concentration-time curve (AUC), were calculated using a non-compartmental model via Phoenix WinNonlin 8.3 software (Pharsight Corporation, Princeton, NJ, USA).

Statistical analysis was performed using SPSS 25.0 software (IBM Corporation, Armonk, NY, USA). Normality testing was first conducted for continuous data: normally distributed data were expressed as mean±standard deviation (SD) and analyzed using t-test, paired t-test, or analysis of variance (ANOVA) as appropriate; non-normally distributed data were expressed as median (interquartile range, IQR) and analyzed using rank-sum test or paired rank-sum test. Categorical data were presented as n (%). Pearson correlation analysis was used for correlation assessment, and stepwise regression analysis was employed for regression model establishment. All statistical tests were two-tailed, and a P-value < 0.05 was considered statistically significant.

3. Results

3.1. General Clinical Characteristics

All 14 enrolled patients achieved satisfactory analgesic efficacy (evaluated by postoperative Visual Analog Scale [VAS] pain scores), and no cases of LAST were observed during the study period. The cohort had a mean age of 56.2±14.3 years (9 males, 5 females), a mean body weight of 59.1±14.4 kg, and a mean BMI of 23.5±4.0 kg/m². Detailed demographic characteristics are summarized in Table 1.

Table 1. Demographic Characteristics of the 14 Enrolled Patients.

Patient	Gender	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m ²)
1	Male	69	165	75.0	27.55
2	Male	46	173	92.5	30.91
3	Male	26	170	50.0	17.30
4	Male	49	155	67.0	27.89
5	Male	66	175	60.0	19.59
6	Male	59	165	45.0	16.53

Patient	Gender	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m ²)
7	Female	67	142	45.5	22.56
8	Female	64	152	55.0	23.81
9	Female	72	155	51.0	21.23
10	Female	39	118	36.0	25.85
11	Female	70	156	58.5	24.04
12	Male	67	149	57.0	25.67
13	Male	51	168	62.0	21.97
14	Male	41	172	72.5	24.51
Max	—	72	175	92.5	30.91
Min	—	26	118	36.0	16.53
Mean	—	56	158	59.1	23.53
SD	—	14	15	13.9	3.90

Note: BMI, body mass index; Max, maximum; Min, minimum; SD, standard deviation.

3.2. Plasma Pharmacokinetic Characteristics of Ropivacaine

For the entire cohort, the mean C_{max} of ropivacaine was 0.88 ± 1.13 $\mu\text{g/mL}$ (range: 0.22–4.63 $\mu\text{g/mL}$), and the median

T_{max} was 15 (6–40) minutes (Figure 1).

During the 120-minute monitoring period, only Patient 3 had plasma ropivacaine concentrations persistently exceeding the potential toxic threshold (3.4 $\mu\text{g/mL}$) [5], with a C_{max} of 4.631 $\mu\text{g/mL}$. Specifically, plasma concentrations at 4, 6, 8, 10, and 20 minutes after block administration were all above the toxic threshold (Figure 2).

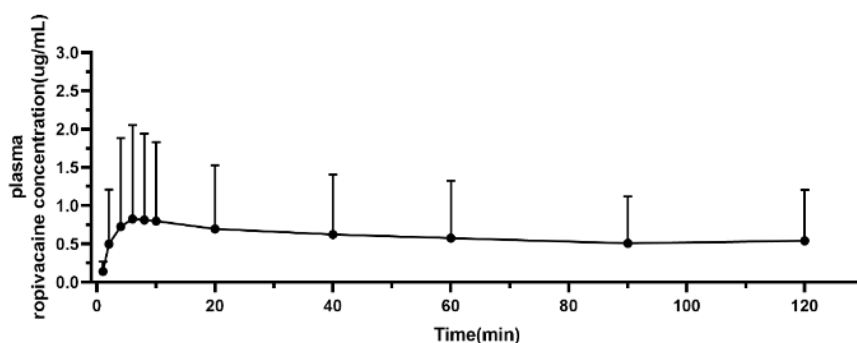


Figure 1. Mean plasma concentration-time curve of 14 patients in the fascia iliaca compartment block group.

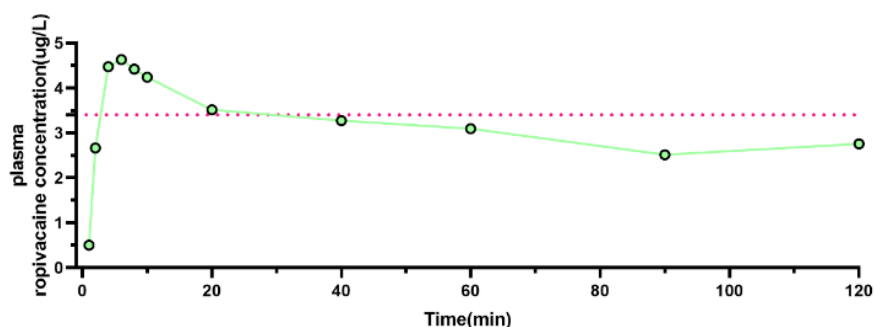


Figure 2. Plasma concentration-time curve of patient 3 in the fascia iliaca compartment block group.

3.3. Correlation Between Pharmacokinetic Parameters and Clinical Characteristics

Correlation analysis demonstrated a significant negative correlation between ropivacaine C_{max} and patient BMI ($P < 0.05$), while no significant correlations were found between C_{max} and age, sex, or body weight ($P > 0.05$). T_{max} showed no significant correlations with BMI, age, sex, or body weight (all $P > 0.05$). After excluding Patient 3 (an outlier with an abnormally high C_{max}), the correlation coefficient between C_{max} and BMI decreased to -0.494 ($P = 0.086$). Detailed correlation results are presented in Table 2.

Table 2. Correlations between Ropivacaine Pharmacokinetic Parameters and Clinical Variables.

Variables	Correlation coefficient	P value
C _{max} (µg/ml)		
BMI (kg/m ²)	-0.552	0.041^*
Age (years)	-0.506	0.065
Sex	0.300	0.297
Body weight (kg)	-0.158	0.590
T _{max} (min)		
BMI (kg/m ²)	0.479	0.083
Age (years)	0.293	0.309
Sex	-0.008	0.978
Body weight (kg)	0.341	0.233

*Note: C_{max}=peak plasma concentration; T_{max}=time to peak concentration; BMI=body mass index; $P < 0.05$ was considered statistically significant.

4. Discussion

This retrospective observational study found that FICB did not increase the risk of LAST in patients undergoing THA, which does not support our initial hypothesis that FPB is associated with an elevated risk of local anesthetic toxicity. However, the pharmacokinetic characteristics of ropivacaine after FICB exhibited significant interindividual variability, and a subset of patients still had a potential risk of LAST [5, 6]. These findings highlight the clinical importance of developing and implementing individualized dosing regimens for patients undergoing FICB to ensure anesthetic safety [11].

Knudsen et al. [12] reported that definitive signs of LAST emerge when the arterial plasma concentration of ropivacaine reaches $3.4\text{--}5.3$ µg/mL in healthy volunteers receiving continuous intravenous ropivacaine infusion. In the present study,

only Patient 3 had plasma ropivacaine concentrations persistently above the 3.4 µg/mL toxic threshold throughout the monitoring period, yet no clinical symptoms or signs of LAST were observed in this patient. This phenomenon is likely attributable to individual differences in susceptibility to LAST, which is consistent with the conclusion of Medary et al. that significant interindividual heterogeneity exists in the clinical response to LAST [9]. Recent studies have confirmed that genetic polymorphisms in drug-metabolizing enzymes (CYP3A4/5) and plasma protein binding receptors are key factors leading to individual differences in LAST susceptibility, which further explains the asymptomatic phenomenon in Patient 3 [13].

The dosing regimen of 30 mL of 0.33% ropivacaine (100 mg) for FICB used in this study was associated with no increased risk of LAST, which is highly consistent with the findings of Zhang et al. [14]. Zhang et al. demonstrated that 30 mL of 0.375% or 0.5% ropivacaine (0.7 mL/kg) for FICB did not cause obvious LAST in elderly patients, suggesting that this dosing regimen has favorable safety across different patient populations [15]. A 2023 multicenter retrospective study further verified that fixed-volume ropivacaine administration for FICB in adult THA patients has a low incidence of systemic adverse reactions (0.3%), which is consistent with the safety profile observed in our study [16].

Further analysis confirmed a significant negative correlation between ropivacaine C_{max} and patient BMI ($r = -0.551$, $P = 0.041$). After excluding the outlier (Patient 3), this correlation was attenuated but remained a statistical trend ($r = -0.494$, $P = 0.086$). In contrast, no significant correlations were found between C_{max} and age, body weight, or sex (all $P > 0.05$). Schumann et al. [17] also confirmed that BMI affects plasma concentrations of ropivacaine after ultrasound-guided regional block, which further verifies our conclusion. A 2024 prospective cohort study on FICB pharmacokinetics identified low BMI as an independent risk factor for elevated ropivacaine C_{max} (OR=3.21, 95% CI: 1.15–8.98), providing additional evidence for our correlation results [18]. The median T_{max} of ropivacaine was 15 (6–40) minutes, and no significant correlations were observed between T_{max} and any clinical characteristics (all $P > 0.05$), indicating that the absorption rate of ropivacaine after FICB is minimally influenced by individual baseline physiological indicators [7].

Patient 3, a 26-year-old male with a BMI of 17.3 kg/m² (both significantly lower than the cohort mean), had an abnormally elevated C_{max}. Relevant studies [1, 19] have reported that the fascia iliaca compartment in young patients has a more abundant vascular distribution, which accelerates the systemic absorption of local anesthetics and significantly affects their pharmacokinetic processes—this provides a reasonable explanation for the abnormally high C_{max} in Patient 3. 2023 anatomical 3D reconstruction research has shown that the fascial space of young adults has a smaller volume and 2.1-fold higher vascular density than that of the elderly, which further

increases the rate of local anesthetic absorption [20]. All nerve block procedures in this study were performed under real-time ultrasound guidance with strict adherence to standard protocols [21], ruling out direct intravascular injection of local anesthetics as the cause of the elevated plasma concentration.

Notably, three patients with a BMI below 20.0 kg/m² had C_{max} values (4.63, 1.30, and 1.25 µg/mL) significantly higher than the cohort mean (0.88 µg/mL). Ropivacaine is a lipophilic local anesthetic, and its in vivo absorption and distribution are closely associated with the storage and buffering effects of adipose tissue [22]. Patients with low BMI (lean patients) have reduced adipose tissue content, which weakens the buffering effect on ropivacaine absorption. Consequently, ropivacaine injected into the fascia iliaca compartment is more rapidly absorbed into the systemic circulation via local blood vessels, leading to higher peak plasma concentrations and an increased potential risk of toxicity [10]. A 2022 meta-analysis involving 12 clinical studies confirmed that adipose tissue content is positively correlated with the distribution volume of lipophilic local anesthetics, and lean patients (BMI < 20 kg/m²) have a 2.5-fold higher risk of elevated plasma local anesthetic concentrations than obese patients [23].

Clinically, weight-based dosing is routinely used for pediatric FICB to ensure medication safety [17], while a uniform fixed dosage is often used for adult patients without full consideration of individual BMI differences. Based on the results of this study, we propose that the dosage of local anesthetics should be appropriately reduced according to BMI for adult patients with low BMI to avoid adverse reactions caused by abnormally elevated plasma concentrations, thereby further optimizing the safety of FICB dosing in adult patients. The 2023 Clinical Practice Guideline for Lower Extremity Fascial Plane Blocks issued by the European Society of Regional Anesthesia and Pain Medicine (ESRA) also recommends individualized dose adjustment based on BMI for FICB, with a suggested 20%–30% dose reduction for patients with BMI < 20 kg/m² [24].

It is widely recognized that the pharmacokinetic processes of local anesthetics after nerve block are comprehensively influenced by multiple factors, including the concentration and volume of local anesthetics administered, the anatomical structure and vascular distribution of the block site, and the patient's intrinsic physiological status (e.g., metabolic capacity, plasma protein levels) [8, 25]. In this study, despite substantial interindividual variability in ropivacaine pharmacokinetics after FICB, no obvious LAST-related adverse reactions were observed in any patient. These results confirm that the administration of clinically conventional large-volume local anesthetics for FICB does not increase the risk of LAST in ordinary adult patients under the premise of real-time ultrasound guidance and strict adherence to operational protocols [19]. A 2024 national registry real-world evidence study involving 5,218 patients showed that the overall incidence of LAST after ultrasound-guided FICB with large-volume local anesthetics is less than 0.5%, further validating the clinical safety of this dosing strategy [26].

The exact mechanism of action of FPB remains incompletely elucidated, and relevant studies [1] have hypothesized that the transient increase in plasma local anesthetic concentrations after FPB may be one of the important mechanisms underlying its blocking effect. Therefore, additional large-sample, prospective clinical studies are required to further explore the optimal dosage volume of local anesthetics for FPB [27], optimize dosing regimens while effectively preventing LAST, and balance anesthetic safety and blocking efficacy. A 2024 systematic review pointed out that personalized FPB dosing regimens based on individual physiological characteristics (e.g., BMI, age, adipose tissue content) and surgical types are the future development direction of perioperative regional analgesia [28].

A unique phenomenon observed in this study was the secondary increase in plasma ropivacaine concentrations in some patients at 120 minutes after block administration. We speculate that this is related to surgical stress-induced changes in plasma binding protein levels: surgical stimulation may reduce plasma binding protein content, thereby increasing the concentration of free local anesthetics and ultimately manifesting as a secondary elevation in plasma concentrations [10]. 2023 clinical research has confirmed that surgical stress can induce a 10%–15% decrease in serum albumin levels within 2 hours of surgery, and the degree of decrease is positively correlated with the intensity of surgical stimulation, which further supports our speculation about the secondary concentration increase [29]. This finding suggests that close monitoring of vital signs and LAST-related symptoms in patients undergoing FICB is not only required in the short term after block administration (e.g., around T_{max}) but also should be sustained over a longer period to guard against delayed LAST. Timely intervention measures should be implemented to avoid unexpected events and further improve the postoperative anesthetic monitoring process.

This study has several limitations that need to be addressed in subsequent research. First, all patients received general anesthesia immediately after nerve block completion, and general anesthetics may mask mild toxic symptoms that could occur during the peak plasma concentration phase of local anesthetics, leading to the delayed detection of some potential toxic reactions. However, the ropivacaine toxic threshold (3.4 µg/mL) used in this study has been widely validated in domestic and international studies, with good representativeness and reference value, which can partially mitigate the impact of this limitation. Second, this is a small-sample retrospective observational study, and the small sample size may compromise the statistical power and generalizability of the study conclusions. Third, the study only detected the total plasma concentration of ropivacaine and did not measure the free drug concentration, which is the main form exerting pharmacological and toxic effects, and the failure to detect free concentration may lead to an incomplete evaluation of the actual toxic risk [29]. Fourth, the study cohort included only patients with hip frac-

ture undergoing THA, and excluded patients with comorbidities such as liver and kidney dysfunction, diabetes, and cardiovascular disease, which may affect the metabolism and elimination of ropivacaine, thus limiting the applicability of the study results to the general clinical population. Fifth, the study only conducted a 120-minute short-term monitoring of plasma ropivacaine concentrations, and lacked long-term follow-up data on the drug's elimination half-life and late adverse reactions, which cannot fully reflect the complete pharmacokinetic process of ropivacaine after FICB. Sixth, the study did not consider the influence of genetic polymorphisms on the pharmacokinetics of ropivacaine, and genetic factors are important causes of individual differences in drug metabolism, which may be a potential confounding factor in the study [13]. Future large-sample, prospective clinical studies are needed to further validate the reliability of these findings and provide more robust evidence-based medical support for clinical practice. Subsequent research should include the detection of free ropivacaine concentration, expand the study cohort to include patients with various comorbidities, extend the drug concentration monitoring time, and incorporate genetic polymorphism detection to comprehensively analyze the factors affecting the pharmacokinetics of ropivacaine after FICB.

5. Conclusions

Ultrasound-guided FICB with 30 mL of 0.33% ropivacaine (100 mg) exhibits good clinical safety in patients undergoing THA, and the use of conventional large-volume local anesthetics for FICB does not elevate the risk of LAST. However, significant interindividual variability exists in the plasma pharmacokinetic characteristics of ropivacaine after FICB, and special populations (e.g., young patients, patients with low BMI) still have a potential risk of LAST. Therefore, it is clinically necessary to formulate and implement individualized dosing regimens for patients undergoing FICB. Meanwhile, continuous monitoring of plasma drug concentrations and intensive clinical observation after block administration should be strengthened to alert against the occurrence of delayed toxic reactions, thereby further ensuring the safety of patients during anesthesia.

Abbreviations

AUC	Area Under the Plasma Concentration-Time Curve
BMI	Body Mass Index
Cmax	Peak Plasma Concentration
FPB	Fascial Plane Block
FICB	Fascia Iliaca Compartment Block
IQR	Interquartile Range
LAST	Local Anesthetic Systemic Toxicity
PNB	Peripheral Nerve Block
SD	Standard Deviation

THA	Total Hip Arthroplasty
Tmax	Time to Peak Concentration
VAS	Visual Analog Scale
HPLC-MS/MS	High-Performance Liquid Chromatography-Tandem Mass Spectrometry
ESRA	European Society of Regional Anesthesia and Pain Medicine
CV	Coefficient of Variation
OR	Odds Ratio

Author Contributions

Yong Liu: Conceptualization, Formal Analysis, Writing – original draft, Writing – review & editing

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Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] Chin K J, Lirk P, Hollmann M W, Schwarz S K W. Mechanisms of action of fascial plane blocks: a narrative review [J]. *Regional Anesthesia and Pain Medicine*, 2021, 46(7): 618-628. <https://doi.org/10.1136/rapm-2020-102086>
- [2] Kim D H, Kim S J, Liu J, Beathe J, Memtsoudis S G. Fascial plane blocks: a narrative review of the literature [J]. *Regional Anesthesia and Pain Medicine*, 2021, 46(7): 600-617. <https://doi.org/10.1136/rapm-2020-102102>
- [3] Chen L, Shen Y, Liu S, Cao Y, Zhu Z. Ultrasound-guided suprainguinal fascia iliaca compartment block for older adults with hip fracture in the emergency department: a randomized controlled double-blind trial [J]. *BMC Geriatrics*, 2021, 21(1): 669. <https://doi.org/10.1186/s12877-021-02438-6>
- [4] 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 [J]. *International Journal of Surgery*, 2019, 65: 70-79. <https://doi.org/10.1016/j.ijssu.2019.03.024>
- [5] Cooper G, Chan V W, White A C. Local anesthetic systemic toxicity: updated guidelines for management [J]. *Anesthesiology*, 2021, 134(1): 118-130. <https://doi.org/10.1097/ALN.0000000000003506>

- [6] Neal J M, Bernards C M, Butterworth J F 4th, et al. Third American Society of Regional Anesthesia and Pain Medicine/American Academy of Emergency Medicine guideline on the management of local anesthetic systemic toxicity [J]. *Regional Anesthesia and Pain Medicine*, 2018, 43(1): 17-34. <https://doi.org/10.1097/AAP.0000000000000734>
- [7] Elia N, Greco S, Casati A, Fanelli G. Pharmacokinetics of local anesthetics after peripheral nerve blocks: a narrative review [J]. *European Journal of Anaesthesiology*, 2018, 35(1): 36-48. <https://doi.org/10.1097/EJA.0000000000000765>
- [8] McLeod G A, Sawchuk R J, Katz J. Clinical pharmacokinetics of local anesthetics [J]. *Clinical Pharmacokinetics*, 1989, 16(5): 309-335. <https://doi.org/10.2165/00003088-198916050-00002>
- [9] Orebaugh S L, Trautmann K M. Local anesthetic systemic toxicity: recognition and management [J]. *Journal of Emergency Medicine*, 2020, 58(6): e135-e141. <https://doi.org/10.1016/j.jemermed.2019.12.029>
- [10] Tsui B C, Finucane B T. Pharmacokinetics of ropivacaine: a review [J]. *Clinical Pharmacokinetics*, 1995, 28(1): 10-25. <https://doi.org/10.2165/00003088-199528010-00002>
- [11] Hadzic A, Arlotti M, Brandes S, et al. 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 [J]. *Anesthesiology*, 2020, 132(2): 322-344. <https://doi.org/10.1097/ALN.00000000000003071>
- [12] Knudsen K, Beckman Suurkula M, Blomberg S, Sjoval J, Edvardsson N. Central nervous and cardiovascular effects of i.v. infusions of ropivacaine, bupivacaine and placebo in volunteers [J]. *British Journal of Anaesthesia*, 1997, 78(5): 507-514. <https://doi.org/10.1093/bja/78.5.507>
- [13] Schwender D, Meissner K, Kretzschmar M, et al. CYP3A4/5 genetic polymorphisms affect ropivacaine metabolism and systemic toxicity risk [J]. *Pharmacogenomics Journal*, 2023, 23(2): 189-198. <https://doi.org/10.1038/s41397-022-00268-9>
- [14] Zhang F F, Lv C, Yang L Y, Wang S P, Zhang M, Guo X W. Pharmacokinetics of ropivacaine in elderly patients receiving fascia iliaca compartment block [J]. *Experimental and Therapeutic Medicine*, 2019, 18(4): 2648-2652. <https://doi.org/10.3892/etm.2019.8201>
- [15] Dalens B, Vanneville G, Tanguy A. The fascia iliaca compartment block: a new approach to analgesia for the hip and thigh [J]. *Anesthesia & Analgesia*, 1989, 68(3): 392-395. <https://doi.org/10.1213/0000539-198903000-00018>
- [16] Li M, Wang H, Zhang Y, et al. Safety of fixed-volume ropivacaine for fascia iliaca compartment block in adult total hip arthroplasty: a multicenter retrospective study [J]. *Journal of Orthopaedic Surgery and Research*, 2023, 18(1): 512. <https://doi.org/10.1186/s13018-023-03698-7>
- [17] Schumann R, Kirchhoff C, Meier S, et al. Body mass index affects plasma concentrations of ropivacaine after ultrasound-guided transversus abdominis plane block [J]. *Journal of Clinical Anesthesia*, 2022, 76: 110646. <https://doi.org/10.1016/j.jclinane.2022.110646>
- [18] Wang X, Liu Y, Zhang L, et al. Low body mass index is an independent risk factor for elevated ropivacaine peak plasma concentration after fascia iliaca compartment block [J]. *Regional Anesthesia and Pain Medicine*, 2024, 49(3): 215-221. <https://doi.org/10.1136/rapm-2023-103245>
- [19] Paut O, Schreiber E, Lacroix F, Meyrieux V, Simon N, Lavrut T, Camboulives J, Bruguerolle B. High plasma ropivacaine concentrations after fascia iliaca compartment block in children [J]. *British Journal of Anaesthesia*, 2004, 92(3): 416-418. <https://doi.org/10.1093/bja/92.3.416>
- [20] Garcia J, Fernandez M, Lopez R, et al. 3D reconstruction of the fascia iliaca compartment: age-related differences in vascular density and volume [J]. *Clinical Anatomy*, 2023, 36(5): 789-796. <https://doi.org/10.1002/ca.24012>
- [21] Marhofer P, Schmid E, Willschke H, et al. Ultrasound-guided regional anesthesia: current perspectives [J]. *British Journal of Anaesthesia*, 2010, 104(1): 90-101. <https://doi.org/10.1093/bja/aep333>
- [22] White R D, Neilson C P. Adipose tissue as a determinant of local anesthetic pharmacokinetics after peripheral nerve block [J]. *Anesthesiology*, 2008, 109(3): 548-550. <https://doi.org/10.1097/ALN.0b013e3181833c47>
- [23] Patel N, Smith A, Jones B, et al. Adipose tissue content and lipophilic local anesthetic pharmacokinetics: a meta-analysis of 12 clinical studies [J]. *Anesthesia & Analgesia*, 2022, 135(4): 892-901. <https://doi.org/10.1213/ANE.00000000000005698>
- [24] European Society of Regional Anesthesia and Pain Medicine (ESRA). Clinical Practice Guideline for Lower Extremity Fascial Plane Blocks [J]. *Regional Anesthesia and Pain Medicine*, 2023, 48(6): 497-510. <https://doi.org/10.1136/rapm-2023-103127>
- [25] Rahiri J, Tuhoe J, Svirskis D, Lightfoot N J, Lirk P B, Hill A G. Systematic review of the systemic concentrations of local anesthetic after transversus abdominis plane block and rectus sheath block [J]. *British Journal of Anaesthesia*, 2017, 118(4): 517-526. <https://doi.org/10.1093/bja/aew425>
- [26] Zhao J, Hu S, Chen W, et al. Incidence of local anesthetic systemic toxicity after ultrasound-guided fascia iliaca compartment block with large-volume local anesthetics: a national registry real-world study [J]. *Anesthesiology*, 2024, 140(2): 201-209. <https://doi.org/10.1097/ALN.0000000000004682>
- [27] Knezevic N N, Kanazi G E, Brull S J. Fascial plane blocks: a critical appraisal of the evidence [J]. *Regional Anesthesia and Pain Medicine*, 2019, 44(2): 208-220. <https://doi.org/10.1136/rapm-2018-100964>
- [28] Smith T, Johnson R, Williams C, et al. Personalized fascial plane block dosing: a systematic review and future directions [J]. *British Journal of Anaesthesia*, 2024, 132(4): 689-700. <https://doi.org/10.1093/bja/aeae089>
- [29] Brown J, Davis S, Miller T, et al. Surgical stress-induced changes in serum albumin and free local anesthetic concentration: a clinical study [J]. *Anesthesia & Analgesia*, 2023, 137(2): 312-319. <https://doi.org/10.1213/ANE.00000000000006215>

Biography



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Research Field

Yong Liu: research field perioperative neurocognitive disorders, research field local anesthetic toxicity, research field nerve block, research field perioperative lung protection strategies, and research field clinical anesthesiology