A pain in the hip: the under-used potential of fascia iliaca compartment block in the prehospital setting

Sarah E Maessen, Jon Leach, Verity F Todd, Elena Garcia, Bridget Dicker

Fascia iliaca compartment block (FICB) is a technique for flooding the fascia iliaca compartment with local anaesthetic, resulting in blockade of the femoral and lateral cutaneous nerves. It has demonstrated potential as an alternative to opiates for perioperative pain management in shaft or neck of femur (NOF) fracture patients, with a favourable side effect profile.[1]

Evidence for FICB in the prehospital setting is comparatively scarce, but it appears to be feasible, safe and effective when administered by emergency medical services (EMS) for proximal femoral fractures, with the majority of evidence from studies of emergency physicians, anaesthetists or nurses.[2] FICB was adopted into Aotearoa New Zealand EMS clinical practice guidelines for suspected femoral neck or proximal shaft fractures in late 2020.[3]

Despite promising results from a small trial (n=24) in Australia and a feasibility study in Wales,[4] we are not aware of any previous studies looking at real-life implementation of paramedic-administered FICB in the prehospital setting. This study aims to describe characteristics and pain outcomes for patients who were administered FICB by Hato Hone St John (HHStJ) in a 1-year period and compare them with a cohort with similar injuries and no FICB.

Methods

HHStJ is New Zealand's largest EMS provider, covering 90% of the country's population. In September 2020, FICB training began for specialist (postgraduate-qualified) paramedics. The anatomically guided, tactile loss of resistance technique may be used to administer 30ml (patients weighing <60kg) or 40ml (patients weighing >60kg) of 0.375% ropivacaine to patients with severe pain associated with clinically obvious fractured NOF or proximal shaft of femur in line with clinical practice guidelines.[3] Guidelines recommend FICB for patients whose pain is not adequately controlled by an opiate, offering FICB as an alternative to additional medicinal analgesia for this patient group.[3]

The Aotearoa New Zealand Paramedic Care Collection (ANZPaCC) combines EMS patient and incident data and is linked to Ministry of Health – Manatū Hauora data using National Health Index numbers.[5] Within ANZPaCC, we identified emergency call incidents attended by HHStJ between 1 May 2022 and 30 April 2023 with International Classification of Diseases 10th revision (ICD-10) codes indicating a fracture of the neck or proximal shaft of the femur (Appendix Table 1). Patients with Glasgow Coma Scale scores ≤12, a clinical impression of major trauma, clinical status indicating immediate threat to life, aged under 12 years, not transported by HHStJ or who declined assessment by ambulance staff were excluded. The patient's home address was used to estimate relative socio-economic deprivation using the New Zealand Index of Deprivation 2018 (NZDep2018),[6] and incident location was categorised by rurality using the Geographic Classification for Health.[7] Pain was patient-reported on a numerical scale from 0 to 10. Transport time was in minutes from scene of the injury to arrival at a hospital. Ministry of Health – Manatū Hauora gender, ethnicity and ICD-10 diagnosis codes were used (Appendix Table 1). FICB cases were checked against a list of reportable events to identify auditor or crew-reported adverse events, and were manually screened to identify further possible safety concerns.

Statistical analysis used SPSS v29. Patient characteristics were compared between FICB and comparison groups using Independent Samples median tests (continuous variables) or Chi-squared tests (categorical variables). The primary outcome was pain score reduction, calculated as the difference between the first and last score recorded for the incident and compared between FICB and comparison groups using linear regression, with the final model adjusted for initial pain score, gender and rurality. This study was approved by the Northern B Health and Disability Ethics

Committee (Aotearoa New Zealand, Paramedic Care Collection [ANZPaCC], 2022 FULL 13415).

Results

There were 3,860 incidents in the time frame potentially eligible for FICB. Patients receiving FICB were predominantly female (73%), aged 80 years or older (71%), of European ethnicity (92%) and injured in urban areas (79%) (Table 1). A higher proportion of FICB patients were female, but they did not differ from other patients on ethnicity, age or neighbourhood deprivation score (Table 1). Distribution across urban/rural locations differed between FICB and comparison patients, with higher proportions of the FICB group injured in Urban 2 and Rural 1 areas (Table 2). FICB patients more often had initial pain scores in the severe range (74% vs 46%).

No adverse events were reported by crews or auditors for any FICB patient. Based on manual screening of patient records, one patient was identified as experiencing a tonic-clonic seizure shortly after ropivacaine administration. The patient recovered without intervention and is not known to have experienced any further adverse outcomes.

Final pain scores were missing for 1,105 patients. For those with complete pain scores, final scores were 3.2 points lower than initial pain scores, on average. FICB patients had a greater mean reduction in pain score than comparison patients (Table 2), which remained significant after adjustment for initial pain scores, gender and rurality (R^2=.38, F[1,11]=150.2, p<.001).

Discussion

This study adds to evidence for safe and effective prehospital use of FICB to manage pain for NOF fracture. Patients who received FICB reported a greater reduction in pain between ambulance arrival and handover to hospital care, even when controlling for higher initial pain scores. Most FICB patients (94%) experienced a reduction in pain, with 21% reporting no pain on handover. These results are consistent with previous literature on FICB indicating favourable outcomes in emergency department, perioperative and prehospital settings.[1,4,8] Different proportions of patients by rurality likely reflect less need in urban areas close to hospitals and less availability in the most rural areas.

One patient experienced a seizure, a documented symptom of ropivacaine toxicity,[9] within minutes of FICB administration. Two similar incidences were reported in a recent meta-analysis including 257 FICB in the prehospital setting.[4] Though rare, training should prepare clinicians for such events.

Only 3.6% of patients with eligible fractures were treated with FICB in this study. Though we were unable to confirm that the comparison patients were suitable candidates for FICB with this dataset, the proportion has reduced from 5.6% in the first year after the skill was introduced in clinical practice guidelines.[10] Changes to the way paramedics trained to perform FICB are deployed has likely resulted in fewer trained clinicians in ambulances tasked to patients with isolated femoral fractures. EMS often must choose between requesting and waiting for trained personnel to perform the procedure or prioritising prompt transport to definitive treatment. Welsh paramedics also noted that painful repositioning of the patient was sometimes needed to prepare for FICB, whereas intravenous medications could more easily be administered prior to extrication, after which obvious benefits of FICB were less apparent.[11]

Perioperatively, FICB has been associated with improved pain management for up to 48 hours.[1] With increasing lengths of time in emergency departments for hip fracture patients in New Zealand,[12] the value of prompt arrival at hospital should be considered against the potential of prehospital interventions to have longer-term benefits for patients while they are awaiting further assessment or treatment after handover from ambulance care.

This study was limited by the use of administrative data, with a high rate of missing pain scores, particularly in the comparison group. Initial pain score was captured at arrival on scene and may not reflect the pain level used for treatment decisions, which takes into account the need for patient mobilisation or transfer. Other potential benefits of FICB compared with other pain management that we were not able to examine in this study include lower morphine consumption and related nausea,[1,8,13] fewer complications,[8] lower cost[4] and better control of dynamic pain in particular.[13] Further research with frontline staff and longer patient follow-up is needed to understand whether FICB use should be promoted in the prehospital environment.

Table 1: Participant and incident characteristics and comparison between hip fracture patients with and without FICB.

	All participants	**FICB**	**Comparison**	**p-value**
	n=3,860	**n=139 (3.6%)**	**n=3,721 (96.4%)**	
Age (years) Median, IQR	84.0, 14	84.0, 12	83.0, 14	.222
Sex (female)	2,531 (65.6%)	102 (73.4%)	2,429 (65.3%)	**.028**
Ethnicity				.557
Māori	205 (5.3%)	8 (5.8%)	197 (5.3%)	
European/other	3,479 (90.1%)	128 (92.1%)	3,352 (90.1%)	
Pacific people	42 (1.1%)	0	42 (1.1%)	
Asian	133 (3.4%)	3 (2.2%)	130 (3.5%)	
Incident rurality				**.001**
Urban 1	2,087 (54.1%)	63 (45.3%)	2,024 (54.4%)	
Urban 2	924 (23.9%)	47 (33.8%)	877 (23.6%)	
Rural 1	522 (13.5%)	27 (19.4%)	495 (13.2%)	
Rural 2	264 (6.8%)	2 (1.4%)	262 (7.0%)	
Rural 3	34 (0.9%)	0	34 (1.0%)	
NZDep quintile				.841
1	549 (14.5%)	21 (15.9%)	528 (14.5%)	
2	809 (21.4%)	30 (22.7%)	779 (21.4%)	
3	874 (23.1%)	25 (18.9%)	849 (23.3%)	
4	873 (23.1%)	32 (24.2%)	841 (23.1%)	
5	673 (17.8%)	24 (18.2%)	649 (17.8%)	
Transport time (minutes)				
Median, IQR	19.1, 20.9	21.9, 27.8	18.9, 20.8	.052
Pain score initial[a]				**<.001**
0	229 (636%)	2 (1.5%)	227 (6.8%)	
Mild	633 (18.3%)	8 (5.9%)	625 (18.8%)	
Moderate	958 (27.7%)	25 (18.5%)	933 (28.1%)	
Severe	1,638 (47.4%)	100 (74.1%)	1,538 (46.3%)	

FICB = fascia iliaca compartment block; IQR = interquartile range; NZDep = NZDep2018 index of deprivation.[6]
[a]Pain scores of 0 were interpreted as no pain, 1–3 as mild pain, 4–6 as moderate pain and 7-10 as severe pain; n=3,323 due to missing pain score data.
Values are presented as n (%) unless otherwise specified.

Table 2: Pain outcomes for hip fracture patients with and without FICB.

	FICB	Comparison	p-value
	n=126*	n=2,629*	
Final pain score[a]			**<.020**
0	26 (20.6%)	346 (12.5%)	
Mild	64 (50.8%)	1,392 (50.5%)	
Moderate	26 (20.6%)	792 (28.7%)	
Severe	10 (7.9%)	225 (8.2%)	
Pain reduction M(SD)	4.8 (2.9)	3.1 (2.8)	**<.001**
Pain reduction adjusted[b] (EMM, 95% CI)	4.6 (3.7–5.4)	3.2 (2.9–3.4)	**<.001**

FICB = fascia iliaca compartment block; M(SD) = mean (standard deviation); EMM = estimated marginal mean; CI = confidence interval.
*Excludes 13 FICB and 1,092 comparison patients with incomplete pain records.
[a]Pain scores of 0 were interpreted as no pain, 1–3 as mild pain, 4–6 as moderate pain and 7–10 as severe pain.
[b]Adjusted for initial pain score, gender and rurality.

COMPETING INTERESTS

SM, JL, EG and BD are employed by Hato Hone St John. The authors have no further conflicts of interest to declare.

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https://nzmj.org.nz/journal/vol-138-no-1613/a-pain-in-the-hip-the-under-used-potential-of-fascia-iliaca-compartment-block-in-the-prehospital-setting

REFERENCES

1. Hong HK, Ma Y. The efficacy of fascia iliaca compartment block for pain control after hip fracture: A meta-analysis. Medicine (Baltamore). 2019;98(28):e16157. doi: 10.1097/MD.0000000000016157.
2. Hards M, Brewer A, Bessant G, Lahiri S. Efficacy of Prehospital Analgesia with Fascia Iliaca Compartment Block for Femoral Bone Fractures: A Systematic Review. Prehosp Disaster Med. 2018;33(3):299-307. doi: 10.1017/S1049023X18000365.
3. National Ambulance Sector Working Group. Emergency Ambulance Service Clinical Procedures and Guidelines. Version: 1.0.1.0: CPG EAS 14.41 Ropivacaine 0.75% [Internet]. [cited 2023 Nov 6]. Available from: https://cpg.stjohn.org.nz/tabs/medicines/page/ropivacaine-zero-point-seven-five-percent-eas
4. Slade S, Hanna E, Pohlkamp-Hartt J, et al. Efficacy of Fascia Iliaca Compartment Blocks in Proximal Femoral Fractures in the Prehospital Setting: A Systematic Review and Meta-Analysis. Prehosp Disaster Med. 2023 Apr;38(2):252-258. doi: 10.1017/S1049023X23000298.
5. Kibblewhite C, Todd VF, Howie G, et al. Out-of-Hospital emergency airway management practices: A nationwide observational study from Aotearoa New Zealand. Resusc Plus. 2023 Jul 28;15:100432. doi: 10.1016/j.resplu.2023.100432.
6. Atkinson J, Crampton P, Salmond C. NZDep2018 analysis of census 2018 variables. University of Otago; 2021 [cited 2024 Jan 11]. Available from: https://www.otago.ac.nz/__data/assets/pdf_file/0028/319780/nzdep2018-analysis-of-census-2018-variables-report-831000.pdf
7. Whitehead J, Davie G, de Graaf B, et al. Defining rural in Aotearoa New Zealand: a novel geographic classification for health purposes. N Z Med J. 2022 Aug 5;135(1559):24-40. doi: 10.26635/6965.5495.
8. Tarekegn F, Sisay A. A review of evidence-based clinical practice on fascia iliaca compartment block for lower limb injury. Ann Med Surg. 2021;69:102758. doi: 10.1016/j.amsu.2021.102758.
9. George AM, Liu M. Ropivicaine [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532924/
10. Leach J. Use of fascia iliaca compartment block (FICB) in the New Zealand pre-hospital setting [Master's thesis]. Auckland, New Zealand: Auckland University of Technology; 2022.
11. Evans BA, Brown A, Bulger J, et al. Paramedics' experinences of administering fascia iliaca compartment block to patients in South Wales with suspected hip fracture at the scene of injury: results of focus groups. BMJ Open. 2019;9(2):e026073. doi: 10.1136/bmjopen-2018-026073.
12. Australian and New Zealand Hip Fracture Registry. Annual report of hip fracture care 2023 [Internet]. [cited 2024 Jan 11]. Available from: https://anzhfr.org/wp-content/uploads/sites/1164/2023/09/ANZHFR-2023-Annual-Report-%E2%80%93-eReport-%E2%80%93-FINAL.pdf
13. Foss NB, Kristensen BB, Bundgaard M, et al. Fascia iliaca compartment blockade for acute pain control in hip fracture patients: a randomized, placebo-controlled trial. Anesthesiology. 2007;106(4):773-8. doi: 10.1097/01.anes.0000264764.56544.d2.

Appendix

Appendix Table 1: ICD-10 codes used to select patients diagnosed with a fracture of the neck or proximal shaft of femur.

ICD-10 code	Definition
S7200	Fracture of neck of femur, part unspecified
S7201	Fracture of intracapsular section of femur, unspecified
S7202	Fracture of upper epiphysis (separation) of femur
S7203	Fracture of subcapital section of femur
S7204	Fracture of midcervical section of femur
S7205	Fracture of base of neck of femur
S7208	Fracture of other parts of neck of femur
S7210	Fracture of trochanteric section of femur
S7211	Fracture of intertrochanteric section of femur
S722	Subtrochanteric fracture
S723	Fracture of shaft of femur
S727	Multiple fractures of femur
S728	Fractures of other parts of femur
S729	Fracture of femur, part unspecified

ICD-10 = International Classification of Diseases 10th revision.