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Emergency Department Femoral Nerve Blocks and 1-Year Mortality in Fragility Hip Fractures

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Abstract

Objective: Femoral nerve blocks (FNBs) for fragility hip fractures have benefits in improving pain relief and early mobilization while decreasing opioid use and rates of pneumonia. However, no study has looked at 1-year mortality outcomes for this intervention. This study aims to provide insight into 1-year outcomes. **Methods:** A single-site retrospective case–control study from 2007 to 2016 in primary fragility hip fractures compared 665 patients who received an emergency department FNB to 326 patients who did not receive an FNB. The primary outcome was 1-year mortality. Secondary outcomes included mortality, mobility, and residence at discharge, 6 months, and 1-year intervals. **Results:** There were no significant differences in preoperative characteristics. Although there was no statistically significant difference in 1-year mortality, patients who did not receive an FNB were more likely to be nonambulant at 1 year (odds ratio 1.71, 95% confidence interval, 1.14-2.57, $P = .005$). There were no other significant differences in mobility, residence, or mortality. **Conclusion:** There was no statistically significant difference in 1-year mortality, although individuals who did not receive an FNB were more likely to be nonambulant at 1 year.

Keywords

emergency department, hip fracture, mobility, residency, mortality, 1 year, outcomes, femoral nerve blocks

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Introduction

Fragility hip fractures are catastrophic injuries for frail Australians. One-fifth of those who sustain this injury die within 1 year, one-half of them will become permanently disabled, and one-tenth of them will require new long-term care in a skilled nursing facility.[1] Multimodal analgesia with femoral nerve blocks (FNBs) are included in Australian guidelines to decrease pain, opioid use, rates of pneumonia, and aid in earlier mobilization.[2,3] Although FNB are suggested as a promising intervention to prevent mortality there is no literature to our knowledge on 1-year outcomes.[4] Since FNB have been shown to decrease morbidity we hypothesize that FNB given in the emergency department will decrease 1-year mortality.

Methods

Ethics

Low negligible risk ethics exemption was provided by Metro South Human Research Ethics Committee in Brisbane, Australia, to undertake a retrospective population-matched case–control study.

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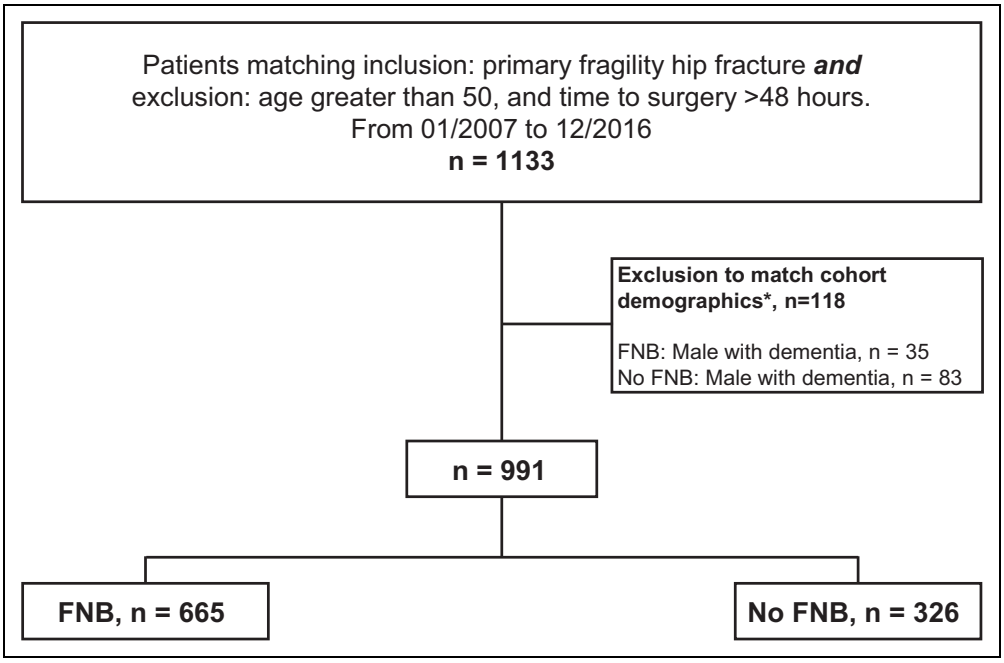

Figure 1. Study flowchart for patients who received an emergency department femoral nerve block versus patients who did not in fragility hip fractures. * Exclusion of these patients-matched cohort demographic proportions from the Australia New Zealand Hip Fracture Registry 2018.

Patient Population

This study was conducted at the Princess Alexandra Hospital in Brisbane, Australia, and complies with the Strengthening The Reporting of Observational studies in Epidemiology guidelines for case–control studies.[5] Princess Alexandra Hospital introduced an orthogeriatric model of care for the management of patients presenting with hip fractures in 2006.

Inclusion criteria for this study were individuals who had a primary fragility hip fracture. Exclusion criteria were any patient who was younger than 50 years or had time to surgery greater than 48 hours.

In all, 1133 patients were identified who matched the inclusion and exclusion criteria. Descriptive and frequency analysis was conducted to describe participant characteristics. Exclusion of 118 male patients with dementia was undertaken to match cohort demographics with the Australia New Zealand Hip Fracture Registry.[2] Thirty-five males with dementia were excluded from the FNB group, and 83 males with dementia were excluded from the no FNB group. In all, 991 patients were then included, with 665 in the FNB group and 326 in the no FNB group (Figure 1).

Data Collection

Data were prospectively collected by clinical nurse consultants from 2007 to 2016 and augmented with retrospective chart reviews. The data collected included the use of an FNB in the emergency department as well as mortality, mobility, and residence data at intervals up to 1 year (on admission, at discharge, at 6 months, and at 1 year). Mobility data were recorded as independent, requiring an aid, or nonambulant. Residence data were recorded as private home, rehabilitation unit, or care facility.

Preoperative patient demographics (age, gender, American Society of Anesthesiologists [ASA] score, preexisting dementia), surgical considerations (time to surgery, surgeon experience), and postoperative complications (urinary tract infections, deep vein thrombosis, pulmonary embolisms, pneumonia, cerebral vascular accidents, myocardial infarcts, and resuscitation codes) were recorded.

Intervention

The FNB intervention was performed by emergency staff physicians and resident physicians using 20 mL of 0.5% bupivacaine inserted adjacent to the femoral nerve. Specific technique for performing the block was not reliably recorded in patient charts. Interventions were based on clinician availability and departmental constraints.

Outcome Measures

The primary outcome was 1-year mortality. Secondary outcomes were in-hospital and 6-month mortality, as well as residency and mobility at discharge, 6 months, and 1-year intervals.

Sample Size Estimation

No published data on 1-year mortality in patients who received an FNB was available to calculate a sample size. Sample size estimates for 6-month mortality with nerve blocks ranged from 443 to 3228 patients.[3,6] G*Power 3.1 stats program[7] was used

to calculate our sample size with a range of effect sizes (0.1-0.25). Given an α of .01 and a power of 0.95, the sample size ranged from 256 to 1580 patients. Our convenience sample of 991 was then collected.

Table 1. Demographics of Patients Who Received an Emergency Femoral Nerve Block Versus Patients Who Did Not in Fragility Hip Fractures From 2007 to 2016.[a]

Demographics	FNB, n = 665	No FNB, n = 326	*P*
Age, median (IQR)	83 (76-88)	82 (74-87)	.02
Female, n (%)	487 (73)	243 (75)	.19
ASA, median (IQR)	3 (3-3)	3 (3-3)	.36
Preexisting dementia, n (%)	205 (31)	103 (32)	.06
Time to surgery in hours, median (IQR)	29 (21-39)	32 (20-30)	.23
Surgeon experience staff versus trainee, n (% staff)	255 (38)	111 (34)	.19

Abbreviations: ASA, American Society of Anesthesiologists; FNB, femoral nerve block; IQR, interquartile range.
[a]$P < .01$ is considered significant.

Table 2. Mortality Outcomes From Patients Who Received an Emergency Department Femoral Nerve Block Versus Patients Who Did Not in Fragility Hip Fractures From 2007 to 2016.[a]

Mortality, n (%)	FNB, n = 665	No FNB, n = 326	*P*
In-hospital	39 (6)	17 (5)	.57
6 months	106 (16)	52 (16)	.99
1 year	155 (23)	72 (22)	.49

Abbreviation: FNB, femoral nerve block.
[a]$P < .01$ is considered significant.

Statistical Analysis

Where data were missing, multiple imputations for chained equivalence (MICE) was used in consultation with a biostatistician. Statistical analysis of the data was undertaken using Statistical Package for Social Sciences version 22 software (IBM, Chicago, Illinois). All ordinal and continuous values were assessed using Mann-Whitney U median testing, and nonordinal values were evaluated using χ^2 with odds ratio (OR) calculations for statistically significant variables. A P value less than .01 was considered statistically significant.

Results

Six-month and 1-year follow-up was recorded in 87% and 75% of individuals, respectively. The remaining data were imputed using MICE with biostatistical support.

There was no statistical difference in preoperative characteristics (Table 1) or 1-year mortality (Table 2). Patients who did not receive an FNB were more likely to be nonambulant at 1 year (OR 1.71, 95% confidence interval, 1.14-2.57; Table 3). There was no other statistically significant difference in mobility, residence, postoperative complications, and mortality outcomes (Tables 2–4, Appendix A). Additional subgroup analysis between FNB and no FNB for age, ASA, time to surgery, type of fracture, and type of anesthetic showed no significant difference in mortality outcomes at 1 year (data not shown).

Discussion

To the best of our knowledge, this is the first study comparing FNB administered in the emergency department and 1-year

Table 3. Mobility Outcomes From Patients Who Received an Emergency Department Femoral Nerve Block Versus Patients Who Did Not in Fragility Hip Fractures From 2007 to 2016.[a]

	FNB, n = 665	No FNB, n = 326	*P*	Odds Ratio
Preadmission mobility, n (%)				
Independent	335 (50)	169 (52)	.66	–
Walking aid	314 (47)	150 (46)	.72	–
Nonambulant	10 (2)	7 (2)	.46	–
Discharge mobility, n (%)				
Independent	2 (0)	2 (1)	.47	–
Walking aid	600 (90)	286 (88)	.23	–
Nonambulant	32 (5)	22 (7)	.21	–
6 months, n (%)				
Independent	101 (15)	50 (15)	.94	–
Walking aid	400 (60)	181 (56)	.16	–
Nonambulant	58 (9)	43 (13)	.03	–
1 year, n (%)				
Independent	140 (21)	63 (19)	.52	–
Walking aid	313 (47)	143 (44)	.34	–
Nonambulant	59 (9)	48 (15)	.005	1.71 (1.14-2.59)

Abbreviation: FNB, femoral nerve block.
[a]$P < .01$ is considered significant.

Table 4. Residence Outcomes From Patients Who Received an Emergency Department Femoral Nerve Block Versus Patients Who Did Not in Fragility Hip Fractures From 2007 to 2016.[a]

	FNB, n = 665	No FNB, n = 326	*P*
Preadmission residence, n (%)			
Private	470 (71)	229 (70)	.89
Care facility	192 (29)	91 (28)	.75
Discharge location, n (%)			
Private residence	79 (12)	55 (17)	.03
Rehabilitation	397 (60)	193 (59)	.88
Care facility	159 (24)	68 (21)	.28
6 months, n (%)			
Private	354 (53)	163 (50)	.34
Care facility	197 (30)	95 (29)	.88
1 year, n (%)			
Private	325 (49)	156 (48)	.76
Care facility	179 (27)	87 (27)	.94

Abbreviation: FNB, femoral nerve block.
[a]$P < .01$ is considered significant.

mortality in patients with fragility hip fractures. Femoral nerve block may not reduce 1-year mortality but may prevent permanent immobilization. We postulate that FNB does this by decreasing pain, opioid use, and subsequent delirium. Patients who are less delirious then mobilize earlier, resulting in more sustained long-term mobility.

When resources and expertise are available, nerve blocks targeting the femoral nerve should be included in hip fracture management. These interventions can easily be performed in the emergency department and be repeated every 12 hours to ensure prolonged effects where possible.[8] Although femoral blocks in hip fractures should be the minimum, new alternatives may include fascia iliaca catheters, transversus abdominis plane quadratus lumborum blocks, and pericapsular nerve group blocks.[9-11] These peripheral anesthesia methods are exciting options that may offer better analgesia or broader coverage of the obturator nerve along with the femoral and lateral cutaneous nerves. They remain an open area for future research.

This case–control study accounted for known mortality risk factors, which include time to surgery, surgeon experience, age, gender, ASA classification, and premorbid mobility.[4] The limitations include missing data regarding nerve block techniques and intervention selection. Prospective randomized trials in future studies may help address these limitations.

Conclusion

In summary, this study was unable to show a difference in 1-year mortality; however, it suggested an association between emergency department FNB and increased mobility at 1 year. Methodology should be considered in interpreting this study.

Appendix A

Postoperative outcomes from patients who received an emergency department femoral nerve block versus patients who did not in fragility hip fractures from 2007 to 2016. $P < .01$ is considered significant.

	FNB, n = 665	No FNB, n = 326	*P*
Postoperative complications, n (%)			
Urinary tract infection	200 (30)	106 (33)	.61
Pneumonia	63 (9)	28 (9)	.21
Deep vein thrombosis	8 (1)	7 (2)	.25
Pulmonary embolism	6 (1)	3 (1)	.98
Stroke	8 (1)	7 (2)	.25
Myocardial infarct	16 (2)	2 (1)	.05
Resuscitation code	16 (2)	7 (2)	.06

Authors' Note

All authors contributions keep with the ICJME authorship with substantial contributions to design/acquisition or analysis of data, drafting/revising, final approval of published versions, and agreement to be accountable for integrity and accuracy of the work.

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Declaration of Conflicting Interests

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