

Opioid Usage During Admission in Hip Fracture Patients—The Effect of the Continuous Femoral Nerve Block

Geriatric Orthopaedic Surgery
& Rehabilitation
2016, Vol. 7(4) 197-201
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DOI: 10.1177/2151458516672284
gos.sagepub.com



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Abstract

Introduction: The aim of this study was to investigate whether there was a difference in opioid usage during admission for hip fracture patients with continuous femoral nerve block (cFNB) when compared to patients nonfemoral nerve block (nFNB). **Methods and Materials:** Patients were identified from the local database on all hip fracture patients admitted to Bispebjerg University Hospital, Denmark. Four hundred fifty-six hip fracture patients were included during the period September 2008 to October 2010. **Results:** Three hundred sixty-six hip fracture patients had cFNB. The mean time with cFNB was 3.4 days. There were no significant differences in gender, length of stay, time to surgery, mortality rate, in-hospital falls, or resurgery rates during admission between the 2 groups. The nFNB group had an insignificant higher use of morphine as needed during the first 5 days of admission (nFNB: 53.1 mg, 95% confidence interval [CI]: 34.4-71.7; cFNB: 47.7 mg, 95% CI: 40.7-64.3; $P = .54$) and during the whole admission (cFNB: 34.3 mg, 95% CI: 23.2-45.5; nFNB: 30.3 mg, 95% CI: 26.6-33.0; $P = .4$). Some 8.47% of the total morphine consumption during admission was morphine as needed for the nFNB group and 9.89% for the cFNB group. **Conclusion:** Patients with cFNB did only have a marginally lower opioid usage during admission when compared to patients without the block, with no significance between the 2 groups. This could indicate that the cFNB is an ineffective analgesic strategy, especially in the postoperative period, but larger randomized studies are needed in order to clarify this.

Keywords

hip fracture, continuous femoral nerve block, morphine consumption, postoperative pain assessment, mortality

Introduction

Patients sustaining a hip fracture generally have a high comorbidity and a poor outcome following their fracture.^{1,2} Many factors influence the mortality for this patient group including American Society of Anesthesiologists (ASA) score, Charlson comorbidity index,³ and preexisting dementia.⁴ But there is also a strong correlation between minimizing the acute pain and the reduction in morbidity and mortality after surgery.⁵ Many types of analgesic strategies have been used for this patient group including different types of nerve blocks. The continuous femoral nerve block (cFNB) is first of all used with the purpose of reducing the acute preoperative pain and secondly reducing the postoperative pain.⁶ The purpose of this study was to investigate the differences in opioid usage during admission in hip fracture patients with cFNB when compared to patients without femoral nerve block (nFNB).

Materials and Methods

Study Design and Data Collection

Since August 2008, all patients sustaining a hip fracture and admitted to Bispebjerg University Hospital, Denmark, have been registered in the local hip fracture database.

For this study, patients admitted during the period September 2008 to October 2010 were identified. The following variables were obtained from the database—age, gender, ASA score, body mass index (BMI), alcohol overuse, smoking, fracture type, morphine consumption during admission, date and time of admission, date of discharge, date of applying and removal of the femoral nerve block, length of stay (LOS), in-hospital- and 30-day mortality, in-hospital fall, resurgery during admission, lack of mobilization due to pain, and number of days postoperatively before the patient was out of bed and second up-and-go. Alcohol overuse was defined as more than 14 units per week for women and more than 21 units per week for men. For the purpose of calculating opioid consumption

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during admission, data were obtained from the hospital medical database on all opioid medications and their doses given during admission. The medical database was built so that nurses upon administration had to sign on what was given and in which dose. Both regular daily use of opioids and opioids as needed were included, with the latter consisting of dimethylaminodiphenylbuten with ketomidon (Ketogan), morphine, and oxycodone, which are solely used as in the acute phase. We considered morphine as needed as a surrogate parameter for breakthrough pain since patients asked for morphine when in these situations. Equivalent doses of morphine were calculated for the different types of opioids given during admission to account for the different potency of the opioids. The calculations were done using the morphine scale by Jensen and Sjøgren.⁷ Patients with opioid abuse were excluded from the analyses. At our hospital, ropivacaine was used in the nerve catheters. To determine the date of applying and removal of the femoral catheter, first and last dose of ropivacaine administered during admission were used as surrogate measure. Lack of mobilization due to pain was defined as the patient had the planned physiotherapy cancelled due to pain minimum once postoperatively.

The Fast-Track Procedure

In the emergency department (ED), patients objectively diagnosed with a hip fracture received oral paracetamol and if necessary intravenous morphine. Unless the department of anesthesiology was too busy, a cFNB was applied by an anesthesiologist using electrostimulation. The only exclusion criterion for cFNB was treatment with warfarin. If the patient received a cFNB, the postoperative analgesic treatment would be 20 mL ropivacaine (2.5 mg/mL) initially followed by 4 administrations of 20 mL daily with the possibility of 2 extra doses of 20 mL daily, if needed. Furthermore, the patients with cFNB did not receive fixed slow-release opioids or acetaminophen as standard but had the possibility to ask for 5 to 10 mg oral morphine in case of breakthrough pain. When the cFNB was removed, no later than 4 days after surgery, the analgesic treatment would be converted into fixed morphine-based oral treatment, most likely Contalgin. Though, in case of a high use of oral morphine, the patients with cFNB would be given slow-release opioids if deemed necessary by the attending physician. For patients not receiving a cFNB, the analgesic treatment would be acetaminophen together with a fixed dose of slow-release oral morphine (Contalgin) unless not tolerated and oral morphine as needed with a maximum of 6 daily administrations. The morphine as needed was administered only when asked for by the patient. Both patients groups received oral paracetamol 1 g, 4 times daily. From the ED, the patient was sent for an X-ray of the hip, and thereafter, the patient was transported to the orthopedic department. After surgery, the patient would remain hospitalized for stabilization and until acceptable mobilization and pain relief were attained.

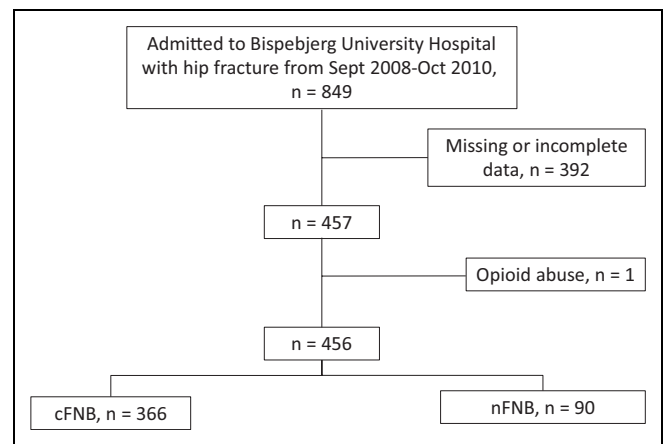


Figure 1. Patient flowchart.

The Femoral Nerve Block

At an FNB, also called 3-in-1 FNB,⁸ the injected local anesthetic infiltrates the femoral nerve sheath and may spread laterally and cranially to the femoral and obturator nerves, the lower cords of the lumbar plexus, and the lateral cutaneous nerve of the thigh.⁹

Statistical Analysis

Analyses of categorical data were conducted using χ^2 tests. Differences in mean values for normally distributed variables between the 2 groups were calculated using Student *t* tests. Nonparametric methods (Mann-Whitney *U* tests) were used to test for differences in median ASA score. All analyses were 2 sided, and a *P* value < .05 was considered as statistically significant. Statistical analysis was performed with SAS statistical software version 9.3 (SAS Institute Inc, Cary, North Carolina). All statistical analyses were conducted using the same software package.

Results

Eight hundred forty-nine patients were admitted during the period, with 392 patients being excluded from the analyses due to missing or incomplete data and 1 patient was excluded due to opioid abuse. As such, a total of 456 patients were included in the study (Figure 1). One patient underwent conservative treatment.

Three hundred sixty-six hip fracture patients had cFNB and 90 did not have femoral block (nFNB). The mean time with cFNB was 3.4 days (95% confidence interval [CI]: 2.0-4.9). As seen in Table 1, there were no significant differences in gender, BMI, ASA, time from injury to surgery, LOS, mortality rate, in-hospital falls, resurgery rate during admission, or mobilization parameters between the 2 groups. The nFNB group had a mean morphine consumption during admission of 626.7 mg (95% CI: 446.5-806.9), whereas the cFNB group had a mean consumption of 536.7 mg (95% CI: 482.4-591.0), *P* = .20. Though, looking at morphine as needed as a surrogate

Table 1. Basic Characteristics of Included Hip Fracture Patients.

	nFNB	cFNB	P
Patients, n	90	366	-
Male, n (%)	29 (32.2)	94 (25.7)	.21
Mean age (95% CI)	77.3 (74.5-80.1)	80.6 (79.4-81.3)	<.05
Mean BMI, mg/m ² (95% CI)	22.3 (21.3-23.4)	22.1 (21.7-22.5)	.64
Median ASA (range)	2 (1-4)	2 (1-4)	1
Alcohol overuse, n (%)	16 (17.8)	49 (13.4)	.29
Smokers, n (%)	34 (37.8)	113 (30.9)	.21
Mean LOS, days (95% CI)	14.5 (12.3-16.6)	15.1 (14.0-16.1)	.6
Time from injury to surgery, days (95% CI)	1.3 (0.9-1.7)	1.3 (1.1-1.3)	.68
Mortality during admission, n (%)	3 (3.3)	16 (4.4)	.7
Mortality 30 days postsurgery, n (%)	7 (7.8)	39 (10.7)	.42
In-hospital fall, n (%)	0 (0)	4 (1.1)	.32
Resurgery during admission, n (%)	0 (0)	4 (1.1)	.32
Mobilization data			
Lack of mobilization due to pain, n (%)	15 (16.6)	74 (20.2)	.26
Mean out of bed postoperatively, days (95% CI)	2.2 (1.7-2.7)	2.5 (2.2-3.0)	.34
Mean up and go postoperatively, days (95% CI)	4.6 (3.1-6.0)	4.1 (3.5-4.7)	.51
Missing data on mobilization, n (%)	19 (21.1)	99 (27.0)	.81

Abbreviations: ASA, American Society of Anesthesiologists score; BMI, body mass index; cFNB, continuous femoral nerve block; CI, confidence interval; LOS, length of stay; nFNB, nonfemoral nerve block.

parameter for breakthrough pain, the nFNB group had an insignificantly higher mean use of morphine as needed during the first 5 days of admission and during the whole admission (Table 2). Some 8.47% of the total morphine consumption during admission was morphine as needed for the nFNB group and 9.89% for the cFNB group. No significant differences were found when looking at consumption of morphine as needed on a daily basis.

Discussion

In general, we found insignificantly higher total opioid consumption during admission and higher use of morphine as needed for hip fracture nFNB patients versus patients with cFNB.

Contrary to our results, 2 small randomized controlled trials (RCTs),^{9,10} including 50 and 36 patients, respectively, found that the nFNB group had a significantly higher pain score and a significantly higher use of morphine than the cFNB group. However, the 2 studies had shorter observation period (24 and 4 hours, respectively) versus a longer observation period in our study, and the observation period in the studies was only preoperative. Furthermore, the femoral nerve block in the 2 studies

Table 2. Morphine As Needed in Hip Fracture Patients During Admission.

	nFNB	cFNB	P
Patients	90	366	-
Morphine as needed, the whole admission, mg (95% CI)	53.1 (34.4-71.7)	47.7 (40.7-64.3)	.54
Morphine as needed, the first 5 days of admission, mg (95% CI)	34.3 (23.2-45.5)	30.3 (26.6-33.0)	.4

Abbreviations: cFNB, continuous femoral nerve block; CI, confidence interval; nFNB, nonfemoral nerve block.

was given as “single shot” and not as continuous nerve block. Another RCT study including 62 patients¹¹ found significant higher morphine use at the cFNB group versus the nFNB group. Again, the study is hardly comparable to ours since the femoral nerve block was applied postoperatively and the observation time was only 48 hours, where in our study, the block was applied preoperatively and the observation period was longer. In a different RCT¹² with an observation period of 72 hours, it was found that the cumulated morphine consumption was significantly higher for the nFNB patients, but the study also found an insignificant lower pain score 54 and 72 hours postoperatively. The observation period is better comparable with our study because the period was perioperative and longer, though we included the total morphine consumption during the whole admission. A RCT study of Gille et al¹³ with cFNB applied preoperatively and an observation period of 3 days postoperatively found no significant difference in pain score or complications postoperatively, though they found that 20% of the catheters were dislodged. In a meta-analysis of 21 RCTs with a total of 1422 patients by Rashid et al,¹⁴ it was concluded that FNB had pain relief monitored by visual analog scale (VAS) score. A limitation of the meta-analysis was the lack of difference between continuous and single-shot block and the observation period. In another meta-analysis¹⁵ including 29 RCTs with a total of 1757 patients, it was stated that patients with FNB had an overall lower use of analgesia than nFNB patients. Most of the included RCTs involved only the preoperative time and time during surgery, and this meta-analysis also did not distinguish between continuous or the single-shot form of FNB. Kullenberg et al¹⁶ found in an RCT including 80 patients that hip fracture patients with cFNB (mean time 15.8 hours) had less pain monitored by VAS score and had a shorter time for immobilization postoperatively versus hip fracture nFNB patients. We found no significant difference in out-of-bed time and up-and-go time. Neither was there any difference in lack of mobilization due to pain. The lack of difference at the mobilization parameters in our study may be connected to the general therapeutic capacity at the orthopedic department, which is high.

In our study, the mean time with cFNB was 3.4 days, which is longer time compared to earlier studies. The longer time with

FNB could imply a smaller opioid use during admission for the cFNB group, but this was not evident in our study. On the other hand, it has been concluded through studies that nerve blocks mainly have an effect on the acute pain preoperatively, and therefore, a longer time with cFNB as in this study could induce insignificant difference looking at opioid use.

For this study, morphine as needed was considered as a surrogate variable for breakthrough pain. Though, it is important to mention that the morphine as needed was administered by nurses when the patient asked for it and thereby a factor as nurse work pressure may have had an impact. A potential negative side effect of the FNB can be motor block that may lead to falls. From our data, in-hospital fall could be construed as a surrogate parameter for motor block. We did not find significantly more events of in-hospital falls or resurgery during admission. Even though it has been stated that patients with cFNB had higher risk of in-hospital falls,¹⁷ it was not evident from our data. Though, it is worth mentioning that incomplete data caused to incorrect registered records may have had an impact on data concerning in-hospital fall and resurgery during admission in this study. Other limitations to this study include the design (nonrandomized) and thereby risk of selection bias, and the known uncertainty connected to the opioid equivalence calculation. Another limitation is the relative big difference in the number of patients between the 2 groups, and the exclusion of the large group of patients due to incomplete data, which could lead to a higher risk of insignificant results (type II error). Finally, the cFNB could have been of incorrectly positioned or dislodged during the admission. Also, in our study, we look at opioid consumption during the whole admission and did not distinguish between the pre- and postoperative period and as such cannot determine whether the block could be more or less effective in one of those periods. The strengths of this study are the large total number of patients included. Furthermore, the number of patients in the cFNB group exceeds the FNB groups of the above-mentioned RCT studies. The data were collected on time and with great accuracy, which underline the accuracy of the time with cFNB and the opioid consumption. Compared to previous studies, the insignificant lower use of morphine may indicate that cFNB is only relevant and indicated the first 24 hours after trauma. On the other hand, there are possible biases in this study to induce insignificance, for which reason cFNB as a primary choice of analgesia for hip fracture patients cannot be excluded.

Conclusion

In summary, this study shows no significant difference regarding the use of morphine during admission, complications during admission, LOS, or mobilization problems in hip fracture patients with cFNB when compared to nFNB patients. In spite of possible bias, the lack of significance between the 2 groups could imply that baseline analgesia as cFNB or morphine does not make a difference concerning the patients' breakthrough pain. But in order to determine the effect, further studies, preferably an RCT, are needed.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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