ABSTRACT

Purpose. To compare the visual analogue score (VAS) for pain in patients with femoral neck fracture who received standard preoperative analgesia with or without fascia iliaca compartment block (FICB).

Methods. In patients with femoral neck fracture, 69 patients who received standard preoperative analgesia (regular paracetamol 1g 4 times a day, codeine 60 mg 4 times a day, and opioid 10 mg 2 hourly as required) were compared with 50 patients who received standard preoperative analgesia plus FICB. VAS for pain at rest and on movement (hip flexion) was assessed before FICB and 15 minutes, 2 and 8 hours after FICB. The amount of additional opioid required and the incidence of opioid overdose (necessitating administration of naloxone) were determined.

Results. VAS for pain was significantly lower after standard analgesia plus FICB than standard analgesia alone (p=0.001). The analgesic effect (pre-score minus post-score) of standard analgesia plus FICB did not differ between genders (p=0.57) or fracture patterns (p=0.79). 19 (38%) patients with standard analgesia plus FICB required no additional opioid analgesia. Compared with standard analgesia alone, addition of FICB reduced the mean dose of opioid from 6.2 to 2.0 (p=0.001) and the number of opioid overdose from 7.2% to 0% (p=0.001). No patient had any complication following FICB.

Conclusion. In patients with femoral neck fracture, FICB reduced the need for additional opioid analgesia and avoided the risk of opioid overdose and respiratory depression.

Key words: analgesia; femoral neck fractures; nerve block

INTRODUCTION

Femoral neck fractures affect approximately 77 000 people per year in the United Kingdom,1 and impose an economic burden of £2 billion,2 with pain being the most debilitating symptom. Opioids remain the most commonly used analgesia.2 Opioids are effective for static pain but not dynamic pain; opioids provide suboptimal analgesia when patients are in a dynamic transition state.2 These patients have a high...
mortality due to co-existing comorbidities, and 40% of them have at least moderate renal dysfunction.\(^1\) This can potentially reduce the excretion of opioids and increase their side effect profile, which can be reduced by using fascia iliaca compartment block (FICB).

FICB involves the fascia iliaca compartment to deliver a large volume of low concentrated local anaesthetic to reduce pain by affecting the femoral and lateral cutaneous nerve of the thigh.\(^4\) Performing FICB in the emergency department provides superior pain relief in both the static and dynamic positions for up to 3 hours in patients with femoral neck fracture.\(^3\) Nonetheless, its use has been limited due to a lack of trained staff or appropriate equipment in direct care personnel.\(^5\)

The National Institute for Health and Care Excellence guidelines recommend the use of nerve blocks in selected patients to provide additional analgesia and/or limit opioid dosage.\(^2,6\) This study compared the visual analogue score (VAS) for pain in patients with femoral neck fracture who received the standard preoperative analgesia with or without FICB.

**MATERIALS AND METHODS**

Between August and November 2012, 69 patients aged 62 to 94 (mean 82.6) years with femoral neck fracture received standard preoperative analgesia (regular paracetamol 1g 4 times a day, codeine 60 mg 4 times a day, and opioid 10 mg 2 hourly as required). Their records were reviewed to determine the amount of additional opioid required and the incidence of opioid overdose (necessitating administration of naloxone).

Between December 2012 and July 2013, 36 women and 14 men aged 58 to 97 (mean, 81.7) years with intracapsular (n=32) or extracapsular (n=28) femoral neck fractures were prospectively included to receive standard preoperative analgesia plus FICB. Patients with subtrochanteric fractures that required application of a splint or traction were excluded, as were those who were prescribed warfarin or had dementia, any overlying skin infection, previous femoral bypass surgery, or local anaesthetic allergy.

The trainee performing the FICB received training in anatomy, pharmacology of local anaesthetic, and the techniques and potential complications of the FICB. Practical sessions were undertaken under direct supervision by an anaesthetic consultant. Once competency was achieved, the trainee could administer the FICB alone in the emergency department setting.

For a patient weighing <50 kg or >50 kg, 30 ml or 40 ml of 0.25% levobupivicaine was introduced into the fascia iliaca compartment. Pressure was applied to the area once FICB was completed.

Complications of FICB included local anaesthetic toxicity, infection, temporary or permanent nerve damage, intravascular injection, and allergy to any of the preparations used. Patients were monitored for any signs of local anaesthetic systemic toxicity (perioral tingling, visual disturbances, arrhythmias, seizures).

VAS for pain at rest and on movement (hip flexion) was assessed by nursing staff before FICB and 15 minutes, 2 and 8 hours after FICB. Block failure was defined as <3 VAS for pain improvement or less than the pre-block score at rest.\(^7\)

Analysis of the change in VAS for pain over time was performed using Kolmogorov-Smirnov test, which confirmed non-normality. The 2 groups were compared using the Mann-Whitney \(U\) test for continuous data and the Wilcoxon signed-rank test for paired data. A \(p\) value of <0.05 was considered statistically significant.

**RESULTS**

The VAS for pain was significantly lower after standard analgesia plus FICB than standard analgesia alone (\(p=0.001, \) Table 1). In patients with standard analgesia alone, the VAS for pain reduced from 15 minutes to 8 hours but not significantly (\(p=0.76, \) Table 1); reduction was <3 in 40 (58%) patients. In patients with standard analgesia plus FICB, the VAS for pain reduced from 15 minutes and the effects lasted for the entire 8 hours; reduction was <3 in 13 (26%) patients.

The analgesic effect (pre-score minus post-score) of standard analgesia plus FICB did not differ between genders (\(p=0.57, \) Table 2) or fracture patterns (\(p=0.79, \) Table 3). 19 (38%) patients with standard analgesia plus FICB required no additional opioid analgesia.

Compared with standard analgesia alone, addition of FICB reduced the mean dose of opioid from 6.2 to 2.0 (\(p=0.001, \) Table 4) and the number of opioid overdose from 7.2% (5/69) to 0% (\(p=0.001, \) Table 4). No patient had any complication following FICB.

**DISCUSSION**

FICB uses the fascia iliaca compartment to deposit a sufficient volume of local anaesthetic to spread to
the femoral and lateral femoral cutaneous nerve.\textsuperscript{4} It is superior to the 3-in-1 block,\textsuperscript{4} intramuscular morphine,\textsuperscript{3} and standard analgesia regimens\textsuperscript{7,9} in terms of pain relief for femoral neck fracture. Its efficacy has been reported to be 69.5\% to 90\%.\textsuperscript{7,9} The use of ultrasonography to guide the FICB increases the reliability of sensory and motor blockade.\textsuperscript{10,11}

Up to 84\% of emergency departments in the UK use regional anaesthesia for hip fracture patients; FICB is the first-line regional anaesthesia.\textsuperscript{5} This has

\begin{table}[h]
\centering
\caption{Visual analogue score (VAS) for pain after standard preoperative analgesia alone versus combined with fascia iliaca compartment block (FICB)}
\begin{tabular}{|c|c|c|c|c|}
\hline
Time & \multicolumn{2}{|c|}{Mean (95\% CI) VAS at rest} & \multicolumn{2}{|c|}{Mean (95\% CI) VAS on movement} \\
\hline & Standard analgesia & Standard analgesia + FICB & Standard analgesia & Standard analgesia + FICB \\
(n=69) & (n=50) & (n=69) & (n=50) \\
\hline
0 minute & 8.0 (7.9–8.2) & 7.9 (7.7–8.2) & 9.5 (9.5–9.8) & 9.6 (9.5–9.7) \\
15 minutes & 7.7 (6.1–8.1) & 5.8 (4.9–6.1) & 9.2 (9.0–9.5) & 8.0 (7.8–8.2) \\
2 hours & 6.1 (5.2–7.4) & 4.1 (3.9–4.3) & 9.0 (8.7–9.3) & 6.0 (5.9–6.3) \\
8 hours & 5.6 (5.0–6.3) & 4.0 (3.8–4.2) & 8.9 (8.6–9.2) & 6.1 (6.0–6.2) \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Visual analogue score (VAS) for pain in males and females after standard preoperative analgesia combined with fascia iliaca compartment block}
\begin{tabular}{|c|c|c|c|c|}
\hline
Time & \multicolumn{2}{|c|}{Mean (95\% CI) VAS at rest} & \multicolumn{2}{|c|}{Mean (95\% CI) VAS on movement} \\
\hline & Male (n=14) & Female (n=36) & Male (n=14) & Female (n=36) \\
\hline
0 minute & 7.9 (7.5–8.2) & 7.9 (7.7–8.2) & 9.5 (9.5–9.7) & 9.6 (9.5–9.7) \\
15 minutes & 5.8 (4.9–6.1) & 5.9 (4.9–6.1) & 8.0 (7.8–8.2) & 8.0 (7.8–8.2) \\
2 hours & 4.0 (3.9–4.2) & 4.1 (4.0–4.3) & 6.0 (5.9–6.2) & 6.0 (5.9–6.3) \\
8 hours & 4.0 (3.8–4.1) & 4.1 (3.9–4.2) & 6.0 (6.0–6.1) & 6.1 (6.0–6.2) \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Visual analogue score (VAS) for pain in patients with intra- or extra-capsular femoral neck fractures after standard preoperative analgesia combined with fascia iliaca compartment block}
\begin{tabular}{|c|c|c|c|c|}
\hline
Time & \multicolumn{2}{|c|}{Mean (95\% CI) VAS for pain at rest} & \multicolumn{2}{|c|}{Mean (95\% CI) VAS for pain on movement} \\
\hline & Intracapsular (n=32) & Extracapsular (n=28) & Intracapsular (n=32) & Extracapsular (n=28) \\
\hline
0 minute & 7.9 (8.2–7.7) & 7.9 (8.2–7.7) & 7.9 (8.2–7.7) & 7.9 (8.2–7.7) \\
15 minutes & 5.8 (4.9–6.1) & 5.8 (4.9–6.1) & 5.8 (4.9–6.0) & 5.8 (4.9–6.0) \\
2 hours & 4.0 (3.9–4.2) & 4.1 (3.9–4.3) & 4.1 (3.9–4.3) & 4.1 (3.9–4.3) \\
8 hours & 4.0 (3.8–4.2) & 4.0 (3.8–4.2) & 4.0 (3.8–4.2) & 4.0 (3.8–4.2) \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Mean dose of opioid administered preoperatively and the number of opioid overdose in patients with standard preoperative analgesia alone versus combined with fascia iliaca compartment block (FICB)}
\begin{tabular}{|c|c|c|c|}
\hline
Time & \multicolumn{2}{|c|}{Mean (95\% CI) dose of opioid*} & \multicolumn{1}{|c|}{No. of opioid overdose} \\
\hline & Standard analgesia & Standard analgesia + FICB & Standard analgesia \\
(n=69) & (n=50) & (n=69) & (n=50) \\
\hline
0 minute & 1.9 (0–4) & 1.9 (0–4) & 0 & 0 \\
15 minutes & 8.2 (4–26) & 8.2 (4–26) & 2 & 0 \\
2 hours & 7.8 (4–20) & 7.8 (4–20) & 2 & 0 \\
8 hours & 6.9 (6–20) & 6.9 (6–20) & 1 & 0 \\
\hline
\end{tabular}
* 1 dose=2.5 mg oramorph
led to the introduction of a nurse-led FICB service for patients with femoral neck fracture. The analgesic reliability of FICB has led to its introduction in the pre-hospital setting in some countries. Bupivacaine has been used to investigate the analgesic effect of FICB. It has a rapid onset (2–5 minutes), with the maximum plasma level occurring 15–30 minutes. It has fewer toxic reactions relative to lidocaine, with a half-life of 157 minutes, and its local anaesthetic effect lasts for up to 8 hours.

In our study, the most effective analgesic effect of FICB was at 2 hours and the effect lasted for 8 hours. The effect of FICB can last up to 8 hours when compared with intravenous non-steroidal anti-inflammatory drugs. In European populations, the analgesic effect of bupivacaine was reported to last for up to 3 hours only and 2 hours in UK.

In our study, the use of FICB in patients with femoral neck fracture reduced the amount of additional opioid required by 66% and eliminated opioid overdose. FICB also reduces the side effects of opioids (sedation, nausea, and vomiting) and provides longer lasting analgesia. In the elderly with comorbidities such as renal dysfunction, reducing the amount of opioid required preoperatively reduces the incidence of opioid overdose.

In our study, FICB was effective in 84% of patients. This may be attributable to the training and the low complexity of FICB. Lecture-based training sessions without practice have resulted in a lower success rate. In our study, the trainees received a lecture in conjunction with practical sessions under direct supervision by an anaesthetic consultant. Once competency was achieved, the trainees could administer the FICB alone in the emergency department setting. FICB also reduced the nursing time spent dispensing controlled drugs.

FICB is superior to a femoral block because ultrasonography or a nerve stimulator is not required. The technique for FICB is easy and safe to perform and ensures a safe distance away from the femoral nerve and artery and reduces the incidence of complications. FICB can be performed quickly and effectively by emergency doctors and effectively reduces the incidence of delirium in patients with femoral neck fracture. FICB should be introduced earlier in the analgesia pathway in patients with femoral neck fracture.

Limitations of this study included the small sample size, and selection and operator bias that may have occurred when assessing VAS for pain. Patients and staff expectations of FICB may have influenced the subjective VAS for pain. The amount of analgesia administered pre-FICB was not controlled, but this has been shown to have no effect. Further studies are needed to compare FICB with intravenous opioid analgesia.

CONCLUSION

In patients with femoral neck fracture, FICB reduced the need for additional opioid analgesia and avoided the risk of opioid overdose and respiratory depression.

DISCLOSURE

No conflicts of interest were declared by the authors.


