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Case Report

The Pericapsular Nerve Group Block for Hip Fracture Surgery: A Prospective Case Report

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ABSTRACT

Background: The Pericapsular Nerve Group (PENG) block is a regional analgesia technique of the hip. This prospective case series investigated the PENG block in Neck of Femur (NOF) fracture surgery.

Methods: Consecutive patients undergoing surgical repair of neck of femur fractures receiving a PENG block were included. This number was limited due to the few anesthesiologists trained in this novel block (DL, BB, MV). The primary outcome was individual patient pain score reduction. Secondary outcomes were opiate use, patient satisfaction, and perioperative complications.

Outcomes: Twenty eight patients were recruited from October 2019 to April 2020. There was a median reduction of 7 points [range -3 to 10] on an 11-point Verbal Numerical Rating Score (VNRS).

Conclusion: The PENG block provides effective pain relief in NOF surgery, and warrants further investigation by randomised controlled trial.

Keywords: PENG; Hip fracture; Regional anesthesia; Pericapsular nerve group block

INTRODUCTION

Neck of Femur (NOF) fracture is a painful condition associated with significant morbidity and mortality [1]. Femoral nerve block is commonly performed as part of multimodal analgesia [2-5]. However shows only modest reductions in pain scores and opioid requirement and results in temporary quadriceps weakness, contributing to delayed mobilization, prolonged hospital stay and in-hospital falls [6-10].

An anatomical study exploring the sensory innervation of the hip joint led to the development of the Pericapsular Nerve Group (PENG) block. This technique suggests greater improvement in pain scores and less motor weakness than the traditional femoral nerve blocks. Current literature on PENG blocks is limited to small case series and editorials only. This case series was designed to evaluate the PENG in a larger patient cohort than previously studied with a focus on pain score reduction in patients undergoing surgical NOF fracture repair.

CASE STUDY

Study design

This is a single-center case series conducted at a large tertiary trauma centre. A prospective cohort of patients undergoing NOF fracture repair were enrolled and received a PENG block prior to their operation. The study was approved by the local ethics committee (AUD/19/SAC/197) in October 2019 and written informed consent was obtained. The primary outcome measure was individual patient pain score reduction. Secondary outcome measures were opioid consumption for the first three days postoperatively, complication rates, patient satisfaction and duration of block effect.

Participants

Three consultant anesthesiologists were trained in performing the PENG block (BB, DL, MV). Twenty-eight patients were recruited between October 2019 and April 2020. Inclusion criteria were age greater than 44 years, and planned NOF surgery. Exclusion criteria

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were contraindications to a regional nerve block, a distracting second injury, and patient's refusal of a regional nerve block. Eligible patients were identified prospectively from these particular anesthesiologists' orthopaedic operating lists. Per patient, a pain score difference was calculated by subtracting the maximum pain score postoperatively in Recovery from the maximum pre-operative pain score.

RESULTS

Twenty eight patients were included in this study. The median age of patients was 78 years (range 59-99). Demographics are detailed (Table 1). Preoperatively, three patients (14%) had no to mild pain (VNRS 0-4), seven had moderate pain (VNRS 5-7), and 12 patients (54%) reported severe pain (VNRS 8-10).

Table 1: Patient and preoperative characteristics.

	PENG (n=28)
Age in years, median (range)	78(59-99)
Gender, n (%)	
Male	8(29)
Female	20(71)
ASA score, n (%)	
I	0
II	7 (25)
III	15 (54)
IV	6 (21)
V	0
Preoperative Mobility, n (%)	
1 (Independent)	14 (50)
2 (Stick/Crutch)	5 (18)
3 (Walker/frame)	8 (28)
4 (Wheelchair/assisted)	1 (4)
Mental status, n (%)	
0 (No impairment)	19 (67)
1-3 (Cognitive impairment)	9 (33)
Residence, n (%)	
1 (Home)	18 (64)
2 (Assisted care)	2 (7)
3 (Nursing home)	8 (29)
Fracture side, n (%)	
1 (Left)	15 (54)
2 (Right)	13 (46)
Type of fracture, n (%)	
intracapsular	13 (46)
extracapsular	15 (54)
Preoperative pain score (VAS), n (%)	1 (5)
None	2 (9)
Mild (1-4)	7 (32)
Moderate (5-7)	12 (54)a
Severe (8-10)	
Type of anaesthesia for surgery, n (%)	15 (54)
General	13 (46)
Spinal	

[a] 5 unable to assess due to dementia.

Postoperative outcomes are outlined (Table 2). At four hours postoperative, patients reported a median decrease in preoperative to postoperative pain of 7 points (range -3 to 10). 15 patients (65%) reported a pain scale of zero at 4 hours postoperative. The median length of stay in hospital was 6 days (range 2-49).

Table 2: Postoperative outcomes.

	PENG (n=28)
Duration of PENG block effect in hours, median (range)	12.5 (5.25 – 23)[a]
Maximum postoperative pain score in recovery), n (%)	
None (0)	15 (65)
Mild (1-4)	5 (22)
Moderate (5-7)	2 (9)
Severe (8-10)	1 (4)b
Pain score (VAS) reduction preoperative to postoperative, median(range)	7 (-3 to 10)[b]
Complications, n (%)	
Pneumonia	2
DVT	0
PE	1
Wound	0
UTI	0
Anemia	3
Reoperation	1
Delirium	10
Death	0
Other	6
Clavien-Dindo complications scale, n (%)	
0	7 (25)
I	6 (21)
II	13 (46)
III	1 (4)
IV	1 (4)
V	0
Length of hospital stay in days, median (range)	6 (2-49)

[a]11 patients excluded from this subanalysis due to their inability to recall;

[b] 5 unable to asses due to dementia

Postoperative opioid use and patient satisfaction scores are reported (Table 3). Every patient in this study required postoperative opioids and use was relatively consistent across all three days of follow up. The median duration of the PENG block was 12.5 hours (range 5.25-23 hours) as recalled by 20 patients. All patients in this subanalysis (n=20) reported they were satisfied with the PENG block and would have it again.

Table 3: Postoperative opiate use and patient satisfaction.

	PENG (n=27)
Postoperative opiate use in morphine equivalents, median (range)	
Day 1	**30 (0-120)**
Day 2	**23 (0-135)**
Day 3	**15 (0-90)**
Total	**65 (8-301)**
Postoperative opiate use for opioid users only, in morphine equivalents, median (range)	
Day 1	30 (3-120)
Day 2	27 (3-135)
Day 3	23 (5-90)
Total	65 (8-301)

Number of patients using opioids, n (%)	
Day 1	26 (93)
Day 2	23 (82)
Day 3	23 (82)
Total	27 (100)
Patient satisfaction, n (%)	
Unsatisfied	0
Satisfied	20 (74)
Unable to assess	7 (26)

DISCUSSION

This case series found a significant reduction in pain scores in patients undergoing surgical repair of a NOF fracture who received a PENG block. This technique was developed to target the high articular sensory branches of the obturator, accessory obturator, and femoral nerves using ultrasound guidance [11,12]. This case series is the largest PENG cohort to date and demonstrates that PENG may improve analgesia for patients undergoing surgical NOF fracture repair with a median pain score reduction of 7 on the VNRS, consistent with previous smaller case series [13,14]. An improved pain score after NOF surgery is important as it results in reduced opioid use, reduced postoperative delirium, better participation in postoperative mobility and rehabilitation. Furthermore, this study is the first to note the duration of the PENG block at a median of 12.5 hours. All eligible patients reported they were satisfied with the PENG block and would be happy to have it again.

CONCLUSION

This PENG block case series demonstrates some potential advantages compared with the conventional nerve blocks used for analgesia in NOF fracture patients, however, further studies are required. This cohort study supports future randomised prospective trials in a larger patient group.

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