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ORIGINAL ARTICLE

Continuous peripheral nerve blocks for pain control after orthopaedic surgery

A prospective study during in-hospital and ambulatory care

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BACKGROUND Continuous peripheral nerve blocks (CPNB) provide an opioid-free alternative for pain control after orthopaedic surgery. However, postdischarge ambulatory patient care and follow-up concerns have prevented CPNB use at home.

OBJECTIVE To address physicians' concerns about the outpatient use of CPNB.

DESIGN Prospective, cohort, observational study.

SETTING Single centre, teaching private hospital in Santiago, Chile, between July 2016 and March 2020.

PATIENTS We included patients aged at least 18 who underwent orthopaedic surgery using CPNB for postoperative pain management. Patients scheduled simultaneously for non-orthopedic surgery on the same event were excluded.

MAIN OUTCOME MEASURES Pain scores, opioid use, and complication rates at both in-hospital and at-home sites.

RESULTS CPNB were provided as an analgesia plan in 497 patients who met inclusion criteria, and 387 (77.87%) were discharged home with this continuous analgesia. At 48 h, 70% of the patients reported no-worse-than-mild pain. Less than 3.1% of patients reported an episode of severe pain, and less than 13% of the patients required opioid rescue medication. Transient neurological symptoms were observed in 13% (95% confidence interval (CI), 10.4 to 16.1) of the patients. No long-term or severe complications were observed. High rates of satisfaction were reached among patients.

CONCLUSION In-hospital and at-home use of CPNB supervised by a pain service team provides a feasible and safe alternative after orthopaedic surgery, pain control with a low requirement of opioids.

KEY POINTS

- CPNB techniques have been widely recognised as effective for controlling inpatient pain following orthopaedic surgery. However, concerns persist regarding the safety and potential complications associated with at-home use of CPNB.
- This study shows CPNB for postoperative analgesia in the ambulatory home setting is a feasible, safe and effective analgesia plan after orthopaedic surgery, under the surveillance of a specialised team.

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INTRODUCTION

Our current scenario of increasing outpatient orthopaedic surgical procedures has challenged us to provide an effective multimodal opioid-free analgesia plan. Continuous peripheral nerve blocks (CPNB) are suitable techniques for postoperative pain control in this setting.[1–4] CPNB aim to prolong the analgesic effect of a regional peripheral nerve block, not only reducing the need for complementary analgesic drugs (opioids and nonsteroidal anti-inflammatory drugs, NSAIDs), [5–12] but also shortening hospital stays,[13,14] lowering the incidence of unscheduled readmission for outpatient procedures[15] and improving sleep quality.[7,9] Patients using CPNB also declare reasonable rates of satisfaction.[16]

Nevertheless, dyspnoea, transient nerve symptoms and infections, among other complications, can occur with CPNB.[17] Concerns about the safety of at-home catheter use have arisen among anaesthesiologists and surgeons because of complications and side effects. Pragmatic, real-world research on CPNB practices has not addressed these issues.

This study aimed to address physicians' concerns about the outpatient use of CPNB. Specifically, we evaluated the main side effects, clinical complications and analgesia quality – with the last serving as proof of effectiveness – in patients using CPNB both in-hospital and, most importantly, at home under the supervision of an Acute Pain Service (APS) team. Our hypothesis was that CPNB are safe and effective techniques for ambulatory pain control following orthopaedic surgery.

METHODS

We conducted a prospective observational study between July 2016 and March 2020 in patients scheduled for orthopaedic surgery in a university affiliated private hospital (Clínica Alemana Santiago, Universidad del Desarrollo, Santiago, Chile). Approval was obtained from the Research Ethics Committee of the Centre of Bioethics Faculty of Medicine, Clínica Alemana-Universidad del Desarrollo, Santiago, Chile (Protocol number 2016-76). Written informed consent was obtained from all the patients.

Consecutive eligible participants were included. Inclusion criteria were individuals over 18 years who were scheduled to undergo CPNB for orthopaedic and trauma surgery, belonging to the ASA physical status I, II or III. The exclusion criteria were refusal to consent to the study and patients scheduled for synchronously combined procedures (orthopaedic plus nonorthopaedic). We followed STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for conducting our study and reporting results.

Continuous peripheral nerve blocks and anaesthesia management

Personal

Only certified regional anaesthesiologists are authorised to perform CPNB procedures at our institution. They must have a proficiency certification in regional anaesthesia training or fellowship. Certification must be renewed every 2 years.

Materials

Catheters utilised for CPNB were Braun Contiplex C over-the-needle catheters (Melsungen, Frankfurt, Germany) and Pajunk StimuLong Sono II catheters (Geisingen, Baden-Wittemberg, Germany). Catheters were fixed using a Lockit Plus G16 system (Smiths Medical Portex, Minneapolis, Minnesota, USA). Baxter elastomeric pumps (Regional Anaesthesia Infusor, Baxter, USA) were used for local anaesthetics infusions, equipped with multirate and patient-control modules (MRM and PCM, respectively). MRM allowed to set a flow rate at 0, 5, 7 or 12 ml h^{-1}. PCM consisted of a mechanical button that, once pressed, delivered a 5 ml bolus of anaesthetic solution.

Anaesthetics

Local anaesthetics for the initial bolus were levobupivacaine 0.5% (Chirocaine™, Antigen Pharmaceutical Limited, Roscrea, Ireland, for Abbott Laboratories Chile) or bupivacaine 0.5% (Hospira, Inc., Rocky Mount, USA, for Pfizer Chile) or a mixture of the previous ones with lidocaine 2% (Fresenius Kabi, Chile). Pharmacists filled elastomeric pumps with 300 ml of levobupivacaine 0.125% or bupivacaine 0.125% solutions, expected to last 60 h.

Procedures

All CPNB procedures were undertaken using a rigorous aseptic technique, ultrasound-assisted with an in-plane approach. CPNB insertion was performed using a method similar to central line placement. The area to be blocked was prepared by an operating room nurse, uncovered, shaved if needed, and cleaned using chlorhexidine gluconate 4% disinfectant soap. Wearing a mask and cap, the anaesthesiologist completed a 3 min surgical hand wash with chlorhexidine gluconate 4% disinfectant soap. Then the anaesthesiologist performed the block wearing a sterile gown and gloves, preparing the area with a 4% chlorhexidine antiseptic solution, isolating the field with sterile drapes and performing the block using sterile supplies – catheter, syringes, gauzes, ultrasound probe sleeve and gel and fixation and dressing material.

The neuraxial or general anaesthesia plan was decided by the attending anaesthesiologist, and no restrictions were imposed.

Analgesia management

A standard infusion rate of local anaesthetics was set to 5 ml h^{-1} using the MRM. For breakthrough pain, a 5 ml bolus could be self-administered by patient or caregiver by pressing the PCM button. Patients were instructed to wait approximately 30 min (lockout time) before pressing the

PCM button again to allow the PCM reservoir to refill completely. Also, patients received analgesia based on paracetamol and NSAIDs (Ketoprofen 100 mg thrice daily or Ketorolac 30 mg thrice daily, or Parecoxib 40 mg twice daily) if no contraindications were present, and tramadol twice daily or thrice daily. No specific instructions were given related to the combination of these medications. Some patients were fitted with a second infusion pump if the APS team assessment warranted its necessity.

Catheter removal

Catheters were removed by patients at home, following instructions provided before discharge. Patients or their caregivers – typically relatives or friends – were advised to wash their hands thoroughly. They were then guided to remove any dressings and gently withdraw the catheter carefully. It was explained that the catheter often came off naturally while removing the dressings. After removal, patients were instructed to clean the area using a gauze moistened with 70% ethanol and to cover the site with an adhesive bandage. They were also advised to contact the APS team or visit the hospital if they encountered any issues, such as difficulty removing the catheter with gentle traction, bleeding or sensations of paraesthesia during removal.

Follow-up

Daily assessments were conducted in the hospital by the APS team led by a staff anaesthesiologist and an APS nurse. Before discharge, the APS team provided both oral and written instructions on CPNB care and removal and detailed information on symptoms and signs of alarms to prevent complications, with a 24-h contact team available for support.

Pain was assessed using a 10-point numerical pain rating scale (NPRS) at 1, 24, 48 and 72 h. We evaluated worst pain, which is defined as the worst pain experienced by the patient throughout the first hour and through the next 24 h. Pain intensity levels were categorised as no pain (NPRS score 0), mild pain (NPRS score 1 to 3), moderate pain (NPRS score 4 to 6), and severe pain (NPRS score 7 to 10); no-worse-than-mild pain was an NPRS score of 3 or less,[18] and moderate-to-severe pain with an NPRS score of 4 or more. The consumption of analgesics and opioid rescue medications was also recorded. All incidents or complications during and after catheter use were recorded.

After discharge, an APS nurse conducted daily telephone follow-ups of patients until the day the catheter was removed. Additionally, a follow-up phone assessment was conducted on postoperative day 10 to identify any side effects, focusing on neurological symptoms. Patients were asked about the presence of numbness, pain, tingling or persistent motor block. Patients were encouraged to report right, left or bilateral issues in the particular scenario of bilateral popliteal-sciatic catheters. Patients reporting neurological symptoms were monitored monthly until recovery or completion of a 1-year follow-up. Patient satisfaction was also assessed on day 10 using a 10-item Likert scale survey.

Statistical analysis

This study was conducted in a convenience sample, including all the consecutive patients treated at our institution who received CPNB during inhospital care and after discharge. Due to the lack of sources for the estimation of incidence of complication of CPNB after discharge, a formal sample size calculation was not possible.

Data was summarised using mean ± standard deviation or median [IQR] for continuous variables and frequency *n* (%) for categorical. Depending on data distribution, measurements were compared using a *t* test, Mann–Whitney test, Kruskal–Wallis test or ANOVA. Fisher exact test and logistic regression were used to assess the association between variables. Subgroup analysis was performed for each of the three most frequent CPNB.

Missing data was random and less than 10%; therefore, the analysis was performed without manipulation. For all analyses, *P* less than 0.05 was used to determine statistical significance. All analyses were performed using STATA 14.0 (Stata Corp, Texas, USA).

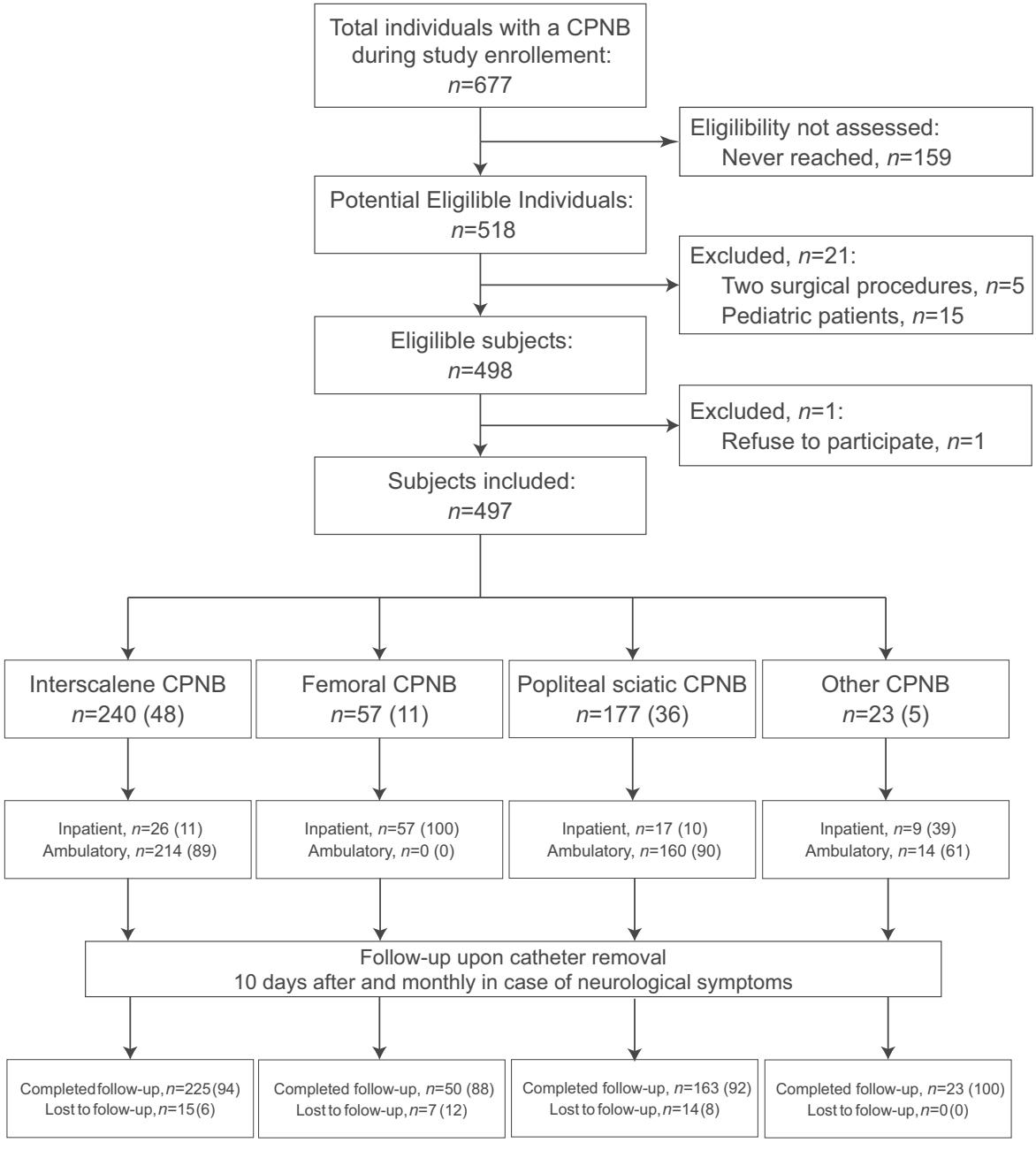
Results

We enrolled 497 patients from 677 who underwent CPNB during the study period (Fig. 1). The demographic characteristics of the patients are presented in Table 1. A total of 576 CPNB were performed, 84% of which corresponded to a single CPNB and 16% to simultaneous CPNB. Neuraxial anaesthesia was administered in 28% of the patients and general anaesthesia in 71%; only three patients (0.6%) received CPNB as an isolated anaesthetic technique. (Supplemental Digital Content, Table 1, http://links.lww.com/EJAIC/A105).

The most frequently performed CPNB were interscalene CPNB (48%), popliteal sciatic CPNB (35%) and femoral CPNB (11%) (Supplemental Digital Content, Table 2, http://links.lww.com/EJAIC/A105). The surgical procedures most frequently performed were rotator cuff surgery, total knee arthroplasty and hallux valgus surgery (Supplemental Digital Content, Table 3, http://links.lww.com/EJAIC/A105).

The initial bolus of local anaesthetics had a mean volume of 21 ± 6.6 ml; the local anaesthetic solution concentration was levobupivacaine or bupivacaine 0.25% in 99% of the cases. Levobupivacaine was used in 90% of the patients, of whom 22% received a solution of levobupivacaine with lidocaine. As part of the prescribed multimodal analgesia, the proportion of patients who consumed a medication was 96% for paracetamol, 82% for NSAIDs and 21% for tramadol.

Fig. 1 Flow chart for the study.



Patients excluded were those the research team could not reach promptly, those who underwent non-orthopaedic surgery in the same surgical event, those under 18 years old, and one who refused to participate. Numbers of patients, n (%).

In-hospital assessment

Overall, postoperative pain-at-rest scores, reported as no-worse-than-mild pain, was 90% in the first 24 h (Table 2). The worst pain in 24 h was above 4 in 29% of the patients. In this period, 7% of patients needed rescue opioids. These 35 patients used a median [IQR] of 5 [3 to 9] mg i.v. of morphine (Supplemental Digital Content, Table 4, http://links.lww.com/EJAIC/A105).

At 48 h, 70% of the patients reported no-worse-than-mild pain, and only 12% required opioid rescue with a median [IQR] of i.v. morphine of 5 mg [4 to 10].

Ambulatory assessment

Of the 497 recruited patients, 388 (78%) were discharged with a CPNB, and 75 had bilateral CPNB. Within 48 h postoperatively, 71% of the patients were discharged.

Table 1 Baseline characteristics of patients included in the study: demographics, habits, and comorbidities

Sample size	*n* = 497
Demographic characteristics	
Sex	
Male	173 (34.8)
Female	324 (65.2)
Age	52.9 ± 15.4
BMI, kg m^{-2}	26.2 ± 3.9
ASA physical status	
I	232 (46.7)
II	259 (52.1)
III	6 (1.2)
Current Smoking	33 (6,6)
Alcohol/Drug consumption	5 (1)
Allergy	99 (19.9)
Comorbidities	
Pulmonary disease	15 (3.0)
Hypertension	100 (20.1)
Coronary disease	11 (2.2)
Arrythmias	14 (2.8)
Diabetes Mellitus	19 (3.8)
Thyroid disease	107 (21.5)
Psychiatric disease	101 (20.3)
Neurological disease	14 (2.8)
Chronic renal disease	10 (2.0)
Hepatic disease	1 (0.2)
Medication consumption	
Sedative use	45 (9.1)
Aspirin use	30 (6.04)
Oral anticoagulant use	2 (0.4)

Data are mean ± SD or n (%). Abbreviations: ASA, American Society Anesthesiologists; BMI, body mass index; F, female; M, male.

In 85% of the patients, catheters remained in place for three or more days. Catheter indwelling median stay was 3 [3 to 4] days (Supplemental Digital Contents, Table 5, http://links.lww.com/EJAIC/A105). Most CPNB catheters were removed at the patient's home, except for femoral CPNB catheters, which were removed before discharge (Supplemental Digital Content, Table 2, http://links.lww.com/EJAIC/A105). At 72 h, the median pain score reported was 3 [2 to 3], and 10% of ambulatory patients required rescue opioids. There was no association between the need for rescue opioids at 48 h ($P = 0.87$) and patient setting location (in-hospital or ambulatory at-home). A similar result was observed at the 72-h assessment ($P = 0.08$).

Continuous peripheral nerve block events, side effects and complications

The most frequent event with CPNB was dislodgment or accidental removal of 31 catheters (5%). Other events included disconnections and leaks (Table 3). Given these events, the analgesic strategy was changed in 32 patients; 13 catheters were reinserted, two cases of single-shot block carried out after CPNB analgesia failure, and 17 cases of new opioid-based analgesia. In the interscalene CPNB group ($n = 240$), 10.8% (95% confidence interval, 7.2 to 15.5) developed dyspnoea, 5.4% (95% confidence interval, 2.9 to 9.8) exhibited Horner's syndrome, and 0.8% (95% Confidence interval, 0.1 to 3) exhibited dysphonia. Fourteen ambulatory patients consulted the Emergency Department (3.6%), with six (1.5%) requiring hospitalisation for pain control. No complications such as local anaesthetic systemic toxicity (LAST), neurological damage, infection, haematoma, pneumothorax, falls attributable to blocked nerves, or medication errors were observed.

Table 2 Pain at rest and worst pain scores

	Pain at rest scores				Worst pain scores	
NPRS	1 h	24 h	48 h	72 h	1 h	24 h
All blocks						
0	379 (76.4)	326 (65.9)	102 (21.2)	65 (15.6)	361 (72.8)	224 (45.3)
≤3	446 (89.9)	437 (88.5)	334 (69.8)	324 (77.7)	399 (80.4)	352 (71.1)
4 to 6	36 (7.2)	47 (9.5)	129 (26.9)	90 (21.5)	48 (9.7)	96 (19.4)
7 to10	14 (2.8)	10 (2)	15 (3.1)	3 (0.7)	49 (9.9)	47 (9.5)
≥4	50 (10)	57 (11.5)	144 (30)	93 (28.5)	97 (19.6)	143 (28.9)
Interscalene						
0	182 (76.2)	159 (66.8)	31 (13.4)	29 (13.9)	172 (71.9)	108 (45.2)
≤3	210 (87.8)	211 (88.7)	155 (67.1)	155 (74.5)	192 (80.3)	175 (73.2)
4 to 6	21 (8.8)	22 (9.2)	69 (29.8)	51 (24.5)	24 (10)	43 (17.9)
7 to 10	8 (3.8)	5 (2.1)	7 (3.03)	2 (1)	23 (9.6)	21 (8.8)
≥4	29 (12.6)	27 (11.3)	76 (32.83)	53 (25.5)	47 (19.6)	64 (26.7)
Popliteal-sciatic						
0	142 (80.2)	124 (70.5)	47 (27.9)	23 (14.38)	135 (76.3)	94 (53.4)
≤ 3	168 (94.9)	163 (92.6)	126 (75)	131 (90.6)	149 (84.2)	137 (77.8)
4 to 6	8 (4.5)	10 (5.5)	37 (22)	18 (11.25)	13 (7.3)	30 (17)
7 to 10	1 (0.6)	3 (1.7)	5 (2.9)	1 (0.6)	15 (8.5)	9 (5.1)
≥4	9 (5.1)	13 (7.2)	42 (24.9)	19 (11.85)	28 (15.8)	39 (23.1)
Femoral						
0	38 (66.67)	27 (47.37)	18 (31.58)	10 (33.33)	37 (64.91)	12 (21.05)
≤ 3	46 (80.7)	45 (78.95)	39 (68.42)	25 (83.33)	41 (71.93)	27 (47.37)
4 to 6	7 (12.2)	10 (17.54)	16 (28.07)	5 (16.33)	8 (14.03)	18 (31.59)
7 to 10	4 (7.01)	2 (3.51)	2 (3.5)	0 (0)	8 (14.03)	12 (21.05)
≥4	11 (19.2)	12 (21.05)	18 (31.57)	5 (16.33)	16 (28.06)	30 (52.64)

Data are n (%). NPRS ≤3 means no-worse-than-mild pain; NPRS ≥4 means moderate-to-severe pain; NPRS, numeric pain rate score.

Table 3 Continuous peripheral nerve block technical events and reported complications

	n	% (CI 95)
Events[a]		
Catheter dislodgement/accidental removal	31	5.3 (3.6 to 7.5)
Clogged catheter	13	2.25 (1.2 to 3.8)
Catheter Reinsertion	13	2.25 (1.2 to 3.8)
Catheter Disconnection	3	0.05 (0.01 to 0.1)
Catheter Filtration/leakage	2	0.03 (0.004 to 0.1)
Complications		
Dyspnoea[b]	26	10.8 (7.2 to 15.5)
Horner's Syndrome[b]	13	5.4 (2.9 to 9.8)
Dysphonia[b]	2	0.08 (0.01 to 0.3)
Transitory neurological symptoms[a]	75	13 (10.4 to 16.1)

Abbreviations: CI, confidence interval; CPNB, Continuous peripheral nerve block. [a] CPNB events over a total of 576 catheters; [b] for dyspnoea, Horner's syndrome and dysphonia, the denominator was 240 Interscalene CPNB.

Four hundred sixty-eight patients completed the follow-up period on day 10 (Table 4). Transient neurological symptoms (TNS) were documented in 13% (95% CI,10.4 to 16.1)% of CPNB. All patients reported sensory symptoms without motor involvement. In 62% of patients, symptoms resolved within the first month and 97% within the first 4 months. Popliteal sciatic CPNB had a higher incidence of TNS (18%), accounting for 61% of all TNS cases in this cohort.

Anaesthetic techniques and continuous peripheral nerve blocks

During the first postoperative hour, 97.6% of the patients who required a rescue dose of opioids had undergone surgery with general anaesthesia, compared with 2.4% of those in whom spinal anaesthesia was used ($P < 0.01$). Likewise, at 24 h, 83% and 17% of the patients who required a rescue dose of opioids underwent surgery under general and spinal anaesthesia, respectively (Supplemental Digital Content, Table 6, http://links.lww.com/EJAIC/A105). This association was driven by femoral CPNB and popliteal sciatic CPNB. All individuals bearing a femoral CPNB, and 89% of those with a popliteal sciatic CPNB who reported moderate-to-severe pain at first postoperative hour had surgery under general anaesthesia (Supplemental Digital Content, Table 7, http://links.lww.com/EJAIC/A105).

Table 4 Continuous peripheral nerve block-associated transient neurological symptoms

Transitory neurological symptoms	*n* = 75
Female/male (*n*)	62/13
Recovery	
Recovered at month 1	47 (62.7)
Recovered at month 2	17 (22.7)
Recovered at month 3	3 (4)
Recovered at month 4	6 (8)
Recovered at month 5	1 (1.3)
Recovered at month 6	1 (1.3)
Distribution according to CPNB	
Popliteal sciatic	46 (61.3)
Interscalene	21 (28)
Femoral	5 (6.6)
Infraclavicular	2 (2.7)
Supraclavicular	1 (1.4)
Incidence according to individual CPNB	
Popliteal sciatic [a]	46 (18.3)
Interscalene [b]	21 (8.75)

Values are number (%). Abbreviations: CPNB, continuous peripheral nerve blocks; ISCPNB, interscalene continuous peripheral nerve block; PSCPNB, popliteal sciatic continuous peripheral nerve block. [a] Total PSCPNB = 252 catheters. [b] Total ISCPNB = 240 patients.

Patient experience

The satisfaction survey was completed in 74% of patients. Regarding pain during the insertion of CPNB, 92% of the patients reported no pain, whereas 87% reported mild or no pain when arriving at the posta-naesthesia care unit. Eighty-nine percent of the patients did not have postoperative nausea or vomiting. Numbness and motor block were referred to as moderate or severely unpleasant in about 10%. Regarding the care quality of the attending anaesthesiologist, over 90% of the patients were at least satisfied (Supplemental Digital Content, Table 8, http://links.lww.com/EJAIC/A105).

Discussion

In our study, CPNB after orthopaedic surgery was a feasible technique for pain control in ambulatory settings, with low pain scores at 72 h and a small fraction of patients requiring rescue opioids. More than three-quarters of patients were discharged home with a CPNB, which stayed in place for 3 days or more with high patient satisfaction. Neurological symptoms were looked for consistently and systematically by the acute pain service. TNS was diagnosed in 13% of patients, with two-thirds recovering in the first month. No severe complications such as LAST, infection, or permanent neurological damage were reported.

Although the effectiveness of CPNB has been investigated in previous studies, anaesthesiologists and surgeons still have concerns regarding the safety and potential complications associated with outpatient home catheter use in real-world clinical settings.

Our study provides data that addresses these concerns. First, in terms of CPNB effectiveness, our findings of a high proportion of no-worse-than-mild pain scores and a low proportion of rescue opioid use align with earlier reports demonstrating good-quality, prolonged analgesia with CPNB.[1–5] The lack of association between patient location at 72 h and the low proportion of patients requiring opioid rescue reinforce CPNB effectiveness in ambulatory settings, as reported by Fredrickson *et al.*[17]

Opioid-free analgesia is in high demand amid the current opioid misuse epidemic and its rising mortality rate.[19] A prevalence of 12.5% for long-term postoperative opioid use has been reported after orthopaedic surgeries.[20] Our results support the well established opioid-sparing effect of CPNB, which may positively prompt physicians to

reduce both doses and quantity of postoperative opioids prescribed. Also, patients who underwent orthopaedic surgery with spinal anaesthesia, as described previously, had better pain control after surgery than patients receiving general anaesthesia.[21–23] This finding supports the recommendation that, whenever possible, regional anaesthesia – which is associated with significantly lower or no opioid use – should be considered in the anaesthesia plan.

Regarding CPNB safety, our data provides a positive safety signal for using CPNB in outpatient settings. Among the concerns about CPNB techniques, the most common worry for our surgeons is the infection risk, particularly surgical wound infection and osteosynthesis material infection associated with CPNB presence. Although Nicolotti *et al.*[24] reported a 3% incidence of infection, we did not identify any CPNB site infection or related distant infections. These findings suggest that using CPNB for an average of 3 days does not pose a greater risk of infection. Factors that may explain these findings are strict aseptic techniques during CPNB catheter insertion, closed monitoring by an experienced APS nurse and instruction to the patient to avoid manipulating the pump and connections.

Our surgeons' second most common concern is the need for their involvement in CPNB management. Although some surgeons expressed a desire to participate in acute postoperative pain management, the APS team efficiently handled this task, providing patient education and 24-h support. During office hours, certified regional anaesthesiologists were on hand to assist patients. At night, one certified regional anaesthesiologist was typically on call; if not, patients were assisted by shift staff and, the following day, by a specialised regional anaesthesiologist and the APS team.

Among anaesthesiologists' CPNB concerns, the most significant are elastomeric pump malfunction and the risk of LAST syndrome. International experience with elastomeric pumps is extensive, and the probability of malfunction is very low, typically involving infusion blockage rather than overdose flows. Teames *et al.*,[25] using Food and Drug Administration's (FDA's) MAUDE database, reported two fatal cases of LAST syndrome associated with local anaesthetics infusions using elastomeric pumps – corresponding to two events out of 4903 elastomeric pump-related incidents linked to local anaesthetics infusions, or approximately 1 in every 200 000 total reported elastomeric pump events. These fatal events were associated with a single brand. In our cohort, no patients experienced elastomeric pump malfunction, and no signs of LAST syndrome, to any degree, were identified.

Some side effects, such as dyspnoea, Horner's syndrome, and extremity numbness, can be easily managed, primarily through patient education; it is crucial to emphasise numbness and muscle weakness in the anaesthetised extremity, as these can lead to preventable complications at home, including falls and fractures, burns and compression lesions to the skin and peripheral nerves.

Anaesthesiologists often express concerns about the occurrence of TNS when using catheters and TNS' attributable causes. In our study, TNS was evaluated systematically. Our findings showed an overall TNS occurrence of 13%, which aligns with previously reported ranges. The upper extremity incidence of TNS in our cohort was higher than previously reported, though, with rates ranging from 7.3 to 8.2%,[17,26] but below the recently published rate of 14.4% in single-dose blocks.[27] Conversely, among popliteal sciatic CPNB, we observed a TNS incidence of 18.3%, lower than the 44% reported in a prospective cohort by Gartke *et al.*[28]

The rates of catheter dislodgment and accidental removal are also important concerns for anaesthesiologists, as such complications can nullify the benefits of CPNB. Our findings revealed an occurrence rate lower than previously reported.[8] This outcome may be attributed to minor leakage, type of catheter, and catheter fixation. High leakage rates with CPNB have been associated with secondary CPNB failure.[7,8] We observed significant leakage in two patients; we believe this is due to our preferential use of over-the-needle catheters, which, in our experience, rarely leak. Moreover, our catheters were fixed using a Lockit Plus system, resulting in a 5.3% overall catheter displacement rate. Properly securing and fixing catheters is a key strategy our regional anaesthesiologists recommend. The APS team also advises patients to avoid sudden movements near the area of the catheter site, particularly in the neck, to reduce the risk of displacement.

Our study has several limitations. First, we did not have a control group given that CPNB is the current standard of care for several surgical procedures at our hospital, thus control groups without catheters were not possible. This study did not have a specific protocol for analgesic management, so we could not assess the association with pain control. We could not determine whether the block was performed with the patient awake, sedated or under general anaesthesia, nor whether it was performed before or after surgery, which may affect the quality of analgesia.[29] We cannot draw conclusions about femoral nerve catheters as they were removed before discharge. Finally, we did not assess the additional costs of CPNB techniques, particularly when patients required additional support such as catheter replacement. However, the number of patients needing additional catheters or new hospital recovery was low.

Further studies, considering a control group, should assess the difference in pain management without CPNB in the setting of new surgical techniques. Also, to determine the benefit of more extended use of CPNB versus

infection risks and costs related to the use or not use of CPNB.

Conclusion

In our study, CPNB pain control management after orthopaedic surgery was successfully extended to the outpatient setting as a feasible and well tolerated technique. CPNB allows to prolonged analgesia and reduction of postoperative opioid use.

Patients should undergo periodic evaluation by a trained pain team capable of providing timely support to ensure the benefits of ambulatory CPNB over potential risks.

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Presentation: none

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