Journal of Clinical Anesthesia (2016) **35**, 20–25

ELSEVIER

Journal of Clinical Anesthesia

Original contribution

Functional outcome and cost-effectiveness of outpatient vs inpatient care for complex hind-foot and ankle surgery. A retrospective cohort study☆

Justin Oh MD (candidate)[a],
Anahi Perlas MD, FRCPC (Staff Anesthesiologist, Associate Professor)[b,c,*],
Johnny Lau MD, FRCSC (Staff Orthopedic Surgeon, Assistant Professor)[d,e],
Rajiv Gandhi MD, FRCSC (Staff Orthopedic Surgeon, Assistant Professor)[d,e],
Vincent W.S. Chan MD, FRCPC (Staff Anesthesiologist, Professor)[b,c]

[a]*University of Toronto*
[b]*Department of Anesthesia and Pain Management, Toronto Western Hospital*
[c]*Department of Anesthesia, University of Toronto*
[d]*Department of Surgery, Division of Orthopedic Surgery, Toronto Western Hospital*
[e]*Department of Surgery, University of Toronto*

Received 24 February 2016; revised 21 June 2016; accepted 5 July 2016

Keywords:
Complex foot and ankle surgery;
Cost-effectiveness;
Functional outcome;
Outpatient care

Abstract
Study objective: To compare the postoperative functional outcome and the total cost associated with outpatient vs inpatient care following complex hind-foot and ankle surgery.
Design: Retrospective, cohort study.
Setting: Tertiary care center.
Patients: Forty patients, American Society of Anesthesiologists 1-3, of either sex undergoing elective complex hind-foot and ankle surgery (fusion, osteotomy, or multiple ligament repair).
Interventions: Both inpatients and outpatients received a continuous perineural infusion of local anesthetic for 48 hours at the core of a multimodal analgesic regimen. Patients were retrospectively identified, and an outpatient cohort was matched to an inpatient cohort in a 1:1 ratio for age, sex, baseline functional score, and type of surgery.
Measurements: The primary outcome was functional outcome upon discharge of the surgical program as measured by the Lower Extremity Functional Score. Secondary outcomes were the incidence of surgical or anesthetic complications and the total perioperative cost of care.

☆ This work was presented before in abstract format at the annual American Orthopaedic Foot & Ankle Society meeting in Long Beach, CA, on July 17, 2015.

* Corresponding author at: Staff Anesthesiologist, Department of Anesthesia and Pain Management, Toronto Western Hospital, Associate Professor, Department of Anesthesia, University of Toronto, 399 Bathurst St, Toronto, Ontario, Canada M5T 2S8. Tel.: +1 416 603 5118; fax: +1 416 603 6494.
E-mail addresses: Jmo77@cornell.edu (J. Oh), Anahi.perlas@uhn.ca (A. Perlas), Johnny.lau@uhn.ca (J. Lau), Rajiv.gandhi@uhn.ca (R. Gandhi), Vincent.chan@uhn.ca (V.W.S. Chan).

http://dx.doi.org/10.1016/j.jclinane.2016.07.014

Results: Patients in both cohorts had similar functional outcome on discharge of the surgical program. Analgesia was effective in both groups, and no complications were reported. The cost of care for outpatients was 54% lower than that for inpatients.
Conclusion: This retrospective study suggests that outpatient care including an ambulatory perineural infusion of local anesthetic may be a cost-effective alternative to inpatient care after complex foot and ankle surgery.

1. Introduction

The standard management for complex foot and ankle surgery at our institution (Toronto Western Hospital in Toronto, Ontario) has been to admit the patients to an orthopedic ward at least overnight and often up to 3 days postoperatively to ensure adequate analgesia. This is typically achieved with a multimodal analgesic regimen centered around a continuous infusion of local anesthetic on the sciatic nerve (in the popliteal fossa). Compared with systemic analgesics alone, continuous peripheral nerve block (CPNB) improves analgesia, reduces opioid requirements, and enhances quality of recovery following major foot and ankle surgery [1-4]. Recent reports suggest that outpatient CPNB is feasible, but experience with ambulatory local anesthetic infusions after lower extremity surgery is limited [5-9]. Potential benefits of outpatient management include improved quality of life convalescing in the comfort of the patients' homes, a lower risk of nosocomial infections, and a lower cost of care [7,10,11]. Over the last few years, we have piloted the possibility of outpatient management for complex hind-foot and ankle surgery by discharging patients home on the surgical day with an ambulatory infusion of local anesthetic that is monitored in the home environment. Patients were considered for expedited discharge if they were younger than 70 years, medically stable, fluent in English, and undergoing major open surgery of the hind-foot or ankle on an elective basis for a work-related injury. However, the potential effects of expedited hospital discharge on functional and safety outcomes have not been systematically evaluated.

The primary aim of this retrospective cohort study was to compare the functional outcome of patients having complex hind-foot or ankle surgery and a sciatic perineural infusion of local anesthetic in the outpatient vs the inpatient setting. The primary outcome variable is the Lower Extremity Functional Scale (LEFS) score at the time of discharge from the surgical program. Our working hypothesis is that outpatient management with a continuous perineural infusion of local anesthetic at home is associated with *similar postoperative functional outcome* (defined as a difference in LEFS score no greater than 9 points) as inpatient management. Secondary outcome variables are rates of *adequate analgesia* (defined as numeric rating score of <4), rate of adverse events (falls, surgical site infection, 30-day readmission, revision surgery), and cost of perioperative care.

2. Materials and methods

Following Hospital Research Ethics Board approval by the University Health Network, a retrospective comparative cohort study was conducted. The surgical database was explored from January 1, 2010, to March 31, 2014, to identify patients with the following inclusion criteria:

a) age 18-70 years,
b) American Society of Anesthesiologists classification I-III,
c) work-related foot or ankle injury,
d) presenting for elective major open complex hind-foot or ankle surgery (tibial, fibular, or calcaneal osteotomies; triple ankle arthrodesis; talonavicular fusion; subtalar fusion; and complex ligament repairs involving more than 1 ligament),
e) requiring a perineural sciatic nerve infusion of local anesthetic for postoperative analgesia, and
f) both inpatients and outpatients were included.

Exclusion criteria were:

a) minor surgical procedures involving superficial soft tissue only (eg, ganglion excisions, hammer-toe reconstruction, hallux valgus surgery),
b) forefoot surgery performed under an ankle block,
c) ankle arthroscopies, and
d) long-term opioid use of more than 20 mg of oxycodone (or equivalent) daily.

All operative procedures were performed by a single surgeon, and a thigh tourniquet was used at a pressure of 300 to 350 mm Hg for all patients. Eligible patients were matched on a 1:1 ratio for age, sex, baseline LEFS score, and type of operative procedure.

Standard anesthetic management included a perinerual sciatic nerve catheter (StimuCath; Arrow International, Reading, PA) inserted preoperatively under real-time ultrasound guidance. An initial dose of 20-30 mL of 0.25% bupivacaine with 1:400 000 epinephrine was administered through the catheter immediately before the operative procedure as per standard institutional practice. A single-dose saphenous nerve block at the adductor canal was performed only for those patients whose surgical procedures included significant medial work. The patients then received either a general anesthetic or a