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Original article

Chronic pain 1 year after foot surgery: Epidemiology and associated factors

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ABSTRACT

Background: Most studies of chronic postoperative pain focussed on major surgical procedures. Chronic postoperative pain occurred in 10% to 50% of patients and exhibited neuropathic features in 5% to 68% of cases. The objectives of this prospective single-centre study were to determine the rates of occurrence and associated factors of any chronic pain and of neuropathic chronic pain 1 year after orthopaedic surgery on the foot.
Methods: We included consecutive patients who underwent scheduled orthopaedic surgery on the foot or ankle at a university hospital centre between 2009 and 2011. All patients received a multimodal analgesia regimen that usually combined a continuous popliteal sciatic nerve block, paracetamol, and ketoprofen, with additional ketamine if deemed appropriate. A telephone interview was conducted 1 year after the surgical procedure. The main outcome measures were moderate-to-severe pain (numerical rating scale score > 3/10) 1 year after surgery at rest and during walking, and presence of neuropathic pain (defined using the DN2 score). Multivariate analysis was performed to look for associations of various perioperative clinical variables with pain.
Results: One year after surgery, 55 of 260 (21%) patients reported moderate-to-severe pain at rest, 111 (43%) moderate-to-severe pain during walking, and 9 (3%) neuropathic pain. By multivariate analysis, factors independently associated with moderate-to-severe pain at rest and/or during walking 1 year after surgery were moderate-to-severe pain during the first postoperative night ($P = 0.048$) and/or day ($P = 0.043$) and revision surgery ($P = 0.001$).
Discussion: The rate of occurrence of moderate-to-severe pain 1 year after orthopaedic foot surgery is similar to that seen after major surgical procedures, whereas neuropathic pain seems rare. Orthopaedic surgery on the ankle or hindfoot is not more likely to be followed by chronic pain compared to surgery for hallux valgus or toe abnormalities. There is some evidence that earlier surgery might be beneficial.
Level of evidence: IV, prospective observational longitudinal cohort study.

1. Introduction

In 20% of patients referred to specialised centres for chronic pain, surgery is the main aetiological factor. Chronic postsurgical pain (CPSP) is defined as postoperative pain occurring in the absence of an identifiable cause (local complication) and persisting for more than 2 months (the time needed for normal healing to occur) [1]. Most studies of CPSP focussed on major procedures (e.g., thoracotomy and mastectomy) and showed rates of occurrence ranging from 10% to 50% [2,3], with neuropathic features in two-thirds of cases [4]. CPSP often occurs in patients with a history of chronic preoperative pain. Thus, in clinical practice, patients with pain before surgery often continue to report pain after surgery.

In orthopaedic practice, surgery is performed to relieve pain. This fact complicates the assessment of pain persisting after surgery. For instance, 1 year after carpal tunnel surgery, 36% of patients reported pain in the wrist and/or hand on the operated side; pain different from the preoperative pain was reported by 22% of patients and pain similar to the preoperative pain by 12% of patients [5]. In studies of total hip or knee arthroplasty, 28% and 35% of patients, respectively, reported persistent pain 1 year

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after the procedure [6,7]. In another study, 27% and 44% of patients complained of pain 3 to 4 years after total hip or knee arthroplasty, respectively, [8] and the pain exhibited neuropathic features in 1% and 6% of patients, respectively [8]. The amount of perioperative data collected in these studies was usually limited, most notably regarding the analgesia regimen. This point is important since specific postoperative analgesic regimens have been proven to decrease the frequency of chronic pain after total hip arthroplasty [9] or of neuropathic pain after total knee arthroplasty [10]. No published data are available on the rate of occurrence of chronic and/or neuropathic pain after orthopaedic surgical procedures on the foot. Studies of these procedures usually focussed on functional scores to describe outcomes [11–13].

Here, our objectives were to determine the rate of occurrence and associated factors of chronic pain and neuropathic pain 1 year after orthopaedic surgery on the foot.

2. Methods

2.1. Inclusion criteria

We conducted a prospective observational study of patients managed at a single university centre between October 2009 and August 2011. The study did not lead to any changes in standard care and ethics committee approval was consequently not required by French legislation. We nevertheless obtained oral informed consent from all patients during the telephone interview 1 year after surgery.

We included patients who met the two following criteria: surgery involving the hallux and/or lesser toes (phalanges and/or metatarsals), Lisfranc joint, Chopart joint, or ankle; and postoperative analgesia regimen comprising a popliteal perineural catheter or long-duration popliteal nerve block (with ropivacaine). Non-inclusion criteria were surgery that did not involve the bones of the foot and surgery involving the bones of a single lesser toe. Exclusion criteria were harvesting of an iliac bone graft, other concomitant surgical procedure, trauma within the past 15 days, sepsis, patient unable to self-evaluate pain intensity on a simple numerical rating scale (NRS, from 0, no pain; to 10, worst pain imaginable), severely impaired sensory function, and refusal to participate in the study.

2.2. Anaesthesia and analgesia

The anaesthesia and analgesia techniques were chosen during the pre-anaesthesia visit based on the patient's medical history and wishes. Regional anaesthesia was suggested as the first-line method if the surgeon predicted that the procedure would last less than 90 minutes. Pre-medication included 0.25 to 0.5 mg of alprazolam. In the operating room, the patient's vital signs were monitored non-invasively.

Continuous regional analgesia was offered routinely and consisted in a continuous popliteal sciatic nerve block. The nerve was identified by stimulation [14] or, starting in October 2010, by ultrasonography with insertion of the needle within the ultrasound field (4–13 MHz 12L-SC probe, Venue 40 ultrasound machine, General Electric Healthcare, Vélizy, France). The needle was then used to inject 20 mL of 0.475% ropivacaine or 2% mepivacaine/0.75% ropivacaine. A non-stimulating catheter (Plexolong 20G, Pajunk, Geisingen, Germany) was introduced 3–5 cm beyond the needle tip then secured to the skin using adhesive tape.

General anaesthesia was induced intravenously (sufentanil 0.2–0.3 μg/kg, propofol 2–3 mg/kg, atracurium 0.5 mg/kg, and ketamine 0.5 mg/kg) then maintained by inhalation of sevoflurane and nitrous oxide.

Regional anaesthesia consisted of femoral and popliteal nerve blocks (20 mL of 2% mepivacaine/0.75% ropivacaine for each block). If deemed necessary by the anaesthesiologist, intravenous sedation could be administered (midazolam 1 mg and sufentanil 5 μg).

All anaesthetic and analgesic procedures were either performed or directly supervised by 1 of 8 anaesthesiologists/intensivists with more than 4 years of experience with orthopaedic surgery.

2.3. Surgical management

The lower-limb veins were emptied and a pneumatic tourniquet was placed at the thigh and inflated to 300 mmHg. At the end of the surgical procedure, a suction drain was usually left in place. All surgical procedures were performed or directly supervised by a senior surgeon.

2.4. Postoperative care

In the post-anaesthesia care unit, intravenous morphine titration was performed in patients with moderate-to-severe pain (defined as a NRS score > 3/10). Continuous regional analgesia comprised 0.2% ropivacaine (5 mL/h) via an electronic pump (AmbIT™, Sorenson Medical, Salt Lake City, UT, USA) or an elastomeric pump (Infusor LV5™ 300 mL, Baxter, Deerfield, MA, USA). The pumps were weighed and checked at regular intervals [14]. The catheter was clamped on the morning of the second day then removed 6 hours later in the absence of moderate-to-severe pain.

The systemic postoperative analgesia regimen consisted of paracetamol (4 g/d), ketoprofen for 48 h (200–300 mg/d) in the absence of contra-indications (creatinine clearance < 30 mL/min, history of gastro-duodenal ulcer, allergy, or asthma induced by non-steroidal anti-inflammatory drugs). The use of ketamine (2 μg/kg/min for 24 h, maximum 250 mg/d) was at the discretion of the anaesthesiologist [15].

Morphine was prescribed as the rescue analgesic and administered either via a patient-controlled intravenous pump (1 mg bolus, refractory period of 7 minutes, maximum dosage 20 mg over 4 h, no continuous administration) or via the oral or subcutaneous route on demand.

At discharge, each patient was given a prescription of paracetamol and an appointment for follow-up radiographs and a surgeon visit 45 days later. At our institution, none of the surgical procedures included in the study were performed on an outpatient basis.

2.5. Collection of clinical perioperative data

The characteristics of the patient, anaesthesia, surgical procedure, and perioperative analgesia were entered in the patient's anaesthesia record and electronic medical record, as well as by our institution's electronic prescription software (Actipidos Nursepad 4.2.7, Medicares, Pessac, France).

2.6. Questionnaire used to evaluate chronic pain 1 year after surgery

Each patient was asked to participate in a telephone interview 1 year (± 3 months) after the surgical procedure. The interview involved completing the questionnaire shown in Appendix 1. Patients who failed to answer three telephone calls were classified as lost to follow-up. The questionnaire included a self-evaluation of pain intensity using an NRS, identification of the location of the pain in the operated foot at rest and during walking, determination of the DN2 score for neuropathic pain features [16], an assessment of the impact of the pain (use of analgesics, difficulties with footwear, need for walking aids, and global interference with daily life), and identification of postoperative complications.