



Predictors of severe pain in the immediate postoperative period in elderly patients following hip fracture surgery



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ABSTRACT

Introduction: The aim of this study was to identify risk factors for severe postoperative pain immediately after hip-fracture surgery.

Patients and methods: Three hundred forty-four elderly patients with an acute hip fracture were admitted to the hospital during a 12-months period. All patients who entered the study answered a structured questionnaire to assess demographic characteristics, previous diseases, drug use, previous surgery, and level of education. Physical status was assessed through the American Society of Anesthesiologists' preoperative risk classification, cognitive status using the Short Portable Mental Status Questionnaire, and depression using the Geriatric Depression Scale. The presence of preoperative delirium using the Confusion Assessment Method was assessed during day and night shifts until surgery. Pain was measured using a numeric rating scale (NRS). An NRS ≥ 7 one hour after surgery indicated severe pain.

Results: Patients with elementary-level education (8 yr in school) presented a higher risk for immediate severe postoperative pain than university-educated patients (>12 yr in school) ($P < 0.05$). Higher cognitive function was associated with higher postoperative pain ($P < 0.01$). Patients with symptoms of depression and patients with preoperative delirium presented a higher risk for severe pain ($P < 0.05$, $P < 0.01$, respectively). Multivariate analysis showed that depression and a low level of education were independent predictors of severe pain immediately after surgery.

Conclusion: Depression and lower levels of education were independent predictors of immediate severe pain following hip-fracture surgery. These predictors could be clinically used to stratify analgesic risk in elderly patients for more aggressive pain treatment immediately after surgery.

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Introduction

Postoperative pain is a subjective and multifaceted experience that is influenced not only by the type of surgery and postoperative analgesia, but also by physiological, sociocultural, cognitive, and behavioural factors and age. Ineffective control of pain after surgery causes patient distress, sleep disturbance, and mood disorders, and has adverse effects on the endocrine and immune functions, which can affect wound healing and provoke

cardiopulmonary and thromboembolic complications [1,2]. It has been reported that pain following hip-fracture surgery is moderate to intense in 20–70% of patients [3,4], indicating that it is still undermanaged in a substantial number of patients. Inadequate control of this pain might worsen the outcome after hip fracture, limit early physiotherapy, and prolong hospital stay; however, very few studies have analyzed the importance of severe pain during the immediate postoperative period, which might also result in increased sympathetic activity and increased levels of stress hormones [5,6]. Therefore, recognizing the predictors for early, severe postoperative pain in patients with hip fractures might contribute to determining the immediate postoperative pain strategy and potentially reduce the incidence of endocrine, cardiopulmonary, and thromboembolic complications.

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The majority of hip-fracture patients are elderly. Careful medical approaches, both anaesthetic and pain management, are required, as changes associated with old age such as physiological changes, co-morbidities, decreased functional reserve, and mental decline or advanced dementia could complicate early recovery after hip-fracture surgery [7]. However, older patients have often been excluded from analysis of postoperative pain management because of vision and hearing impairment, decreased cognitive function, psychiatric comorbidities, and other factors that could potentially compromise pain assessment [8]. Thus, factors that affect postoperative pain in the elderly, especially early after anaesthesia, are poorly defined [8].

The aim of this study was to identify risk factors, other than type of postoperative analgesia, for severe postoperative pain immediately after hip-fracture surgery in the elderly.

Patients and methods

This prospective cohort study was carried out at the Clinic for Orthopaedic Surgery and Traumatology, Clinical Centre of Serbia, which is a tertiary-care university hospital. The study was performed during a 1-yr period from September 2010 to September 2011. All adult patients ≥ 60 yr with an acute hip fracture were screened for potential enrolment in the study. Exclusion criteria were: age < 60 , pathological fracture, multiple traumas, and an end-stage disease (malignancy). Patients who were treated non-operatively because of high surgical risk and who had severe cognitive impairment (Short Portable Mental Status Questionnaire [SPMSQ] < 3) were also excluded from the study. Informed consent to participate in the study from patients with observed delirium at admission to the hospital was obtained from a proxy. This observational study was performed without pharmacological intervention, and standardized postoperative pain therapy was applied. The research was conducted according to the Helsinki Declaration and approved by the Ethics Committee of the Medical Faculty at the University of Belgrade in Serbia on 20 April 2010 (No. 29/V-9).

Preoperative evaluation

Preoperative pain management was based on multimodal pain approach which combined analgesics with different pharmacological mechanisms to improve pain-control efficacy and minimize side effects with respect to basic principles of WHO's "analgesic ladder".

All patients with hip fracture from admission into hospital until surgery were administered oral paracetamol (acetaminofen) (1 g every 6 h) combined with non-steroidal anti-inflammatory drugs (NSAIDs): ketorolac (10 mg every 8 h), if no contra-indications were present, such as renal insufficiency, a history of upper gastrointestinal ulceration, or severe asthma; and tramadol (50 mg every 6 h) for pain relief. A subcutaneous low-molecular-weight heparin adjusted to the patient's body weight was used for thromboprophylaxis. Because of the nature of this pathological condition and its emergency, we did not evaluate the level of chronic preoperative pain.

All patients who entered the study answered a structured questionnaire within 48 h of admission to assess demographic characteristics, previous diseases, history of sedative use, previous surgeries, and level of education. At the same time, a trained evaluator conducted patient interviews regarding physical status, baseline cognitive status, and depression. The presence of preoperative delirium was assessed by trained nursing staff during daily and nightly rounds until surgery and was recorded in the medical records.

Physical status defined by the American Society of Anesthesiologists (ASA) denotes preoperative risk classification based on comorbidity from ASA 1 (healthy) to ASA 5 (moribund) [9]. No patient in our study was graded as moribund; therefore, for the purpose of this study, two rating categories were used: grade 1 or 2 and grade 3 or 4.

Cognitive status at admission was assessed using the Short Portable Mental Status Questionnaire (SPMSQ) [10], as it was previously used in similar populations [11]. Depending on the number of correct answers on the 10-item questionnaire, the patient's cognitive status was described as lucid (8–10), mild to moderate cognitive dysfunction (3–7), and severe cognitive dysfunction (0–2). According to SPMSQ score, patients were divided into two groups: those who were cognitively intact (SPMSQ ≥ 8) and those who had mild or moderate cognitive impairment (SPMSQ < 8), as we had previously excluded patients with severe cognitive function. The cut-off limit of < 8 correct answers has already been used in elderly patients with hip fractures [12].

Symptoms of depression were assessed using the 15-item Geriatric Depression Scale (GDS). The GDS is a valid depression screening test that is easy to administer and has been shown to be a reliable measure of symptoms of depression, even in subjects with cognitive impairment [13]. The cut-off score of 6 was regarded as the presence of depression [14].

To detect the presence of preoperative delirium, patients underwent assessment using the Confusion Assessment Method (CAM) by trained nurses during their daily and nightly rounds until the surgery [15]. The CAM is a reliable and valid measure of delirium in general medical and surgical populations. It focuses on four key features: (1) acute change in mental status with a fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness. The onset of delirium was registered at the moment that the patient had met the CAM diagnostic algorithm, which requires a presence of features 1 and 2 and either 3 or 4 [16].

Surgical and anaesthetic techniques

The surgical team consisted of three surgeons, at least two of whom had long-standing experience performing the surgery depending on the type of hip fracture: bipolar hemiarthroplasty was used to treat femoral-neck fractures, while the compression hip screw was the fixation method for trochanteric fractures. A central neural block (subarachnoid) or general anaesthesia was performed by two experienced anaesthesiologists according to the type of surgical procedure and the patient's clinical status. Intraoperative monitoring included heart rate, non-invasive arterial pressure, pulse oximetry, 3-lead electrocardiogram, and end-tidal carbon dioxide. The decision of whether to perform a central neuromuscular block was made by the anaesthesiologist. General anaesthesia was induced with propofol (1.5–2.0 mg/kg) and fentanyl (3.0 μ g/kg), followed by a neuromuscular block using rocuronium bromide (0.6 mg/kg) to facilitate endotracheal intubation. Anaesthesia was maintained with sevoflurane and oxygen with or without nitrous oxide and was associated with intravenous fentanyl boluses according to clinical necessity. Spinal block was performed with a pencil-point needle (Becton, Dickinson and Company) placed at the L3–4 or L4–5 interspace using 0.5% isobaric bupivacaine in doses of 15 mg.

Postoperative pain therapy within the first hour after arriving at the postanesthesia care unit comprised tramadol 100 mg with paracetamol (acetaminofen) 1 g applied as intravenous infusions for moderate pain (NRS = 5–6). Rescue analgesic was provided as morphine 2–4 mg bolus intravenously for severe pain (NRS = 7–10).

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