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Postoperative analgesia in patients older than 75 years undergoing intervention for per-trochanteric hip fracture: a single centre retrospective cohort study

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Abstract The aim of this study was to compare the efficacy of four analgesia techniques on postoperative pain after per-trochanteric femur fracture. A retrospective cohort study was conducted on 131 consecutive patients older than 75 years enrolled in an 18-month period and who underwent per-trochanteric fracture repair under spinal analgesia. Patients received postoperative analgesia from: G1 ($n = 36$), intravenous analgesia on demand only; G2 ($n = 28$) administration of acetaminophen at fixed hours; G3 ($n = 50$) continuous morphine infusion; G4 ($n = 17$), preoperative echo-graphic guided femoral nerve block. Continuous opioid infusion failed to prevent the onset of pain at the end of the effects of subarachnoid anesthesia (rescue dose of analgesic in 48 % of patients in G3 vs. 22 % in G2 in the first day; $p < 0.05$). The greater effectiveness was achieved by preventing the onset of pain with drugs administered at time intervals (rescue dose of analgesic in 48 % of patients in G3, 58 % in G1 and 48 % in G4 vs. 22 % in G2 in the first day and rescue dose of analgesic in 32 % of patients in G3, 67 % in G1 and 76 % in G4 vs. 18 % in G2 in the second day; $p < 0.05$). Our study does not confirm the effectiveness of a single shot

femoral nerve block on postoperative pain in per-trochanteric femur fracture (PAIN VAS score > 3 at t1 in 23 % of patients in G1 and 19 % in G4 vs. 10 % in G2 and G3; $p < 0.05$).

Keywords Postoperative pain management · Elderly · Orthopedic surgery · Anesthesia · Regional

Backgrounds

Despite improvements in analgesia techniques, including patient controlled analgesia (PCA) and sustained-release opioids, up to 80 % of patients report significant pain after surgery [1]. Untreated severe pain can increase patient fear and anxiety, lead to aggressive behavior and disturbance of cognition, and have a detrimental effect on physiological parameters. Fracture of femur is a common emergency and typically occurs in elderly patient, a population particularly vulnerable to the deleterious effects of poorly managed pain [2]. Provision of analgesia in these cases is often complicated by the advanced age of the patients and their co-morbidities [3].

Patients, older than 75 years appear to be particularly vulnerable to the adverse effects of both drugs and postoperative pain, thus, achieving effective analgesia, is particularly difficult because it is necessary to personalize the treatments and, at the same time, the ineffective analgesia may lead to serious complications such as delirium [2].

The addition of nerve blocks may allow a sparing in the doses of analgesics intravenously [4] and to improve the postoperative course particularly in proximal femoral fracture [5, 6] and if a continuous infusion in the postoperative period is applied [7].

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In the case of per-trochanteric fracture the block of femoral and lateral femoral cutaneous nerves could have beneficial effects on mobilization and postoperative analgesia given the anatomical innervations of the region submitted to surgery [8].

The purpose of this study was to compare retrospectively, in a selected group of patients, older than 75 years of age who underwent surgery for reduction of per-trochanteric fracture of the femur, four techniques (including peripheral block and intravenous administration) of postoperative analgesia in a tertiary trauma center and verify their effectiveness.

Methods

After obtaining the approval of the local ethics committee (Prot. N 2013/0014267; 23.04.13) a retrospective cohort study was performed. For all patients older than 75 years, admitted from January 2012 to June 2013 because of a per-trochanteric hip fracture, medical records were collected through Archimed® (Electronic Medical Records used at the Department of Orthopedics of AOU Careggi). Patients were excluded from the study in case of general anesthesia, liver insufficiency and pre-existing sensorium alterations (mainly communication problems) such as to not allow the assessment of the quality and intensity of postoperative pain by Visual Analogue Scale (PAIN VAS), previous chronic treatment with analgesic drugs.

Spinal anesthesia was performed with patient in a sitting position and the injection at a lumbar level of 15–20 mg of levobupivacaine 0.5 %. Postoperatively, patients received intravenous analgesia on demand (i.e., acetaminophen 1 g; tramadol 50–100 mg; trometamin ketorolac, 30 mg) in case of moderate-intense pain (i.e., VAS > 3 points).

For each eligible patient were collected demographic data, anesthesia and postoperative analgesia techniques, and, Q6H for 2 days after intervention, pain VAS (where zero stands for no pain and 10 is the maximum pain) and total rescue drug dosages. The patients' data were divided in four groups according to patterns of postoperative analgesia as follows:

- G1, analgesia on demand only;
- G2, ev acetaminophen 1 g, every 6 h;
- G3, continuous morphine infusion (0.01 mg/kg/h);
- G4, preoperative ultrasound guided block of femoral nerve (levobupivacaine 0.5 %, 75 mg) and of cutaneous lateral femoral nerve (levobupivacaine 0.5 %, 25 mg).

Statistical comparisons were carried out with a Chi-square test.

Results

In the 18 months of observation, 288 patients older than 75 years and affected by per-trochanteric femur fracture were admitted to the Orthopedics Department of the Careggi Hospital of Florence.

Of these, 229 were submitted to surgical reduction and fixation; 20 patients underwent general anesthesia, and, of the remaining 209 patients, 78 were not able to communicate with the medical and nursing staff (34 % of the patients submitted to intervention).

For these reasons 131 patients met inclusion criteria of the study (mean age 86.05 ± 5.8 years; 102 women and 29 men)

The distribution into the postoperative analgesia pattern groups was as follows:

- G1) $N = 36$ patients; mean age 86.8 ± 5.36 years; 31 women and 5 men
- G2) $N = 28$ patients; mean age 87.6 ± 6.14 years; 24 women and 4 men
- G3) $N = 50$ patients; mean age 84.54 ± 5.99 years; 34 women and 16 men
- G4) $N = 17$ patients; mean age 85.05 ± 5.16 years; 13 women and 4 men.

No significant differences in the means and distributions of demographic data were observed.

The frequency of moderate pain (PAIN VAS > 3) was significantly higher in G1 and in G4 at t1 (19 and 23 % of patients, respectively, vs. 10 % in G2 and G3; $p < 0.05$) and in t6 (19 and 17 % of patients, respectively, vs. 10 % in G2 and 6 % in G3; $p < 0.05$) (Fig. 1). The percentage of patients who received a rescue dose of analgesic drug in each group is described in Fig. 2: on the first day the number of rescue doses of analgesic was significantly lower in G2 compared to the other three groups (25 % vs. 58, 48 and 65 %, respectively; $p < 0.05$); on the second day the number of rescue doses of analgesic was significantly lower in G2 and G3 compared to the other two groups (17 and 32 %, vs. 67 and 76 %, respectively; $p < 0.05$).

The number of doses/each patients of rescue analgesic drug administered are described in Fig. 3. In the first day the number of rescue doses/each patient of analgesic were lower in G2 compared to the other three groups (0.39 vs. 1.39, 0.7, and 1, respectively); in the second day the number of rescue doses of analgesic were lower in G2 and G3 compared to the other two groups (0.46 and 0.44, vs. 1.14 and 1.29 respectively).

The analgesic infusion of morphine was stopped in four patients of G3, due to the occurrence of side effects related to an opioid overdose.

Fig. 1 Percentage of patients suffering moderate pain (PAIN VAS more than 3) at each observation time (t1–t8: every 6 h after intervention) in 131 patients, older than 75 years, submitted to reduction of per-trochanteric fracture with different patterns of postoperative analgesia. * $p < 0.01$ (Chi square test for multiple comparison)

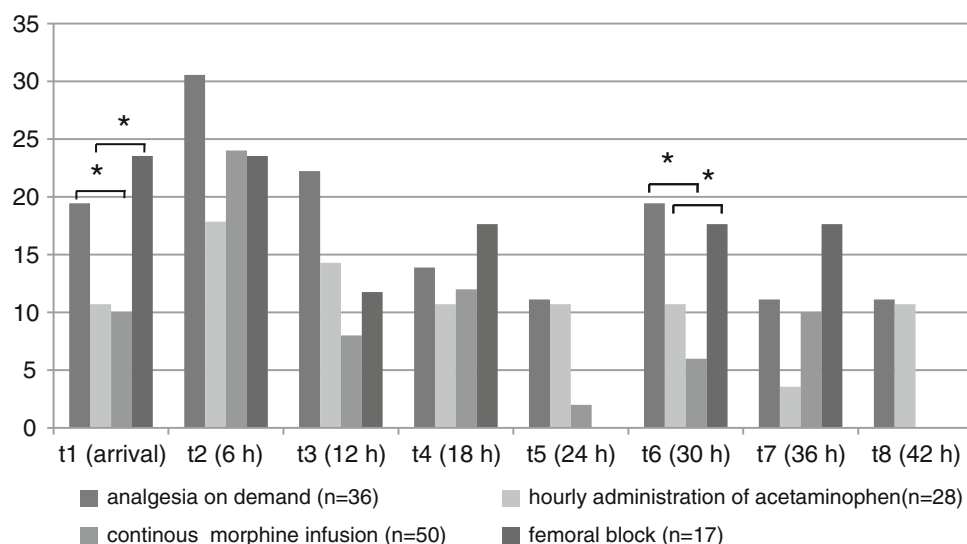


Fig. 2 Percentage of patients subjected to the administration of a rescue dose of analgesic drug in 131 patients, older than 75 years, submitted to reduction of per-trochanteric fracture with different patterns of postoperative analgesia. * $p < 0.01$ (Chi square test for multiple comparison)

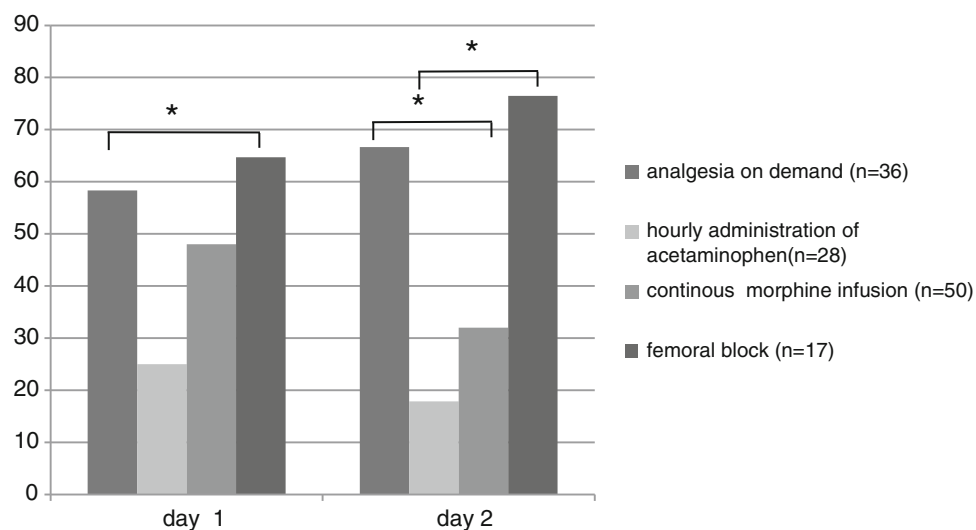
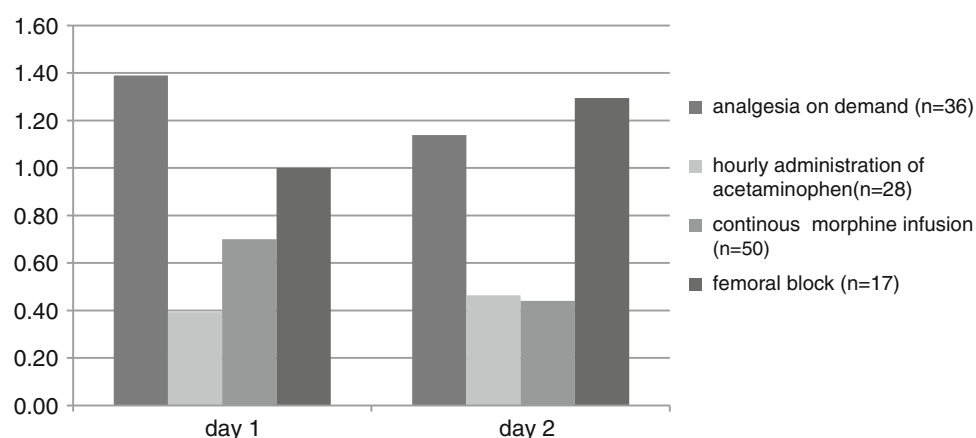


Fig. 3 Number of doses/each patients of rescue analgesic drug administered in the first 42 h in 131 patients, older than 75 years, submitted to reduction of per-trochanteric fracture with different patterns of postoperative analgesia



Discussion

Systemic opioids represent the standard approach to postoperative pain management. However, they are responsible for numerous side effects [9]. Therefore, it has been suggested that multimodal analgesia [10] may improve postoperative pain treatment, allowing the administration of lower doses of each analgesic and, consequently, with fewer adverse events.

Non-steroidal anti-inflammatory drugs (NSAIDs) have shown good efficacy in this respect [11]. However, they have significant contraindications in several clinical conditions [12].

Furthermore, the injectable form of acetaminophen has been used with success also in orthopedic surgery [13].

Concomitant administration of intravenous medications, however, adds some management problems, particularly in older patients, in relation to drug interactions and the effectiveness of the excretory renal and respiratory functions [3, 14, 15].

Therefore, for some years, loco-regional anaesthesia/analgesia techniques were added to achieve a saving in the use of intravenous drugs. Recently, numerous experts stated the effectiveness of these methods not only on pain [4–7] but also on functional outcome and on length of stay [16].

Our study, conversely, does not confirm the effectiveness of a single shot peripheral block of femoral and cutaneous lateral femoral nerves on postoperative pain in per-trochanteric femur fracture. The failure of the technique could be due to the insufficient abolition of pain due to innervations of femur by sciatic and obturator nerve branches or to the insufficient duration of block.

Therefore, the femoral nerves block appears to be usable in the context of a multimodal analgesia, and with a continuous administration of local anesthetic.

Our other observed data show that it is very difficult to overlap the analgesia obtained with the continuous intravenous infusion of analgesics to the end of the effects of spinal anesthesia; in fact, this method, in our series, has proved unsuccessful on the first day (Figs. 2 and 3). Moreover, the observed cases of discontinuation of intravenous infusion of morphine, due to side effects, prove the difficulty of finding the right dosage of opioids in older patients.

A solution to this pharmacokinetic trouble could be represented by the patient controlled analgesia (PCA). The first reports were favorable to the administration of morphine with PCA, even if with different doses in relation to age until the individualization of treatment [17]. Unfortunately some clinical observations have highlighted the possibility of side effects from opioid overdose in the

postoperative period [15] and also in the administration with PCA [14].

Finally, our results seem to demonstrate that the greater effectiveness in the postoperative analgesia in the elderly can be achieved by preventing the onset of pain, also with less powerful drugs, even if administered at time intervals indicated by their pharmacokinetic and pharmaco-dynamic properties [18].

Conflict of interest There is no actual or potential conflict of interest.

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