



## Pain relief management following proximal femoral fractures: Options, issues and controversies



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### ARTICLE INFO

#### Keywords:

Elderly  
Pain  
Hip fractures  
Proximal femoral fractures  
Analgesia

### ABSTRACT

The majority of proximal femoral fractures occur in the elderly population. Safe and adequate pain relief is an integral part of the overall management of hip fractures. Inherent difficulties in the assessment of pain in elderly need to be taken into account and unique considerations should be made regarding the effective analgesia due to different elderly physiology, and their response to trauma and subsequent surgery. The pain management should start as soon as possible and special emphasis should be paid to contemporary methods of regional anaesthesia whilst a multimodal approach should be adopted in the perioperative period. The present review summarises the contemporary treatment options and controversies pertaining to the management of pain in elderly patients with proximal femoral fractures.

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### Introduction

Fractures of the proximal femur are the second commonest fragility fractures and their worldwide incidence is increasing [1]. It is estimated that in the United States of America the total number of hip fractures will be 289,000 by 2030 [2]. Their number in the United Kingdom has been estimated to be 77,000 per year with a projected annual incidence of 100,000 by 2033 [3]. In Germany more than 125,000 people suffer a hip fracture every year [4]. Proximal femoral fractures are most common in women older than 65 years old [5]. The mean age of a patient with a fracture of the proximal femur is above 80 years, the presence of dementia in these patients is high [6] and the pain experienced severe [7,8]. It is well documented that cognitively impaired patients with a fractured proximal femur receive less analgesia than their cognitively intact counterparts [9]. It has also been demonstrated that monitoring of pain and appropriate analgesia in this population improves post-operative functional outcome [10].

This review aims to summarise the current evidence and techniques available for analgesia following a fracture of the

proximal femur and the special considerations pertaining to the geriatric population. The contemporary options and controversies are presented.

### Physiological considerations in the elderly

Different cut off ages have been used to define the “elderly” population but the geriatric hip fracture literature is best reviewed using the age of 60 as cut off point [11]. The elderly population in general has a lower physiological reserve than their younger counterparts. Elderly trauma patients are more vulnerable and their treatment may be associated with greater complications as they are likely to have other co-morbidities and the index trauma decreases the already compromised physiological reserve of the patient [12–18]. Physiological changes of increased age are various including but not limited to reduced cardiac output, reduced lean body mass, increased fat storage, a varying plasma volume and impaired renal and hepatic functions, affected drug metabolism and elimination [19]. The decreased compensation and maintenance of homeostasis in elderly suffering trauma has been described with the term “Homeostenosis” and is well known to occur after hip fracture surgery in elderly [20,21]. The term “pain homeostenosis” has also been used in elderly to describe the effect of persistent pain in the ability to accommodate physiologic stressors [22].

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Adequate pain management is of paramount importance pre- and post-operatively as it has been shown that it facilitates nursing care [23]. Additionally there is evidence suggesting that not well-controlled pain during the post-operative period is related to significant complications including infection and thromboembolism [24]. Pain relief in elderly has been demonstrated to be more difficult compared to young people due to concomitant diseases and medication, different pharmacokinetics and pharmacodynamics, decreased physiologic reserve, different pain response and difficulties in pain assessment [23].

### The assessment of pain

Adequate assessment of pain is crucial to the administration of adequate analgesia. Pain in the trauma patient is a dynamic phenomenon and pain assessment must be a continuous process, as a single point-assessment of pain is likely to be inaccurate whilst repeat assessments are likely to better correlate with analgesia requirements. Motion related pain at a fracture site and expanding hematoma inevitably contribute to the dynamic and changing characteristics of pain generated thus necessitating continuous monitoring and assessment. Additionally the possibility of the development of a compartment syndrome mandates constant vigilance and continuous monitoring of pain levels. Oligoanalgesia is a well-described phenomenon in elderly patients [25] and the term is used to describe undertreatment of pain. In a recent retrospective study Quattromani et al. [26] reviewed the analgesia provided in 460 blunt trauma patients in a Level-1 Trauma Centre Emergency Department. The authors concluded that patients older than 65 years were less likely to receive sufficient analgesia in timely manner compared to younger patients.

The vast majority of proximal femoral fractures are managed operatively with the aim of surgery being the early and secure mobilisation of the patient whilst at the same time providing the best chances for adequate functional recovery to pre-injury levels. Postoperative mobilisation and rehabilitation constitute an integral part of the overall management. Dynamic pain relief at the immediate postoperative period that allows comfortable mobilisation and adequate respiratory efforts is paramount to effective rehabilitation and the prevention of complications associated with immobility and recumbency.

Multiple scoring systems are utilised for the assessment of pain. Self reported one-dimensional scales include the Visual Analogue Scale (VAS-rated on a 10 cm line labelled 0–10), Verbal Rating Scale (VRS-rated verbally as no pain, mild, moderate or severe pain) and Numeric Rating Scale (NRS-rated as a pain score given as a range 0–3 or 0–10) [27]. These scales require that the patient is not confused and is able to communicate. In this subset of patients, the VRS and NRS are reliable scales validated for reproducibility as well as being preferred by patients and clinicians [28]. In the mildly confused patient, or when the verbal assessment of pain is challenging, there is a role for the use of a VRS as long as the patient is able to communicate [28]. VAS for pain assessment is validated for impaired cognition but a vertically orientated line is preferable if it is used [29].

In patients with severe delirium or dementia the assessment of pain presents a unique challenge. These patients are less likely to outwardly complain of pain or request analgesia and therefore are at risk of being undertreated for pain [9,30]. Options to assess pain are to use non-verbal cues, formal behaviour scales and surrogates such as family or carers [31]. Non-verbal pain indicators may include vocalisation on movement of the affected limb, facial expressions and changes to usual demeanour or posture [31]. The patient's family or carers may be able to assist with the identification of expressions specific to the patient's individual

response to pain. Formal pain behaviour reporting tools such as Doloplus and the Discomfort Scale for Dementia of the Alzheimer's Type, have been validated, however these are time consuming and require specific skills to administer and therefore not necessarily viable in clinical practice [31,32]. Interestingly, in a recent prospective study of 344 patients with hip fractures, Radinovic et al. [33] identified dementia and low levels of education as independent predictors of severe postoperative pain after hip fracture surgery.

The type of injury and the surgical intervention in relation to pain levels have been examined in various studies. In a retrospective report of 231 patients above the age of 65 with a surgically fixed hip fracture, Strike et al. [34] found no difference in postoperative pain or opioid analgesics based on the type of fracture (femoral neck, intertrochanteric) and the surgical procedure (hemiarthroplasty, cannulated screws, intramedullary nail, total hip arthroplasty, dynamic hip screw). On the other hand, Foss et al. [35] in a descriptive prospective study of 117 patient with hip fractures receiving epidural analgesia and following a standardised perioperative rehabilitation protocol, concluded that cumulated pain levels were significant lower in patient with hemiarthroplasty compared to patients that underwent fixation (dynamic hip screw, intramedullary nail).

### Analgesia at admission to the emergency department

Adequate pain relief is considered part of good clinical practice and a key feature of improving patients' experience. Regional anaesthesia is gaining popularity across Emergency Departments in UK but its use has not been universally adopted. In a national UK Emergency Department survey, Rashid et al. [36] found that only 44% of the departments who participated were using regional analgesia for adults with proximal femoral fracture. Likewise in a Canadian study, Haslam et al. [37] demonstrated that nerve block analgesia is grossly underutilised in Emergency Departments.

#### *Fascia Iliaca blockade*

Fascia Iliaca blockade is a simple and effective procedure that provides superior analgesia to parenteral morphine in patients with a fracture of the proximal femur [38]. This is a relatively safe technique with few reported complications [39]. It is performed by locating the junction between the lateral and middle thirds of the inguinal ligament and piercing disinfected skin 1 cm below this point with a semi-blunt needle. The needle is advanced perpendicular to the skin and the practitioner feels for two loss-of-resistance 'pops' (the fascia lata and then the fascia iliaca). At this point 30–40 mls of local anaesthetic is injected after aspiration to ensure that the needle is not in a vessel [38,40].

The technique is easy to teach to junior physicians and can be used before or after radiographic diagnosis of proximal femoral fracture [38,41]. Theoretically, the spread of local anaesthetic along the fascia iliaca should block the femoral nerve, the obturator nerve and the lateral femoral cutaneous nerve [42,43]. In practice, however, a femoral nerve block is superior in providing analgesia than fascia iliaca block (see below). Its use in the ED setting is therefore often limited, perhaps due to its limited efficacy. A recent study, however, promoted its use as it is quick to teach, easy to administer, does not require ultrasound or nerve stimulator guidance as well as being cheaper [40].

#### *Femoral nerve blockade*

Injection of local anaesthetic around the femoral nerve with ultrasound guidance or a nerve stimulator is an effective and relatively safe method of pain relief following fracture of the

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