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## REVIEW ARTICLE

# Preoperative Optimization and Timing of Surgery in a Patient with a Hip Fracture

## Abstract

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Successful treatment of a patient with a hip fracture requires thorough preoperative assessment and resuscitation, and timely surgery. A multidisciplinary approach is worthwhile with early involvement of an orthogeriatric team and preoperative anesthetic assessment where possible. The fundamentals of assessment of these patients are the fundamentals of medical assessment of all patients ie history, examination and investigation. While younger patients with femoral neck fractures warrant early surgery to prevent avascular necrosis (AVN), older patients with per trochanteric fractures need to be expedited to prevent complications of recumbency.

## KEYWORDS

Hip Fractures; Preoperative Care; Time-to-Treatment; Aged; Patient Care Team; Postoperative Complications; Femur Head Necrosis; Mortality

## Introduction

In assessing a patient with a hip fracture, it is important to differentiate between a young patient with a hip fracture and an elderly patient since the injury and consequent treatment may be quite different. A hip fracture in a young patient is usually a high energy injury, for example a motor bike accident. The patient may have multiple injuries and needs to be assessed thoroughly and resuscitated using Advanced Trauma Life Support/ Early Management of Severe Trauma principles.<sup>1</sup> The long-term consequences such as employment may be more significant in the younger patient and osteosynthesis may be preferable to arthroplasty.

The majority of hip fractures however will be in the elderly and these patients are the focus of this paper. The effects of this injury in the elderly are more profound. In a large cohort of 169,145 patients from the Danish Hospital Register, Vestergaard et al.<sup>2</sup> noted that

the average age for a hip fracture was a mean age of 77. The mortality from the injury was greater with increasing age. Men less than 50 years of age lost 18% of their remaining life compared to controls whereas men over the age of 80 lost as much as 58% of their remaining life compared to patient controls.

## History

Important features of the history include:

- The mechanism of injury
- Were there witnesses to the fall?
- Is there any suggestion of an associated head injury?
- Does the patient have any history of cognitive impairment? Is the patient capable of giving informed consent?
- Does the patient live alone? Does the patient live at home? If not, are there records available from the nursing home?

- What was the patient's mobility before the injury?
- What medications does the patient take? In particular is the patient taking anticoagulants?
- When did the injury occur? Was the patient lying on the floor unattended for hours before being found? Was there a delay in ambulance arrival to the patient? Was there a delay for the ambulance officers being able to deliver the patient to the emergency room?

## Examination

Examination of the patient with a suspected hip fracture should include a general examination of the patient with baseline observations. Examination is made for any signs of other external injury such a head injury. Katsanos<sup>3</sup> found that one of the commonest causes of early mortality in this cohort is acute renal failure and an assessment of hydration is very important. The patient may have had a delay in rescue and a delay in transport. The patient will be asked to fast and there may be a delay in getting to theatre. Early administration of intravenous fluids and a urinary catheter with hourly measures can be lifesaving in an elderly patient.

The classical physical examination of a hip fracture patient may demonstrate shortening and external rotation of the leg due to unopposed pull of the iliopsoas but many patients, especially with an undisplaced fracture will not exhibit these signs. A careful and gentle examination of flexion and internal rotation is likely to demonstrate hip irritability with flexion and internal rotation. As per any Orthopaedic examination an assessment of the neurovascular status of the limb is made but neurovascular compromise would be rare in this elderly cohort with a low energy injury.

## Investigations

Prior to a patient being transferred to radiology it is important that the patient be given analgesia. This is likely to take the form of an intramuscular narcotic analgesic. Ultrasound blocks

are being increasingly utilized by emergency physicians and may take the form of a fascia iliac block. Okereke<sup>4</sup> found that this was a safe reliable technique for junior doctors in a district hospital. They reduce the need for narcotic analgesia in the elderly and can last for up to 12 hours. A hip fracture is a painful injury and the patient needs appropriate analgesia before being transferred on and off a hard radiology table.

Radiology would normally include AP X-ray of the pelvis, AP and lateral of the hip. Most patients would have a chest X-ray, given that they are elderly and may well need operative intervention. In my own hospital I am seeing an increasing number of hip fracture patients having a head Computed Tomography (CT) scan on the basis that the patient had an "unwitnessed fall" and may or may not have been on anticoagulants. A CT scan is a relatively expensive investigation and in my experience is rarely abnormal in this cohort. Having a CT scan may also add to delays in the patient having timely treatment. This issue was addressed by Danielson et al.<sup>5</sup> in a cohort of 713 elderly patients with a low-energy hip fracture having a head CT. Only 0.4% of the patients had acute findings on the CT and none required neurosurgical intervention. They concluded that Head CT scans should have a limited role in the workup of this patient population and should be reserved for patients with a history and physical exam findings that support head trauma, an Injury Severity Score (ISS) > 9 and Glasgow Coma Scale (GCS) < 15.

A more common issue is failure to detect a hip fracture in a patient with a normal hip X-ray. Too often we see an elderly patient being sent home following a normal X-ray, only to represent a few weeks later with a displaced subcapital hip fracture. An opportunity has been lost for percutaneous screw fixation and the patient now requires a more invasive arthroplasty. Emergency doctors require education and reinforcement that an elderly patient with hip pain has a hip fracture unless proven

otherwise. Hip pain in the presence of a normal X-ray should lead to more advanced imaging in the form of a CT scan, bone scan or MRI, depending upon availability.

Parker<sup>6</sup> looked at the issue of missed hip fractures in 825 consecutive admissions with a hip fracture. In 16 cases the diagnosis was not made on initial presentation. In 10 cases there was failure to interpret the X-rays properly. In 3 cases no X-ray was performed and in 3 cases the fracture was not visible on the X-ray. This paper highlights the need for education and awareness by junior doctors and the need for secondary review of X-rays by a senior member of the emergency team.

Preoperative pathology would include full blood count electrolytes and creatinine and a blood group and hold. Smith et al.<sup>7</sup> looked at serial patient hemoglobin in patients waiting over 48 hrs for surgery and found a mean drop of 20.2 g/l in the extracapsular group and 14.9 g/l in the intracapsular group, highlight anemia as a possible cause of morbidity and mortality in these patients.

## Models of Care

The "usual" model of care for these patients is being admitted to an orthopedic ward under the care of an orthopedic team. Increasingly advanced models of care such as the "hip fracture program" in the UK and the "orthogeriatric model of care" in Australia and New Zealand are being utilized as a shared care arrangement to allow preoperative optimization of patients, multidisciplinary postoperative care and discharge planning. Grigoryan et al.<sup>8</sup> performed a systematic review and meta-analysis of orthogeriatric shared care models and found evidence of clear benefits of such models. The National Institute for Health and Care Excellence (NICE) in the UK (<https://www.nice.org.uk/guidance/cg124>) cites an evidence-based recommendation that from admission patients should be offered a formal, acute orthogeriatric service that includes:<sup>9</sup>

- Regular orthogeriatrician assessment
- Rapid optimization of fitness for surgery
- Early identification of individual goals for multidisciplinary rehabilitation to return to mobility and independence, and to facilitate return to preference residence and long-term wellbeing.
- Early identification of most appropriate service to deliver rehabilitation
- Continued, coordinated, orthogeriatric and multidisciplinary review and discharge planning liaison or integration with related services, including falls prevention, secondary fracture prevention, mental health, cultural services, primary care, community support services and carer support services.

The Guideline Development Group of NICE recommends identification and treatment of correctable comorbidities immediately to avoid delaying surgery.<sup>10</sup> Such comorbidities may include anemia, anticoagulation, volume depletion, electrolyte imbalance, uncontrolled diabetes, uncontrolled heart failure, correctable cardiac arrhythmia or ischemia, acute respiratory infection, and exacerbation of chronic respiratory disorders. Most elderly patients with hip fractures will have comorbidities but many of these will be not correctable in the short term and their investigation and management will only delay their surgery and increase their perioperative risks.

### Timing of Surgery

In healthy young adults with a femoral neck fracture, the importance of early surgery is to avoid avascular necrosis (AVN) of the femoral head, whereas the same problem in an elderly patient, surgery has to be expedited to avoid complications of recumbency. Delayed surgery will likely increase the risks of surgery markedly. The risks of hypostatic pneumonia, pressure sores, delirium, venous thromboembolism are likely to be significantly increased with surgical

delay, not to mention muscle wasting and impaired rehabilitation.

NICE (<https://www.nice.org.uk/guidance/cg124>) recommends that surgery be performed on the day of admission or the following day.<sup>9,10</sup> The Australian Commission on Quality and Safety in Health Care recently updated its clinical care standards for hip fractures (<https://www.safetyandquality.gov.au/>). The updated Hip Fracture Clinical Care Standard reduced the suggested maximum time to surgery from 48 to 36 hours.

Are such standard effective? Harvey et al.<sup>11</sup> examined whether adherence to such standards has an effect on mortality following hip fractures. Australia and New Zealand have linked hip fracture registries and they examined data retrospectively for 9236 hip fractures in patients over the age of 50. They examined 6 clinical care standards including timing of surgery within 48 hours and use of an orthogeriatric model and early mobilization. They noted that clinical care for two-thirds of hip fractures attained a high level of adherence to the six quality care indicators, and short and longer term mortality was lower among people who received such care than among those who received low adherence care.

Klestil et al.<sup>12</sup> performed a systematic review and meta-analysis looking at the timing surgery in elderly hip fracture patients and found that patients having surgery within 48 hours of admission had a 20% lower risk of dying within 12 months with fewer complications (8% vs 17%) and a lower risk of pressure area sores.

Siegmoth et al. found that delay in surgery after 48 hours from admission in a prospective study of 3628 patients significantly increased the average length of stay in hospital by an average of 10.9 days.<sup>13</sup> This would suggest that there are economic reasons in addition to medical reasons supporting early surgery. In a prospective study of 858 patients, Al-Ani et al. found that patients who had early surgery had a better ability to return to independent living, as well as a lower risk of pressure sores and a shorter hospital stay.<sup>14</sup>

Seong et al. performed a literature review regarding the timing of hip fracture surgery and found moderate evidence supporting the idea that early surgery is associated with better outcomes.<sup>15</sup> The majority of studies favored improved outcomes in regards to mortality, pain, complications, or length of stay.

### Delay in Operative Fixation & Avascular Necrosis

It is established orthopaedic practice to reduce a traumatic hip dislocation as soon as possible (within 6 hours) and recognized that surgical delay can be associated with an increased risk of avascular necrosis of the femoral head.<sup>16</sup> Wang et al. also found a higher rate of avascular necrosis in patients with a femoral head fracture associated with posterior hip dislocation and a delay to surgery.<sup>17</sup> However, there is no conclusive evidence in the literature to suggest that delay in surgery leads to higher rates of avascular necrosis in femoral neck fractures, intertrochanteric fractures or subtrochanteric fractures. Sarrafan et al. performed a retrospective study of 72 patients between the ages of 20 and 60 with intracapsular femoral neck fractures and found that delay in surgery had no significant effect on the development of avascular necrosis.<sup>18</sup> Razik et al looked at 92 patients under the age of 60 who had internal fixation of intracapsular femoral neck fractures. They found a higher rate of osteonecrosis with cannulated hip screws compared to dynamic hip screw fixation but did not find an association with time to surgery.<sup>19</sup> Xu et al performed a systematic review and meta-analysis involving 17 case control studies and 2065 patients in the literature and noted no correlation between avascular necrosis and injury-operation interval.<sup>20</sup>

There is a concern that relatively bulky implants such as the dynamic hip screw may increase the risk of avascular necrosis. Avoiding the anterolateral quadrant with the lag screw is important to reduce the risk of avascular necrosis. Schwartzmann et al performed a prospective study of 96

patients with subcapital hip fractures treated with a dynamic hip screw.<sup>21</sup> They found 8 patients in whom the lag screw had been positioned high and lateral within the femoral head and that 5 out of these patients developed avascular necrosis. They did actually find a higher rate of avascular necrosis in patients operated on later than 72 hours post injury (23% compared to 13%).

In summary, there is little or no evidence to connect delay in surgery to rates of avascular necrosis in elderly patients with femoral neck fractures, intertrochanteric fractures or subtrochanteric fractures. The main benefits of surgery within 24 to 48 hrs remain the reduced generalized risks of delay in elderly patients including pressure sores, hypostatic pneumonia, thromboembolic disease, pain, delirium and increased overall costs.

## Conclusion

Elderly patients with peritrochanteric femoral fractures should have thorough initial assessment and preoperative optimization, preferably utilizing a shared orthogeriatric model of care. Optimization should focus on rapid correction of reversible co-morbidities only. There is strong evidence within the literature supporting early surgery for these patients. This may require cultural and procedural change within a hospital and an Orthopaedic department to ensure that these patients receive urgent and timely assessment and management.

## Conflict of Interest

None

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