

Fix and replace: An emerging paradigm for treating acetabular fractures in older patients

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in older patients. We present this in the context of the current literature. This invited editorial presents early results from our centre and the ongoing challenges are discussed.

Key words: Acetabular fracture; Total hip arthroplasty; Trauma

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Core tip: Acetabular fractures in older patients are challenging to manage. The "fix and replace" construct may present a new paradigm for the management of these injuries.

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Acetabular fractures in older patients pose a challenge for both patients and clinicians providing care. These fractures and the circumstances in which they occur require multidisciplinary management from both medical and surgical specialties, and new ways of managing these injuries in this patient cohort are required. The annual incidence of acetabular fractures is estimated at 2000 per year in the United Kingdom with 72.5% of these occurring in older patients (patients greater than 65 years of age)^[1,2]. With an ageing population, the incidence is increasing with one study demonstrating a 2.4 fold increase between 1980 and 2007^[3]. Furthermore, outcomes have historically been poor - with up to 30% of patients who are managed non-operatively having an unacceptable functional result^[4] and mortality is high (25% in one study^[5]). For patients managed with open

Abstract

Acetabular fractures in older patients are challenging to manage. The "fix and replace" construct may present a new paradigm for the management of these injuries. We present the current challenge of acetabular fractures

Table 1 Fix and replace cohort; early results (*n* = 19)

Characteristic	Details
Age	Average 77 yr (range 63-94)
Gender	9 females 10 males
Pre-morbid mobility	9 independently mobile 10 mobile with walking aid
Mechanism of injury	12 fall from standing height 3 road traffic collision 2 fall from height 1 seizure resulting in fall 1 unknown
Mobility day 1 post op	11 not mobile out of bed 6 sat out 2 unknown
Number of days to mobilise post up	Average 2.5 d (range 1-11)

reduction and internal fixation, results in older patients are significantly poorer compared to younger patients with up to 50% of older patients requiring an early total hip replacement^[6]. Overall, the quality of evidence is poor and limited to retrospective cohort reviews. As a result there is no clear consensus or guidelines on how best to manage these challenging injuries. As the incidence of these fractures in older patients is increasing, and outcomes of treatment uncertain or poor, better evidence and new strategies of treatment are required to improve the management of these injuries in this patient cohort.

Acetabular fractures in older patients may be viewed to be a similar injury to hip fractures (neck of femur) where the treatment aims to restore hip function to allow immediate weight bearing. As hip fractures represent a major fracture burden in older patients, a well developed conceptual framework has been established in the United Kingdom including a level one evidence-based treatment pathway (Orthopaedic Blue Book), national guidelines (NICE Guideline 2011)^[7] and an associated best practice tariff. Fundamental pillars in this treatment pathway include multi-disciplinary team (MDT) care, timely surgery and full weight bearing post operatively (BOAST Guideline 1 Version 2). The hip fracture framework - and the financial incentives associated with it - have significantly improved outcomes post hip fracture with year on year reductions in mortality^[8]. There was a hip fracture paradigm shift; one is now needed for fractures on the other side of the hip joint - the acetabular fracture. The hip fracture framework - MDT care, early surgery and early full weight bearing - can be equally applied to acetabular fractures in older patients.

To achieve the aim of immediate mobilization post fracture, a surgical paradigm shift is also required from the prolonged immobilisation associated with non-operative treatment or operative fixation alone to surgical treatment that enables immediate weight bearing. A paper from two decades ago stated, "Hip arthroplasty for acute treatment of acetabular fractures is rarely indicated"^[9]. Our conceptual framework has changed since then. Acetabular fractures in the elderly have a particular injury pattern: A separate quadrilateral-plate

component and roof impaction in the anterior column fractures with medialisation of the femoral head, and comminution and marginal impaction in posterior-wall/column fractures^[3]. Surgical fixation methods must take this in to account and total hip arthroplasty (THA) is an important component of the surgical armamentarium in these fractures. THA aids in the goal of early full weight bearing. Non-weight bearing or restricted weight bearing is difficult or impossible for older patients. Particularly in the frail and cognitively impaired, restricted weight bearing significantly increases medical complications and prolongs dependence on care. They are often observed to slowly decline, both physically and psychologically; and usually do not recover to their pre-fracture function, with overall loss of quality of life. A management strategy is required that allows early, unrestricted weight bearing.

Is the "fix and replace" construct a new surgical paradigm in the management of the elderly acetabular fracture? There is room for early optimism. Rickman *et al*^[10] in the United Kingdom reported on a cohort in 2014. Their surgical technique included plate stabilization of both acetabular columns plus simultaneous THA using a tantalum socket and a cemented femoral stem. All 24 patients mobilized with full weight bearing by day 7 postoperatively. Complications included: Superficial wound infection, symptomatic deep venous thrombosis and one in-hospital death from myocardial infarction. A more recent international report^[10] reiterates the challenges posed by this group of patients. Their cohort of 18 patients included younger patients (average 66 years, range 35-81) but with excellent Harris Hip Scores at almost 2 years average follow-up.

Early results from our centre are promising. Our current "fix and replace" cohort includes 19 patients (14 with a minimum of 3 mo follow-up). The age range is from 63 to 94 with 9 females and 10 males. Initial data from our cohort is summarized in Table 1. Cognitive impairment is not a contraindication in our institution. Anecdotally these patients seem to benefit the most with their full weight bearing status post operatively. They are generically unable to comply with anything less. In our series, 9 (47%) were independently mobile prior to admission and the most common mechanism of injury was a fall from a standing height. Our surgical approach includes open reduction and internal fixation of the anterior fracture component (through a modified Stoppa approach) followed by posterior column reconstruction with a THA or hip arthroplasty revision (in 4 cases) (through a posterior or Kocher Langenbeck approach). Open reduction internal fixation of both acetabular columns is achieved with standard reconstruction acetabular plates (Synthes), occasionally supplemented by suprapectineal plates (Stryker) to buttress quadrilateral plate comminution and prevent medial migration of the cup. For acetabular cup reconstruction, we use a trabecular metal shell (TMARS, Zimmer Biomet) to address any bone defects and enable further fracture fixation with screw fixation in both columns. A cup is then cemented into the shell (either polyethylene lipped liner or a dual mobility

cup) in appropriate alignment to optimise hip stability. A cemented femoral stem is then used. The cost of these implants is approximately £6000 per case.

The mean time to get out of bed (with assistance) was 2.5 d. This is a significant improvement on the alternative of usually a minimum of 2 wk bed rest and another 6 wk of restricted weight bearing status with non-operative management. Despite efforts aiming for early mobilization, most patients (58%) did not get out of bed on the first post-operative day. The mean post operative Oxford Hip Score was 31, at a minimum of 3 mo.

Medical complications in this cohort included: A urinary tract infection, a lower respiratory tract infection, acute kidney injury, malignant neuroleptic syndrome in a patient with Parkinson's disease and a non-fatal pulmonary embolus. Two groups of patients posed a particular challenge: Patients with neurological conditions such as Parkinson's disease and patients with periprosthetic fractures (the "fix and revise" cohort). There were 6 hip dislocations in 5 patients (2 in the "fix and revise" group, 2 in the Parkinson's group and 1 Parkinson's patient with a "fix and revise"). Of these dislocations, 2 underwent a closed reduction; there were 3 stem revisions (one with subsequent Girdlestone after a repeat dislocation) and one Girdlestone in a patient with severe Parkinson's disease. The dislocations that required open reduction and revision were in the group with severe Parkinson's disease, and/or periprosthetic fractures. Dislocation rates and subsequent complications are known to be high in this group^[11-13]. There were two deaths in the cohort— one due to an out of hospital cardiac arrest 20 mo post surgery and one due to pneumonia 8 mo post-surgery.

The early results of this cohort highlight the potential gains with this strategy (early mobilization compared to non-operative management) but also concerns related to length of surgery and cost of treatment. Complications have been medical as well as directly related to surgery and continuous service evaluation allows medical and surgical care to be adapted as our protocol develops.

Despite the early promising potential, questions remain. There are concerns about the length of surgery and the physiological reserve required to withstand this. Are the complications that can arise from this complex surgery surmountable? Do the benefits of early mobilization outweigh the potential risks of sciatic nerve injury, periprosthetic infection, haemorrhage (including potential catastrophic bleeding from the friable elderly presacral plexus), hip dislocation, periprosthetic fracture or failure of the construct? Who in this cohort benefits from the "fix and replace" construct? What are our goals beyond early weight bearing?

Which is better: Non-operative management, operative management with open reduction and internal fixation alone or operative management with open reduction and internal fixation and THA? There is no agreed consensus^[5,13].

A 2014 systematic review presents pooled data from 8 studies demonstrating that satisfactory surgical fixation had only been achieved in 45.3% of patients and 23.1% of patients had significant pain and reduced function necessitating THA. When surgical fixation alone and surgical fixation with THA was compared, there was no increase in complications compared to patients who underwent surgical fixation alone^[5]. The paper highlights that there is a paucity of high quality data to draw robust conclusions. Clinical trials are now needed to provide high quality evidence that address the above described challenges and ultimately determine the optimum management of acetabular fractures in older patients. The new "fix and replace" paradigm may help provide the answer.

REFERENCES

- 1 Laird A, Keating JF. Acetabular fractures: a 16-year prospective epidemiological study. *J Bone Joint Surg Br* 2005; **87**: 969-973 [PMID: 15972913 DOI: 10.1302/0301-620X.87B7.16017]
- 2 Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury* 2006; **37**: 691-697 [PMID: 16814787 DOI: 10.1016/j.injury.2006.04.130]
- 3 Ferguson TA, Patel R, Bhandari M, Matta JM. Fractures of the acetabulum in patients aged 60 years and older: an epidemiological and radiological study. *J Bone Joint Surg Br* 2010; **92**: 250-257 [PMID: 20130318 DOI: 10.1302/0301-620X.92B2.22488]
- 4 Spencer RF. Acetabular fractures in older patients. *J Bone Joint Surg Br* 1989; **71**: 774-776 [PMID: 2584245]
- 5 Daurka JS, Pastides PS, Lewis A, Rickman M, Bircher MD. Acetabular fractures in patients aged > 55 years: a systematic review of the literature. *Bone Joint J* 2014; **96-B**: 157-163 [PMID: 24493178 DOI: 10.1302/0301-620X.96B2.32979]
- 6 Kreder HJ, Rozen N, Borkhoff CM, Laflamme YG, McKee MD, Schemitsch EH, Stephen DJ. Determinants of functional outcome after simple and complex acetabular fractures involving the posterior wall. *J Bone Joint Surg Br* 2006; **88**: 776-782 [PMID: 16720773 DOI: 10.1302/0301-620X.88B6.17342]
- 7 Nice NIfHaCE. Hip fracture: The management of hip fracture in adults. Hip fracture: Quick reference guide, 2011
- 8 Giannoulis D, Calori GM, Giannoudis PV. Thirty-day mortality after hip fractures: has anything changed? *Eur J Orthop Surg Traumatol* 2016; **26**: 365-370 [PMID: 26943870 DOI: 10.1007/s00590-016-1744-4]
- 9 Jimenez ML, Tile M, Schenk RS. Total hip replacement after acetabular fracture. *Orthop Clin North Am* 1997; **28**: 435-446 [PMID: 9208835]
- 10 Rickman M, Young J, Trompeter A, Pearce R, Hamilton M. Managing acetabular fractures in the elderly with fixation and primary arthroplasty: aiming for early weightbearing. *Clin Orthop Relat Res* 2014; **472**: 3375-3382 [PMID: 24452793 DOI: 10.1007/s11999-014-3467-3]
- 11 Sah AP, Estok DM. Dislocation rate after conversion from hip hemiarthroplasty to total hip arthroplasty. *J Bone Joint Surg Am* 2008; **90**: 506-516 [PMID: 18310700 DOI: 10.2106/JBJS.G.00479]
- 12 Alberton GM, High WA, Morrey BF. Dislocation after revision total hip arthroplasty: an analysis of risk factors and treatment options. *J Bone Joint Surg Am* 2002; **84-A**: 1788-1792 [PMID: 12377909]
- 13 Ward AJ, Chesser TJ. The role of acute total hip arthroplasty in the treatment of acetabular fractures. *Injury* 2010; **41**: 777-779 [PMID: 20579996 DOI: 10.1016/j.injury.2010.05.020]

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