



## Original Article

## Mortality in patients sustaining a periprosthetic fracture following a hemiarthroplasty

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## ABSTRACT

Periprosthetic fractures of the proximal femur after hip hemiarthroplasty are an increasing concern. The aim of this study was to analyse the 30 day mortality of periprosthetic fractures around a hip hemiarthroplasty. A retrospective case review at a single institution. 32 patients. Mean age 76.5, 16 males and 16 females. 13% underwent non-operative treatment, 50% open reduction internal fixation and 38% revision arthroplasty. 30 day mortality was 12.5% and 1 year mortality 28.1%. Time to surgery was the only significant risk factor for 30 day mortality Periprosthetic fractures following a hip hemiarthroplasty have high 30 day mortality.

## 1. Introduction

Periprosthetic fractures of the proximal femur after hip hemiarthroplasty are an increasing concern in orthopaedics. There are approximately 65,000 hip fractures per year in the UK.<sup>1</sup> As outcomes continue to improve and mortality rates decrease, patients are surviving longer at a higher functional state. This increases the risk of these patients sustaining a periprosthetic fracture.<sup>1,2</sup> These patients are usually elderly with a number of medical co-morbidities and pose significant surgical and anaesthetic challenges.

The surgical treatments of these fractures are complex and depend on the patients co-morbidities, the fracture pattern and stem stability.<sup>3,4</sup> The two commonly used options are open reduction internal fixation of the femoral fracture or revision arthroplasty. Fractures around a stable implant or distal to it are usually treated with open reduction internal fixation. An advantage of this method of treatment is that this can be performed by the majority of orthopaedic trauma surgeons. An unstable stem usually requires a revision arthroplasty procedure which can only be performed by a specialist revision hip surgeon.<sup>3,4</sup>

Whilst there have been several studies on mortality following periprosthetic fractures in total hip replacements, there have been very few in those following hemiarthroplasty.<sup>5,6</sup>

The aim of this study was to analyse the 30 day mortality of periprosthetic fractures around a hip hemiarthroplasty. Secondary outcomes included 1 year mortality, the time patients were waiting for surgery and an assessment of other risk factors associated with mortality.

## 2. Materials and methods

A retrospective case review of all proximal femoral periprosthetic fractures between 1st January and 2008 and 31st March 2015 at a single institution.

Patients were identified by using a hospital database of periprosthetic fractures and by identification through ICD codes, S72.1 Pertrochanteric fracture, S72.2 Subtrochanteric fracture, S72.3 Fracture of shaft of femur, S72.4 Fracture of lower end of femur, S72.7 Multiple fractures of femur, S72.8 Fractures of other parts of femur, S72.9 Fracture of femur, part unspecified. All radiographs of patients with these codes were reviewed for inclusion.

The inclusion criteria were any patient presenting to the Orthopaedic team with a periprosthetic fracture around a hemiarthroplasty. Patients were excluded if they had a total hip replacement, an intra-operative fracture or if the fracture was in the metaphysis or epiphysis of the distal femur.

The Vancouver classification system was used to classify these fractures. The fractures were reviewed by the 2 authors independently and in those with debate about classification, a consensus decision was made.

A retrospective case note review was undertaken identifying patient demographics, living status, mobility, ASA and co-morbidities. Initially the pre-operative AMTS score was to be included. Capacity was presumed if patients had signed a consent form 1 for surgery or had a recorded pre-operative AMTS of 7 or more.

Operation notes were reviewed for operative technique, and time of surgery. Surgery start time was taken as time of the first vital sign

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observations taken in the anaesthetic room as recorded in the anaesthetic charts. ASA grade was taken from anaesthetic charts.

Time of diagnosis was collected from emergency admission documentation.

Pre-operative blood results were recorded from the blood results taken immediately prior to surgery.

The Charlson Co-Morbidity score was designed and validated as a tool to assess 1 year mortality. A score is calculated based on patients co-morbidities. It consists of 17 co-morbidities with each being given a certain number of points. These are added to calculate the Charlson co-morbidity score, with the risk of 1 year mortality increasing as the score increases.<sup>9</sup>

The Nottingham Hip Fracture score is a validated scoring system that predicts 30 day mortality in hip fracture patients. The score is based on age, sex, number of co-morbidities, mini-mental test score, admission haemoglobin, living in an institution, and presence of malignant disease.<sup>10</sup>

Date of discharge was collected from hospital records from discharge letters.

Primary outcome was 1 year mortality. This was found from hospital records, as was 30 day mortality.

Statistical Analysis was undertaken using Minitab Version 17. The Mann Whitney U Test was used for parametric data and the Chi squared test for non-parametric data. A P value of 0.05 was considered statistically significant.

### 3. Results

There were 32 patients who sustained a fracture around a hip hemiarthroplasty. All these occurred in previously cemented hemiarthroplasties.

The mean age was 76.5 (57–96). There were 16 males and 16 females. 29 (90.6%) patients had capacity to consent for surgery. Pre-operatively 9 (28.1) mobilised independently without any walking aids, 14 (43.8%) mobilised with 1 stick, 3 (9.4%) mobilised with 2 aids and 6 (18.8%) mobilised with a frame. 26 (81.2%) lived at home, whilst 6 (18.8%) lived in institutional care prior to fracture.

17 (53.1%) had a Charlson co-morbidity score of 0 or 1, 10 (31.3%) had a score of 2 or 3, 0 had a score of 4 and 5, and 5 (15.6%) had a score of more than 5.

Nottingham Hip Fracture Score was 0–1 in 2 patients, 2-3 in 1 patient, 3-4 in 19 patients and greater than 5 in 10 patients.

The ASA grade of patients was 1 (3.1%) ASA 1, 11 (34.4%) ASA2, 14 (43.8%) ASA 3 and 6 (18.8%) were ASA 4.

The mean pre-operative GFR was 66ml/min/1.73 m<sup>2</sup>. 8 patients had CKD stage 1, 15 CKD stage 2, 7 CKD stage 3, 2 patients with CKD stage 4.

The mean Hb was 118g/L (77–149). In those alive at 1 year the mean was 120g/L and in those that died within 1 year the mean was 114g/L (p = 0.2801).

According to the Vancouver classification there were 6 (18.8%) Vancouver B1 fractures, 10 (31.3%) Vancouver B2 fractures, 9 (28.1%) Vancouver B3 fractures and 7 (21.9%) Vancouver C fractures.

4 (12.5%) underwent non-operative treatment, 16 (50%) underwent open reduction internal fixation and 12 (37.5%) underwent revision arthroplasty.

Of the 6 Vancouver B1 fractures 3 underwent open reduction internal fixation, 1 underwent revision and 2 underwent conservative treatment.

Of the 10 Vancouver B2 fractures 4 underwent open reduction internal fixation, 5 underwent revision and 1 underwent conservative treatment.

Of the 9 Vancouver B3 fractures 2 underwent open reduction internal fixation, 6 underwent revision and 1 underwent conservative treatment.

Of the 7 Vancouver C fractures, all underwent open reduction

**Table 1**  
30 day mortality.

	Alive at 30 days	Dead at 30 days	P Value
Age	78.5	81.3	0.6223
Sex	Males 16	Males 1	0.2281
	Females 12	Females 3	
Time to surgery	248.00	94.12	0.0170
ASA	ASA 1 1	ASA 1 0	0.3904
	ASA 2 10	ASA 2 1	
	ASA 3 13	ASA 3 1	
	ASA 4 4	ASA 4 2	
Capacity	Capacity 26	Capacity 3	0.2517
	None 2	None 1	
Residential Status	Home 26	Home 3	0.7529
	Institutional 2	Institutional 1	
Pre-op mobility	Independent 8	Independent 1	0.907304
	1 aid 12	1 aid 2	
	2 aids 2	2 aids 1	
	Zimmer 6	Zimmer 0	
Charlson co-morbidity score	0-1 16	0-1 0	0.3371
	1-2 8	1-2 2	
	3-4 0	3-4 0	
	> 5 4	> 5 1	
Nottingham Hip Fracture Score	0 2	0 0	0.8794
	1-2 1	1-2 0	
	3-4 16	3-4 3	
	> 5 9	> 5 1	

internal fixation.

The mean time to surgery from admission was 105 h. 7 out of 28 (25%) patients underwent surgery within 36 h. The mean time to surgery in those undergoing open reduction internal fixation was 68.3 h (range 16–280), and those undergoing revision was 150 h (range 7–331). (p < 0.001).

The mean length of stay was 16 days (6–27).

There were 2 (6.3%) in-patient deaths. The 30 day mortality 12.5% (4 patients) was and the 1 year mortality was 28.1% (9 patients).

There were 0 readmissions and 0 re-operations in this group of patients.

Time to surgery was the only significant risk factor for 30 day mortality (p = 0.0170), and lack of capacity was the only significant risk factor for 1 year mortality (p = 0.0036). (Tables 1 and 2).

**Table 2**  
1 year mortality.

	Alive at 1 year	Dead at 1 year	P Value
Age	77.2	83.1	0.5874
Sex	Males 13	Males 4	0.5381
	Females 10	Females 5	
Time to surgery	109.86	103.52	0.8757
ASA	ASA 1 1	ASA 1 0	0.2425
	ASA 2 10	ASA 2 1	
	ASA 3 9	ASA 3 5	
	ASA 4 3	ASA 4 3	
Capacity	Capacity 23	Capacity 6	0.0036
	None 0	None 3	
Residential Status	Home 19	Home 7	0.7529
	Institutional 4	Institutional 2	
Pre-op mobility	Independent 6	Independent 3	0.9073
	1 aid 11	1 aid 3	
	2 aids 2	2 aids 1	
	Zimmer 4	Zimmer 2	
Charlson co-morbidity score	0-1 15	0-1 2	0.1624
	1-2 5	1-2 5	
	3-4 0	3-4 0	
	> 5 3	> 5 2	
Nottingham Hip Fracture Score	0 0	0 2	0.2603
	1-2 0	1-2 1	
	3-4 4	3-4 15	
	> 5 5	> 5 5	

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