Injury, Int. J. Care Injured xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

A prospective study with ten years follow-up of two-hundred patients with proximal femoral fracture

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ARTICLE INFO

Article history:
Received 18 November 2017
Received in revised form 19 February 2018
Accepted 25 February 2018

Keywords:
Hip fractures
Long term follow-up
Complications
Contralateral fractures
Outcome

ABSTRACT

Background: The proximal femoral fracture is one of the most common injuries in the elderly. Nevertheless, no results beyond the second year post surgery have been reported in the literature. Therefore, the purpose of this study was to evaluate any revision and mortality within 10 years follow-up as well as the walking ability of still alive patients.

Methods: A total of 200 consecutive patients were included. A prospective database was first used to collect the demographic data. Exactly ten years after the surgery, a final evaluation was conducted by telephone for every patient. Any revision, any contralateral as well as other fractures and the date of death were recorded. For all patients who were still alive, the mobility score according to Parker was also surveyed.

Results: The average age was 79.0 years (SD: 12.5); women were affected at higher numbers (73.5%). The total surgical revision rate was 17.5% (35/200), due in particular to hematoma (9×) or infection (7×). A surgical revision later than two years was only needed in three patients (1.5%).

The risk of another fracture caused by a fall was 19% (38/200), most often a contralateral femoral fracture (22/200; 11%) that happened on average 51.9 months (1–97) after the initial surgery. The risk of a contralateral femoral fracture was 15.4% (22/143) in patients who survived the first year post surgery. The postoperative mortality was 1, 2, 5 and 10 years or 23.5%, 32.5%, 55% as well as 81.5%, respectively. An average Parker's mobility score of 6.3 points (0–9) was determined for the 37 patients (18.5%) who were still alive at the time of the follow-up.

Conclusion: The long-term study showed that revision surgery was only required in 3/200 patients (1.5%) beyond the second year of that surgery. On the other hand, more than half of all patients had already passed away five years after the initial surgery. The exact incidence of a contralateral femoral fracture was 11.9%, climbing to 15.4% if the patient survived at least one year. Nearly every fifth patient experienced another fall resulting in a severe fracture requiring treatment during the long-term course.

Introduction

Aside from distal radial as well as proximal humerus fractures, proximal femoral fractures are among the most common fractures in old age [1]. These injuries can easily be the exclusive result of a trivial fall. Based on the steady rise in age, a further increase in the post-surgical survival is likewise expected, even though 20% to 30% of patients with proximal femoral fractures pass away during the first year post surgery [2–4]. Registry data with high case numbers have also been presented in the literature in the meantime, but they only represent short-term and usually in-patient results [5,6].

As mentioned, no analyses have been conducted over a period of ten years post surgery beyond that, in particular with regard to the precise incidence of a renewed fracture, and more specifically, a contralateral femoral fracture. Furthermore, no valid data has been published on revision surgeries during the late follow-up period, such as aseptic loosening or *peri*-implant or periprosthetic fractures. Therefore, the authors conducted this study to evaluate the exact incidence rate of a contralateral femoral fracture, any revision and mortality rate within 10 years follow-up, as well as the walking ability of still alive patients.

Material and methods

A total of 200 consecutive patients who underwent surgery at our level 1 trauma centre for a proximal femoral fracture between 01/01/2006 and 20/02/2007 fulfilled the inclusion criteria for this

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https://doi.org/10.1016/j.injury.2018.02.026
0020-1383/

prospective and monocentric cohort study. The inclusion criteria were a neck or a (sub)trochanteric fracture, extending not more than 5 cm below the lesser trochanter. The exclusion criteria were an age below 18 years at the time of the surgery, femoral head fractures (AO/OTA classification [7]: 31-C) as well as histologically confirmed pathological, benign or malignant fractures – except for osteoporotic femoral fractures. No simultaneous bilateral proximal femoral fractures were diagnosed during the course of the study.

First, the demographic data was collected from a prospectively created database containing a total of 13 variables (see Table 1). Furthermore, any revision surgeries with regard to the index surgery (including two hip dislocations without surgical revision), any other fractures that occurred and required treatment, as well as the date of death for deceased patients were documented. Any revision for an infection needed the criteria and definition from the workgroup of the Musculoskeletal Infection Society [8]. Missing data was collected by telephone, by contacting the patients, family members or general practitioners. Exactly ten years post surgery, all patients who were still alive were again contacted by telephone, and the current degree of mobility using the Parker's mobility score was additionally recorded for them [9].

The study was approved by our institutional review board, and the informed consent for participating in the study was obtained from all contacted patients.

Statistics

Statistical analyses were performed using SPSS for Windows, Version 24.0 (SPSS Inc., USA). Metric variables were presented as mean values, while the ranges were specified as standard deviations. The normal distribution of metric variables was assessed using the Shapiro-Wilk test. All tested variables did not show a normal distribution (Shapiro-Wilk test: $p < 0.05$). Therefore, for comparing samples without a normal distribution, the Mann-Whitney-U test (as a non-parametric method) was used. Categorised data were analysed using the Fisher's exact test. A two-sided significance test was performed for all of the tests, and a p-value < 0.05 was considered to be statistically significant for all of the statistical tests. The survival analysis was performed using the Kaplan-Meier curve [10].

Results

We were able to contact all 200 consecutive patients directly or indirectly; thus, the follow-up is exactly 100% due to the following target criteria: any revision, mobility status, and mortality.

Women were affected at higher rates (n = 147; 73.5%); the average age of the overall collective at the time of surgery for the proximal femoral fracture was 79.0 years (32–101; SD: 12.5). The typ of fractures due to the AO/OTA classification [7] was very heterogenic (21 × 31-A1; 87× A2; 5× B1; 7× B2; 80× B3). The other basic demographic data are illustrated in Table 1, which also shows that osteosynthesis was used in trochanteric fractures, whereas arthroplasty was performed for cervical fractures. Moreover, the surgical implantation of an endoprosthesis following admission to the emergency department was performed at a significantly later time than osteosynthesis (37.1 versus 19.6 h)

The total revision surgery rate with respect to the initial surgery was 17.5% (Table 2), with 23/35 complications treated within 30 days and a total of 31/35 within one year post surgery. Only three revision surgeries were performed later than two years after the initial surgery (one *peri*-implant, two periprosthetic femoral fractures). Revision surgery for aseptic loosening was likewise only required once in ten years. The individual indications are illustrated in Table 2, with hematomas and infections accounting for almost 50% of all revisions. Failure of osteosynthesis included 6× cut out and 2× secondary fracture dislocation. Therefore, osteosynthesis was associated with a higher rate of revision surgeries, albeit without statistical significance (p = 0.573).

An additional analysis revealed that nearly every fifth patient (38/200; 19%) had experienced at least one or even two (nine patients) other fractures requiring treatment in connection with a renewed fall in the long term (Table 3). Of these 47 documented fractures in total, 36 (76.6%) were treated surgically.

Contralateral femoral fractures were by far the most common occurrences (22 patients), on average 4.3 years (range 13–97 months) after the initial surgery. The exact analysis of the incidence of contralateral femoral fractures is shown in the flow chart (Fig. 1). It documents an incidence rate of exactly 11.9% (22/185 patients) within ten years. All patients who already had an implant assembled in-situ for a contralateral fracture of the proximal femur at the time of the initial surgery were excluded from this analysis. And if only those patients are considered who survived at least one year post surgery, the risk of a contralateral femoral fracture was 15.4% (22/143). The gender-specific risk of a contralateral femoral fracture was markedly higher in women (12.9% versus 5.7%), albeit without statistical significance (p = 0.202; Fischer's exact test). Likewise, no statistically significant difference was determined between osteosynthesis and endoprosthesis (12.2% versus 9.4%; p = 0.650; Fisher's exact test) with regard to a contralateral femoral fracture.

Table 1
Basis demographic data of the total 200 consecutive patients.

Variables	total	Osteosynthesis	Endoprosthesis	Statistic value
Age/years (mean)	79.0	78.1 (SD 14.3)	80.2 (SD 9.3)	0.961
Sex female/male	147/53	79/36	68/17	0.077
Side right/left	102/98	55/60	47/38	0.319
Cervical neck/trochanteric fractures	92/108	10/105	82/3	0.000
BMI (Body mass Index)	25.6	25.5 (SD 4.3)	25.8 (4.7)	0,626
Creatinine initial mg/dl (0.7-1.2)	1.0	0.96 (SD 0.4)	1.1 (SD 0.6)	0.273
CRP initial mg/l (0–5)	19.2	19.2 (SD 34.2)	19.2 (SD 28.0)	0.291
Hemoglobin initial g/dl (14–18)	12.6	12.5 (SD 1.7)	12.7 (SD 1.5)	0.308
ASA 3/4 [19]	154/13	90/6	64/7	0.511
Dementia	78	46	32	0.771
Interval/h (A)	27.0	19.6 (SD 17.3)	37.0 (SD 31.7)	0.000
Duration of surgery/minutes	68	63 (SD 26)	74 (SD 20)	0.000
red blood cell concentrate/Units	1.7	1.4 (SD 1.6)	2.2 (SD 1.9)	0.002
Surgical Revisions	35	22	13	0.573
contralateral femoral fractures	22	14	8	0.650

(A) Interval in hours between arrival at emergency room and starting surgery/skin incision).
[21] ASA. New classification of physical status. Anaesthesiology 1963;24:111.

Please cite this article in press as: M. Galler, et al., A prospective study with ten years follow-up of two-hundred patients with proximal femoral fracture, Injury (2018), https://doi.org/10.1016/j.injury.2018.02.026