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Comparable Cumulative Incidence of Late Periprosthetic Femoral Fracture and Aseptic Stem Loosening in Uncemented Total Hip Arthroplasty—A Concise Follow-Up Report at a Minimum of 20 Years

Moritz M. Innmann, MD [a], Marcus R. Streit, MD, MSc [a], Thomas Bruckner, PhD [b], Christian Merle, MD, MSc [a], Tobias Gotterbarm, MD [a, *]

[a] Department of Orthopaedic and Trauma Surgery, University of Heidelberg, Heidelberg, Germany
[b] Institute of Medical Biometry and Informatics, University of Heidelberg, Heidelberg, Germany

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ABSTRACT

Background: There is a lack of long-term studies into the third decade reporting on the incidence of periprosthetic femoral fracture (PPFF) and aseptic stem loosening (ASL) after cementless total hip arthroplasty (THA). The aim of the present retrospective, longitudinal cohort study was to compare the cumulative incidence of PPFF and ASL in a consecutive cohort of 326 patients with 354 primary uncemented THAs after 20-25 years and to identify risk factors being associated with PPFFs.
Methods: Postoperative femoral fractures were investigated for timing, mechanism of injury, Vancouver classification, and subsequent treatment. The cumulative incidence of PPFF and ASL was estimated using Kaplan-Meier survival analysis. Risk factors for PPFFs were analyzed using a Cox proportional hazards regression model.
Results: One hundred sixty-three patients (180 hips) were available for follow-up at a mean of 22 years. Twenty-one fractures occurred during the follow-up period. The cumulative incidence of PPFF was 1.6% at 10 years, 4.5% at 17 years, and 9.4% at 22 years after surgery. The cumulative incidence of PPFF and ASL after 22 years was comparable (9.4% [95% confidence interval, 5.9%-14.7%] and 6.9% [95% confidence interval, 4.5%-10.5%]). Gender, age at surgery, diagnosis, cup revision, and canal fill index of the stem in the proximal femur were no risk factors for the occurrence of a PPFF.
Conclusion: The cumulative incidence of PPFF after primary uncemented THA further increased in the second decade and reached the incidence of ASL in the third decade, while no risk factors for the occurrence of a PPFF could be identified.

We previously reported the cumulative incidence of periprosthetic femoral fracture (PPFF) at a mean of 17 years (range, 15-20 years) after 354 consecutive primary uncemented total hip arthroplasties (THAs). In our previous report, we found an increase in the cumulative incidence of PPFF from 1.6% at a mean of 10 years to 4.5% at 17 years [1]. For the first time, a recently published institutional registry study on 32,644 primary THAs reported a high cumulative incidence of PPFF of 7.7% for uncemented stems after 20 years [2]. There is still a substantial lack of data reporting on the modes of failure in uncemented THA in the third decade. Besides the advantages of registry studies, the drawback that not every patient can be followed up in detail should be acknowledged. Therefore, the cumulative incidence of PPFF might still be underestimated. This lack of knowledge can be closed by retrospective cohort studies with a high rate of follow-up in the long term after cementless THA.

Therefore, the primary aim of the present update of our previous report was to determine the cumulative incidence of PPFFs in the third decade and compare it to the incidence of aseptic stem loosening (ASL), following a consecutive cohort of primary uncemented

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Ethical review committee statement: Institutional review board–approved study.

* Reprint requests: Tobias Gotterbarm, MD, PhD, Department of Orthopaedic and Trauma Surgery, University of Heidelberg, Schlierbacher Landstrasse 200a, 69118 Heidelberg, Germany.

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THAs after 20-25 years. Our secondary aim was to identify demographic risk factors, clinically relevant features of the fractures, and subsequent treatment strategies employed.

Patients and Methods

We retrospectively reviewed a consecutive series of 326 patients (354 hips) who had undergone primary uncemented THA with a straight, tapered titanium stem (CLS Spotorno, Zimmer Inc, Warsaw, IN) between January 1985 and December 1989. Data were retrieved, using the institutional total joint registry, in which preoperatively and postoperatively outcomes were prospectively recorded in regular intervals at 3 months, 6 months, 1 year, and every 5 years thereafter. Postoperative PPFFs were analyzed based on demographic details (age, gender), time point, mechanism of injury, fracture type (Vancouver classification), and fracture treatment. Inclusion criteria for the use of the uncemented stem were absence of severe femoral canal deformity and adequate bone stock according to the index of Singh et al [3,4]. The surgical techniques and survival rates with this device have been described previously [1].

Radiographs were evaluated for stem alignment in the coronal and sagittal plane, stem subsidence, and the femoral canal fill index as described earlier [1]. Stems were considered as undersized with a canal fill index of ≤80% [5]. Fractures were classified by 2 independent reviewers according to the internationally validated Vancouver classification with respect to site of the fracture, stability of implant, and quality of surrounding bone (A_G: at the greater trochanter, A_L: at the lesser trochanter, B_1: around a well-fixed stem, B_2: around a loose stem with adequate bone, B_3: around a loose stem with poor proximal bone stock, C: below the tip of the stem) [6–9]. The mechanism of injury leading to PPFF was categorized as minor trauma (fall to the floor from standing or sitting position), major trauma (high-energy trauma, eg, traffic accidents), and spontaneous (without a fall or obvious trauma) [1].

The cumulative incidence of postoperative periprosthetic fracture and ASL was estimated using Kaplan-Meier survival with 95% confidence intervals (CI) [2]. Patients were censored at death, at stem revision unrelated to periprosthetic fracture, or at the end of follow-up, whichever came first. The hazard ratios for risk factors being associated with the event of a PPFF were calculated using a Cox regression model. Continuous variables between groups were compared using the Mann-Whitney *U* test. We considered *P* values of <.05 to be significant. SPSS version 22.0 (SPSS Inc, Chicago, IL) and GraphPad Prism version 5.0 (GraphPad Software, San Diego, CA) were used to record and analyze the collected data.

All patients gave informed consent before inclusion in the study. The study was approved by the institutional review board of the University of Heidelberg (346/2004) and conducted in accordance with the Helsinki Declaration of 1975, as revised in 2008.

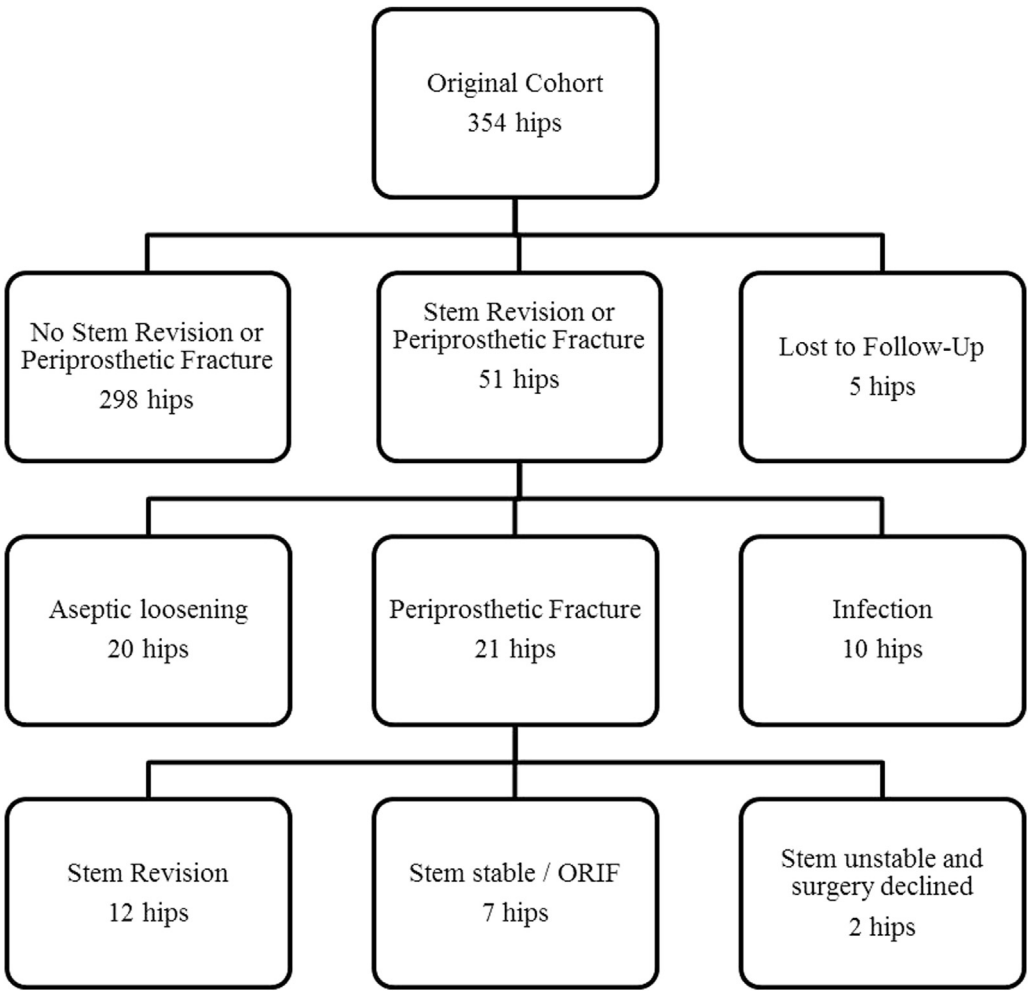

Fig. 1. Flowchart illustrating the distribution of hips at a mean of 22 years (20-25) postoperatively. ORIF, open reduction and internal fixation.