

Initial Misdiagnosis of a Traumatic Ceramic Femoral Head Fracture

Mohammad H. Fard-Aghaie[†], Mustafa Citak[†], Joao Correia[†], Carl Haasper[†], Thorsten Gehrke[†],
and Daniel Kendoff[†]

A destructive ceramic head fracture was diagnosed 1 year after a serious motorcycle accident in a patient who had undergone primary THA 7 years earlier.

Introduction

In the 1970s, Boutin implemented ceramic in modern total hip arthroplasty (THA). Although initial fracture rates of 13.4 % for ceramic heads were described before the 1990s, the inferior rate of wear and friction when compared with metallic heads and the optimized tribology were promising in THA [1-3]. Gradual improvements in processing of the material led to a significant reduction of the fracture rate to below 0.1 % [3]. Thus, alumina ceramic heads have currently become the standard material in THA with ceramic bearing surfaces.

Nevertheless, multiple case reports have been published describing ceramic head fractures [4-11]. The causes of fractures are diverse and vary from traumatic events [5,9,12,13] to impingement between the neck and the liner rim [7]. Spontaneous fractures without any history of trauma have also been described [4,6,8,10,11]. However, only two reports describing delayed fractures of ceramic heads were found [12,13].

In this report, we present a 24-year old patient who underwent primary THA at our institution and was a victim of high-energy trauma 7 years later. Initial radiographs were misinterpreted in a non-designated total joint clinic at the time of primary admission (after the accident). A destructive ceramic head fracture was diagnosed more than 1 year after initial



Figure 1. Anteroposterior pelvic radiograph (24-year-old male) after primary THA for secondary osteoarthritis due to Perthes disease (right hip: cementless CFP stem and TOP acetabular cup; left hip: hybrid THA with cemented ENDO Mark III stem + cementless TOP acetabular cup; Waldemar Link GmbH, Hamburg, Germany).

trauma at our institution, with major destruction of the ceramic head and the remaining THA.

This was followed by an extensive revision. Based on this experience, the general question of adequate radiographic diagnosis after trauma to a THA, especially one with partial or full ceramic bearing surfaces, will be further discussed in this report.

Case Report

A 24-year old patient with secondary osteoarthritis of the hips due to Legg-Calve-Perthes disease underwent primary hybrid THA of the left hip seven years before trauma, followed by primary cement-

[†] Orthopaedic Department, Helios ENDO-Klinik Hamburg, Germany

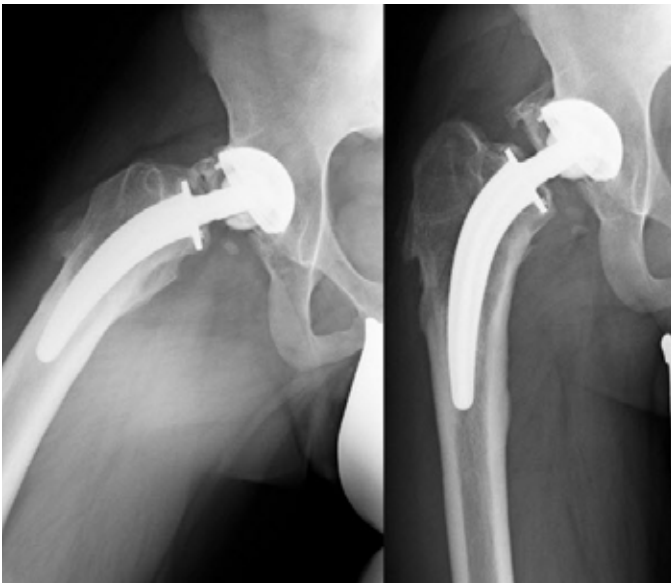


Figure 2. Conventional pelvic radiographs directly after trauma, revealing ceramic head fracture.

less THA of the right hip 1 year later at our institution (Figure 1).

Six years after the right THA, he was involved in a motorcycle accident, in which he suffered direct trauma to this hip, as well as a complex ankle fracture that was treated in a smaller regional hospital on admission.

Although initial anteroposterior radiographs of the pelvis and right hip axial views were performed, no signs of fractures, aseptic loosening, or implant damage were diagnosed by the attending trauma surgeons (Figure 2). Two weeks after surgical treatment of the ankle fracture, the patient noticed a sudden “cracking” sound in his right hip, as well as shortening of the right lower limb. Interestingly, the patient had no relevant pain.

Despite this sign, he had no further medical observation or secondary radiographic evaluation over the next month. In the following months, he was increasingly troubled by back pain and an unpleasant cracking “phenomenon” with movement of his right hip; no severe hip pain or associated direct thigh pain was mentioned at any time.

Further conventional radiographs, in two planes, more than a year after the initial radiographs, revealed a completely destroyed, multi-fragmented ceramic head (Figure 3).

A thorough clinical examination revealed a shortening of 2 cm of the right lower limb, yet the patient was able to walk without relevant pain.



Figure 3. Anteroposterior pelvic radiograph 8 months after the initial radiographs, showing a fractured ceramic head.

Management

Intraoperatively, extensive damage of the ceramic head and correlating taper junction of the femoral neck was found (Figures 4-6). Concomitantly, there was severe debris-related metallosis throughout the entire joint (Figure 7).

The intervention consisted of conversion of the short cementless CFP stem to a cementless revision stem and an acetabular cup revision to a ceramic-ceramic bearing surface (Alloclassic stem and Allofit-IT acetabulum with Delta Ceramic Inlay, Zimmer, Warsaw, Indiana, USA, and CeramTec, Plochingen, Germany).

Meticulous debridement of all affected soft tissues and extensive lavage were also performed.

The postoperative course was uneventful, with radiographs revealing a correct position and articulation of the cementless implant (Figure 8).

A 12-month postoperative inquiry was performed and the Oxford Hip Score obtained, with both indicating satisfactory joint function [14]. The patient had no pain and was able to perform his daily activities.

Discussion

Although a relatively rare complication in modern THA, the described ceramic head fracture was misinterpreted in initial radiographs, which showed a discreet fracture of the ceramic head. Two assumptions



Figure 4. Intra-operative image showing countless debris and the damaged taper junction of the femoral neck (in situ).



Figure 5. Intra-operative image showing the fragmentation of the ceramic head.

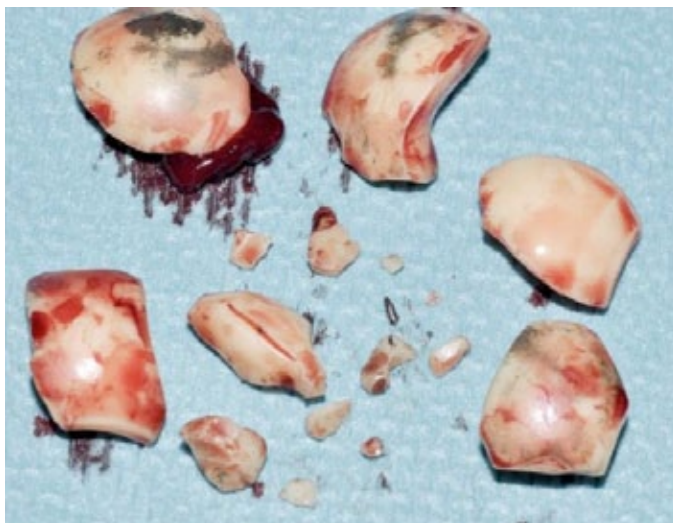


Figure 6. Image showing the explanted components: a fragmented ceramic head, a damaged stem, and acetabular cup and liner.



Figure 7. Intra-operative image showing debris with ceramic fragments.



Figure 8. Postoperative anteroposterior pelvic radiograph.

can be made which led to this misdiagnosis. Firstly, the complex ankle fracture was probably more painful than the ceramic head fracture and this misled the surgeons. Secondly, although the initial radiographs revealed a ceramic head fracture, the staff at the initial center of admission did not have the training necessary to reach the correct diagnosis.

The “cracking sound” incident 2 weeks after trauma, as described by the patient, was probably due to the complete fracture of the ceramic head. Ultimately, a multi-fragmented ceramic head fracture was diagnosed 1 year later. This raises the question of the need of a possible guideline or recommendation for patients suffering acute trauma of the lower limb with a total hip arthroplasty, especially those with ceramic bearing surfaces.

This case remarkably demonstrates the variability and intensity of symptoms: When one considers the implants' damage, the patient was able to walk without any pain originating from the hip. His only complaint was mild back pain over the subsequent months. This clearly represents a challenge for the assisting physician to obtain a correct diagnosis. The

post-traumatic patient who previously underwent THA should therefore be carefully followed. We suggest a close follow-up including repeat conventional radiographs several weeks after trauma. Furthermore, in some cases, a CT-scan could provide the correct diagnosis [15].

Ultimately, if a definitive diagnosis cannot be assured at the initial assessment center (eg, a low-volume or non-dedicated joint replacement center), consideration should be given to transferring the patient to a dedicated joint replacement center.

We present our case report to increase awareness among physicians and training staff who treat trauma patients with a previous total joint replacement and to expedite the diagnosis of possible post-traumatic implant fractures/failures in the future.

Acknowledgements

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article. No funds were received in support of this study.

Source

Fard-Aghaie MH, Citak M, Correia J, Haasper C, Gehrke T, Kendoff D. Traumatic Ceramic Femoral Head Fracture: An Initial Misdiagnosis. *The Open Orthopaedics Journal* 2012; 6:362-5. doi: 10.2174/1874325001206010362. <http://www.benthamscience.com/open/toorthj/articles/V006/362TOORTHJ.pdf>

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