



Case report

Avascular necrosis of the femoral head at 2 years after pertrochanteric fracture surgery: Case report



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H I G H L I G H T S

- Avascular necrosis of the femoral head.
- Operative management.
- Postoperative rehabilitation.
- Complications.

A R T I C L E I N F O

Article history:

Received 16 September 2015

Received in revised form

30 November 2015

Accepted 19 December 2015

Keywords:

Petrochanteric fracture

Gamma nail

Avascular necrosis

A B S T R A C T

Introduction: The avascular necrosis of the femoral head represents the death of bone tissue due to the lack of blood supply. The disease has a progressive evolution and left untreated leads to femoral head collapse and severe arthritis.

Case presentation: We present a case of a pertrochanteric fracture which has been successfully operated with a dynamic interlocking trochanteric gamma nail on the right hip. At 2 years after surgery the patient developed an incipient avascular necrosis of the femoral head. Despite the good positioning of the implant, we considered that the source of the pain was an intolerance of the implant, and thus we removed it. After implant removal, the patient was kept under observation and conservative treatment, to prevent further damage to the right hip and allow the healing to occur. At 6 months after the gamma nail was removed the X-rays revealed advanced avascular necrosis of the femoral head and secondary osteoarthritis on the right hip. The patient underwent surgery with an uncemented total hip arthroplasty.

Discussion: There are a few discussions regarding the avascular necrosis of the femoral head. These discussions may include the predisposing risk factors, the treatment of choice and the postoperative complications.

Conclusion: The avascular necrosis of the femoral head is a complication of pertrochanteric fractures that can not be foreseen or avoided. The optimal treatment in these cases is uncemented total hip arthroplasty.

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1. Introduction

The avascular necrosis of the femoral head represents the death of bone tissue due to the lack of blood supply. There are two main

groups of vessels which supplies the periphery of the femoral head: the inferior metaphysical and the lateral epiphysial vessels. The damage of the lateral epiphysial vessels is the most important cause of avascular necrosis of the femoral head. This complication occurs more often in intracapsular hip fractures then in extracapsular fractures. The disease has a progressive evolution and untreated leads to femoral head collapse and severe arthritis. In the young

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population, avascular necrosis can be caused by non-traumatic events such as steroid medication, alcohol excess, blood clotting disorders and any other affection that may cause bad blood-flow at the femoral head.

In our study, we present a patient with a pertrochanteric fracture that developed avascular necrosis of the femoral head, 2 years after surgery. We used the Ficat classification system for avascular necrosis, because it is a common system based on clinical examination and standard radiographs [1]. There are only a few similar cases described in the published literature because this complication does not occur very often.

2. Case presentation

We present the case of a 67 year old man, with previous medical history of Grade I hypertension and current smoking history (a pack of cigarettes a day), who presented into the Emergency Department with severe pain in the right hip and inability to walk caused by an accidental fall from the same level. A standard emergency antero-posterior radiograph showed an Evans type II [2] pertrochanteric fracture of the right hip (Fig. 1). The patient was operated with a dynamic interlocking trochanteric gamma nail (Fig. 2). There were no intraoperative or postoperative complications. The recovery plan began in the second postoperative day, with partial weight bearing on the right lower limb, and 3 months after the surgery, the patient could walk unassisted. At 6 months the radiographs showed union of the right hip fracture (Fig. 3). 2 years after the operation, the patient presented moderate pain on the right hip and limited joint mobility with no history of recent trauma. The antero-posterior radiograph revealed incipient avascular necrosis of the femoral head, Ficat stage 2 [2] (Fig. 4). Despite that the gamma nail was in a good position we considered that the source of the pain was the intolerance to the implant. The patient was operated again and the



Fig. 1. Preoperative antero-posterior radiograph.

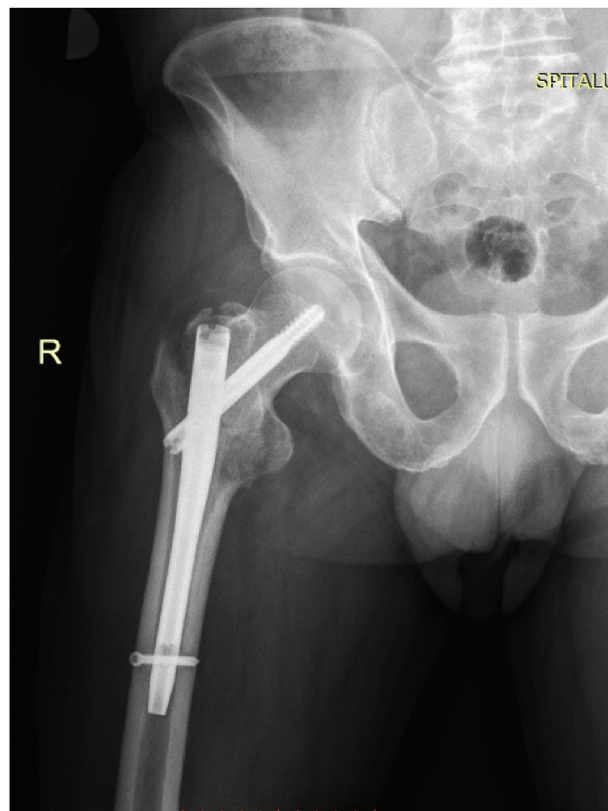


Fig. 2. Postoperative antero-posterior radiograph.

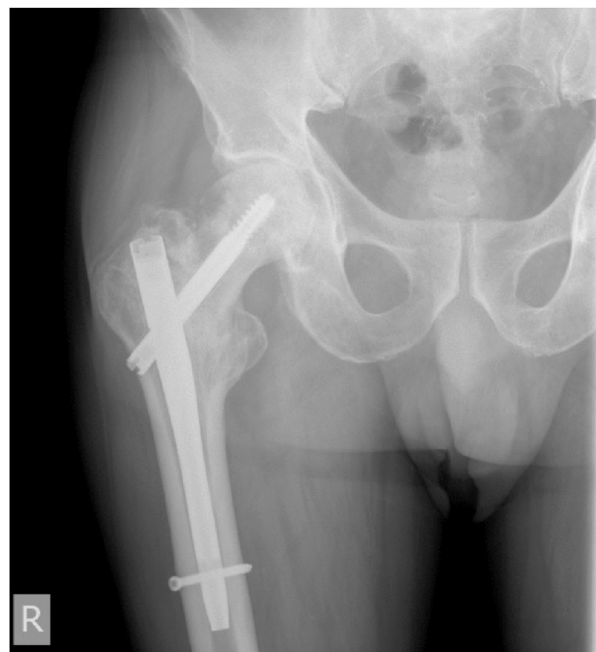


Fig. 3. Antero-posterior radiograph at 6 months.

gamma nail on the right hip was removed (Fig. 5). Postoperative the evolution was satisfactory, with small limitation of the hip mobility and a decrease in the level of local pain. After the implant removal, the patient was kept under observation and conservative treatment, to prevent further damage to the right hip and allow the healing to



Fig. 4. Antero-posterior radiograph at 2 years.



Fig. 5. Antero-posterior radiograph after gamma nail was removed.



Fig. 6. Antero-posterior radiograph at 6 months after gamma nail was removed.



Fig. 7. Antero-posterior radiograph with uncemented total hip arthroplasty.

3. Discussion

The avascular necrosis of the femoral head affects young patients between 20 and 50 years old, the majority of them being men. The avascular necrosis of the femoral head arises when the blood supply of the hip joint is damaged. In order to develop osteonecrosis, these ischaemic events must be repeated constantly [3]. There are many causes that lead to this complication, most of them being joint or bone trauma (fractures of the femoral neck, dislocation of the hip), certain medication (corticosteroids), lifestyle choices (smoking and alcohol abuse) and idiopathic forms representing 25%. Kamal et al. revealed in an epidemiological study, on 92 patients diagnosed with avascular necrosis of the femoral head, that the main risk factors are smoking (36.96%), alcohol intake (20.65%), trauma (11.96%), corticosteroid therapy (8.70%) and 29.35% are idiopathic [4].

Avascular necrosis after pertrochanteric fractures is a very rare complication with a rate of incidence of 0.3%–0.5% [5,6]. Barquet et al. revealed in a systematic review that the incidence of avascular

occur. In time, the symptoms increased progressively, including the development of a limp, stiffness in the hip joint and pain without effort. At 6 months after the gamma nail was removed the X-rays revealed avascular necrosis of the femoral head Ficat stage 4 and secondary osteoarthritis of the right hip (Fig. 6). The patient underwent surgery once again and an uncemented total hip arthroplasty was performed (Fig. 7). Postoperative the patient's evolution was good and after 3 months he could walk unassisted.

necrosis of the femoral head after trochanteric fracture surgery is 1.37% within the first 2 years of injury [7]. Intertrochanteric fractures are produced through metaphyseal cancellous bone, where there is a good blood supply [8]. These fractures are treated with reduction and internal fixation and the risk of complications is minimal [8].

We rarely see the surgical treatment as being the cause of avascular necrosis of the femoral head if the surgical protocol is respected, the postoperative radiograph show a normal neck-head angle and the tip of the screw is situated in the lower quadrants of the femoral head. However, we found a published case of an adolescent with a femoral diaphyseal fracture which developed avascular necrosis of the femoral head due to the superior ascending branch of the medial circumflex artery being injured during nail insertion [9].

Another complication after the fixation of intertrochanteric fractures with intramedullary gamma nail is the cut-out of the lag screw, a cause of late mechanical failure. Even if there is a transitory ischaemic event during surgery there are no studies that can demonstrate how mechanical failure can induce avascular necrosis [10].

There are multiple choices of treating avascular necrosis of femoral head. If the disease is asymptomatic and there is a small lesion, (a modified index of necrotic extent of <25) spontaneous resolution of osteonecrosis can occur by reducing weight-bearing on the affected hip joint [11]. Core decompression of the femoral head is an early surgical treatment of avascular necrosis. Ficat and Arlet revealed good results on core decompression in early stages (I and II) avascular necrosis at an average follow-up of 7.9 years [12] along with other studies that came to the same conclusion [13]. Total hip arthroplasty is the most common and successful surgical treatment for advanced avascular necrosis of femoral head [14,15]. Brinker et al. demonstrated in their study that total hip arthroplasty using noncemented porous-coated femoral stems gives better results than cemented procedures in patients with osteonecrosis of the femoral head [16]. In young patients bipolar arthroplasty is better than total hip arthroplasty because it preserves bone stock for later revisions, but one must also take into account the persistent groin pain after bipolar arthroplasty [17].

4. Conclusion

In conclusion, the avascular necrosis of the femoral head is a rare complication following pertrochanteric fractures which can not be foreseen or avoided. All we can do is maintain the patients with risk factors under observation and to treat them in an incipient stage in case osteonecrosis occurs. Optimal surgical treatment in advanced stages is uncemented total hip arthroplasty.

Ethical approval

Ethical approved by Professor Ioana Zosin M.D. Ph.D., President of the Ethic Committee from Emergency Clinical County Hospital Timisoara, Romania.

Funds for research

None.

Author contribution

Bogdan Deleanu – study concept, data collection, data analysis;
 Radu Prejbeanu – data collection, data analysis;
 Dinu Vermesan – data collection, data analysis;
 Lucian Honcea - writing the paper, data analysis;
 Mihai Mioc Lazar - writing the paper, data analysis;
 Vlad Predescu - data analysis;
 Eleftherios Tsiridis – data analysis.

Conflicts of interest

None.

Guarantor

Bogdan Deleanu.

References

- [1] R.P. Ficat, Idiopathic bone necrosis of the femoral head: early diagnosis and treatment, *J. Bone Jt. Surg. Br.* 67 (1985) 3–9.
- [2] E.M. Evans, The treatment of trochanteric fractures of the femur, *J. Bone Jt. Surg. Br.* 31B (1949) 190–203.
- [3] Takashi Atsumi, Yoshikatsu Kuroki, Role of impairment of blood supply of the femoral head in the pathogenesis of idiopathic osteonecrosis, *Clin. Orthopaedics & Relat. Res.* 277 (April 1992).
- [4] D. Kamal, R. Traistaru, D.O. Alexandru, D.C. Grecu, L. Mogoanta, Epidemiologic study of avascular necrosis of femoral head, *Curr. Health Sci. J.* 39 (3) (2013).
- [5] E.J. Baixauli, F. Baixauli Jr., F. Baixauli, J.A. Lozano, Avascular necrosis of the femoral head after intertrochanteric fractures, *J. Orthop. Traum.* 13 (1999) 9–12.
- [6] L.Y. Shih, T.H. Chen, W.H. Lo, Avascular necrosis of the femoral head. An unusual complication of an intertrochanteric fracture, *J. Orthop. Traum.* 6 (1992) 382–385.
- [7] A. Barquet, G. Mayora, J.M. Guimaraes, R. Suárez, Avascular necrosis of the femoral head following trochanteric fractures in adults: a systematic review, *Injury* 45 (12) (2014 Dec) 1848–1858.
- [8] J.C. DeLee, Fractures and dislocations of the hip, in: Rockwood, Green, Bucholz (Eds.), *Fractures in Adults*, Lippincott Raven, Philadelphia, 1996, 1714 ± 39.
- [9] D.E. O'Malley, J.M. Mazur, R.J. Cummings, Femoral head avascular necrosis associated with intramedullary nailing in an adolescent, *J. Pediatr. Orthop.* 15 (1995) 21–23.
- [10] C. Vicario, F. Marco, L. Ortega, M. Alcobendas, I. Domínguez, L. López-Durán, Necrosis of the femoral head after fixation of trochanteric fractures with Gamma locking nail. A cause of late mechanical failure, *Injury* 34 (2003) 129.
- [11] E.Y. Cheng, I. Thongtrangan, A. Laorr, K.J. Saleh, Spontaneous resolution of osteonecrosis of the femoral head, *J. Bone Jt. Surg. Am.* 86 (2004) 2594–2599.
- [12] R.P. Ficat, J. Arlet, in: D.S. Hungerford (Ed.), *Ischemia and Necroses of Bone*, Williams and Wilkins, Baltimore, 1980.
- [13] D.S. Hungerford, Early diagnosis of ischemic necrosis of the femoral head, *Johns Hopkins Med. J.* 137 (1975) 270–275.
- [14] Jonathan P. Garino, Marvin E. Steinberg, Total hip arthroplasty in patients with avascular necrosis of the femoral head; A 2- to 10- year followup, *Clin. Orthop. Relat. Res.* 334 (January 1997).
- [15] P. Zangger, D.D. Gladman, M.B. Urowitz, E.R. Bogoch, Outcome of total hip replacement for avascular necrosis in systemic lupus erythematosus, *J. Rheumatol.* 27 (4) (2000 Apr) 919–923.
- [16] Mark R. Brinker, Aaron G. Rosenberg, Laura Kull, Jorge O. Galante, Primary total hip arthroplasty using noncemented porous-coated femoral components in patients with osteonecrosis of the femoral head, *J. Arthroplasty* 9 (5) (October 1994) 457–468.
- [17] T. Scheerlinck, M. Dezillie, A. Monsaert, P. Opdecam, Bipolar versus total hip arthroplasty in the treatment of avascular necrosis of the femoral head in young patients, *Hip Int.* 12 (2) (2002) 142–149.