v. 5, n. 22, 2025

International Journal of Health Science

Acceptance date: 20/05/2025

CUT OUT PHENOMENON AFTER STABLE TROCHANTERIC FRACTURE TREATED WITH SLIDING PIN PLATE: OSTEONECROSIS OR SIMPLE IMPLANT FAILURE?

Gustavo Alves Colombo
Third Year Resident in Orthopedics and Traumatology, Cascavel-PR
ORCID 0000-0002-2306-9858

Luiza Orth
MD. Assis Gurgacz Foundation University Center
ORCID 0000-0003-0518-1958

Amanda Colombo Canezin
MD, Assis Gurgacz Foundation University Center
ORCID 0009-0004-4082-6971

Emilio Aires Carvalho de Castro
Orthopedist and Traumatologist, specialist in Hip Surgery, São Lucas Hospital Foundation// CEOT, Cascavel-PR
ORCID 0000-0002-0955-5868

Pedro Paulo Verona Pércio
Orthopedist and Traumatologist, specialist in Hip Surgery, São Lucas Hospital Foundation// CEOT, Cascavel-PR
ORCID 0000-0003-0200-0357

André Muxfeldt Chagas
Orthopedist and Traumatologist, specialist in Hip Surgery, andre. São Lucas Hospital Foundation // CEOT, Cascavel-PR
ORCID 0000-0001-5948-7958

Abstract: Transtrochanteric fractures are an orthopedic emergency, accounting for almost half of all femur fractures, with an incidence between the seventh and eighth decade of life. Its treatment is imminently surgical, except in special conditions where the patient's surgical risk outweighs the benefits of the procedure. Surgical treatment offers mostly good and predictable results, but it is not without risks and complications. In this article, we report a case of the *cut-out* phenomenon following the use of a sliding pin plate in a stable trochanteric fracture, with characteristic intraoperative evolution of the anatomopathological material suggestive of osteonecrosis of the femoral head (ONCF).
Keywords: Trochanteric fracture, Osteonecrosis, DHS, Arthoplasty, Cut-Out

INTRODUCTION

Transtrochanteric fractures account for around 50% of femoral fractures, with an average incidence of between 66 and 76 years, and the risk increases with age [1] Although generally associated with low-energy trauma in elderly patients, young people can experience fractures with a similar pattern when high-energy trauma is involved [3] Furthermore, it is considered extracapsular and its topography is located between the greater and lesser trochanter[,] [2] since they correspond to those that occur in the region between the extracapsular basilar neck to the lesser trochanter proximal to the medullary canal. [3]

Hip fracture is an important cause of morbidity and mortality in the elderly population and its occurrence is linked to significant health costs. [1] The reason why transtrochanteric fractures have high socio-economic costs is partly related to the poor recovery of functional independence after conventional treatment in many patients. [3] In addition, the condition is linked to a high morbidity and mortality rate, with around 20% of patients not recovering their previous social functionality one year after the fracture.[2] The main factors linked to increased mortality and related to the patient are: age over 80, male gender, three or more comorbidities, especially heart disease, lowered level of consciousness and institutionalized patients. [2]

The success of surgical treatment is related to factors such as bone quality, fracture pattern, adequate reduction and positioning of the implant. Contraindications to surgical treatment with specific plates or rods include active infection, a prohibitive clinical condition on the part of the patient and inexperience on the part of the surgeon. The most common complications associated with the procedure include acute infection, pseudoarthrosis, implant fatigue or failure and deep vein thrombosis, and less frequently, osteonecrosis of the femoral head. [1, 6]

Osteonecrosis of the femoral head is prevalent in the younger population, with a predominance between the ages of 30 and 50. Among the clinical manifestations that characterize the patient affected by the disease, we can mention pain in the joint, as well as functional restriction of the limb and limitation in the performance of activities of daily living, in addition to reduced joint mobility. [5] This condition can also be due to intra- and extracapsular fractures of the proximal femur, such as neck fractures and, to a lesser extent, pertrochanteric fractures.

The risk factors for this occurrence vary, including diabetes, dyslipidemia, lupus, smoking, corticotherapy, use of immunosuppressants, fracture comminution and high energy trauma, none of which apply to the case reported below. [7]

REPORT

A previously healthy 80-year-old male patient fell from his own height, directly injuring his right hip on the ground and developing pain and functional impotence of the limb. During the hospital assessment and after X-rays, a transtrochanteric fracture was found on the right, with a complete simple trace, stable, without deviation, classified as Tronzo 2, Boyd and Griffin 1, AO-OTA 31A1.2. (Fig 1)

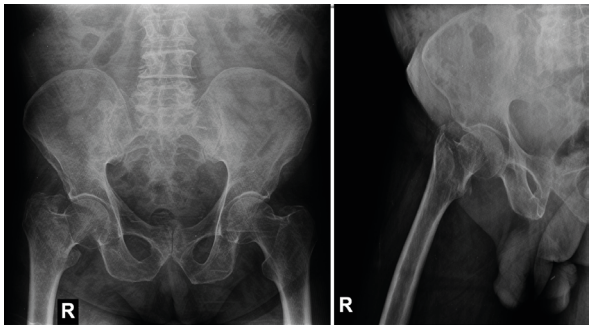

Fig 1 - AP X-ray of pelvis and lateral X-ray of right hip showing right pertrochanteric fracture

Surgical treatment was chosen for the condition, and the decision was made to use a Sliding Hip Pin (DHS), which was carried out after clinical stabilization and relevant preoperative assessments (Fig 2).

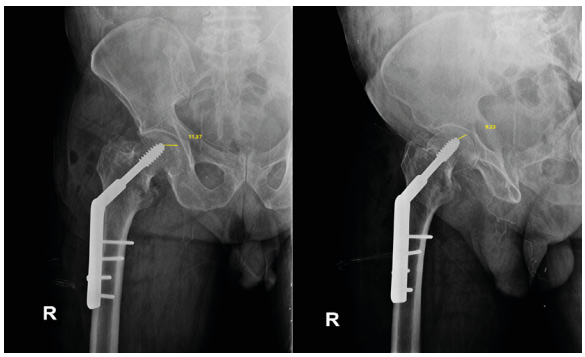

Fig 2 - AP and lateral radiographs of the right hip in the immediate post-operative period, showing good fracture reduction and a well-positioned DHS implant, respecting the TAD (Tip Apex Distance) <25mm (Baumgartner index, represented by the measurement and numbers in yellow).

In the first 45 days after surgery, the patient did not impose any load on the operated limb and only underwent passive physiotherapy for hip range of motion and active stimulation of the knee and ankles, as well as anti- DVT physiotherapy. A post-operative control X-ray was taken at this time - Fig 3 - showing that the fracture had been reduced and there were no signs of migration or component failure. The patient was then allowed to walk with partial weight bearing and use of crutches.

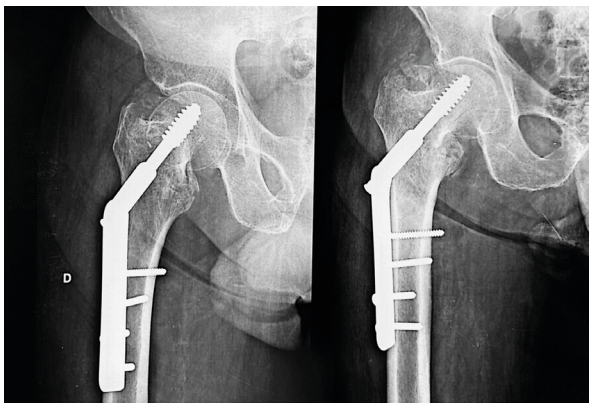

Fig 3 - Lateral and AP radiographs of the right hip 45 days after surgery, showing maintenance of the fracture reduction and implant without fatigue or migration.

At 120 days post-surgery, the patient had still not recovered his functions satisfactorily. He still had considerable pain, especially in flexion and internal rotation of the hip, as well as being unable to walk without assistance, which was not compatible with a favorable and normal post-surgery condition after this period.

A new X-ray of the limb was then taken, which showed a cut-out phenomenon of the cephalic pin, as well as loss of reduction of the varus fracture focus (Fig 4).

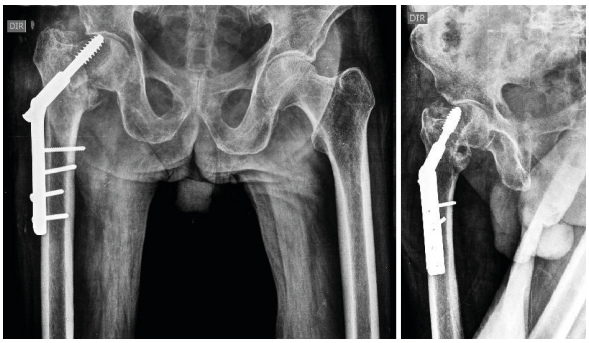

Fig 4 - AP radiographs of the pelvis and side view of the right hip 120 days post-operatively, showing varus collapse of the fracture, as well as cut-out of the cephalic screw.

After the event and diagnosis, and after assessing possible infection, which was ruled out, the decision was made to perform a Synthesis Material Removal (SMR) procedure followed by a single-stage right Total Hip Arthroplasty (THA), carried out via the Kocher-Langenbeck approach (posterior approach). An uncemented total implant was chosen, despite Dorr C.

Intraoperatively (Fig 5) we found a sclerotic femoral head with rigid cortices, in addition to the absence of the normal aspect of the medullary trabeculate and an area of "emptiness" in the superolateral topography of the head, where the migration of the cephalic pin had taken place, common characteristics of bone infarction, suggesting a diagnosis of Avascular Osteonecrosis of the Femoral Head. Despite these findings, we cannot rule out the hypothesis of a simple failure of the implant in a previously osteoporotic and fragile bone, which then generated osteonecrosis, due to local direct vascular trauma.

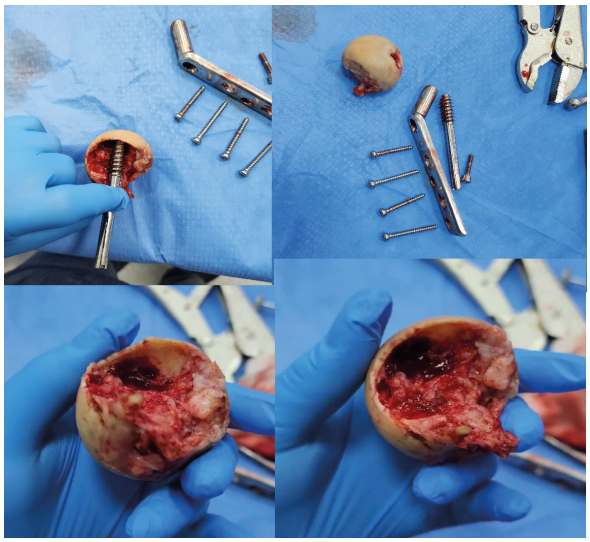

Fig 5 - Femoral head with sclerotic appearance and signs of necrosis, mainly in the superolateral region.

After the proposed procedure, the patient began walking on the first day after surgery, as well as active and passive exercises and stimuli for range of motion (ROM), with good progress. At the end of motor physiotherapy rehabilitation, satisfactory recovery of previous function and resolution of pain were achieved, with a significant improvement in the patient's quality of life.

Fig 6 - AP radiograph of the pelvis after SMR and THA on the right.

DISCUSSION

In view of the picture presented, it can be inferred that transtrochanteric fracture is a prevalent disease in the elderly population and its occurrence is linked to impairment of the patient's quality of life. In addition, the condition is diagnosed by means of an anteroposterior radiograph, after traction and internal rotation, and the mortality rate associated with the condition varies between 6 and 11% in the first month and 14 to 36% in the first year. [2] Furthermore, the literature indicates that the following are considered to be criteria for transtrochanteric fracture instability: subtrochanteric trace, posteromedial comminution and reverse trace. When displaced, transtrochanteric fractures are generally treated surgically.1 With regard to the classification of these fractures, it is possible to classify them according to AO, as stable (type A1), unstable with standard fracture trace (type A2) and unstable with reverse obliquity trace (type A3). [2]

It is important to note that performing the surgical procedure early, i.e. within the first 24 hours, does not reduce the mortality rate in the first year of the patient's life. In addition, it must be taken into account that the patient's underlying comorbidities must be compensated in order to undergo the procedure. [2] The available studies also show that the conservative approach to transtrochanteric fractures should be adopted exclusively in cases of prohibitive surgical conditions, since the mortality rate in the first 30 days can be 2.5 times higher than surgical treatment. [2]

After the surgical procedure, the patient is allowed to mobilize the hip early on. However, the affected limb should only be partially loaded for about six weeks. After this period, the full load is gradually restored and muscle strength is progressively achieved. [1]

With regard to osteonecrosis of the femoral head, a possible, albeit infrequent, complication of transtrochanteric femoral fractures, it is known that the pathophysiology of the condition occurs due to the ischemic process that is imposed on the territory of the femoral head microcirculation. [4] Thus, among the clinical conditions that can trigger osteonecrosis, we can mention fracture of the femoral head, dislocation of the hip joint, blood dyscrasias, alcoholism and chronic use of corticosteroids, which cause local extravascular compression due to the accumulation of fatty content in the bone marrow. Less common pathologies include Gaucher's disease, Caisson's disease, HIV, radiotherapy, pregnancy and, more recently, coronavirus infection [4, 5].

In relation to ONCF after trochanteric fracture, Bartonicek et al. found an incidence of 0.5-1% of osteonecrosis after trochanteric fracture treated surgically, the majority in the first year after the surgical procedure, which can occur up to the fourth year after surgery, caused by direct injury to the nutrient vessels of the head, either by the fracture or by the surgical act and/or thermal necrosis due to drilling for the cephalic pins. Even with this evidence, the real rate of ONCF in these cases is considered to be underestimated [8].

The clinical presentation stems from the joint destruction seen after the ischemic process and results, among other symptoms, in local pain, difficulty walking, gait impairment and restricted hip mobility.5 In addition, the clinical presentation can be manifested by subacute symptoms, such as arthralgia in the inguinal region which can be exacerbated by physical activity due to the ischemic process and intensification of bone edema in the proximal femur. [4] The patient in the report in question showed very prevalent symptoms, marked by a lack of improvement in the previous pain, functional incapacity in the limb affected by the fracture even after surgery and worsening of hip joint mobilization.

The condition is diagnosed using a simple anteroposterior and lateral X-ray of the hip joint, which is considered the initial diagnostic test. However, it can be completely unaltered in the early stages of the disease. When altered, the X-ray can reveal anything from sclerosis of the femoral head to subchondral fracture, which is manifested by the crescent sign, a radiolucent image in the subchondral area. [4]

In this sense, although plain radiography is considered the initial examination for diagnosis, magnetic resonance imaging of the hip is the gold standard due to its better accuracy. Thus, evidence of an area with a geographic lesion of hyposignal on T1 and hypersignal on T2, as well as a double contour lesion on T2 are considered pathognomonic alterations. [4]

The treatment proposed for the pathology generally depends on the radiographic stage it is in, according to the location and size of the affected area.

CONCLUSION

We report a case of probable osteonecrosis of the femoral head after a trochanteric femoral fracture, treated surgically during the initial trauma and after its complication. The case reported shows clinical features suggestive of osteonecrosis, which was mainly evident during surgery, although simple implant failure was not completely ruled out. Regardless of the etiological origin of the condition, clinical suspicions of unsatisfactory results in these cases should always be considered. Another issue is early diagnosis, whether clinical or surgical, in such situations. Surgeons must act quickly to prevent progression and complications and guarantee the patient's quality of life and independence, whatever the origin and etiopathological definition of the disease that caused the condition.

Osteonecrosis is a possible complication of a transtrochanteric fracture and, although uncommon, can lead to various complications in the quality of life of the affected patient. Its prevalence is more common in the 30-50 age group and its early diagnosis is essential for appropriate treatment. Diagnostic suspicion should be raised when symptoms such as pain in the hip joint and limitation of local mobility are present, as well as when the patient's clinical condition does not improve or worsens after surgery for a transtrochanteric fracture. In this way, by offering the appropriate therapeutic proposal at the right time, complications such as progressive necrosis, acute bone marrow edema syndrome and other consequences that compromise the affected patient's lifestyle and full joint mobility can be avoided.

This study is not funded

The researchers declare no conflicts of interest, whether political, personal or financial, in the conduct and writing of this article.

We would like to thank all our family members, spouses and colleagues who directly and indirectly contributed to this work.

REFERENCES

1. Filho, L. C. M., et al. Tratamento das Fraturas do fêmur Proximal com Placa de Apoio Trocantérica Associada ao DHS. Serviço de Ortopedia e Traumatologia de São Paulo. Técnicas em ortopedia, 2010; 4:14-21.

2. Canto, R. S. T., et al. Fratura Transtrocantérica. Sociedade Brasileira de Ortopedia e Traumatologia, Colégio Brasileiro de Radiologia. Revista Associada Médica Brasileira, 2011: 57(2): 123-127.

3. Russell TA, Taylor JC. Subtrochanteric fractures of the femur . In: Browner BD, Jupiter JB, Levine AM, Trafton PG, eds. Skeletal Trauma. Vol 2 Philadelphia, PA, USA: Saunders; 1992:1490-1492.

4. Miyahara, H. S., et al. Osteonecrose da cabeça femoral: Artigo de atualização. São Paulo, SP, Brasil. Revista Brasileira de Ortopedia 2022;57 (3):351-359.

5. Zacarias, J R S, et al; Osteonecrose da cabeça femoral bilateral pós COVID-19: Relato de Caso. Brazilian Journal of Health Review, Curitiba v.4 n.5, p 21880-21886, sep./oct. 2021.

6. Bartoníc˘ek J, Fric V, Skala-Rosenbaum J, et al. Avascular necrosis of the femoral head in pertrochanteric fractures: A report of 8 cases and a review of the literature. J Orthop Trauma. 2007;21(4):229–236

7. Ferreres-Claramunt A, Castillo-Garcı´a F, Macule´-Beneyto F, et al. Femoral head necrosis after intertrochanteric fracture. A case report after synthesis with Ender nails. J Trauma. 1995;39:1000–1002

8. Gautier E, Ganz K, Krügel N, et al. Anatomy of the medial femoral circumflex artery and its surgical implications. J Bone Joint Surg Br. 2000;82(5):679–683.