



## Case report

## Simultaneous Bilateral Femoral Neck Fracture Due to a Tonic-Clonic Seizure and High-Dose Steroid Therapy

Fernando Diaz Dilernia, MD<sup>\*</sup>, Martin M. Estefan, MD, Gerardo Zanotti, MD, Fernando Comba, MD, Francisco Piccaluga, MD, Martin Buttaró, MD

*Institute of Orthopaedics "Carlos E. Ottolenghi" Italian Hospital of Buenos Aires, Buenos Aires, Argentina*

## ARTICLE INFO

*Article history:*

Received 7 December 2019  
Received in revised form  
3 May 2020  
Accepted 9 May 2020  
Available online xxx

*Keywords:*

Simultaneous bilateral femoral neck fractures  
High-dose steroid therapy  
Seizure  
Bilateral one-stage total hip arthroplasty

## ABSTRACT

Simultaneous bilateral femoral neck fractures (FNFs) are extremely rare and usually associated with an underlying condition affecting the bone quality and mineralization. Convulsions have also been described as a possible cause, mostly as a consequence of epilepsy, hyponatremia, and hypocalcemia. We present a 52-year-old female patient, with bilateral displaced FNFs due to a tonic-clonic seizure and high-dose steroid therapy related to a frontal lobe anaplastic oligodendroglioma brain tumor resection. Two days after admission, bilateral one-stage uncemented total hip arthroplasty (THA) under general anesthesia and through a posterolateral approach was performed using a metal-on-polyethylene bearing surface. Several risk factors can be identified in this unique case, such as the high-dose steroid therapy, the low-demand activity of the patient due to her functional sequelae, and finally, the convulsive episode. Surgeons should be aware of this uncommon injury to ensure early diagnosis and treatment in all patients with a previous history of seizures, chronic steroid use, severe hip pain, and inability to walk. For bone metabolic diseases, preventive measures should be indicated to avoid these complications. Bilateral one-stage uncemented THA represents an effective procedure with a low complication rate allowing early rehabilitation.

© 2020 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Introduction

Femoral neck fractures (FNFs) are a persistent entity with a bimodal distribution that mostly affects older women with osteoporosis and younger patients because of high-energy trauma [1]. Simultaneous bilateral FNFs are extremely rare and usually associated with an underlying condition affecting the bone quality and mineralization. Although there are only a few reports in the literature, most of them are related to bone metabolism disorders such as chronic steroid use, renal osteodystrophy, and hypocalcemia. Convulsions have also been described as a possible cause, mostly as a consequence of epilepsy, hyponatremia, and hypocalcemia [2–7].

We present a 52-year-old female patient, with simultaneous bilateral displaced FNFs due to a tonic-clonic seizure and high-dose

steroid therapy related to an anaplastic oligodendroglioma brain tumor resection.

### Case history

A 52-year-old female patient presented to our emergency department with complaints of bilateral hip pain and inability to ambulate after a tonic-clonic seizure. On physical examination, she was found to have both lower limbs shortened and externally rotated, and anteroposterior (AP) and lateral (L) view radiographs confirmed bilateral Garden IV [8] FNFs (Fig. 1). The patient had a frontal lobe anaplastic oligodendroglioma diagnosed 5 years before the presentation. After diagnosis, surgical resection was indicated with concomitant high-dose steroid therapy that remained until the time of presentation. After 5 years of the intervention, the patient remained with functional sequelae, needing a permanent walker for ambulation because of lower limb weakness.

Two days after admission, the patient underwent uncomplicated bilateral, posterior total hip arthroplasties (THAs) using a

<sup>\*</sup> Corresponding author. Hospital Italiano de Buenos Aires, Potosí 4215 (C1199ACK), Buenos Aires, Argentina. Tel.: (54 11) 4959 0200x8409.

E-mail addresses: [ferdiaz18@hotmail.com](mailto:ferdiaz18@hotmail.com), [fernando.diaz@hospitalitaliano.org.ar](mailto:fernando.diaz@hospitalitaliano.org.ar)

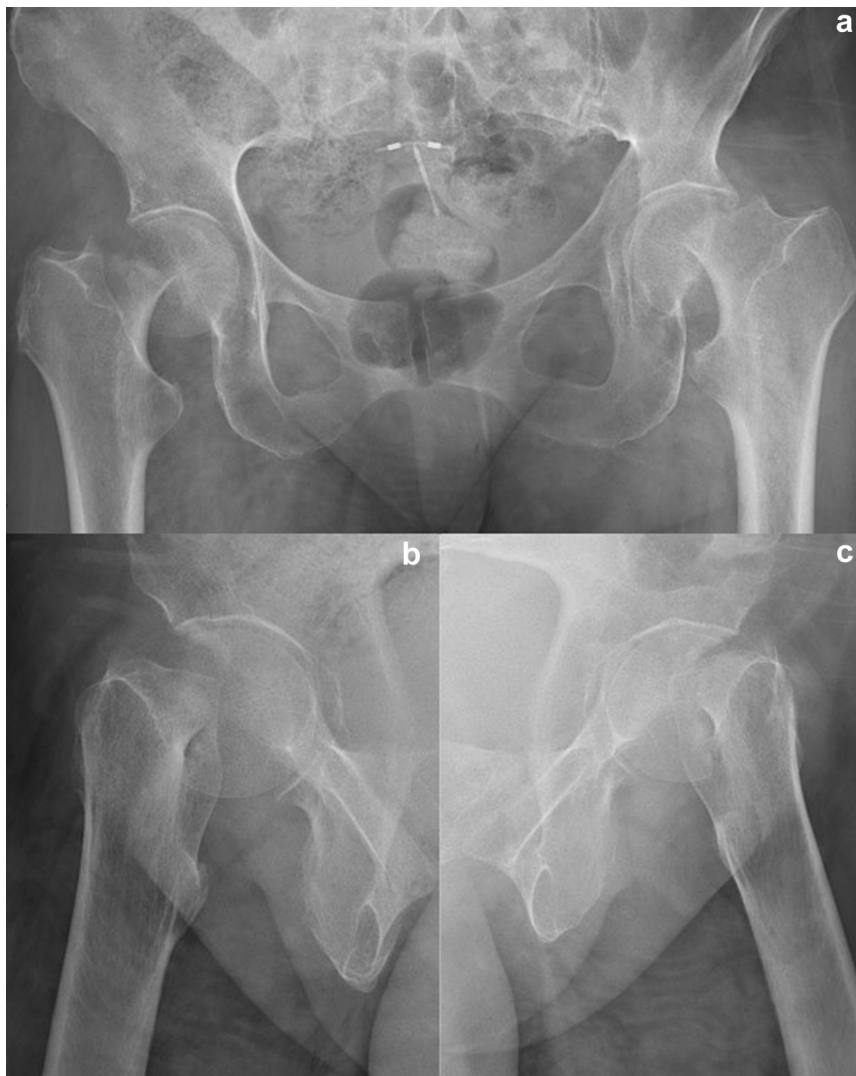
cementless UNITED Hip System (U-MOTION II™ Acetabular cup and UTF™ stem, United Orthopedic Corporation, Taiwan) with a 36-mm metal-on-polyethylene bearing surface (Fig. 2). Surgical time was 45 minutes for each replacement. After surgery, the patient was sent to the intensive care unit (ICU) for pain management and volume expansion because of the amount of blood loss during both surgeries (750 mL) and her previous anemic condition; 2 red blood cell units were transfused during both THAs. The rehabilitation protocol included early mobilization within 24 hours after surgery and ambulation with a walker and full weight-bearing. From an orthopaedic standpoint, the patient had an uncomplicated postoperative course. She did require a 4-week hospitalization in the ICU because of new seizures that required medical treatment and strict control.

At 6 weeks, the patient was seen in the outpatient clinic without complications related to the surgical procedure. After discharge, she was referred to the endocrinology clinic and initiated treatment with vitamin D supplements and zoledronic acid as an anti-resorptive treatment. Two years after surgery, the patient remained without complications, needing a permanent walker for ambulation, after an exhaustive rehabilitation program.

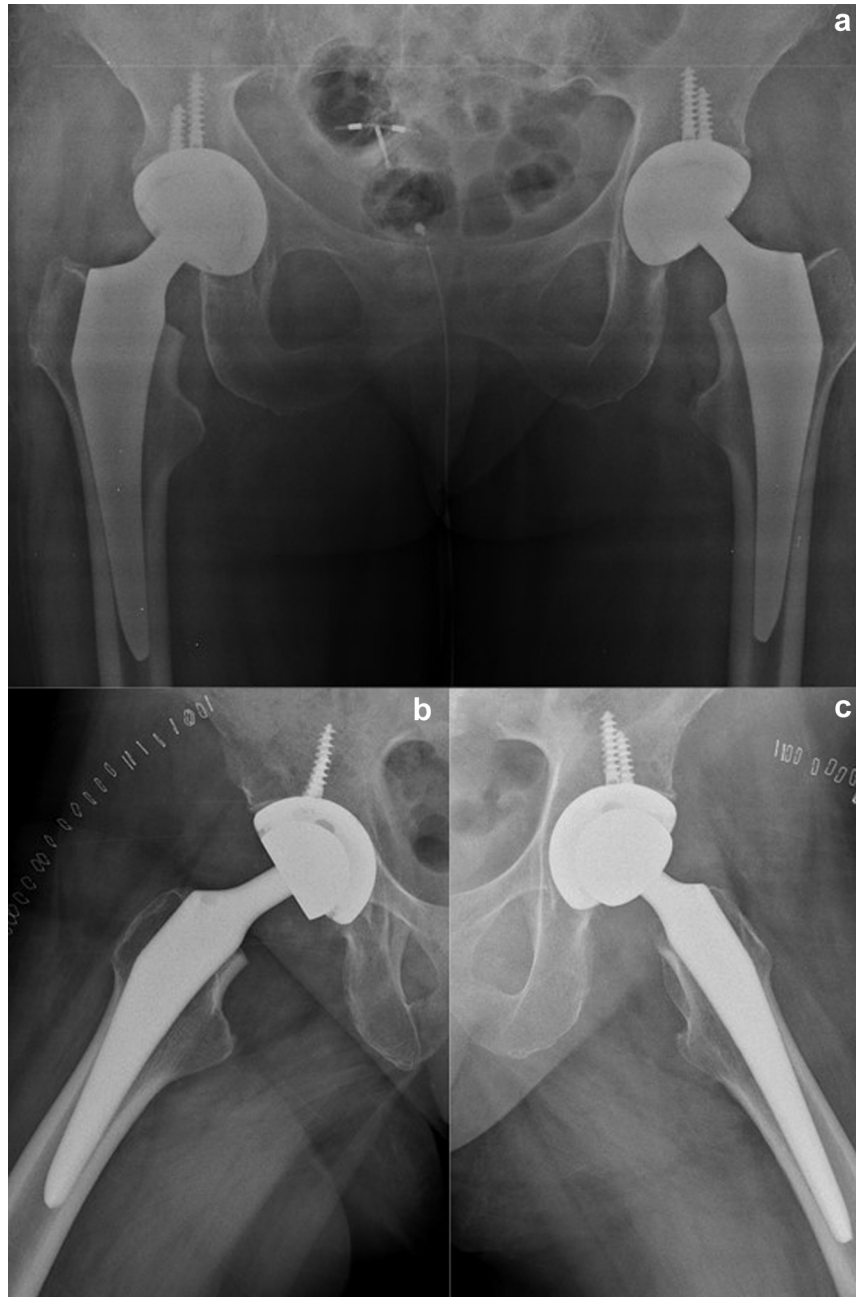
## Discussion

FNFs are extremely frequent worldwide, especially in older patients with osteoporosis, but there are just a few reports of simultaneous bilateral FNFs described in the literature. Before the 1960s, simultaneous bilateral FNFs were associated with electroconvulsive therapies [9], especially indicated in chronic institutionalized psychiatric patients with diagnoses such as psychosis, depression, and schizophrenia. More recently, most reported cases are related to bone metabolism disorders such as osteomalacia [10], vitamin D deficiency [11,12], and chronic steroid treatment [13–16]. Of course, it is not an exclusive pathology of these syndromes, and some patients with high-energy trauma [17], collagen disorders [18], and cerebral palsy [19] and older patients with neurologic diseases such as epilepsy and osteoporosis have been described [20].

Several risk factors can be identified in this unique case. First, our patient received high-dose steroid therapy, which has been reported as one of the most frequent causes of bilateral FNFs in the current literature [13–16]. Steroids induce osteopenia through several mechanisms. They produce suppression of osteoblastic activity, reduction of intestinal calcium absorption, an increase in



**Figure 1.** Anteroposterior view (a), right (b), and left (c) lateral views showing a bilateral grade IV FNF, according to Garden's classification.



**Figure 2.** Immediate postoperative radiographs. The anteroposterior view (a), right (b), and left (c) lateral views showing bilateral one-stage uncemented THA with a 36-mm metal-on-polyethylene bearing surface.

calcium excretion, and the decrease in renal tubular calcium absorption. This can develop secondary hyperparathyroidism by increasing bone resorption [21]. In our patient, it can also be associated with the low-demand activity due to her functional sequelae, with both factors contributing to the final bone mineral disorder.

Second, the trigger for the simultaneous bilateral FNF was a tonic-clonic seizure as a consequence of its tumor resection and the associated brain edema that was already being followed by the neurology department. In 1956, Andreini described the simultaneous contraction of the pelvic-trochanteric muscles during the tonic phase of the seizure as the probable biomechanical reason for

a bilateral hip fracture [22]. When the legs are in adduction, a hip dislocation can occur, and when they are in abduction, a hip fracture can be seen.

Patients with a previous history of steroid use and epilepsy may be at risk, and hip surgeons should be aware of this kind of patients. Moreover, it is necessary to emphasize that high-dose steroid therapy alone can cause FNFs without any significant event or even a seizure. To our knowledge, this is the first case report of a simultaneous bilateral FNF secondary to steroid-induced osteopenia and a tonic-clonic seizure disorder from a patient with a previous history of an anaplastic oligodendroglioma brain tumor resection.

Hip fractures in the elderly are a recognized problem worldwide, but for displaced FNFs, there remains uncertainty regarding the idyllic treatment. In this sense, in 2019, Bhandari et al. performed an international, expertise-based, randomized, controlled trial including patients with a displaced FNF, to evaluate the results of THA, as compared with hemiarthroplasty. The authors did not find a significant difference in the incidence of secondary procedures between both groups. Moreover, at 24 months of follow-up, there was no statistical difference in function and quality of life [23]. Bilateral one-stage THA has the advantage of single anesthesia, single hospital admission, and single rehabilitation protocol. The theoretical disadvantage is an increased surgical risk. Trojani et al. [24] reported excellent functional outcomes without perioperative deaths and with 91% of patient's satisfaction rate. Hence, bilateral one-stage THA represents a valid alternative to the 2-stage procedure in highly selected patients. In our patient, we performed a bilateral uncemented THA because it is an effective and shorter procedure than a cemented prosthesis, avoiding an additional risk of a thromboembolic episode in a patient with a previous history of deep vein thrombosis, pulmonary thromboembolism, and oncologic disease.

### Conclusion

To conclude, we would like to emphasize the infrequency of this rare entity. All orthopaedic surgeons and emergency physicians should be aware of such uncommon pathology to ensure early diagnosis and treatment in all patients with a previous history of seizures, chronic steroid use, severe hip pain, and inability to walk. For bone metabolic diseases, preventive measures should be indicated to avoid these complications. The bilateral one-stage uncemented THA represents an effective and fast procedure with a low complication rate allowing early rehabilitation in highly selected patients.

### Conflict of interest

The authors declare there are no conflicts of interest.

### Acknowledgments

The study was performed at the Italian Hospital of Buenos Aires, Argentina.

All authors certify that their institution has approved the reporting of this case.

All investigations were conducted in conformity with ethical principles of research.

### References

- [1] Karagas MR, Lu-Yao GL, Barrett JA, et al. Heterogeneity of hip fracture: age, race, sex, and geographic patterns of femoral neck and trochanteric fractures among the US elderly. *Am J Epidemiol* 1996;143:677.
- [2] Simon J-P, Robbens E, Maes M, Bellemans J. Single-stage bilateral total hip arthroplasty in patients less than 35 years Forty arthroplasties with 5–17 years follow-up. *Acta Orthop Belg* 2009;75(2):189.
- [3] Taylor LJ, Grant SC. Bilateral fracture of the femoral neck during a hypocalcaemic convulsion: a case report. *J Bone Joint Surg* 1985;67(4):536.
- [4] Csotye J, Sisak K, Bardocz L, Toth K. Bilateral spontaneous displaced femoral neck fractures during pregnancy. *J Trauma* 2010;68(5):E115.
- [5] Kalender AM, Dogan A, Cakar A, Turkoz T. Neglected bilateral femoral neck fracture associated with pregnancy and primary hyperparathyroidism. *Acta Orthop Belg* 2010;76(4):559.
- [6] Ohishi H, Nakamura Y, Kishiya M, Toh S. Spontaneous femoral neck fracture associated with a low serum level of vitamin D. *J Orthop Sci* 2013;18(3):496.
- [7] Undar L, Topcu S, Percin S. Simultaneous bilateral fractures of the femoral neck and superior pubis ramus following renal failure-induced hypocalcaemic convulsions. *Br J Clin Pract* 1990;44(12):774.
- [8] Garden RS. Low-angle fixation in fractures of the femoral neck. *J Bone Joint Surg Br* 1961;43B:647.
- [9] Powell HD. Simultaneous bilateral fractures of the neck of the femur. *J Bone Joint Surg* 1960;42-B:236.
- [10] Chadha M, Balain B, Maini L, Dhal A. Spontaneous bilateral displaced femoral neck fractures in nutritional osteomalacia—a case report. *Acta Orthop Scand* 2001;72(1):94.
- [11] Gaulke R. Spontaneous bilateral fractures of the femoral neck. *Z Orthop* 2002;140:297.
- [12] Moo IH, et al. Bilateral femoral neck stress fractures in military recruits with unilateral hip pain. *J R Army Med Corps* 2015;165:387.
- [13] Gurdezi S, Rickman M. Bilateral undisplaced insufficiency neck of femur fractures associated with short-term steroid use: a case report. *J Med Case Rep* 2008;2:79.
- [14] Zuckerman JD, Shin SS, Polatsch DB, Schweitzer M. Concurrent bilateral femoral neck stress fractures and osteonecrosis of the hip: a case report. *J Bone Joint Surg Am* 2006;88(4):857.
- [15] Austin JC, Chrissos M. Displaced bilateral femoral neck fractures in a woman with a history of oral steroid use. *Orthopaedics* 2005;28(8):795.
- [16] Haddad FS, Mohanna PN, Goddard NJ. Bilateral femoral neck stress fractures following steroid treatment. *Injury* 1997;28(9–10):671.
- [17] Schroder J, Marti RK. Simultaneous bilateral femoral neck fractures: case report. *Swiss Surg* 2001;7(5):222.
- [18] Kharrazi FD, Rodgers WB, Coran DL, Kasser JR, Hall JE. Protrusion acetabuli and bilateral basicervical femoral neck fractures in a patient with Marfan Syndrome. *Am J Orthop* 1997;26(10):689.
- [19] Mariani P, Buttaro M. Bilateral simultaneous femoral neck fracture mimicking abdominal pain in a cerebral palsy patient case. *Rep Orthop* 2014;2014:925201.
- [20] McGoldrick NP, Keith S. Management of simultaneous bilateral neck of femur fractures in an elderly patient. *Geriatr Orthop Surg Rehab* 2013;4(3):71.
- [21] Hodgson SF. Corticosteroid-induced osteoporosis. *Endocrinol Metab Clin North Am* 1990;19(1):95.
- [22] Andreini G. Unusual case of bilateral fracture of the neck of femur. *Arch Orthop* 1956;69:25–39.
- [23] Bhandari M, Einhorn TA, Guyatt G, et al. Total hip arthroplasty or hemiarthroplasty for hip fracture. *N Engl J Med* 2019;381:2199.
- [24] Trojani C, d'Ollonne T, Saragaglia D, Vielpeau C, Carles M, Prudhon JL. One-stage bilateral total hip arthroplasty: functional outcomes and complications in 112 patients. *Orthop Traumatol Surg Res* 2012;98(6 Suppl):S120.