



## Case report

## Bilateral femoral neck fracture following a convulsion in the presence of chronic kidney disease. A case report

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## ARTICLE INFO

## Keywords:

Bilateral femoral neck fracture  
Seizure  
End stage renal disease  
Convulsions  
Chronic kidney disease

## ABSTRACT

**Introduction and importance:** Bilateral femoral neck fractures in young adults are a rare entity. It is usually associated with pre-existing metabolic diseases, such as osteoporosis, renal osteodystrophy, or hypocalcemic seizures. Hence, it is essential in such cases to look for other associated injuries following a traumatic event. Missing associated injuries may lead to significant morbidities and poor functional outcomes.

**Case presentation:** A 37 years old male, who had chronic renal failure secondary to hypertension, and presented to the emergency room following a seizure episode, in which he developed a generalized tonic-clonic convulsion secondary to electrolyte imbalances with metabolic acidosis. As a result, he developed bilateral neck of femur fracture.

**Intervention and outcome:** The medical team optimized electrolytes imbalance and then the patient underwent surgical stabilization of both femur neck fracture, 1 year following the surgical fixation the patient had full range of motion of both hips with radiological evidence of complete healing of the fracture.

**Conclusion:** In cases of fractures secondary to metabolic conditions, bilateral femoral neck fractures should be suspected and investigated; especially in young patients who develop a generalized tonic-clonic seizure. The etiology is multifactorial, and the treating surgeon should be aware of predisposing factors which may affect bone quality, thereby raising the risk of fractures even with low-energy atraumatic events. Hip preservation should always be the primary target when treating these patients.

## 1. Introduction and importance

Femoral neck fractures are commonly sustained following low-energy traumatic events in elderly osteoporotic patients. They may be less commonly seen in younger patients following high-energy trauma. Although bilateral simultaneous involvement of femoral neck fractures is relatively uncommon, it has been reported in association with metabolic bone diseases like renal osteodystrophy, rickets, osteomalacia, and osteoporosis. [1–6] Bilateral femoral neck fractures are rare sequel of grand-mal seizure episodes, believed to be related to the unopposed vigorous tonic-clonic muscle contractions, rather than as a result of direct trauma to the limb, in the presence of an underlying metabolic condition affecting bone quality due to an impairment in bone mineralization processes. [7,8]

Management of femoral neck fractures is surgical and, depending on the patient's age, options are generally categorized into either surgical

fixation or femoral head replacement. [9,10]

Presented here is a case of atraumatic bilateral femoral neck fractures following a tonic-clonic seizure in a 37 years old male with chronic kidney disease. We report this case in line with the updated consensus-based surgical case report (SCARE) guidelines [11].

## 2. Case presentation

A 37-year-old Asian male, with a medical background of chronic kidney disease secondary to hypertension on oral antihypertensive drugs for 17 years, and without any family history of similar condition or genetic disorders. The patient presented to the emergency room (ER) following a seizure attack that lasted for thirty minutes while he was laying in bed and was witnessed and described by the patient's sister. No post-ictal confusion or urinary incontinence was reported. The seizure attack was initially localized to the face but eventually spread to the rest

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<https://doi.org/10.1016/j.ijscr.2021.106545>

Received 19 September 2021; Received in revised form 19 October 2021; Accepted 27 October 2021

Available online 2 November 2021

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of the body and involved jerky and repetitive movements. The characteristics fit the description of a generalized tonic-clonic (grand-mal) seizure. The patient was independent ambulatory without using any walking aids. Eventually, the patient was taken to the ER where he developed another seizure, lasting for about 2 min. He was initially managed by the ER physicians and, as part of his initial treatment; he received a 1 g loading dose of levetiracetam (KEPPRA) intravenously. He noted that it was his first seizure attack with no history of previous neurological conditions.

On clinical examination, following his second attack in the ER, the patient was conscious, alert, and oriented to time, place, and person, with no signs of any respiratory distress. He was hemodynamically stable and his Glasgow Coma Scale was 15/15. His primary survey revealed a bilateral temporomandibular joint dislocation, which was successfully reduced under conscious sedation by a maxillofacial surgeon. His musculoskeletal examination revealed bilateral hip tenderness with reduced range of motion and no obvious skin discoloration, wounds, or soft-tissue swelling. Peripheral neurovascular assessments revealed normal findings bilaterally. Pelvic radiographs, shown in Fig. 1, demonstrated bilateral transcervical femoral neck fractures, Garden type 4. Further Computed Tomography (CT) imaging revealed no other fractures.

Laboratory data showed severe electrolyte imbalances, with hyponatremia (Sodium 114 mEq/L), hypokalemia (Potassium 2.8 mmol/L), hypocalcemia (Calcium 1.49 mg/dL, Adjusted Calcium 0.43 mg/dL), elevated blood urea nitrogen (BUN 46.4 mmol/L), elevated creatinine (Creatinine 1290 umol/L), and an absolute neutrophilic count (ANC) of 8.1. Arterial blood gases revealed a picture of metabolic acidosis (PH 7.27, PO<sub>2</sub> 67, PCO<sub>2</sub> 25, BE -13.6, HCO<sub>3</sub> 116) and underlying secondary hyperparathyroidism (PTH 1588 pg/mL).

The patient was referred to the medical team who gradually corrected the patient's electrolytes and pre-surgically optimized him with hemodialysis. After medical optimization, the patient underwent a closed reduction of the femoral neck fracture with fluoroscopic guidance followed by fixation of bilateral neck of femur fractures using an inverted triangle configuration of 8 mm cannulated screws as shown in (Fig. 2). A senior trauma surgeon at our institute performed the surgery. The patient was initially mobilized on post-op day 1 using a wheelchair, which was changed to weight-bearing as tolerated using a walking frame at 3 months post-surgical fixation.

After discharging the patient, he was instructed to follow up in the



Fig. 1. Initial radiograph showing an AP view of the pelvis with bilateral Garden type 4 transcervical femoral neck fractures.

outpatient clinic at the 6 weeks, 12 weeks, 6 months, 9 months, and 1-year post-op marks, with regular imaging to assess for bone healing and to monitor the femoral heads for any signs of avascular necrosis. A year following surgical fixation, the patient demonstrated full range of motion and was found to have radiographic evidence of complete bone healing of the fracture with no signs of avascular necrosis of the femur head as shown in Fig. 3. He also continued to follow up regularly in the epilepsy clinic, and was kept on maintenance doses of levetiracetam 500 mg twice daily to keep his seizures under control.

### 3. Discussion

Femoral neck fractures in young patients are typically a result of high-energy traumatic events, and the vast majority is unilateral. In the presence of pre-existing medical conditions that affect bone strength including, but not limited to: osteoporosis, renal osteodystrophy, hypocalcemic convulsions with epileptic attacks, bilateral involvement may be seen following low-energy trauma or even following no history of trauma. [2,4,6,7,12]

In 1956, Andreini proposed that the simultaneous contraction of pelvic-trochanteric muscles is the main cause of fractures around the hip following a convulsion. He demonstrated that only these muscles can apply their force irrespective of the relative position of the femur and the pelvis. [4] Devkota et al. reported a similar case in which the patient suffered from chronic kidney disease and sustained an impacted femoral neck fracture with no history of trauma nor a history of seizure attacks. They attributed the cause of this fracture to the changes that occur secondary to chronic renal failure, which significantly affects bone minerals and degrades bone structure. Consequently, this places the patient at an increased risk of atraumatic and/or pathological fractures. [13]

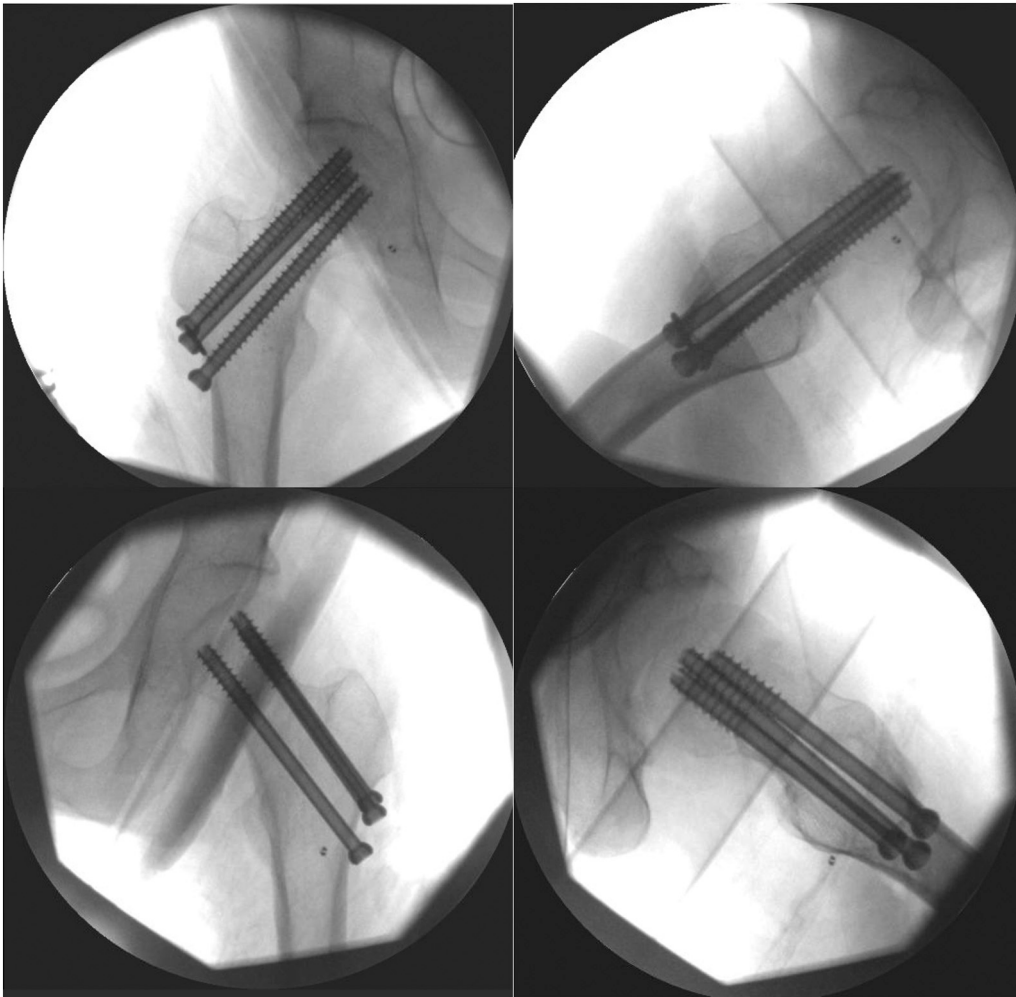
In the presented case, a combination of these two factors including the chronic effect of renal failure on bone mineralization, and the onset of a generalized tonic-clonic grand-mal seizure, resulted in bilateral femoral neck fractures. Other rare associated injuries have been reported in the literature, which includes: posterior shoulder dislocations, proximal humerus fractures, fractures of the scapula, Galeazzi fractures, spine fractures, among others. Therefore, screening of the pelvis, spine, and shoulder in patients who present following a tonic-clonic convulsion, is critically important. [14–17]

Hip preservation should be the primary goal of treatment in young patients. Different methods may be used to achieve this goal, including fixation using cannulated screw (as done in this case), or the use of dynamic hip screws. On the other hand, performing a hemiarthroplasty may be a better choice for elderly patients with a low-demand lifestyle. [7,8,12,18,19] Another factor, which should be considered in treating such patients, is the ideal control of the seizures especially in-patient with pre existing metabolic bone disorder as this may reduce the risk for developing a pathological fracture.

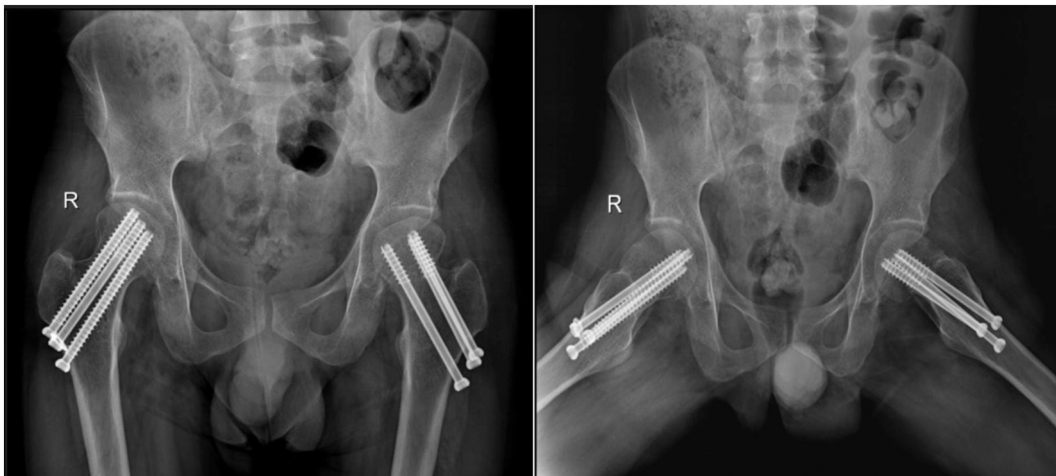
Although osteonecrosis can develop following any femoral neck fracture, it is much more frequently seen in displaced femoral neck fractures Garden types 3 and 4, with estimated rates ranging from 11 to 40%. [20,21] Serious complications as such should always be discussed with the patient, as this may lead to potential long-term morbidities and poor outcomes which eventually necessitate arthroplasty.

### 4. Conclusion

In cases of fractures secondary to metabolic conditions, bilateral femoral neck fractures should be suspected and investigated; especially in young patients who develop a generalized tonic-clonic seizure. The etiology is multifactorial, and the treating surgeon should be aware of predisposing factors which may affect bone quality, thereby raising the risk of fractures even with low-energy or atraumatic events. Hip preservation should always be the primary target when treating these patients.



**Fig. 2.** Intraoperative fluoroscopic AP and frog lateral views of both femur necks showing in-situ fixation with cannulated screws.



**Fig. 3.** One-year post-operative x-ray of both hips AP and frog lateral views showing in-situ fixation with complete healing of the fractures.

**Ethical approval**

Approved by the Medical Research Center at Hamad Medical Corporation.

**Funding**

Authors received no funding from any individual or institution and this work is completely a voluntary work.

**CRedit authorship contribution statement**

Isam Moghamis: Investigation, Writing - original draft - review & editing. Aiman Mudawi: Investigation, Writing, Writing - review & editing. Elhadi Babikir: Investigation, Writing - review & editing. Mohamed Hafez: Investigation, Writing - review & editing. Maamoun Abou Samhadaneh: Investigation, Project administration, Writing - review & editing. Shamsi Abdul Hameed: Investigation, Supervision, Project administration, Writing - original draft, Writing - review & editing.

**Guarantor**

Shamsi Abdul Hameed.

**Registration of research studies**

No prior registration.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor of this journal upon request.

**Provenance and peer review**

Non commissioned, externally peer-reviewed.

**Declaration of competing interest**

The authors have no competing interests to declare.

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