Non-traumatic vertebral fractures: An uncommon complication following the first episode of a convulsive seizure

Nalli Ramanathan Uvaraj, Nalli Ramanathan Gopinath, Aju Bosco

ABSTRACT

Introduction: Non-traumatic vertebral fractures that occur solely as a consequence of the muscle forces that develop during a convulsive seizure, has rarely been reported in orthopedic literature.

Case Report: Therein, we present a case of non-traumatic vertebral compression fractures in an 18-year-old male, who presented with severe back pain following a convulsive seizure, which occurred while he was sitting in his bed. He had no other reported trauma and no previous history of seizure. A detailed neurological work-up revealed no organic cause for the seizure. His bone mineral density measurements, hormonal and metabolic profiles were normal.

Conclusion: Forceful muscle contractions that develop during a single episode of convulsive seizure, occurring for the first time, can result in vertebral compression fractures, even in a normal healthy individual. Vertebral fractures occurring in a healthy young (non-epileptic) male, with normal bone mineral density, presenting with back pain after a convulsive seizure is a rare clinical presentation. These vertebral fractures can appear clinically asymptomatic and can easily be overseen, especially in the absence of overt signs of external trauma and possible postictal consciousness disturbance, which may fail to provide clue to early diagnosis. A high index of clinical suspicion is needed in patients presenting with back pain after a tonic-clonic seizure even in the absence of a fall or a significant trauma. Such patients may be subjected to a systematic musculoskeletal examination and a thorough radiological evaluation to rule out potential bony injuries.
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Keywords: Seizure, Epilepsy, Non-traumatic, Vertebral fracture

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INTRODUCTION

Vertebral fractures occur in patients with convulsive seizures. It has been reported in literature that the incidence of vertebral fractures associated with convulsive seizures varies from 0.95–16% [1, 2]. These fractures usually result from trauma due to a fall or accident occurring during the seizure. These patients have an associated osteopenia induced by long-term anticonvulsive medications or other bone mineral density decreasing agents. However, non-traumatic
vertebral fractures that occur from violent contraction of the paraspinal muscles during a convulsive seizure is very rare (0.3%) [3]. Non-traumatic vertebral fractures that occur solely as a consequence of the muscle forces that develop during a convulsive seizure, has rarely been reported in orthopedic literature.

We present a case of non-traumatic vertebral compression fracture in a healthy young male, with normal bone mineral density. The patient is not a known epileptic and had experienced the first episode of a convulsive seizure.

CASE REPORT

An 18-year-old male presented to the medical department with a history of fever with chills and rigor and loss of appetite for one week. In the night after admission, he developed an episode of generalized tonic-clonic seizure for the first-time while sitting on his couch, during the early morning hours. His mother was a witness to the seizure. There was no history of overt trauma as reported by his mother. The patient had no history of previous seizure episodes and a detailed history in this regard also did not throw light as to the cause of the seizure. Next morning, the patient complained of mild back pain and chest pain which were ignored due to the absence of any signs of significant external trauma. His neurologic examination was unremarkable. As the back pain persisted on the third day, the patient was referred to the orthopedic department for further evaluation. A thorough musculoskeletal examination revealed a paraspinal muscle spasm and tenderness in the middorsal region with no obvious deformity. Plain radiographs showed loss of height of D5 and D6 vertebrae (Figure 1A–B). Magnetic resonance imaging (MRI) scan confirmed compression fractures of D5, D6, D7 and D8 vertebrae (Figure 2). His hormonal and metabolic profiles and bone mineral density were normal. A detailed neurological work-up (computed tomography scan of the brain and electroencephalogram) revealed no organic cause for the seizure. The patient was fitted with a thoracolumbar orthotic support. Pain at the fracture site subsided after two weeks when rehabilitation was started, following which the patient resumed normal activities. Radiographs taken at follow-up showed that his spine was stable with no further loss of vertebral body height and no progression of kyphosis (Figure 3A–B). Patient was kept on antiseizure medication and was followed-up periodically. On regular follow-up there had been no further episode of seizures for the last four years.

DISCUSSION

In 1907, Lehndorff was the first to suggest that strong muscle contractions during a convulsive seizure can cause vertebral compression fractures [4]. Violent contractions
of the paraspinal muscles and the muscles of the neck, abdomen and pelvis, occur during convulsive seizures. With increasing muscular tension of the posterior spinous and abdominal muscles, the spine flexes forward and is subjected to axial loading and flexion compressive forces, directed along the anterior and middle columns, which can cause vertebral compression or burst fractures [5, 6]. For biomechanical reasons, seizure induced non-traumatic vertebral fractures have a predilection for the mid-thoracic spine (T3–T8), as in this case [6, 7]. In contrast traumatic vertebral fractures affect the cervical, thoracolumbar or lumbosacral junction. Cervical fracture and lumbosacral dislocation have been documented on rare occasions [8]. Most vertebral fractures induced by seizure are inherently stable with no neurological deficit.

Vertebral fractures are most frequent in patients whose attacks occur during sleep and in patients with a history of convulsive status epilepticus [7]. There has been a previous case report of a vertebral compression fracture which was the only presenting feature of an unwitnessed nocturnal convulsive seizure [4]. But in this case report, the mother witnessed the tonic-clonic seizure which occurred during the early morning hours, which was the only and the most valuable clinical clue to the diagnosis. Most vertebral fractures (80.9%) resulted from recurrent convulsions, due to a repetitive additive mechanism in patients with a history of convulsive status epilepticus [5]. But this is a case of a non-epileptic who was presented with a vertebral compression fracture from the first episode of convulsive seizure.

There have been reports of non-traumatic vertebral fractures in convulsive seizures secondary to osteopenia induced by long-term anticonvulsive medications or other bone mineral density decreasing agents, diabetic hypoglycemia, electrolyte imbalance, hypocalcaemia, electroconvulsive therapy or trauma during the convulsive episode [1, 9–11]. Patients with increased muscle mass, anticonvulsant induced osteoporosis, a prolonged seizure or recurrent seizures are at increased risk for fractures [1, 7]. Our patient was not a known epileptic and was not on anticonvulsive medication. His bone mineral density was normal. This is a rare case of a vertebral compression fracture that occurred in a normal healthy individual during the first episode of a convulsive seizure. Hence, the fracture was the sole result of violent muscle contractions alone that occurred during tonic-clonic convulsion. Vertebral fractures occurring in a healthy young (non-epileptic) male, with normal bone mineral density, presenting with back pain after a convulsive seizure is a rare clinical presentation which could easily be missed unless there is a high index of clinical suspicion.

Vasconseles suggested a rate of 15% of primarily asymptomatic fractures caused by seizures [7]. This emphasizes the importance of a critical musculoskeletal examination and a radiographic assessment in patients presenting with back pain after a tonic-clonic seizure even if an event of fall or accident is neglected by the patient. In a young patient, absence of overt signs of trauma, postictal amnesia or an inadequate clinical history provided by the patient or family members may mislead the clinician into the evaluation of a spontaneous non-porotic spine fracture which is often equated with a metabolic disorder or metastasis [4]. This may lead to an unnecessary costly diagnostic work-up.

CONCLUSION

Forceful muscle contractions during a single episode of convulsive seizure occurring for the first time, can result in vertebral compression fracture, even in a normal healthy individual. These vertebral fractures can appear clinically asymptomatic and can easily be overseen due to absence of external trauma and also due to possible postictal consciousness disturbance, which may fail to provide clue to early diagnosis. A high degree of clinical suspicion is needed whenever an epileptic patient complains of back pain. Such patients may be subjected to a thorough radiological evaluation to rule out potential bony injury, especially in the presence of symptoms.

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Author Contributions

Nalli Ramanathan Uvaraj – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Nalli Ramanathan Gopinath – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Aju Bosco – Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final
approval of the version to be published

Guarantor
The corresponding author is the guarantor of submission.

Conflict of Interest
Authors declare no conflict of interest.

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