

Non-Traumatic Spinal Fracture Due to Generalized Tonic-Clonic Epileptic Seizure

Jeneralize Tonik Klonik Epileptik Nöbet Sonrası Non-Travmatik Omurga Kırığı

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ABSTRACT In people with epilepsy, injuries are more common due to the direct effect of epilepsy and/or comorbid conditions. Excessive and strong muscle contractions that occur during the tonic phase of the seizure force the bones and may cause fractures. Abdominal and paraspinal muscle contractions cause significant vertebral axial loading resulting in vertebral compression fractures (CFs). The following report describes a seizure-induced CF of the T5 vertebra without an external trauma. The painful CF, in this case, led to the diagnosis of osteoporosis. Those with epilepsy have an increased risk of vertebral/non-vertebral fractures and vitamin D deficiency which is a well known risk factor for osteoporosis. Diagnosis of osteoporosis and prevention of its complications are of critical importance in people with epilepsy. Vertebral fracture is an important complication that should be kept in mind in patients with back pain and tenderness in the spinal region after an epileptic seizure.

Keywords: Back pain; compression fracture; osteoporosis; epilepsy; seizure

ÖZET Epilepsili bireylerde, epilepsi ve/veya komorbid durumların doğrudan etkisi nedeniyle yaralanmalar daha yaygındır. Nöbetin tonik evresinde meydana gelen aşırı ve güçlü kas kasılmaları, kemikleri zorlayarak kırıklara neden olabilir. Abdominal ve paraspinal kas kasılmaları vertebral aksiyal yüklenme sonucu vertebral kompresyon kırıklarına neden olur. Bu olgu sunumunda, T5 vertebrada epileptik nöbet sonrası gelişen nontravmatik kompresyon kırığı olan olgudan bahsedilmektedir. Ağırli kompresyon kırığı aracılığıyla bu olguda osteoporoz teşhis edilmiştir. Epilepsisi olanlarda osteoporoz için bilinen bir risk faktörü olan D vitamini eksikliği ve vertebra/vertebra dışı kırık riski daha yüksektir. Bu nedenle osteoporozun teşhisi ve komplikasyonlarının önlenmesi kritik öneme sahiptir. Vertebra kırığı, epileptik nöbet sonrası sırt ağrısı ve spinal bölgede hassasiyet olan hastalarda akılda tutulması gereken önemli bir komplikasyondur.

Anahtar Kelimeler: Sırt ağrısı; kompresyon kırığı; osteoporoz; epilepsi; nöbet

In people with epilepsy, injuries are more common due to the direct effect of epilepsy and/or comorbid conditions. About 80% of epilepsy-related injuries occur in people with generalized tonic-clonic (GTC) seizures.^{1,2} Excessive and strong muscle contractions that occur during the tonic phase of the seizure force the bones and may cause fractures.^{3,4} The risk of any fracture is doubled, while the risk of hip and spine fractures is higher 5 and 6 times, re-

spectively.⁵ Abdominal and paraspinal muscle contractions cause significant vertebral axial loading result in vertebral compression fractures (CFs). These CFs are more common in the upper and middle thoracic spine.⁶ GTC seizures are usually asymptomatic. However, some post-seizure thoracolumbar burst fractures may lead to neurological deficits.⁴

Vertebral fracture (VF) is a clinical condition that can be overlooked for reasons such as under-re-

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porting and lack of awareness. The following report describes a seizure-induced CF of the T5 vertebra without external trauma. The painful CF in this case led to the diagnosis of osteoporosis. The purposes of sharing this case is to increase awareness about post-seizure fractures and to review the literature.

DECLARATION OF PATIENT CONSENT

Written informed consent form was obtained from the patient to publish the demographic, clinical features and imaging findings. All procedures in this case report were carried out in accordance with the latest version of the World Medical Association Declaration of Helsinki and the Good Clinical Practices Guidelines published by the Ministry of Health.

CASE REPORT

The presented case is a 65-year-old male (weight 68 kg, height 165 cm) who had undergone craniotomy for acute subdural hematoma 5 years ago. Two years after the craniotomy, he was diagnosed with epilepsy due to having GTC seizures. The patient had been seizure-free for 2.5 years under 1000 mg of levetiracetam daily. Since he was seizure-free, antiepileptic therapy was stopped. During this period, in which he was followed without medication for 3 months, he applied to the emergency room with the GTC seizure that he had while asleep. His treatment was rearranged to use levetiracetam 1000 mg daily. One week after, he was referred to the physical medicine and rehabilitation (PM&R) clinic because of his back pain that started after the seizure. His back pain was sharp and stabbing. Mean visual analogue scale on his baseline pain intensity was 7/10, and increased to 8/10 at night. His back pain was not relieved by non-steroidal anti-inflammatory and myorelaxant drugs.

Increased thoracic kyphosis, paravertebral muscle spasms in the thoracic region and processus spinosus tenderness in the upper thoracic spine were detected. Thoracolumbar movements were painful in all directions.

Thorax computed tomography (CT) images taken before and after the epileptic seizure were compared. Both CT images showed height loss in the T7 vertebra. In the post-seizure CT, height loss was ob-

served in the T5 vertebra, which wasn't in the pre-seizure CT. Thoracic magnetic resonance imaging taken with the preliminary diagnosis of VF showed bone marrow edema consistent with acute-subacute CF in the T5 vertebra and 50% height loss, and chronic CF sequelae and 60% height loss in the T7 vertebra (Figure 1).

The patient's 25-OH vitamin D level was 17.4 µg/L. Bone mineral density (BMD) was measured and severe osteoporosis was detected (Table 1).

Thoracic-lumbo-sacral orthosis and brace were prescribed for the fracture because the fracture was stable and neurological examination findings were normal. Vitamin D deficiency was replaced. The combination of 325 mg paracetamol and 37.5 mg tramadol 3 times per day reduced pain. Denosumab and calcium carbonate were started for osteoporosis treatment. The patient was trained for fall prevention and an exercise program for osteoporosis. The patient's follow-up continues in the PM&R clinic.

DISCUSSION

This case report showed that a GTC seizure in the lying position without external trauma can cause osteoporotic vertebral CF. In the presented case, the use of antiepileptic drugs may have contributed to the development of osteoporosis and the increased fracture risk.

VFs caused by GTC seizures were first described by Vasconcelos who stated that these fractures are frequently seen in the T3 to T8 range in those whose seizures start in adult life and who have epileptic seizures during sleep.⁴ Fall-induced spine fractures occur in the lumbar, where the spine is more mobile, and seizure-induced spine fractures occur in the thoracic, where the spine is less mobile.^{3,4} In a research investigating GTC seizures and evaluating 626 seizure-related injuries, the VFs rate was 1.7%.⁷ None of the VFs in this study were caused by falling. The fractures occurred in the tonic phase of the seizure, in the lying position, without external trauma. Those with VFs had back pain and tenderness in the vertebral region of the fracture, similarly to the presented case. In this case report, the patient suffered a CF in the T5 vertebra as a result of a seizure in the lying position, in line with the literature.

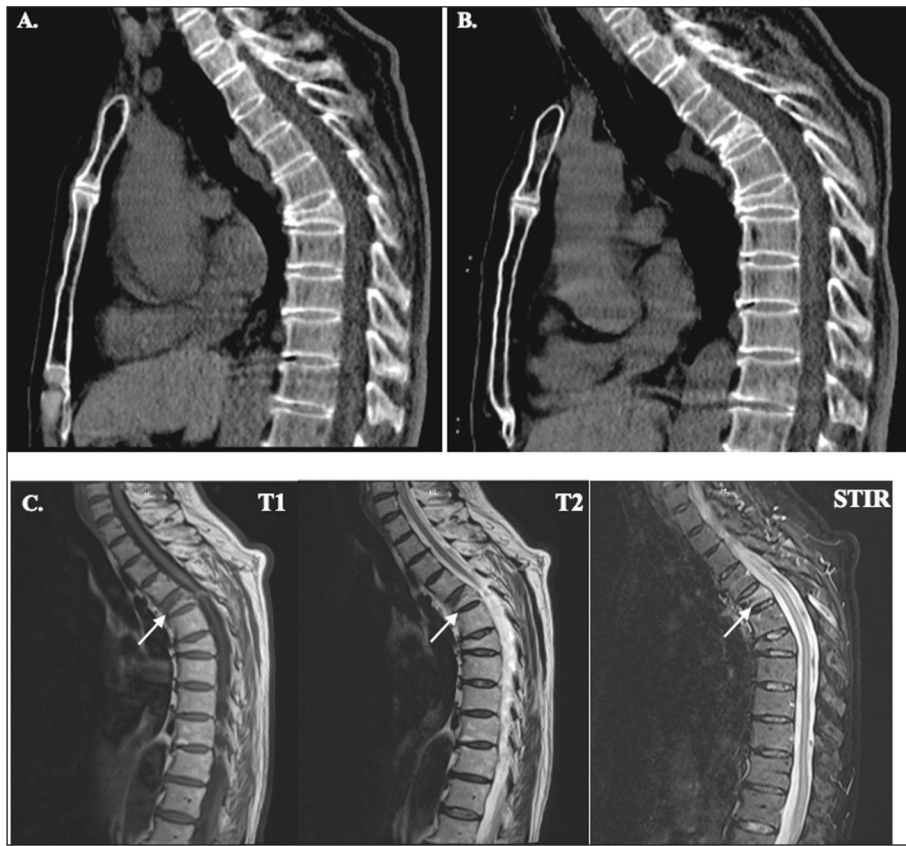


FIGURE 1: Vertebral images of the case

A: Pre-seizure thoracic vertebra CT. B: Post-seizure thoracic vertebra CT. C: Post-seizure thoracic vertebra MRI. Acute-subacute compression fracture in the T5 vertebra indicated by the arrow. CT: Computed tomography, MRI: Magnetic resonance imaging.

TABLE 1: DXA scan results and FRAX® values of the case.

DXA scan results			
Region	BMD (g/cm ²)	T-score	Z-score
L1 spine	0.663	-3.7	-3.2
L2 spine	0.837	-2.9	-2.4
L3 spine	0.660	-4.3	-3.8
L4 spine	0.615	-4.5	-4.1
L1-4 spine	0.687	-3.9	-3.5
Femoral neck	0.778	-2.2	-0.7
Total hip	0.786	-2.4	-1.4
FRAX® tool			
The ten year probability of fractures (%)			
Major osteoporotic	15		
Hip fracture	5.2		

DXA: Dual energy x-ray absorptiometry; BMD: Bone mineral density; FRAX®: Fracture risk assessment tool.

Those with epilepsy have an increased risk of vertebral/non-vertebral fractures and vitamin D deficiency which is a well known risk factor for osteo-

porosis. Although conflicting results were found regarding the effects of levetiracetam, most antiepileptic drugs may increase the risk of vertebral and nonvertebral fractures by negatively affecting the level of BMD.⁸ Therefore, diagnosis of osteoporosis and prevention of osteoporosis complications are crucial for patients with epilepsy. Clinicians should be aware of this matter, perform an adequate physical examination, and use imaging methods when necessary. To detect post-seizure fractures, a 3-stage screening procedure is recommended (Table 2).⁹

In the presence of high fracture risk or a previous fragility fracture, current osteoporosis treatment guidelines recommend the use of bisphosphonates or denosumab in the treatment of osteoporosis. Treatment guidelines do not specify any superiority of these agents over each other.^{10,11} In patients with dysmotility, it is recommended to be careful in the use of oral bisphosphonates as drug transfer may be de-

TABLE 2: A 3-stage screening procedure for the detection of post-seizure fractures.⁹

1. Questioning the pain
• The first step is to question whether there is a pain in the joints, back, and extremities after the seizure.
2. Physical examination
• The second step is to palpate the risky areas and see if there is tenderness, deformity, or joint movement limitation and whether there is bruising.
3. Imaging methods
• The third step is to examine the suspicious areas with imaging methods.

layed.¹² Although there is insufficient data to indicate that bisphosphonates induce atrial fibrillation, a recent meta-analysis found an increased risk of atrial fibrillation in those taking oral and intravenous bisphosphonates.¹³ The patient has a history of dysmotility and a family history of sudden cardiac death. Therefore, denosumab was preferred for his osteoporosis treatment. Better compliance may be predicted due to the injectable nature of denosumab treatment. For men over 50, the guidelines recommend 1200 mg of calcium and 800-1500 IU of cholecalciferol daily.¹⁴ After the vitamin D replacement of the presented case, maintenance treatment was started with 800 IU cholecalciferol daily. Because his dietary calcium intake was insufficient, 1200 mg of daily cal-

cium was prescribed in line with the guideline recommendations.

The osteoporosis treatment of the case was arranged according to current guidelines.¹⁰ Denosumab was chosen as the treatment agent because of his fragility fracture and high fracture risk. Training for fall prevention and an exercise program for osteoporosis were added to the patient's treatment program as an integral part of treatment.

In conclusion, VF is an important complication that should be kept in mind in patients with back pain and tenderness in the spinal region after a seizure. Due to the increased risk, osteoporosis screening should be performed when a VF is detected.

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