Seizure-induced Muscle Force Can Caused Lumbar Spine Fracture

Epileptický záchvat s následkem fraktury bederní páteře

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SUMMARY

Patients suffering form epilepsy have an increased risk for fractures. Beside fractures caused by fall or accident muscles forces alone generated during tonic–clonic seizure can result in severe musculoskeletal injury. Contractions of strong paraspinal muscles can lead to compression fracture of the mid–thoracic spine.

We report a patient who had suffered from a tonic–clonic seizure during early morning hours. After a cracking sound the patient woke up in a state of post-ictal disorientation, loss of urine and tongue bite. He was admitted to our facilities with the suspected vertebral fracture albeit he just reported of mild lower back pain. Native X–rays and computer–tomography scans showed instable burst fractures of L2 and L4. The fractures were stabilised with a dorsally instrumented internal fixator from L1 to L5 followed by hemi-laminectomy and ventral spondylodesis.

Muscle force alone can result in severe skeletal trauma including vertebral fractures. This example emphasizes the importance of critical examination of patients after grand mal seizures. Seizures–induced injuries can appear clinically asymptomatic and can easily be overseen due to absence of trauma and post–ictal impairment of consciousness.

CASE REPORT

A 45-years old male was admitted to Freiburg University Medical Centre with lumbar back pain following a grand mal seizure. On admission blood pressure was 170/100 mmHg, heart rate 110/min and oxygen saturation was 93 %. He awoke during the early morning hours after a two minutes period of seizure with tongue bite and urine loss. His wife described a generalized seizure event accompanied by a loud cracking sound. It was the patient's second seizure event with the first occurring six month earlier. Past medical history revealed neither an event of fall nor an accident. He had not been treated with any anticonvulsive medication up to admission date.

The patient was in post–ictal state of disorientation, showed adequate reactions, seemed to be tired and reported mild lower back pain. The clinical examination showed a tongue bite and no abnormality was detected in the neurological examination including EEG and CT scans of the skull. The blood count revealed a leukocytosis, serum measurements a hyperglycaemia of 7.1mmol/l. Conventional X–rays of the lumbar spine showed a transverse fracture of L2 and a burst fracture of L4 with an injured third column slightly penetrating the spinal canal approximately 5 mm (Fig. 1 and Fig. 2). Both fractures were considered an instable type A 2.3 fracture according to the AO classification (Magerl).

The patient was initially administered phenytoin (8ml/h) and 40mVal potassium chloride solution/24h. The day after surgical treatment with a dorsal stabilisation of the vertebral column was performed. Following reposition of the fractures an internal fixation system was tagged from L1 to L3 and from L3 to L5. Additionally, hemi–laminectomy was performed on the right side of segment L3/L4. Intraoperative discography revealed an intact intervertebral disc of L2/L3 and L4/L5. The intervertebral discs of L1/L2 and L3/L4 showed efflux of dye indicating ruptured discs in the respective segments. Therefore, a ventral spondylodesis of the segments L1/L2 and L3/L4 was performed in a second look operation using a tri–cortical bone graft harvested from the iliac crest (Fig. 3). The patient was postoperatively mobilised on crutches under continuous supervision of a physiotherapist. He was introduced to an in–house neurologist for prevention therapy of his epilepsy and discharged after 21 days for after–treatment in a centre of rehabilitation. Bone density was measured at the femoral neck (FN) using a Lunar DPX–L scanner. Repeated measurements revealed a T–score at LS of –1.78 and a Z–score of –1.24 due to a clinical osteopenia according to WHO definition of osteoporosis (–2.5 SDM < T–Score< –1.0 SDM). Bone mineral density (BMD) was 0.839 g/cm^2 and bone mineral content (BMC) was 4.38 g (Fig. 4). Oral treatment with 1000 mg calcium, 800 I.E. colecalciferol was initiated before the patient was discharged. A calcium substitution and treatment with colecalciferol was initiated. Radiographic controls and measurement of bone mineral density were performed after 2 and 6 month following operation.

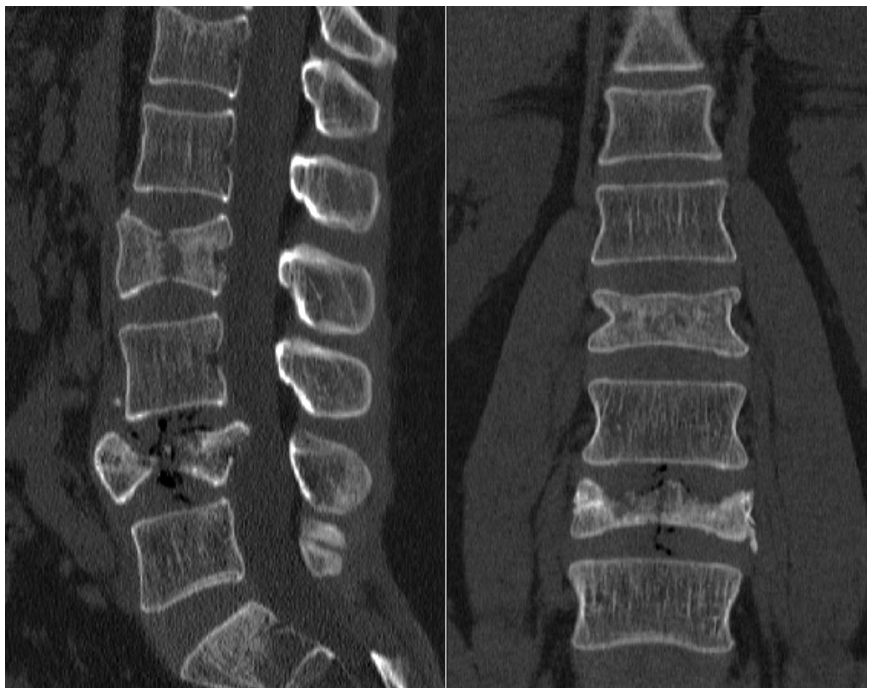

Fig.1. Following a tonic–clonic seizure a 45–years old was admitted with lower back pain. Computertomography (Sagittal and coronar plane) showed a transverse fracture of L2 and a burst fracture of L4 with an injured third column penetrating into spinal canal approximately 5mm.

Fig. 2. Three–dimensional CT–reconstruction of a transverse fracture of L2 and a burst fracture of L4.

DISCUSSION

Bone fractures, especially vertebral compression fractures, are well–known complications of convulsive seizures (Matson et al. 2004), (8). These fractures mostly result from fall or accident caused by the seizure (Finelli et al. 1989, Vestergaard et al. 1999), (3, 16). The incidence of vertebral fracture stated in the literature varies from 1–16 % in patients suffering from epilepsy, (Pedersen et al. 1976, Vasconcelos 1973, Youssef et al. 1995, (10, 14, 17). In contrast, contraction of the paraspinal muscles alone leads to vertebral fractures in epileptic patients at an incidence rate of 0.3 %, (Finelli et al. 1989, Vernay et al. 1990), (3, 15). Vertebral fractures caused by muscle force first have been reported after electric–convulsion therapy in psychiatric patients. These fracture could not even be prevented by a careful fixation of the patients, (Kelly 1954, Vasconcelos 1973), (7, 14). Similar fractures of the vertebral bodies were observed following tetanus attacks, (Aubry et al. 1971, Gertsman 1973, Srinivas et al. 1994), (1, 4, 12).

However, vertebral fractures caused by muscle force show a different pattern of affected region as compared to spine fractures following direct trauma. Seizure–induced vertebral fractures are generally located mid–thoracic between T3–T8 whereas the cervical spine or the thoraco–lumbar or lumbar–sacral junction is rather affected after trauma, (Takahashi et al. 2002), (13). In contrast, our patient presented mid–lumbar fractures which happen extremely rare according to literature data.

Non-traumatic vertebral fractures caused by muscle force special surgical treatment to supply the needs of the special fracture pattern. We decided to perform a internal stabilisation of the lumbar spine with an fixator system. Recently, treatment with percuntaneous kyphoplasty was introduced in a patient suffering from non–traumatic compression fractures of the thoracic spine following seizure, (Gnanalingham et al. 2004), (6).

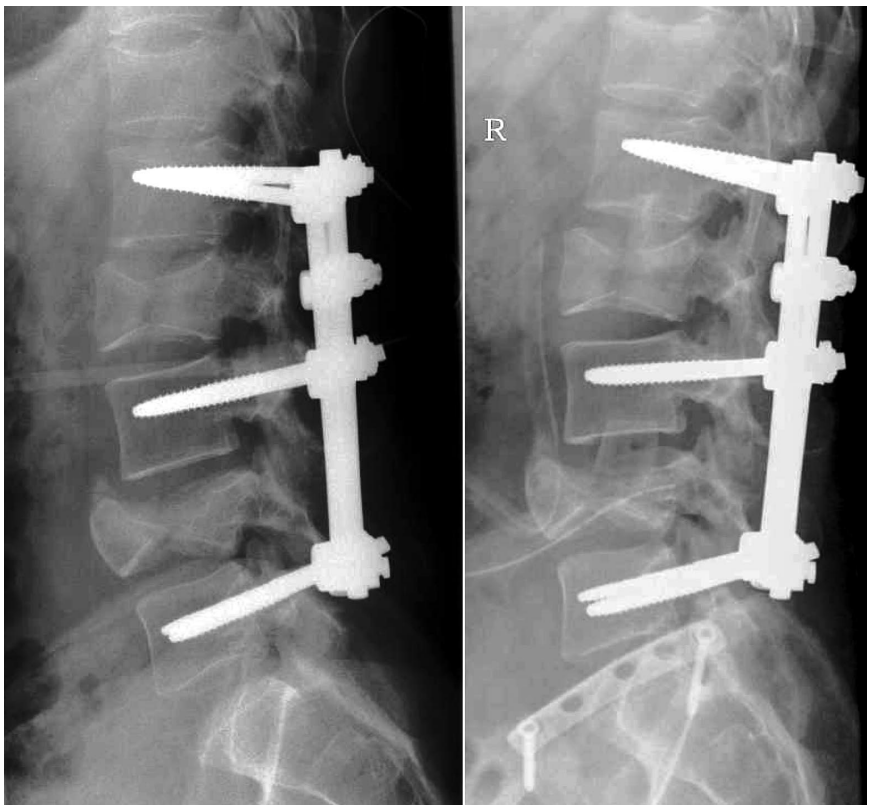

Fig. 3a, b. A patient with a seizure–induced spine compression fracture of L2 and L4 was treated operatively with a dorsal stabilisation of the vertebral column. Following reposition of the fractures an internal fixation system was tagged from L1 to L3 and from L3 to L5 (a). Hemi–laminectomy was performed on the right side of segment L3/L4. Intraoperative discography revealed an intact intervertebral disc of L2/L3 and L4/L5. The intervertebral discs of L1/L2 and L3/L4 showed efflux of dye indicating ruptured discs in the respective segments. Therefore a ventral spondylodesis of the segments L1/L2 and L3/L4 was performed in a second look operation using a tri–cortical bone graft harvested from the iliac crest (b).

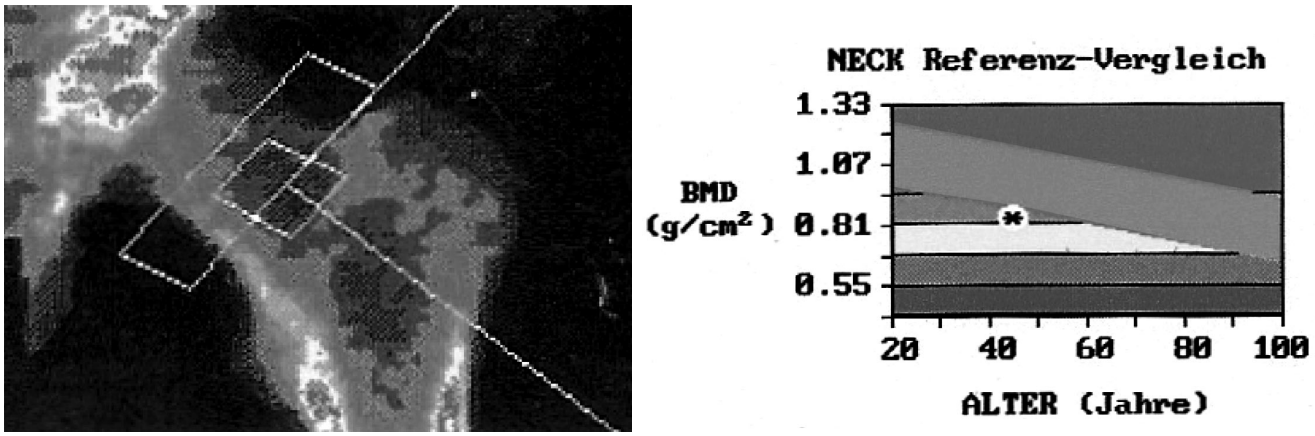

Fig. 4. Bone density was measured at the femoral neck (FN) using a Lunar DPX–L scanner. Repeated measurements revealed a T–score of –1.78 and a Z–score of –1.24. Bone mineral density (BMD was 0.839 g/cm2 and bone mineral content (BMC) was 4.38 g.

The majority of authors report on patients treated with anti-convulsive medication like valproate and carbamazepin or other BMD-decreasing agents, (Dubost et al. 1993, Nilsson et al. 1986), (2, 9). Several studies show that anti-convulsive medication reduces bone mineral density and increases the risk of fracture of bone, especially the vertebral bodies (Gilles et al. 1996, Nilsson et al. 1986, Sheth et al. 1995), (5, 9, 11). In 27 children carbamazepine or valproate decreased bone mineral density by 14 % and 10 %, respectively, (Sheth et al. 1995), (11). Despite our patient had no anticonvulsive therapy before fracture event which might have supported the typical fracture pattern, BMD measurement of the femoral neck revealed mild osteopenia.

During seizure strong muscle activity can cause fractures that are associated with only mild pain, (Takahashi et al. 2002), (13). Thus, Vasconcelos suggests a rate of 15 % of primarily asymptomatic fractures caused by seizure, (Vasconcelos 1973), (14). This emphasises the importance of a critical examination of patients admitted after tonic–clonic seizures even if an event of fall or accident is neglected by the patient. Especially, it should be paid attention to fractures of the spine or limbs as well as shoulder dislocations and in case of doubt radiographic assessment should be performed.

ZÁVĚR

U pacientů trpících epilepsií je zvýšené riziko fraktur. Kromě zlomenin následkem pádů nebo jiných nehod může mít svalová kontrakce, vznikající během generalizovaného tonicko-klonického záchvatu, za následek závažné poranění pohybového aparátu. Stahy silných paraspinálních svalů mohou způsobit kompresní frakturu obratlů ve střední hrudní páteři.

V této práci je popsán případ pacienta, který měl tonicko-klonický záchvat v ranních hodinách. Pacient zaslechl křupnutí a probudil se zmatený po prodělaném záchvatu, pomočen a s pokousaným jazykem. Byl přijat do našeho zařízení s podezřením na zlomeninu obratle, ačkoliv si stěžoval pouze na mírnou bolest dolních zad. Prostý rentgenový snímek a tomogram ukázaly nestabilní zlomeniny obratlů L2 a L4. Fraktury byly ošetřeny s použitím vnitřního instrumentária dorzálně aplikovaného od obratle L1 po L5 a následnou hemilaminektonií a ventrální spondylodézou.

Samotná svalová síla může způsobit závažné kosterní zranění včetně zlomenin obratlů. Tento příklad ukazuje na důležitost kritického posouzení výsledků vyšetření u pacientů po velkém (grand mal) epileptickém záchvatu. Zranění vyvolaná záchvatem mohou být klinicky asymptomatická a snadno přehlédnutelná vzhledem k nepřítomnosti zjevného zranění a zmatenosti pacienta po prodělaném záchvatu.

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