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Diagnosis of male osteoporosis after severe lumbar trauma

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Abstract: Introduction. Primary osteoporosis in men is significantly less frequent than in women but is similarly associated with an increased risk of fractures (including fragility fractures i.e.fractures that occurr without any causal trauma). Vertebrae are common sites for fragility fractures which can be oligo- or completely asymptomatic.

Case report. We present the case of a man diagnosed after a traumatic event with both severe spine fractures and age-related osteoporosis. A 65-year non-smoking Caucasian man with negative medical history suffered a spine trauma during his work in constructions. Fractures at T12 and L1 were diagnosed and surgically managed (T12 laminectomy and T12-L1 bilateral titanium osteosynthesis). Osteoporosis was also confirmed by DXA osteodensitometry. He received antiosteoporotic treatment (bisphosphonates, vitamin D supplementation) but at the 1 year- follow-up visit a new fragility fracture (T7 vertebra) was diagnosed. The occurrence of fragility fractures despite active antiosteoporotic treatment raised significant dillemas related to the individual contributions of osteoporosis and trauma to the initial, apparently posttraumatic vertebral fractures.

Conclusion. In the presence of confirmed osteoporosis (a condition with increased risk of spontaneous vertebral fractures, frequently asymptomatic) it is very difficult to correctly discern the contribution of a spinal trauma to the etiopathogenesis of vertebral fractures.

Key Words: primary osteoporosis, vertebral fractures, fracture risk.

Forensic studies proved that the biomechanical parameters of the adult bone (stiffness, radio-density of cranial or axial bones) decrease with age while the risk of fractures increases with age [1, 2]. The progressive bone loss with age occurs in individuals of either sex [1, 2]. However, as a consequence of higher peak bone mass in males and more stable gonadal function, male osteoporosis is significantly less frequent and its diagnosis is challenging [3]. Similarly to women, the diagnosis of osteoporosis in males is based on the evaluation of bone mineral density (BMD) by central Dual-Energy X-Ray Absortiometry (DXA) (at the level of the spine, hip and third distal radius). In men older than 50 years osteoporosis is defined by a T-score of less than or equal to -2.5 standard deviations (SD) at the lumbar spine or hip, or by the presence of a previous fragility fracture regardless the T-score [4]. Due to the decreased awareness of this diagnosis in men and the oligosymptomatic nature of the disease, many male patients are only diagnosed following a fragility fracture. Vertebral fractures (VF) account for more than a quarter of all osteoporotic fractures in both men and women [5]. Fragility VF are relatively frequently diagnosed incidentally on a radiography of the spine because they commonly cause little or no symptoms [6].

Fractures occurring after a severe traumatism

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are more challenging from the forensic point of view. These can not be considered fragility fractures (because they occur as a result of a trauma). However, it is obvious that the severity and number of fractures are highly dependent on the pre-existing bone mass and quality. The trauma may act as a revelator event of a previously unknown decreased bone mass and in that case it is difficult to clearly discern the contribution of each factor. We present a male case diagnosed and operated for severe spine fractures that were considered the effect of both lumbar trauma and age-related osteoporosis.

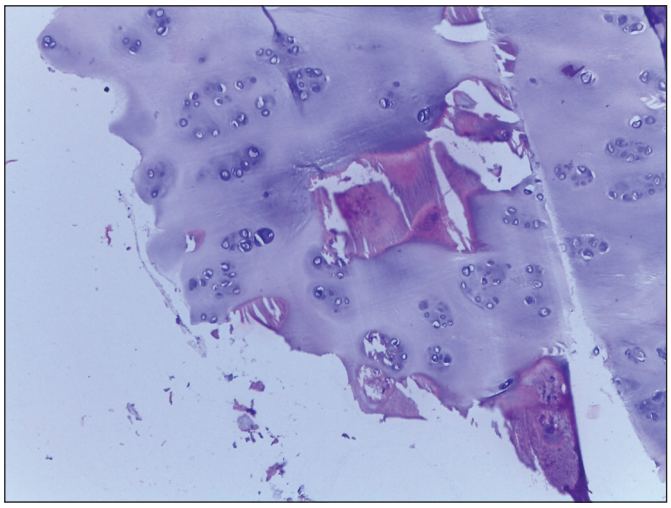

Figure 1A. Hyaline cartilage with areas of endochondral ossification (Hematoxilin-eosin 10x).

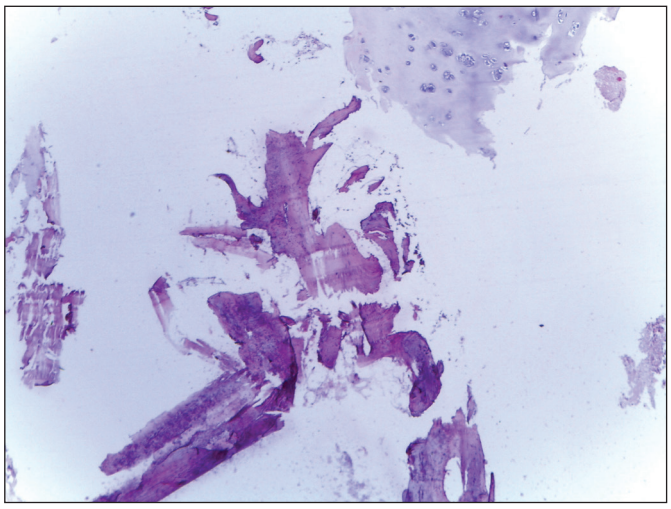

Figure 1B. Bone tissue with basophile areas and fragment of hyaline cartilage (HE 4X).

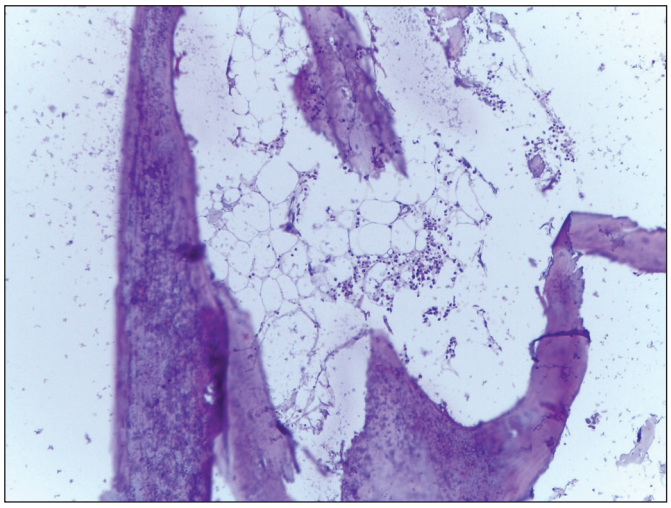

Figure 1C. Bone tissue with basophile areas (HE 10X).

CASE PRESENTATION

A 65-year non-smoking Caucasian man was referred to endocrinological evaluation one year after a traumatic vertebral fracture had been diagnosed. He had suffered a spine trauma during his work in constructions. Afterwards, he complained of intense lumbar pain and a vertebral fracture at T12 and L1 level was confirmed. The thoracic vertebra was protrusive into the medullar cavity so he underwent neurosurgical intervention (T12 laminectomy and T12-L1 bilateral titanium ostesynthesis). The pathological report of the bone tissue in the affected areas revealed typical bone fragments without neoplastic elements (Fig. 1). The DXA osteodensitometry established the diagnosis of osteoporosis - see Table 2. He was treated for 1 year with oral bisphosphonates (35 mg weekly risendronate) with vitamin D supplementation.

Table 1. The endocrine evaluation in 65-year old male with history of vertebral fractures

Parameter	Level	Normal ranges	Units
Bone metabolism			
Serum CrossLaps	0.18	0.2-0.704	ng/mL
Serum osteocalcin	13.97	14-46	ng/mL
Serum P1NP	28.91	15-74	ng/mL
parathormone	33.73	16-65	pg/mL
Total serum calcium	9.9	8.5-10.2	mg/dL
Serum phosphorus	4	2.5-4.5	mg/dL
25-hydroxyvitamin D	21	30-100	ng/mL
Gondal function			
Specific prostate antigen	1.08	0-4	ng/mL
Total testosterone	2.04	1.75-7.81	ng/mL
Neuroendocrine markers			
Neuron specific enolase	3.44	0-12	ng/mL
Calcitonin	1	1-11.8	ng/mL
Chromogranin A	67.4	20-125	ng/mL

Table 2. Osteodensitometric (DXA) parameters at the initial and 1 year follow-up evaluation

Parameter	Lumbar BMD (g/sqcm)	T-score (SD)	Z score (SD)
Initial evaluation	0.838	-3.4	-3.8
1 year evaluation	0.915	-2.6	-3

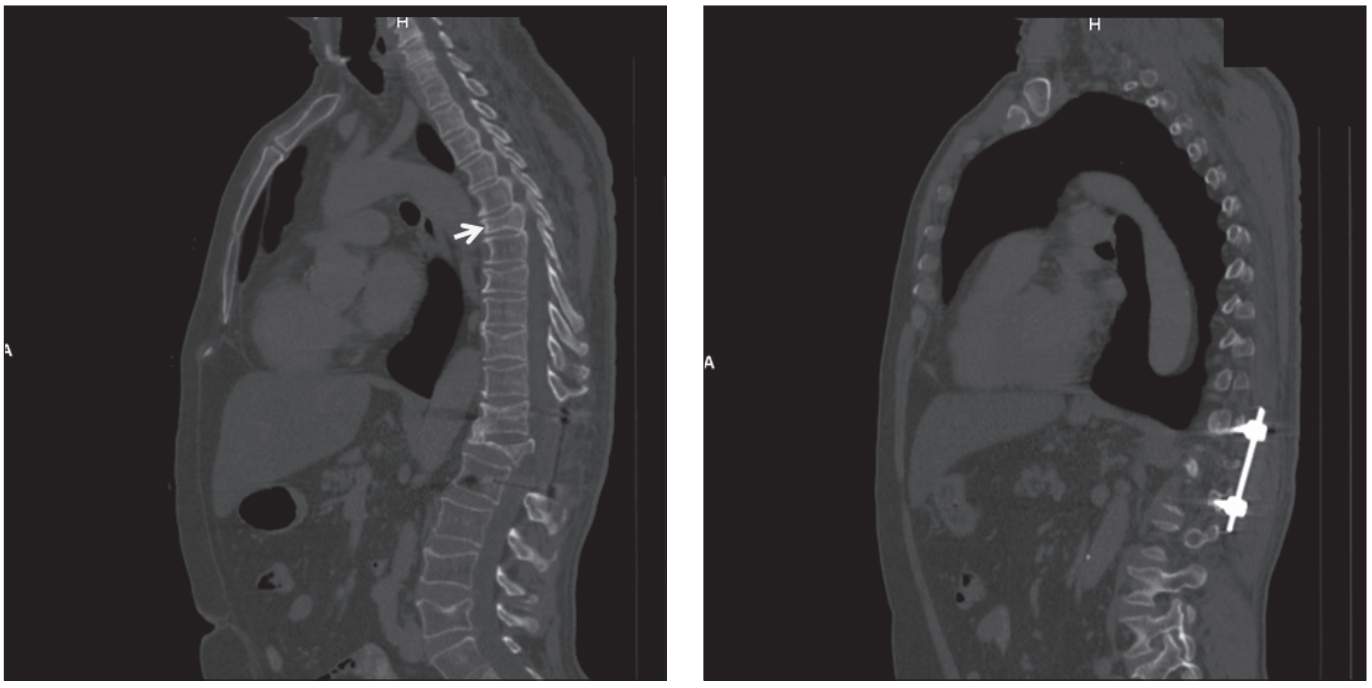

Figure 2. Computed tomography one year after the accident: T7 vertebral fracture (white arrow) and T12-L1 osteosynthesis material (sagital plane).

Twelve months later the osteodensitometric results were significantly improved – see Table 2. The extensive checkup for secondary osteoporosis causes was negative (Table 1). The serum concentration of 25-hydroxyvitaminD was still suboptimal. A new vertebral fracture (apparently non-traumatic) was found on T7 vertebra (Fig. 2). Anabolic treatment with teriparatide was recommended together with increased doses of vitamin D.

DISCUSSIONS

This case underlines the difficulties that can be occasionally encountered in establishing the contribution of a traumatic event to secondary fractures. This is particularly significant if the apparent posttraumatic fractures involve sites that are commonly affected in medical conditions with high fracture risk such as osteoporosis.

At the initial posttraumatic evaluation, significant osteoporosis was diagnosed in our case (obviously unrelated to the trauma). Although rare in males, marked bone loss can still affect a significant percentage of elderly men. Study of Health in Pomerania (SHIP-2) proved that 4.6% of the males have a high risk of fracture, and this risk increases to 8.8% in subjects over age 65 proving an age-dependent pattern of bone loss [7]. Even more, since many vertebral fragility fractures are asymptomatic [5], the etiological impact of the trauma can not be adequately proved in relation to the vertebral fractures either.

The evolution of the patient further increased this initial dilemma. The BMD did improve with potent antiresorbtive medication but a new fragility fracture occurred during one-year follow-up. This represents an argument of severe osteoporosis (idiopathic or age-related). The traumatic event was revelatory for this pre-existing severe primary osteoporosis.

In addition to its causal role related to the VF, the traumatic injury might have acted also as an aggravating factor of slow response to bisphosphonates. Studies on men with spinal cord injuries proved that with severe posttraumatic neurological damage significant BMD loss is found at the level of the affected lumbar vertebrae [8]. Of course, the mild VD deficiency can also contribute to the suboptimal response. VD deficiency is highly prevalent [8] (including in cases with traumatic spinal injury [9]), frequently suboptimally replaced (due to either insufficient doses recommended or decreased compliance) and plays a major role in rehabilitation [9].

This case illustrates the difficulties sometimes raised in appreciating the exact impact of a traumatic event in a patients with severe underlying bone disease.

CONCLUSION

A severe lumbar trauma may cause vertebral fractures but also may act as a revelatory event of a previous osteoporotic status. The traumatism contributes to both the pathogenesis of fractures and possibly impairs the response to antiosteoporotic therapy but the exact impact is very difficult to be established.

Conflict of interest. The authors declare that they have no conflict of interest concerning this article.

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