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OSTEOPOROTIC LUMBAR SPINE FRACTURES: DIAGNOSTIC AND TREATMENT STRATEGY. CASE REPORT

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Abstract

This article presents a case of surgical treatment of osteoporotic compression fracture. Osteoporosis is a common disease that is associated with an increased risk of pathological fractures. Bone mineral density testing (BMD) is a key component in the management of patients with osteoporosis. The technologies used in bone densitometry are dual-energy X-ray absorptiometry (DXA). In this case, the role of vertebroplasty in the surgical treatment of a patient with osteoporotic fractures of the vertebral body is described and discussed.

Keywords: osteoporosis, bone mineral density, vertebroplasty, vertebral body fracture, densitometry.

Резюме

ОСТЕОПОРОТИЧЕСКИЕ ПЕРЕЛОМЫ ПОЯСНИЧНОГО ОТДЕЛА ПОЗВОНОЧНИКА: СТРАТЕГИЯ ДИАГНОСТИКИ И ЛЕЧЕНИЯ. КЛИНИЧЕСКИЙ СЛУЧАЙ

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В данной статье представлен клинический случай хирургического лечения остеопоротического компрессионного перелома. Остеопороз - это распространенное заболевание, которое связано с повышенным риском патологических переломов. Тестирование минеральной плотности костной ткани (МПК) является ключевым моментом в ведении пациентов с остеопорозом. Технологии, используемые при денситометрии костей - это двухэнергетическая рентгеновская абсорбциометрия (DXA). В данном случае обсуждается роль вертебропластики в хирургическом лечении пациента с остеопоротическими переломами тела позвонка.

Ключевые слова: остеопороз, минеральная плотность кости, вертебропластика, перелом тела позвонка, денситометрия.

Түйіндеме

БЕЛ ОМЫРТҚАСЫНЫҢ ОСТЕОПОРОТИКАЛЫҚ СЫНЫҚТАРЫ: ДИАГНОСТИКА ЖӘНЕ ЕМДЕУ СТРАТЕГИЯСЫ. КЛИНИКАЛЫҚ ЖАҒДАЙ.

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Бұл мақалада остеопороздың компрессиалық сынуын хирургиялық емдеудің клиникалық жағдайы келтірілген. Остеопороз бұл патологиялық сыну қаупінің жоғарылауымен байланысты кең таралған ауру. Сүйектің минералды тығыздығын (BMD) сынау остеопорозбен ауыратын науқастарды емдеудің негізгі құрамдас бөлігі болып табылады. Сүйек денситометриясында қолданылатын технологиялар екі энергиялы рентгендік абсорбциометрия (DXA) болып табылады. Бұл жағдайда омыртқа денесінің остеопорозды сынықтары бар науқастарды хирургиялық емдеудегі вертебропластиканың рөлі талқыланады.

Түйінді сөздер: остеопороз, сүйек минералды тығыздығы, вертебропластика, омыртқа денесінің сынуы, денситометрия.

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Background

Osteoporosis is a common disease all over the world. Osteoporosis is a common disease that is associated with increases in fracture risk, morbidity and mortality rates, and healthcare expenses [1]. Bone mineral density (BMD) testing is a key component in the management of patients with osteoporosis. A number of devices are currently available for the measurement of BMD and other surrogates of bone strength and fracture risk. The technologies used in bone densitometry devices include dual-energy X-ray absorptiometry (DXA), quantitative ultrasound (QUS), and quantitative CT (QCT) [7]. According to the WHO criteria, osteoporosis is defined as a BMD that lies 2.5 standard deviations or more below the average value for young, healthy women (a T-score of < -2.5 SD) [15].

Osteoporosis is classified into primary and secondary. Primary osteoporosis is observed in postmenopausal women, as well as in men and women over 70 years of age due to aging [8]. Secondary osteoporosis is caused by disease, treatment (chronic use of glucocorticoids, antidepressants and etc.), or idiopathic. Diseases that

cause secondary osteoporosis include systemic diseases, endocrine diseases, and malignant neoplasms. Juvenile idiopathic osteoporosis (JIO) is a very rare condition of primary bone demineralization [6]. The exact prevalence is unknown. Diagnosis of JIO is based on clinical presentation, skeletal X-rays, BMD, and exclusion of other common causes of osteoporosis in this age [6].

Osteoporosis risk factors are divided into two groups: modifiable and non-modifiable [11]. Body weight, smoking [2], lack of physical activity, calcium deficiency in the diet, and long-term use of glucocorticoids are risk factors for the modified osteoporosis group. Gender, age, genetic predisposition are risk factors for the group of non-modifiable osteoporosis. Women suffer more from osteoporosis. For example, in women, premature menopause and loss of ovarian function before menopause are risk factors for osteoporosis [16]. The clinical symptoms of osteoporosis in old age include decreased body height, dowager's hump or kyphosis, bone fracture and respiratory impairment.

Treatment of osteoporosis includes therapeutic and surgical. The main goal of treating osteoporosis is to

prevent fractures. Based on the essence of the disease itself, this goal is achieved by increasing bone mineral density and improving its quality. Drug treatment includes nitrogen-containing bisphosphonates, vitamin D, hormone replacement therapy.

If osteoporosis has caused a compression fracture with a decrease in the height of the vertebral body by more than 30%, as well as if conservative therapy is ineffective, surgical intervention is indicated. Percutaneous vertebroplasty is still widely used to treat osteoporotic vertebral fractures [3]. However, surgical treatment, including traditional open or minimally invasive decompression surgery, should be carried out with caution in elderly patients with osteoporosis with progressive neurological deficiency and/or painful progressive spinal deformity and with concomitant somatic diseases.

Aim. To update the available evidence of the benefits and harms of vertebroplasty for treatment of Osteoporotic Vertebral Fractures.

Search methods. X-ray diagnostics and result of surgical treatment of a patient with Osteoporotic Vertebral Body Fractures.

Case presentation.

A 63-year-old woman was admitted (02.15.2023) to the Department of Neurosurgery of the University hospital of the Semei Medical University.

Complaints on admission of pain in the thoracic spine, severe restriction of movement in the spine. These complaints are about 1 month old. He was treated by a neurologist for spondylosis of the thoracic spine. Conservative treatment without effect.

Status neurosis: conscious, antalgic pose. Pupils D=S, photoreaction is alive. Tendon reflexes D=S. The strength and volume of leg movements in full. The sensitivity of the legs is not impaired. Urination is independent. Locally: Pain in the area of vertebra Th8-Th9.

Instrumental examination: dual-energy X-ray absorptiometry (DXA) of hips (02.17.2023) Conclusion: Bone mineral density ranges from (-2.2 to -2.8) SD. Osteoporosis. (Fig.1.)

Computed tomography of Spine (02.17.2023) Conclusion: CT-signs of severe osteoporosis of the spine, pathological compression vertebral body fracture of Th9,

grade III. Violation of the physiological axis of the spine. To exclude multiple hemangiomas of Th3–Th12 vertebrae, MRI Spine is recommended. (Fig. 2.)

Magnetic resonance imaging (02.17.2023) Conclusion: MR-signs of compression vertebral body fracture of Th9 with a change in the MR signal of the bone marrow. Schmorl hernia Th11–Th12.

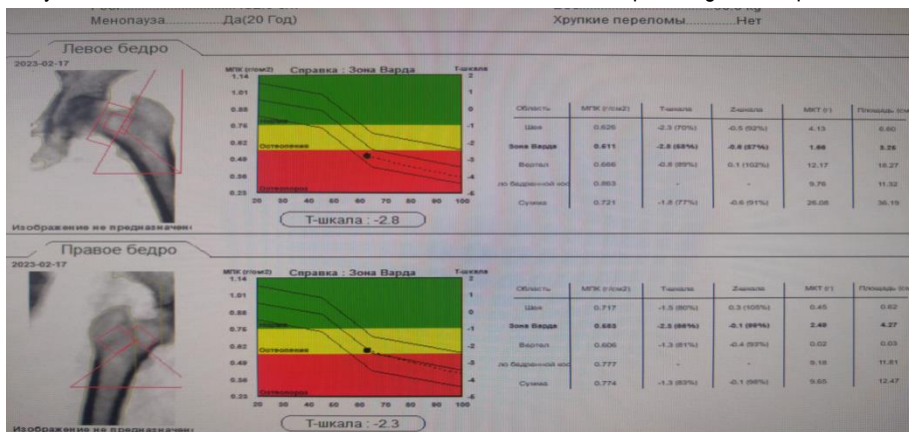


Figure 1.DXA of Hips (February 17, 2023)

BMD of the right femoral neck, 0.717 g/sm²; BMD of the left femoral neck, 0.626 g/sm²

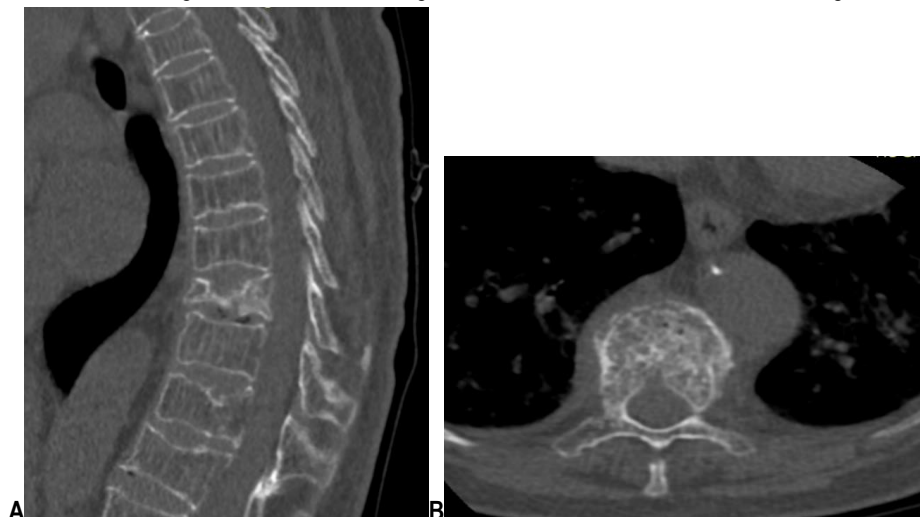


Figure 2. CT of Spine (February 17, 2023) A. Sagittal view, B. axial view

Compression vertebral body fracture of Th9

The diagnosis was form: Closed stable compression vertebral body fracture of the Th9. Pain syndrome. (S22.0) Fracture of the thoracic vertebra.

Operative treatment for Vertebral Fracture was recommended: Percutaneous vertebroplasty of Th9.

02.22.2023 percutaneous vertebroplasty (81.65) was performed, bone cement "V-Max" was introduced in an amount of 2.5 ml. There are no cement leaks on the control radiograph of the thoracic spine.

03.31.2023 the patient was discharged with positive dynamics, relief of pain in the paravertebral region.

Re-enters the Department of Neurosurgery of the University Hospital of the Semey Medical University with complaints of pain in the thoracic spine, severe restriction of movement in the spine. The patient was assigned a computed tomography of the bone and joint system (04.04.2023). Conclusion (Fig. 3): CT-signs of severe osteoporosis of the spine, dishormonal spondylopathy, consolidated compression vertebral body fracture of the Th9, grade III, with relative

stenosis of the spinal canal, biconcave deformity of the bodies Th11, 12. Condition after vertebroplasty Th9.

The diagnosis was formulated: Closed stable compression fracture of the body Th11, 12 vertebrae. Pain syndrome.(S22.0) Fracture of the thoracic vertebra. Condition after percutaneous vertebroplasty Th9.

Conservative treatment is recommended. 04.08.2023 the patient was discharged in a relatively satisfactory condition with medical (medications, therapeutic gymnastics) and labor recommendations.

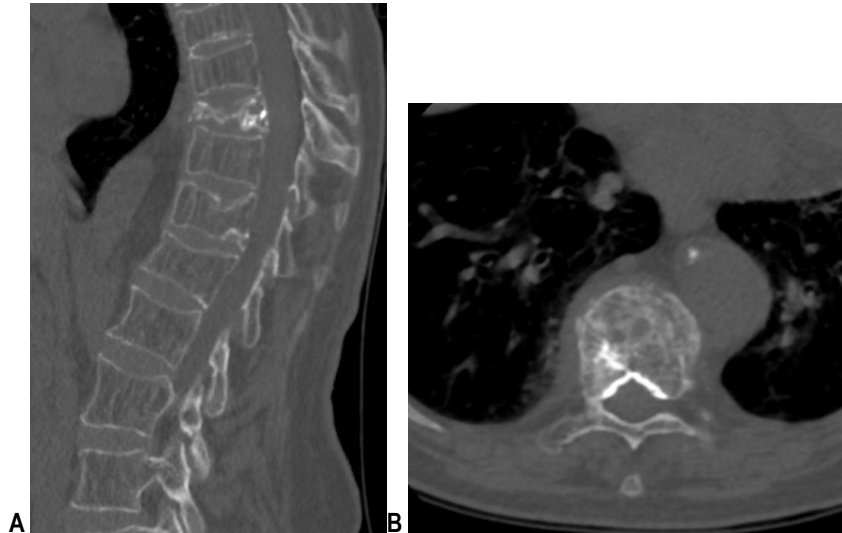


Figure 3. CT of Spine (April 4, 2023) A. Sagittal view, B. Axial view
Vertebroplasty Th9. Compression vertebral body fracture of Th11, Th12

Discussion.

With the accelerating aging of the world's population, osteoporosis is becoming more common and threatens more people or is becoming more common. Osteoporotic vertebral fracture (OVF) is one of the most common consequences of osteoporosis. This often leads to lower back pain and spinal deformity, which seriously affects the quality of life of patients [17]. Some studies have reported that subcutaneous administration of denosumab or teriparatide and standardized oral bisphosphonates is recommended to slow the progression of osteoporosis and improve bone metabolism, it can achieve satisfactory clinical effects [9]. However, if pain and disability persist for more than 2 months, the possibility of enlarging the vertebral body using vertebroplasty (VP) or balloon kyphoplasty (KP) using polymethylmethacrylate (PMMA) is considered. VP and KP is a good method of treating patients with OVF who do not tolerate pain or do not get well from conservative treatment [10]. However, the operation is mainly focused on the fractured vertebral body itself, ignoring the treatment of the adjacent damaged end plate-disc complex (EDC). EDC performs important functions such as maintaining the stability and integrity of the spine, protecting spinal nerves, shock absorption and axial load distribution [17].

The first classification intervertebral disc injuries based on MRI images of spinal fractures [12]. However, the study included patients with normal bone tissue, and its classification method is not fully applicable to patients with osteoporosis. The working group «Osteoporotic Fractures» of the German Society of Orthopedics and Traumatology has developed a classification system (OF classification) of osteoporotic thoracolumbar fractures. The OVF classification consists of 5 groups: OF 1, no vertebral deformation (vertebral edema); OF

2, deformation with no or minor (<1/5) involvement of the posterior wall; OF 3, deformation with distinct involvement (>1/5) of the posterior wall; OF 4, loss of integrity of the vertebral frame or vertebral body collapse or pincer-type fracture; OF 5, injuries with distraction or rotation [13].

However, currently, the Republic of Kazakhstan has adopted a classification of vertebral body fractures as in traumatic fractures, described by many authors [12,14]. In the conclusion of a CT of spine made in our University hospital, the Th9 fracture stage was also determined based on these recommendations (Fig 2). Also in our clinical case, woman suffers from postmenopausal osteoporosis, which is confirmed by the data of dual-energy X-ray absorptiometry. According to the International Society for Clinical Densitometry (ISCD), measuring the BMD in the spine with an existing vertebra fracture can distort the result. Therefore, we measured the BMD in the femoral neck. It is known from the anamnesis that the woman had early menopause, pain for one month in the spine, which were diagnosed and treated as spondylosis of the thoracic spine.

Due to the asymptomatic course, three quarters of patients with vertebral fractures do not seek medical help at the time of their occurrence [4]. Pain in the vertebral body fracture, unlike spondylosis appears under static load only, which is associated with the reaction of sensitive nerve fibers to micro-fractures of trabeculae, their number increases against the deficiency of BMD and a decrease of the remaining bone structures in the compressed vertebra [5]. Such patients first of all need to carry out DXA of osteoporosis and begin conservative treatment if it detection. The literature [9] describes cases of drug treatment with bisphosphonates in women aged 70.60 ± 8.81 years. After 12 months, there was a significant improvement in both the

BMD of the lumbar spine (LS) ($p < 0.001$) and the BMD of the femoral neck (FN) ($p < 0.001$).

In the patient's medical history, there is no data on visiting a specialist who would prescribe DXA for osteoporosis and further antiporotic therapy. This led to the fact that after vertebroplasty of Th9, two months later there was a fracture of other vertebrae of Th11-12.

This confirms the data of the authors [3] on the reassessment of VP for the treatment of osteoporotic vertebral fractures. Also, after VP, numerous serious adverse events were observed, for example, people who underwent vertebroplasty rated the overall quality of life by 0.32 points, and the feeling of pain decreased by only 0.7 points on a scale from 0 to 10 points.

Conclusion

Our clinical case showed that early diagnosis of postmenopausal osteoporosis by the dual-energy X-ray absorptiometry method is important because it allows to prevent osteoporotic vertebral fractures and reduce the number of surgical interventions. In patients with OVF, both severe osteoporosis and severe fractures in the thoracolumbar segments are often combined with a more severe EDC injury. Therefore, the role of vertebroplasty in the treatment of osteoporotic fractures should be justified.

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