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TREATMENT OF OSTEOPOROTIC VERTEBRAL FRACTURES

SUMMARY

Vertebral compression fractures are the most common skeletal injuries due to osteoporosis. Osteoporotic vertebral compression fractures stand for the leading cause of disability and morbidity in the elderly.

The aim of the paper was to present the modern management of osteoporotic vertebral fractures.

The paper presents the results of the treatment of 44 patients with osteoporotic vertebral fractures in the period from January 1, 2002 to December 31, 2005 at the Clinic of Orthopaedic Surgery and Traumatology, Clinical Center Nis. In the analyzed group there were 31 (70.45%) females and 13 (29.55%) males. The subjects in the sixth decade - 16 (36.36%), the fifth decade - 13 (29.55) and the seventh decade of life - 6 (13.66) prevailed. The most frequent cause of osteoporotic vertebral fractures in the elderly was minor trauma.

Most of the patients - 34 (77.27%) with osteoporotic vertebral fractures were treated with bed rest and analgesic medications, 7 (15.91%) patients were treated with bed rest, analgesic medications and bracing, while three patients were treated by vertebroplasty. Anti-osteoporotic drugs (calcium, vitamin D, bisphosphonates) were administered to all patients. Among the complications associated with osteoporotic vertebral fractures, the collapse of vertebral body followed by chronic pain was reported in 15 (34.09%) cases and development of kyphotic deformity in 12 (27.27%) cases. In the patients treated by vertebroplasty, no complications were registered. Good results have been reported following vertebroplasty in the treatment of osteoporotic vertebral fractures.

Key words: osteoporosis, osteoporotic vertebral fractures

INTRODUCTION

Besides degenerative rheumatism, osteoporosis belongs to the group of the most frequent bone diseases in the elderly (1). It is characterized by quantitative decrease in bone mass per unit of volume due to decreased osteoclast production. This is the consequence of diminished anabolic activity, i.e. insufficient stimulation of the osteoblastic function with preserved decomposition

process (2).

Insufficient stimulation of osteoblastic function occurs for a number of reasons, of which inactivity and estrogen deficiency are the most important in clinical practice (3). According to the cause, osteoporosis can be divided into primary (involutional-menopausal and idiopathic-juvenile) and secondary (2).

As a generalized metabolic process, osteoporosis plays a significant role in the etiology of

fractures in the elderly. The fractures usually occur in bones bearing the greatest load, such as the spine and hip (4). The USA National Osteoporosis Foundation estimates that more than 100 million people worldwide are at risk of fractures secondary to osteoporosis (5).

Osteoporotic vertebral compression fractures occur in 20% of people over the age of seventy and in 16% of postmenopausal women (6).

Osteoporotic vertebral compression fractures are the leading cause of disability and morbidity in the elderly. The consequences of these fractures are chronic pain and progressive vertebral collapse followed by spinal kyphosis and systemic manifestations (7).

AIMS

The aim of the paper was to present the frequency of osteoporotic vertebral fractures in the elderly treated at the Clinic of Orthopedics and Traumatology, Clinical Center Nis. In addition, one of the aims was to analyze the kind of management, as well as the final management results.

MATERIAL AND METHODS

The prospective study encompassed 44 subjects with osteoporotic vertebral compression fractures treated at the Clinic of Orthopaedic Surgery and Traumatology, Clinical Center Nis, in the period from January 1, 2002 to December 31, 2005.

In the analyzed group, there were 31 (70.45%) females and 13 (29.55%) males. The subjects in the sixth decade -16 (36.36%), the fifth decade - 13 (29.55) and the seventh decade of life - 6 (13.66) prevailed (Table 1). The largest number of vertebral fractures occurred accidentally due to minor trauma.

Table 1. Sex and age of patients

Age Sex	41-50 year	51-60 year	61-70 year	71-80 year	81-90 year	Total n %
Male	1	4	5	1	2	13 (30%)
Female	3	9	11	5	3	31 (70%)
Total n %	4 (9%)	13 (30%)	16 (36%)	6 (14%)	5 (11%)	44 (100%)

In the analyzed group, the fracture localization, kind of management and complications of osteoporotic vertebral compression fractures were followed. The patients were followed for one year after the incident.

Vertebroplasty, as a minimally invasive procedure in the management of these fractures, was performed in three (6.19%) patients at the Institute of Radiology, Clinical Center Nis.

RESULTS

In the analyzed group, the largest number of vertebral fractures occurred in the lumbar spine - 26 (59.09%) and thorax - 10 (22.73%). In 8 patients, two or more osteoporotic vertebrae sustained fractures in the thoracolumbar spine (Figure 1).

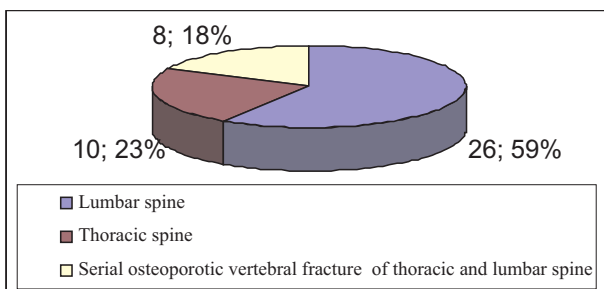


Figure 1. Locality of osteoporotic vertebral fractures

The largest number of patients - 34 (77.27%) with vertebral fractures were treated with bed rest, analgesics and physical therapy, while in 7 (15.91%) patients, besides the aforementioned treatment procedures, bracing was applied. Vertebroplasty, as a minimally invasive surgical intervention, was performed in 3 (16.9%) patients (Figure 2).

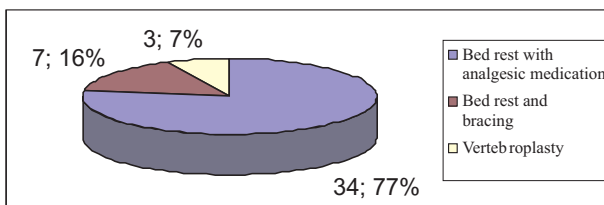


Figure 2. Treatment of osteoporotic vertebral fractures

In 15 (34.09) patients of the analyzed group, a collapse increase associated with chronic pain was reported. In 12 (27.27%) patients, the gibus deformity was noted. All the patients in whom vertebroplasty had been performed presented with good results and absence of pain (Figure 3).

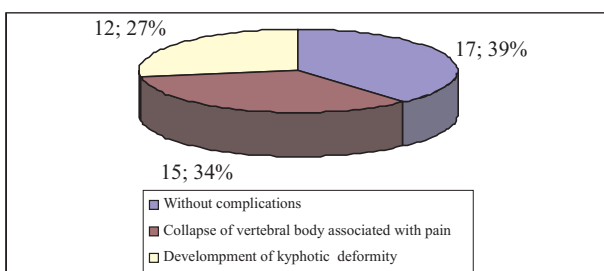


Figure 3. Complications of osteoporotic vertebral fractures

DISCUSSION

Osteoporosis is a pathological change having an important place in Orthopedics. Decreased osteoblastic activity undoubtedly results in osteoporosis, though the very reason of such activity has not been thoroughly explained yet. Although osteoporosis is not the disease typical of the advanced age only, it usually occurs in the elderly along with degenerative changes of the joints and blood vessels. In these subjects, osteoporosis is explained by decreased physical activity, inadequate nutrition and hormonal imbalance (2).

The spinal column is the localization of the most marked changes in osteoporosis. Osteoporotic lumbar spine after the age of 65 is reported in 8% of men and 12% of women. The difference in the frequency of osteoporosis in women is more pronounced in generalized osteoporosis as well (6).

In the thoracic region, the vertebrae have a wedge deformity, while the lumbar vertebral bodies, under the influence of the disc expansive forces, get concaved on the anterior and posterior sides, which is the reason of the series of biconcave vertebrae with expanded intravertebral spaces. On radiographic appearance, the vertebral borders are ill-defined, associated with transversal trabeculae loss (*Figure 4*).



Figure 4. A seventy-year-old man with an osteoporotic vertebral compression fracture

Pathological fractures occur mostly in the thoracolumbar region. Vertebral body fractures usually occur at the sites where one mobile spine column segment is followed by less mobile one, so that the most frequent fractures are those of the 11th and 12th thoracic and 1st, 2nd, and 4th lumbar vertebra (8).

Many osteoporotic vertebral fractures may be initially asymptomatic and are discovered later. Approximately, 30% of these fractures become clinically evident (9, 10). The muscle spasm, sensibility on palpation, kyphotic angulation and local swelling, possibly with subcutaneous hematoma in the wound area can occur. Injuries with nerve lesions are rare in osteoporotic vertebral fractures. The diagnosis of thoracic spine fracture requires a detail clinical and neurological examination, radiographs in anteroposterior, laterolateral and oblique projections, computerized tomography, magnetic resonance imaging and electromyography. Magnetic resonance imaging is the most useful visualization method for the diagnostics of osteoporotic vertebral fractures. It is useful in determining the fracture age, ruling out a metastatic tumor, and choosing the appropriate treatment. (*Figure 5*) (11).



Figure 5. Magnetic resonance image showing serial osteoporotic vertebral fractures in a seventy-year-old patient

Reduction of vertebral body height by 20% or 4 mm is considered a compressive vertebral fracture (3).

Three fracture patterns are described in the osteoporotic spine: wedge, biconcave and crush fractures. In the wedge fractures, there is a collapse of anterior vertebral border, while the posterior border stays almost intact. These fractures usually occur in the midthoracic and thoracolumbar regions. Biconcave fractures show the collapse of the central portion of the vertebral body, and usually occur in the lumbar region. Crush fractures mostly occur in the midthoracic and lumbar regions, and here the whole vertebral body is collapsed. In osteoporotic fractures, the most frequent are the wedge and biconcave fractures (12).

In compressive vertebral fractures, pain can be very strong and incapacitating. In a number of cases, the pain subsides within few weeks or few months, but it is not uncommon to turn into chronic pain. After osteoporotic fractures, chronic pain is the result of incomplete vertebral healing associated with progressive osseous collapse, altered spine kinematics due to development of spinal deformity or pseudarthrosis at the affected vertebra (4). Kyphotic deformities in the osteoporotic spine create a biomechanical environment that favors the occurrence of additional fractures. Clinical studies have shown that the risk of new fractures in the first year after the first vertebral fracture increases five to twenty-five times (13). Because of the kyphotic deformity, paravertebral muscles are more engaged, which brings about muscle fatigue. Vertebral compression fractures vastly decrease life quality, physical function, mental health and survival. In the elderly, vertebral fractures increase both morbidity and mortality, which is usually related to impaired pulmonary function due to the associated spine deformities (14).

Traditionally, acute osteoporotic vertebral fractures have been treated nonoperatively except in rare cases when associated with neurological compromise and great spinal instability. All the ways of nonoperative treatments (bed rest, symptomatic medications, bracing, physical therapy) cannot reduce the fracture, so that these fractures, after undertaken treatment, are usually associated with pain, deformity and systemic manifestations (impaired pulmonary function) (12).

All the ways of conservative treatments in the elderly have their shortcomings. Strong anti-inflammatory drugs and narcotics administered to the elderly may be the cause of confusion and fear of a new fall. Long bed rest may accelerate the bone loss, while bracing is poorly tolerated by older patients, is expensive and decrease the diaphragm function (4).

Vertebroplasty and kyphoplasty are two minimally invasive surgical interventions offering promising results in the elderly in whom the classic

operative reduction and stabilization of osteoporotic vertebral compression fractures are not possible to perform.

Vertebroplasty is a percutaneous injection of a bone-filler, mostly poly-methylmethacrylate, directly into a fractured vertebral body guided by fluoroscopy. The goals of vertebroplasty are not only to attenuate or eliminate pain but also to prevent any further collapse of vertebral body. Sometimes, it is possible to achieve the postural reduction (*Figure 6*) (15).

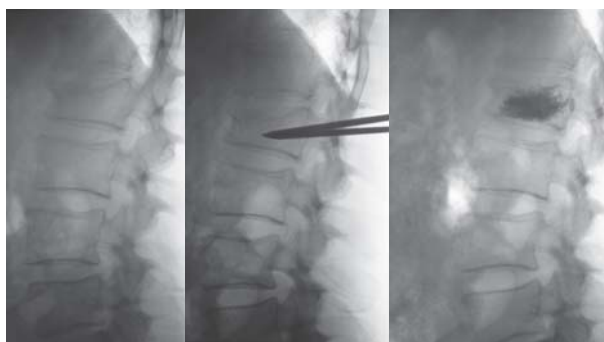


Figure 6. Vertebroplasty-a minimally invasive technique for the treatment of osteoporotic vertebral fractures

Kyphoplasty stands for percutaneous insertion of an inflatable bone tamp into a fractured vertebral body under the guidance of fluoroscopy. Inflation of the bone tamp raises the vertebral body almost to normal height and the created cavity is filled with bone-void filler. Kyphoplasty aims at pain relief, vertebral body height restoration and kyphotic deformity reduction (16). These two methods are identified in the treatment of painful osteoporotic vertebral fractures but also in metastatic changes, multiple myeloma and painful vertebral hemangioma. Kyphoplasty may be indicated to correct severe and progressive kyphosis which is the result of compressive vertebral fractures (4).

Besides undertaken treatment of vertebral fractures, it is necessary to administer the adequate therapy for the treatment of osteoporosis. In this treatment, the most applied are vitamin D (alpha D3), Ca, and antiresorption agents such as calcitonin and bisphosphonates (alendronate, risedronate, ibandronate) (1).

CONCLUSION

Osteoporosis is a generalized metabolic process having an important role in etiology of vertebral compression fractures in the elderly.

Osteoporotic vertebral compression fractures are the leading cause of disability and morbidity in older population. The consequences of these fractures include pain, progressive vertebral collapse

associated with development of kyphosis and systemic manifestations, the most important of which is the impaired pulmonary function.

Osteoporotic vertebral fractures are treated nonoperatively except in rare cases when associated with neurological compromise and great spinal instability. All the ways of nonoperative treatments (bed rest, symptomatic medications, bracing, physical therapy) cannot reduce the fracture, so that these fractures, after undertaken treatment, are usually associated with pain, deformity and systemic manifestations (impaired pulmonary function).

Classic operative stabilization techniques are very risky because of the age of patients with osteoporotic fractures. Therefore, vertebroplasty and kyphoplasty are two minimally invasive interventions recommended for this group of patients.

Along with treatment measures, it is necessary to administer the therapy adequate for the treatment of osteoporosis. The most applied are vitamin D (alpha D₃), Ca, and antiresorption agents such as calcitonin and bisphosphonates (alendronate, risedronate, ibandronate).

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PRELOMI PRŠLJENOVA KIČMENOG STUBA KOD BOLESNIKA SA OSTEOPOROZOM

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SAŽETAK

Osteoporoza, kao generalizovani metabolički proces, ima značajnu ulogu u etiologiji preloma pršljenova kičmenog stuba kod osoba starije životne dobi. Osteoporotični prelomi kičmenih pršljenova su vodeći uzrok invalidnosti i morbiditeta starijih osoba.

Cilj rada bio je da se analizira učestalost osteoporotičnih preloma pršljenova kod starijih bolesnika i način lečenja ovih preloma.

U periodu od 01.01.2002. do 31.12.2005. godine u Klinici za ortopediju i traumatologiju Kliničkog centra u Nišu lečeno je 44 bolesnika sa osteoporotičnim prelomima pršljenova. U analiziranoj grupi bila je 31 (70.45%) osoba ženskog pola i 13 (29.55%) osoba muškog pola. Dominiraju osobe šeste 16 (36.36%), pete 13 (29.55%) i sedme decenije života 6 (13.64%). Najveći broj kompresivnih preloma pršljenova kičmenog stuba kod bolesnika starije životne dobi nastao je kao posledica minimalne traume.

U analiziranoj grupi, najveći broj bolesnika - 34 (77.27%), sa kompresivnim osteoporotičnim prelomom kičmenog stuba, lečen je mirovanjem, analgeticima i fizikalnom terapijom, dok je kod 7 (15.91%) bolesnika, pored navedenih mera lečenja, primenjeno i lečenje rasteretnim torakolumbalnim miderom. Kod 3 (6.19%) bolesnika urađena je vertebroplastika koštanim cementom. Pored preduzetih mera lečenja, ordinirana je i terapija za lečenje osteoporoze vitaminom D, Ca i bifosfonatima. Komplikacije, kao što je povećanje kolapsa slomljenog pršljenja, registrovane su kod 15 (34.09%) bolesnika i formiranje gibusa kičmenog stuba kod 12 (27.27%) bolesnika. Kod bolesnika kod kojih je urađena vertebroplastika nije bilo komplikacija.

Pored klasičnog konzervativnog lečenja (mirovanje, analgetska terapija, fizikalne procedure i nošenje midera), vertebroplastika i kifoplastika su dve minimalno invazivne intervencije koje se preporučuju u lečenju ovih preloma.

Ključne reči: osteoporoza, osteoprotični prelomi pršljenova