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Vertebroplasty in the Treatment of Pain in Osteoporotic Vertebral Compression Fractures

Wertebroplastyka w leczeniu bólu w osteoporotycznych kompresyjnych złamaniach kręgów

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Abstract

Introduction. Osteoporosis is a metabolic disorder found in 1/3 of women and 1/8 of men over the age of 50. Increased bone fragility leads to low-energy fractures, 50% of them affect the vertebral bodies of the thoracic and lumbar spine. Fractures produce intensive pain which practically immobilize patients and require strong pain killers taking.
Aim. We retrospectively evaluated the effectiveness of vertebroplasty in treating pain caused by fresh osteoporotic vertebral fractures.
Material and Methods. 270 patients, 206 women and 64 men were included. Mean age of women was 78, and in men 79 years. All patients had fresh vertebral fracture producing intensive pain. Pain intensity was measured using a 10 cm Visual Analog Scale. Pain intensity was assessed using the VAS scale before vertebroplasty and then 12 hours, 1 day and 30 days after the procedure. All surgical procedures were performed under local anaesthesia in an operating theatre using a two-plane X-ray machine.
Results. Significant reduction of pain was noted in almost all patients within 12 hours after procedure, and perfect result with pain reduction from 7–9 cm in VAS scale to 2–4 cm were noted in all follow-up exams. Only 1of 270 patients had not reported any improvement. No systemic or local complication of the procedure were noted.
Conclusions. Vertebroplasty quickly, efficiently and for a longer period of time significantly reduces pain caused by osteoporotic vertebral fractures and should be considered as one of the primary method of treatment of pain caused by osteoporotic vertebral fracture. **(JNNN 2025;14(4):178–181)**
Key Words: osteoporosis, post-fracture pain, vertebral fracture, vertebroplasty

Streszczenie

Wstęp. Osteoporoza jest zaburzeniem metabolicznym występującym u 1/3 kobiet i 1/8 mężczyzn powyżej 50 roku życia. Zwiększona kruchość kości prowadzi do niskoenergetycznych złamań, a 50% z nich dotyczy trzonów kręgów odcinka piersiowego i lędźwiowego kręgosłupa. Złamania powodują silny ból, który praktycznie unieruchamia pacjentów i wymaga stosowania silnych środków przeciwbólowych.
Cel. Oceniliśmy retrospektywnie skuteczność wertebroplastyki w leczeniu bólu spowodowanego świeżymi złamaniami osteoporotycznymi kręgów.
Materiał i metody. Badanie objęło 270 pacjentów, w tym 206 kobiet i 64 mężczyzn. Średni wiek kobiet wynosił 78 lat, a mężczyzn 79 lat. Wszyscy pacjenci mieli świeże złamania kręgów powodujące intensywny ból. Intensywność bólu mierzono za pomocą 10-centymetrowej Wzrokowej Skali Oceny Bólu. Intensywność bólu określono za pomocą skali VAS przed wertebroplastyką, a następnie 12 godzin, 1 dzień i 30 dni po zabiegu. Wszystkie zabiegi chirurgiczne przeprowadzono w znieczuleniu miejscowym, w warunkach sali operacyjnej z użyciem dwupłaszczyznowego aparatu rtg.
Wyniki. U prawie wszystkich pacjentów odnotowano znaczne zmniejszenie bólu w ciągu 12 godzin po zabiegu, a we wszystkich badaniach kontrolnych odnotowano doskonałe wyniki z redukcją bólu z 7–9 cm w skali VAS do 2–4 cm. Tylko 1 z 270 pacjentów nie zgłosił żadnej poprawy. Nie odnotowano żadnych ogólnoustrojowych ani miejscowych powikłań zabiegu.

Wnioski. Wertebroplastyka szybko, skutecznie i na dłuższy okres znacznie zmniejsza ból spowodowany osteoporotycznymi złamaniami kręgów i powinna być brana po uwagę za jedną z podstawowych metod leczenia bólu powodowanego złamaniem osteoporotycznym kręgu. **(PNN 2025;14(4):178–181)**
Słowa kluczowe: osteoporoza, ból po złamaniu, złamania kręgów, wertebroplastyka

Introduction

Osteoporosis is defined by the World Health Organization (WHO) as a progressive systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, with the consequent increase in bone fragility and susceptibility to fractures [1]. Osteoporosis is found in 1/3 of women and 1/8 of men over the age of 50. The loss of bone tissue results in increased bone fragility, leading to low-energy fractures, and approximately 50% of them affect the vertebral bodies of the thoracic and lumbar verterbral column [1,2]. In many patients, such a fracture is the first clinical symptom of osteoporosis. The dominant symptom of a compression fracture of the vertebra is severe pain, the intensity of which significantly limits the patient's mobility, in most cases forcing them to remain immobile, what leads to a number of systemic complications [3,4].

In this paper we evaluated the effectiveness of a minimally invasive surgical procedure — percutaneous vertebroplasty in the treatment of pain caused by osteoporotic vertebral fractures.

Material and Methods

The analysis included 270 consecutive patients, 206 women and 64 men, treated with vertebroplasty for osteoporotic vertebral fractures between 2015 and 2024. All the procedures were performed in Clinical Neurosurgery Department of the Mazovian Specialist Hospital in Radom by one of the authors (ZK). All patients admitted to the ward with osteoporotic vertebral fractures underwent surgery and were included in the analysed material; no patients were excluded. After the study period ended, all data were collected and analysed. A follow-up examination was performed one month after surgery at the neurosurgery clinic. The level of pain was noted before surgery, 12 hours after surgery, the next day, and one month later. Females were aged 59–91 years, with a mean age of 78 years, and only 17 of them were younger than 70 years. Males were aged 67–94, with an average age of 79. All patients experienced sudden, very severe back pain between 3 and 30 days before the procedure, and CT or MR studies revealed fresh compression fractures of the vertebral body, 142 in the lumbar and 128 in the thoracic vertebral column. Sixty–seven patients had a history of osteoporotic vertebral fracture, and all of them had undergone vertebroplasty 1 to 5 years earlier, with very good treatment results. Pain intensity was determined on a 10 cm VAS scale and was measured before the procedure, 12 hours after surgery, 24 hours later and 30 days after the procedure. The Visual Analogue Scale (VAS) is a widely used scale for assessing pain intensity. On a 10 cm scale, the patient subjectively rates their pain from 0 cm (no pain) to 10 cm (the most severe pain imaginable). In subsequent examinations, after treatment, the patient again places their pain assessment on the same scale, which allows to determine the subjective change in the severity of pain. It also allows to compare pain intensity between different patients. Vertebroplasty was performed under local anaesthesia with 1% lignocaine, in an operating theatre, using two-plane X-ray imaging. An 11G needle was inserted into the fractured vertebral body, a standard biopsy of the fractured vertebral body was performed, and then, under X-ray fluoroscopy, 1 to 2 cm of bone cement — PMMA (polymethyl methacrylate) — was injected into the vertebral body (Figure 1).

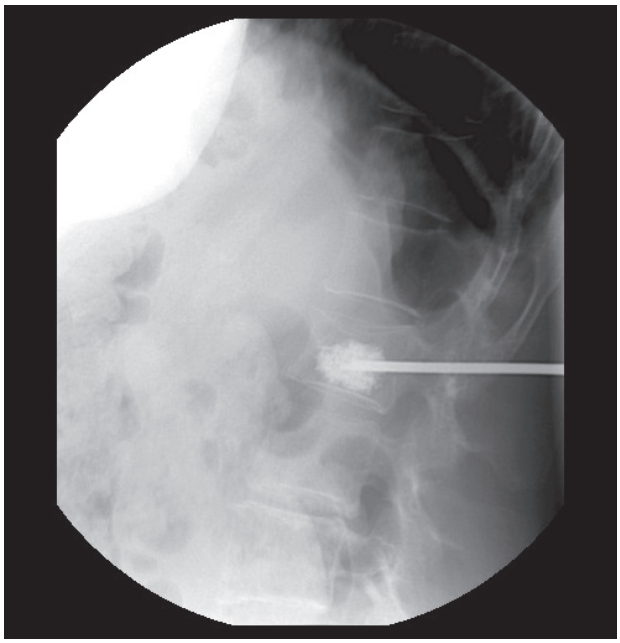

Figure 1. Sagittal intraoperative X-ray showing vertebroplasty needle inserted into Th12 vertebral body. PMMA is located in the central area of fractured vertebra

The study was approved by the Ethics Committee of Faculty of Health Sciences, University of Technology and Humanities, Radom/nº WNZKF12/01/. All data

were entered into Excel, and t tests were used to compare pain intensity at different periods after surgery. P values of <0.01 were deemed significant.

Results

Out of 270 patients, prior to surgery 246 rated their pain intensity at 7 cm, 12 at 8 cm, 10 at 9 cm, and 2 at 10 cm. In all patients, pain was so severe that it did not allow them to perform even the simplest everyday activities. From the day of the fracture, all patients received tramadol at a dose of 100–200 mg/24 h, which did not significantly reduce the symptoms in any of the patients. Twelve hours after the procedure, 252 patients reported a significant reduction in pain with a VAS score of 2–3 cm, 16 reported pain at a level of 4 cm, and only in 2 patients procedure did not bring any effects of pain reduction, with the level of pain remaining at 7 and 8 cm. In 268 patients who responded favourably to treatment, tramadol was completely withdrawn immediately after the procedure. 24 hours later, the results were the same in all patients, except for one patient who did not feel relief immediately after the procedure and reported pain at 8 cm, which decreased to 5 cm after 24 hours. One month after the operation, pain levels were the same as the next day after vertebroplasty in all patients. All but one patient, in whom the procedure did not give any effect in pain reduction, showed a significant improvement in mobility, which was at the same level as before the fracture. All biopsy tests showed no evidence of cancer cells, and the bone tissue was found to be typical of osteoporosis.

The summary of the results is shown in Table 1.

Table 1. Results regarding the intensity of pain experienced by the subjects

Time of examination \ Intensity of pain in VAS in 270 patients	1–3 cm	4–6 cm	7–8 cm	9–10 cm	Total
Before surgery	0	0	258	12	270
12 h after surgery	252	16	2	0	270
1 day after surgery	252	17	1	0	270
1 month after surgery	152	17	1	0	270

Discussion

Osteoporosis is a common medical problem and treatment is based on pharmacological therapy, an appropriate diet and physiotherapy, and is primarily aimed at preventing fractures. The standard treatment is the administration of antiresorptive drugs, depending on the risk of fracture, and anabolic drugs [1–3].

The intensity of pain caused by osteoporotic vertebral fractures is so severe that it hinders or prevents patients from moving and performing even basic everyday activities. Pain immobilises and debilitates patients, causes psychomotor slowing, and significantly limits their mental abilities. In such situations, strong painkillers are routinely used. In Poland, medics typically prescribe tramadol derivatives, which, especially in older age groups, often cause significant side effects such as dizziness, constipation and confusion, and, when taken over a longer period of time, lead to addiction and paradoxically increased pain [5,6]. Traditional, conservative treatment of fractures initially involves several days of immobilisation, followed by the use of a orthopaedic corset for several weeks or even months. Unfortunately, such treatment requires the constant administration of painkillers and significantly limits patient mobility, leading to serious complications, including fatal ones. Patients with osteoporotic spinal fractures treated conservatively have a significantly shorter life expectancy than those without osteoporosis or those treated aggressively with surgery [7–9].

In our study we noted significant reduction of pain in all but one of the 270 patients. Pain diminshed immediately after vertebroplasty and significant improvement was noted within 12 hours after surgery, pain diminished from very severe to easily acceptable in 268 patients. In all these 268 patients pain reduction from 7–9 cm in VAS scale to 2–4 cm was noted in all follow-up exams. Of the remaining two, a marked improvement was noted in one the following day and the same result was observed one month after vertebroplasty, only one patient reported no reduction in pain either immediately after the procedure or one month later. Vertebroplasty can produce local and systemic complications. In 69 patients we observed small local cement leakage to adjacent tissues and in 18 patients cement embolization of paravertebral veins. These complications occur quite frequently but usually do not cause any clinical symptoms [9,10]. In our patients, we did not observe any clinical symptoms in anyone. Systemic complications in vertebroplasty are rare [4,9,11,12], most commonly pulmonary embolism with cement particles. In tan analyzed group we did not observe cement entering the lungs in any patient.

Conclusions

Vertebroplasty is an effective method of treating pain caused by osteoporotic fractures of the thoracic or lumbar vertebral column. This treatment method is safe and can also be used in older age groups or in patients whose

poor clinical conditions preclude other surgical treatment methods. Since pharmacological pain treatment carries the risk of many complications in older age groups, vertebroplasty should be considered, at least, as an alternative to pharmacological treatment for pain relief in osteoporotic vertebral fractures.

Implications for Nursing Practice

Patients at risk of osteoporotic fractures should be monitored by nurses not only in terms of diet and taking medication to treat or prevent osteoporosis, but also closely monitored for pain and, above all, sudden increase in pain. In the event of pain associated with osteoporotic fractures, nurses assess the severity of the pain and apply appropriate pharmacological interventions. If a vertebral fracture is suspected, after basic diagnostic imaging, the patient should be informed about the possibility of surgical treatment of pain and referred to a centre where surgical procedures aimed at reducing or eliminating pain, primarily vertebroplasty, can be performed. In their educational activities, nurses should inform patients about such treatment options and educate them about the adverse effects of long-term use of painkillers.

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