



## Treatment of subacute osteoporotic vertebral compression fractures with percutaneous vertebroplasty – A case report

Lečenje subakutnih kompresivnih fraktura osteoporotičnih pršljenova primenom perkutane vertebroplastike

Zoran Aleksić\*, Ivana Stanković†, Ivana Živanović-Mačuzić‡§, Dejan Jeremić‡§, Aleksandar Radunović||, Zoran Milenković¶, Andjelka Stojković\*\*††, Aleksandra Simović\*\*††, Ivan Stojadinović||, Maja Vulović‡§

University Clinical Center of Republic of Srpska, \*Clinic for General and Abdominal Surgery, Banja Luka, Bosnia and Herzegovina; †Ambulance of Brigade of Guards, Belgrade, Serbia; University of Kragujevac, \*\*Faculty of Medical Sciences, ‡Department of Anatomy and Forensic Medicine, Kragujevac, Serbia; University of Defence, §Faculty of Medicine of the Military Medical Academy, Belgrade, Serbia; Military Medical Academy, ||Clinic for Orthopedic Surgery, Belgrade, Serbia; ††Clinical Center of Kragujevac, ¶Department of Orthopedics and Traumatology, Kragujevac, Serbia

### Abstract

**Introduction.** Percutaneous vertebroplasty (PVP), as a mini-invasive approach in the treatment of patients with osteoporotic vertebral compression fractures (OVCFs), provides stabilization of the spine and relieves pain. The most commonly it is applied in the 3–6 weeks before bending of the spine. Complete cessation of pain is easier to achieve if you treat “less mature” fractures. The aim of the report is to show that PVP is effective and safe for old fractures too. **Case report.** A 77-old patient suffered from a stable compression fracture of 3th lumbar (L3) vertebral body after minor trauma. This fracture was clinically and radiologically diagnosed. The conservative treatment that included lumbo-sacral orthosis (LSO), analgesic drugs and physical therapy, was primarily applied due to permanent pain and type of fracture. After a period of two months,

pain persisted, but it was localized in a thoracic spinal segment with radiologically diagnosed fractured bodies of 8th (Th8) and 10th (Th10), thoracic vertebra without neurological deficit. Thoraco-lumbo-sacral orthosis (TLSO) was prescribed and after six months the indication for vertebroplasty of the Th8 and Th10 vertebral body was given. The pain relief had been achieved and the patient was discharged from the Clinic for Orthopedics on the postoperative day 2, and was symptom free during the follow-up period. **Conclusion.** In patients with stable OVCFs, PVP is an effective therapy for reducing pain and improving mobility of 6 months old fractures.

### Key words:

spinal fractures; fractures, compression; osteoporosis; pain; vertebroplasty; treatment outcome.

### Apstrakt

**Uvod.** Perkutana vertebroplastika (PVP), kao mini invazivni pristup u lečenju bolesnika sa kompresivnom frakturom osteoporotičnog pršljena (KFOP), obezbeđuje stabilizaciju kičmenog stuba i otklanja bol. Najčešće se primenjuje u periodu od tri do šest nedelja, pre pojave krivljenja/pogrbljenja kičme. Potpuni prestanak bola je lakše postići ako se leče “manje zreli” prelomi. Cilj prikaza je da se pokaže da je PVP efikasna i bezbedna i kod starih fraktura. **Prikaz bolesnika.** Bolesnik starosti 77 godina, posle minimalne traume, zadobio

je stabilnu kompresivnu frakturu tela trećeg lumbalnog (L3) pršljena koja je klinički i radiološki verifikovana. Zbog permanentnog bola i tipa frakture primarno je uključeno konzervativno lečenje (lumbosakralna ortoza-mider), analgetici i fizikalna terapija. Posle dva meseca bol je i dalje perzistirao, ali sada u torakalnom segmentu kičmenog stuba gde je dao radiološki konstatovane frakture tela osmog torakalnog (Th8) i desetog torakalnog (Th10) pršljena, bez neurološkog deficita. Ordinirana je konzervativna terapija, ali zbog perzistentnog bola 6 meseci kasnije postavljena je indikacija za operativno lečenje u smislu PVP tela Th 8 i Th 10. Bol je kupiran i

bolesnik je otpušten iz klinike drugog postoperativnog dana. Kontrolni pregledi bili su uredni. **Zaključak.** Kod bolesnika sa stabilnom KFOP, PVP je efikasna terapija za redukciju bola i poboljšanje mobilnosti i kod preloma starih šest meseci.

## Introduction

Painful vertebral compression fractures (VCFs) may be the consequences of different pathological factors such as osteoporosis, myeloma or vertebral metastases. The very common cause of these fractures is trauma, even the minor one, especially when associated with osteoporosis<sup>1</sup>. The most of these fractures are asymptomatic, but even in this cases and especially in symptomatic ones, quality of life may be notably changed due to height loss, kyphosis, back pain, and lost self-confidence regarding physical activities<sup>2</sup>. The conservative treatment including analgesic medications, rest and physical therapy is often ineffective on long-term basis, because of the persistent pain, decreased mobility and neurological complications<sup>3,4</sup>. Operative management of VCFs has gained popularity as it produces rapid, significant and sustained improvements in back pain, function and quality of life. Surgical intervention is indicated for those patients with intractable back pain in whom conservative therapy failed, or where there is evidence of impending or existing neurologic deficit, or where the spinal deformity is extremely severe<sup>5</sup>.

Percutaneous vertebroplasty (PVP) is one of the favored methods of treating painful VCFs. It encompasses augmentation of the vertebral body by injection of polymethylmethacrylate. Short-term results indicated that 75% to 100% of patients can have good to moderate pain relief after vertebroplasty. PVP is most effective in compression fractures less than 6 months old<sup>5</sup>.

The pain relief is the primary goal of this treatment, beside the vertebral stabilization, better mobility and functional improvement<sup>4</sup>. Indications for the PVP are persistent and intensive back pain at the level of osteoporotic fractured vertebra when the Visual Analogue Scale (VAS) is 5 or higher<sup>4,6</sup>; fracture not older than a year, with the best analgesic results with lesions not older than six months, increased risk for kyphosis<sup>2,7</sup>, vertebral fracture with less than 30% height loss<sup>8</sup>. Contraindications include coagulation disorders, allergies to bone cement or contrast, systemic or local infection<sup>7</sup>, osteomyelitis and spondylodiscitis, tumor extension into epidural space<sup>2</sup>, unstable or older fractures<sup>7</sup>, asymptomatic fractures and fracture with spinal cord compression and resulting neurological signs<sup>4,6</sup>.

The aim of this paper was to show that PVP can successfully be used for six months old osteoporotic VCFs.

## Case report

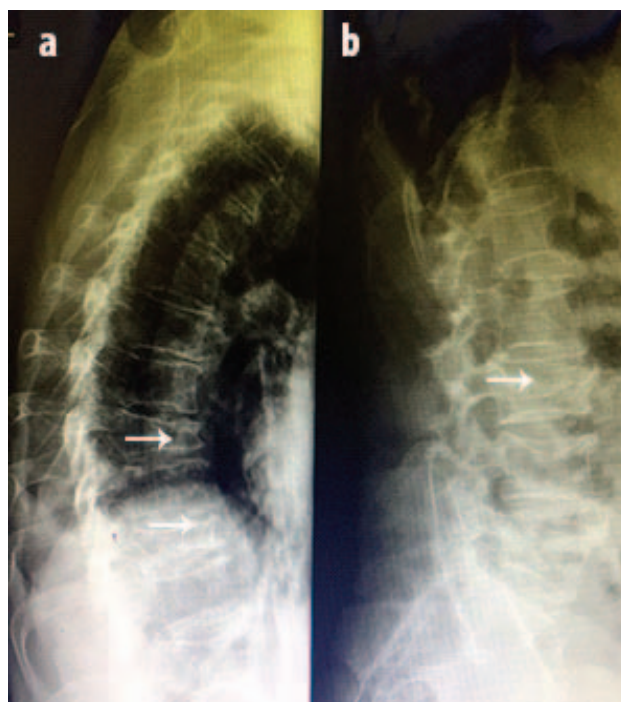
A 77-old patient was admitted with a chief complaint of the back pain, primarily localized in lumbosacral (LS) region after minor injury. The fracture of the body of third lumbar (L3) vertebra was clinically and radiologically diagnosed and

## Ključne reči:

kičmeni pršljenovi, prelomi; prelomi, kompresivni; osteoporoza; bol; vertebroplastika; lečenje, ishod.

estimated as stable, with no indication for surgical treatment. The lumbo-sacral orthosis (LSO), analgesic drugs and physical therapy were prescribed as conservative treatment for spine stability and pain reduction.

After a period of 2 months, the patient, denying any kind of trauma, was examined again due to back pain in the thoracic region. Pain in the LS spinal segment persisted, in spite of prescribed therapy and wearing of LSO. Vertebral injuries of thoracic vertebra 8 (Th8) and thoracic vertebra 10 (Th10) were radiologically diagnosed, with no neurological deficit on physical examination (Figure 1).

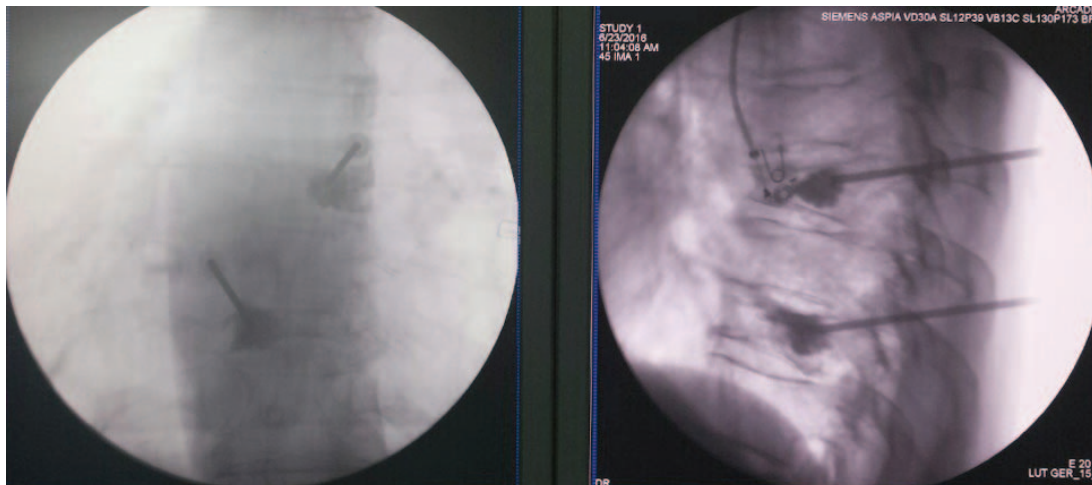


**Fig. 1 – a) Radiographic left-lateral projection: thoracic (Th) vertebrae – de novo fractures of Th8 and Th10 vertebral body before vertebroplasty; b) Radiographic right-lateral projection: primarily fracture of lumbar third (L3) vertebral body.**

Thoraco-lumbo-sacral orthosis (TLSO) was prescribed. After 6 months, the patient still felt pain in the injured region, predominantly in thoracic region, with the Visual Analogue Scale (VAS) score of 8. Nervous structures were intact and the strength of lower extremity muscle was preserved – score was 5. Earlier fracture of L3 was healed, but because of persisted pain, the indication for PVP of the Th8 and Th10 vertebral body was given. The patient was admitted to the Clinic for Orthopedics at the Clinical Center Kragujevac. After the usual and appropriate preoperative preparation and administration of 2% lidocaine (10 mL) as local anesthetic, standard PVP<sup>2</sup> of injured vertebral bodies of Th8 and Th10 was performed (Figures 2 and 3).



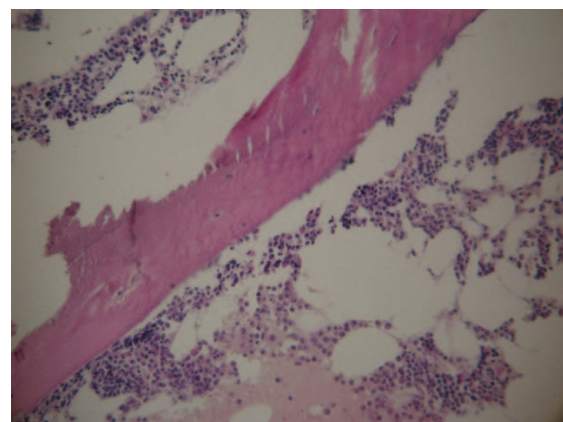
**Fig. 2 – a) Operative field in the level of thoracic 8 (Th8) and thoracic 9 (Th9) vertebra; b) The cement application during the vertebroplasty.**



**Fig. 3 – Radiographic imaging: Needle position in anteroposterior (AP) and lateral projection; Unipedicular approach to vertebral body.**

Pathohistological findings showed fragments of cortical, partly grossly calcified bone, with elements of active bone marrow, with slight domination of granulocytes (eosinophils), with no elements of myeloproliferative or metastatic disease (Figure 4).

The patient's early postoperative course was uneventful; he achieved full vertical posture a day after the surgical treatment and was able to walk without assistance. He was discharged from the Clinic for Orthopedics on the second postoperative day without clinical symptoms, with recommendation to use TLSO brace. The patient was reviewed in clinic 5 days after the procedure, when he came without help, with no complaints and without prescribed TLSO brace. He was followed-up in two weeks intervals and was symptom free. Complete physical rehabilitation program was conducted and patient returned to his daily life activities.



**Fig. 4 – Fragments of cortical bone with elements of active bone marrow, with domination of granulocytes hematoxylin-eosin (HE x 400).**

## Discussion

The first PVP was performed in 1984 by French radiologists Galibert and Deramond for treatment of a painful hemangioma in the cervical spine of a young female patient. PVP is a technique in which a medical grade cement is injected through a needle into a painful vertebral body. This stabilizes the fracture, allowing most patients to discontinue or significantly decrease analgesics and resume normal activities. The success rate for this procedure in treating osteoporotic VCFs is 73%–90%. Significant complications of the procedure are less than 1%<sup>5</sup>.

The presented patient underwent PVP in order to reduce the back pain caused by the vertebral fractures occurred after the minor trauma.

The symptoms associated with vertebral osteoporotic vertebral compression fractures (OVCFs) changes in quality of life. In the group of patients with clinical symptoms due to an OVCFs (one-third of all patients with a OVCFs), pain is the most striking feature of the fracture. In 80%–85% of the acute symptomatic patients, pain will disappear with conservative treatment within 6–8 weeks after initiation of the treatment<sup>9</sup>.

In managing the presented patient, the surgeons opted for PVP, considering that conservative therapy was not effective in the pain relief in thoracic and lumbar spine. The pain reduction in our patient was complete after the conducted PVP. The results of most of the studies showed much better pain relief after PVP than after conservative treatment<sup>4, 10</sup>. The significant reduction of pain score from the first postoperative day is also the great advantage of PVP<sup>11</sup>. The adverse effects of analgesic drugs and long period in bed during the conservative medical management may contribute to worsening of the symptoms and the further demineralization of the bones<sup>12, 13</sup>. Several studies also reported improving kyphosis to a certain degree after PVP<sup>11, 14</sup>. It is also shown that minimally invasive procedures, such as this one, are cost-effective in comparison to nonsurgical treatment for osteoporotic and tumor related vertebral fractures<sup>15</sup>.

Also, obtaining bone biopsies during PVP does not lead to increased morbidity and can verify the pathologic process underlying the VCFs<sup>16</sup>.

According to Röllinghoff et al.<sup>6</sup> PVP should not be conducted in patients younger than 48 years. Also, patients over the 85 are not candidates for PVP, considering the low bone mineral density<sup>16</sup>. The presented patient in our case was 77 years old, so the age was not the contraindication for PVP. The fractured vertebrae of our patient were not with posterior dislocation, which would also be the contraindication for this surgical procedure<sup>6, 12</sup>. The presented PVP was

conducted with satisfactory results six months after the reported trauma. In several conducted studies it was shown that better results were obtained when the procedure was done in the first months after the trauma<sup>4</sup>, but the pain relief and normal life quality after PVP were also described in patients with one year old fracture of the spine<sup>14</sup>. In managing this patient, surgeons opted for unilateral transpedicular approach, which advantages over the bilateral approach are in the reducing the time required to perform the treatment, radiation exposure, risks of the side effects and the costs<sup>15</sup>. The one of the described common complications of PVP is the fracture of the non-treated vertebrae next to the treated one<sup>16, 17</sup>. This may be the consequence of the greater stiffness of the vertebra filled with bone cement and altered biomechanics and the load transfer of the spine<sup>11</sup>. According to the others, these new fractures are not the side effect of the PVP, but the result of the further deterioration of the osteoporotic spine and reduction of bone mineral density<sup>3, 10, 16</sup>. In presented case, no complications were encountered.

Several clinical studies and meta-analysis concluded that the PVP is very successful surgical method in reducing the pain in OVCFs, the complications of this technique are rare and that is more successful in pain relief and functional recovery than non-surgical therapy<sup>12, 17</sup>. PVP is effective in patients with chronic painful osteoporotic VCFs. Pain relief after PVP was immediate, sustained for one year and may be an important factor for reducing persistent pain. PVP for patients with chronic painful osteoporotic VCFs has not been extensively studied<sup>18</sup>. The majority of papers describe populations that are a case mix of “acute” (fracture age < 8 weeks) and “long-standing” (fracture > 8 weeks) OVCFs. Subacute (> 2 month old) and chronic (> 6 month old) OVCFs are fractures which do not respond to at least 8 weeks of conservative treatment using analgesics, a short period of bed rest and a corset. Treatment of long-standing fractures remains controversial. Despite these preliminary reports, outcomes in patients with older fractures treated by PVP remain undefined. The most of the older fractures respond to PVP, although there may be fewer complete responses. However, treating patients earlier is still preferable because they are more likely to have complete eradication of pain and may retain more mobility<sup>19</sup>.

## Conclusion

In patient with compression fracture of vertebral body, when the pain relief cannot be achieved by application the conservative therapy, PVP, performed under local anesthesia, is the treatment of choice for spine stabilization and fast and lasting pain reduction even for OVCF six months old.

## R E F E R E N C E S

1. *Liu L, Cheng S, Lu R, Zhou Q.* Extrapedicular Infiltration Anesthesia as an Improved Method of Local Anesthesia for Unipedicular Percutaneous Vertebroplasty or Percutaneous Kyphoplasty. *Bio Med Res Int* 2016; 2016: 5086414.
2. *Lamy O, Uebelhart B, Aubry-Rozier B.* Risks and benefits of percutaneous vertebroplasty or kyphoplasty in the management of osteoporotic vertebral fractures. *Osteoporos Int* 2014; 25(3): 807–19.

3. *Stephenson MB, Glaenger B, Malamis A.* Percutaneous Minimally Invasive Techniques in the Treatment of Spinal Metastases. *Curr Treat Options Oncol* 2016; 17(11): 56.
4. *Peh WC, Gilula LA.* Percutaneous vertebroplasty: Indications, contraindications, and technique. *Br J Radiol* 2003; 76(901): 69–75.
5. *Alexandru D, So W.* Evaluation and management of vertebral compression fractures. *Perm J* 2012; 16(4): 46–51.
6. *Röllinghoff M, Zarghooni K, Schlüter-Brust K, Sobottke R, Schlegel U, Eysel P, et al.* Indications and contraindications for vertebroplasty and kyphoplasty. *Arch Orthop Trauma Surg* 2010; 130(6): 765–74.
7. *Dobm M, Black CM, Dacre A, Tillman JB, Fueredi G.* A Randomized Trial Comparing Balloon Kyphoplasty and Vertebroplasty for Vertebral Compression Fractures due to Osteoporosis. *AJNR Am J Neuroradiol* 2014; 35(12): 2227–36.
8. *Vanni D, Galzio R, Kazakova A, Pantalone A, Grillea G, Bartolo M, et al.* Third-generation percutaneous vertebral augmentation systems. *J Spine Surg* 2016; 2(1): 13–20.
9. *Anderson PA, Froysheter AB, Tontz WL Jr.* Meta-analysis of vertebral augmentation compared with conservative treatment for osteoporotic spinal fractures. *J Bone Miner Res* 2013; 28(2): 372–82.
10. *Yokoyama K, Kawanishi M, Yamada M, Tanaka H, Ito Y, Kuroiwa T.* Long-term therapeutic effects of vertebroplasty for painful vertebral compression fracture: A retrospective comparative study. *Br J Neurosurg* 2017; 31(2): 184–8.
11. *Balkarli H, Kiliç M, Balkarli A, Erdogan M.* An evaluation of the functional and radiological results of percutaneous vertebroplasty versus conservative treatment for acute symptomatic osteoporotic spinal fractures. *Injury* 2016; 47(4): 865–71.
12. *Layton KF, Thielen KR, Koch CA, Luetmer PH, Lane JJ, Wald JT, et al.* Vertebroplasty, first 1000 levels of a single center: evaluation of the outcomes and complications. *AJNR Am J Neuroradiol* 2007; 28(4): 683–9.
13. *Cheng X, Long HQ, Xu JH, Huang YL, Li FB.* Comparison of unilateral versus bilateral percutaneous kyphoplasty for the treatment of patients with osteoporosis vertebral compression fracture (OVCF): a systematic review and meta-analysis. *Eur Spine J* 2016; 25(11): 3439–49.
14. *Chen D, An ZQ, Song S, Tang JF, Qin H.* Percutaneous vertebroplasty compared with conservative treatment in patients with chronic painful osteoporotic spinal fractures. *J Clin Neurosci* 2014; 21(3): 473–7.
15. *Teles AR, Mattei TA, Righesso O, Falavigna A.* Controversies on vertebroplasty and kyphoplasty for vertebral compression fractures. *Coluna/Columna (São Paulo)* 2015; 14(4): 324–9.
16. *Takahara K, Kamimura M, Moriya H, Ashizawa R, Koike T, Hidai Y, et al.* Risk factors of adjacent vertebral collapse after percutaneous vertebroplasty for osteoporotic vertebral fracture in postmenopausal women. *BMC Musculoskelet Disord* 2016; 17: 12.
17. *Papanastassiou ID, Phillips FM, van Meirhaeghe J, Berenson JR, Andersson GBJ, Chung G, et al.* Comparing effects of kyphoplasty, vertebroplasty, and non-surgical management in a systematic review of randomized and non-randomized controlled studies. *Eur Spine J* 2012; 21(9): 1826–4.
18. *Tan HY, Wang LM, Zhao L, Liu YL, Song RP.* A prospective study of percutaneous vertebroplasty for chronic painful osteoporotic vertebral compression fracture. *Pain Res Manag* 2015; 20(1): 8–11.
19. *Brown DB, Gilula LA, Sebgal M, Shimony JS.* Treatment of chronic symptomatic vertebral compression fractures with percutaneous vertebroplasty. *AJR Am J Roentgenol* 2004; 182(2): 319–22.

Received on January 30, 2017.  
Revised on February 9, 2017.  
Accepted on February 13, 2017.  
Online First March, 2017.