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Total spinal anesthesia caused by lidocaine during unilateral percutaneous vertebroplasty performed under local anesthesia: A case report

Wang YF *et al.* Total spinal anesthesia during unilateral percutaneous vertebroplasty

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Abstract

BACKGROUND

Intradural anesthesia caused by anesthetic drug leakage during percutaneous vertebroplasty (PVP) performed under local anesthesia has rarely been reported, we herein report a 71 years-old woman who suffered this rare and life-threatening complication during PVP.

CASE SUMMARY

A 71-year-old woman suffered from 2 wk of severe back pain with a visual analog score (VAS:8) came to our outpatient, she was later diagnosed with a newly compressed L1 fracture and was then admitted in our department, PVP was initially again attempted under local anesthesia, however, serendipitous intradural anesthesia leading to total spinal anesthesia happened, fortunately, after successful resuscitation of the patient, PVP was safely and smoothly performed. Great pain relief was achieved postoperatively, and she was safely discharged on postoperative day 4. Patient recovered normally at 3 mo follow up.

CONCLUSION

Total spinal anesthesia secondary to PVP by anesthetic drug leakage rarely occurs, in case of inadvertent wrong puncture leading to drug leakage when performing it under local anesthesia, surgeons should be highly vigilant during the whole procedure. An electrocardiogram monitoring, oxygen inhalation, intravenous cannula set prior to

surgery, regular checking of motor activity and a meticulous imaging monitoring with slower pushing of anesthetic drugs, *etc.* should be highly recommended.

Key Words: Percutaneous vertebroplasty; Intradural anesthesia; Total spinal anesthesia; Minimally invasive surgery; Osteoporotic vertebral compression fracture; Fracture; Spinal anesthesia; Case report

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Core Tip: Total spinal anesthesia secondary to percutaneous vertebroplasty (PVP) rarely occurs, in our case we encountered this phenomenon when performing PVP under local anesthesia, fortunately with our prompt interventions, patient received a satisfactory outcome. To our experience, it is fundamentally important, therefore that an electrocardiogram monitoring, oxygen inhalation, intravenous cannula set prior to surgery, regular checking of motor activity and a meticulous imaging monitoring with slower pushing of anesthetic drugs, *etc.* should be highly recommended.

INTRODUCTION

Osteoporosis is a degenerative disease with a gradually deteriorated bone density and bone micro-architecture, which increases the risk of fracture^[1]. As people gradually aged, the incidence rate increases rapidly. One of the most common complications to the old patients is osteoporotic vertebral compression fracture (OVCF) which leads to persistent chest and/or unbearable back pain. Non-operative treatment usually takes a longer time to achieve a satisfactory and full recovery, while open surgery might cause many annoying complications. Therefore, minimally invasive surgery has been increasingly preferred^[2]. Percutaneous vertebroplasty (PVP) was first applied in the 1980s and was used in OVCF shortly thereafter. PVP has been validated to be effective in consolidating

a fractured vertebral body and relieving pain. Apparently, it greatly and immediately improves the quality of patients' life^[3,4]. Currently, unilateral approach has also been widely accepted and regarded as a safer and much quicker way^[5]. The most frequently reported complication is cement leakage. It has been reported that the rate occurred in OVCF ranges from 30% to 65%^[6,7]. Rare and life threatening cement leakage complications of PVP have been sporadically reported. Such as permanent paraplegia^[8], pulmonary embolism and perforation of the heart^[9,10]. There are also only few case reports discussing about other complications caused by PVP, such as local bleeding at the puncture site, spinal infection, and cement leakage in the vertebral canal and intervertebral foramen^[11]. Besides, lumbar artery pseudoaneurysm^[12], and adjacent segmental diseases^[13] were also noted. While complications as intradural anesthesia rarely occurred, it could be induced in other spine surgery, such as in surgery of percutaneous endoscopic cervical discectomy and percutaneous vertebral augmentation^[14,15]. Based on literature reviewed, intradural anesthesia leading to total spinal anesthesia caused by anesthetic leakage during PVP has rarely been reported, we herein report a rare and life-threatening complication during unilateral PVP performed under local anesthesia.

CASE PRESENTATION

Chief complaints

A 71-year-old woman suffered from 2 wk of severe back pain (VAS:8) came to our outpatient.

History of present illness

This patient suffered from severe back pain with no specific predisposing reasons for almost 2 wk, she was later suspected with a newly compressed lumbar fracture and was then admitted in our department.

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History of past illness

The patient had a history of T12, L2,3 fracture caused by osteoporosis which was safely treated with PVP without any complications 1 year ago. No other remarkable past history was mentioned except PVP performed one year ago.

Personal and family history

No other remarkable past history was mentioned except PVP performed one year ago.

Physical examination

Her body weight: 52 kg, height:162 cm, BMI: 19.8 kg/m². Physical examination showed: Intensified pain induced when bending or twisting her spine, visual analog score (VAS) of back pain was 8, neurological deficit was not detected.

Laboratory examinations

No remarkable laboratory results was found. Dual X-ray bone absorptimetry T < -3.5.

Imaging examinations

Inpatient MRI showed fractured T12, L2,3 successfully treated with PVP a year ago; L1- newly diagnosed osteoporotic vertebral compression fracture (red arrows) (Figure 1).

FINAL DIAGNOSIS

Newly compressed L1 fracture.

TREATMENT

After full examinations and preoperative preparations, patient was arranged to operation room with prone position, an ECG monitoring and oxygen inhalation of 3L/min were regularly given, her Blood pressure was 140/85 mmHg, Pulse: 82/min, Respiration: 20/min, SpO₂ 98%, fluid.

Supplementation with 0.9%, 500 mL sodium chloride was given through intravenous cannula set up prior to surgery. During the operation, we used a 20 mL syringe with

needle diameter 0.7 mm containing 200 mg lidocaine plus 10 mL sodium chloride injected progressively from skin to facet joint level, meanwhile we regularly checked the motor activity of lower extremities. A puncture needle with a diameter of 3 mm was engaged to puncture. However, after 30-45 s needle puncture, we suddenly found out that our patient could not move her legs, sensation disappeared, subsequently, patient developed paraplegia, shortly after she lost her consciousness, then we immediately stopped the operation, using C-armed X-ray rechecked our patient (Both antero-posteriorly, and laterally), puncture needle was confirmed in a safe position which was not into the spinal canal. We then pulled out the puncture needle, turning our patient into supine position, promptly patient's vital signs started decreasing with a BP: 60/35 mmHg, P: 35/min, R: 10/min, SpO2 45%. For fear of lidocaine allergic reaction, 10mg of dexamethasone and 1 mg adrenaline were given intravenously, fluid supplementation of sodium chloride was given with maximum speed (6 mL/min), mask oxygen inhalation with 8 L/min was given. Fortunately, after 15 min resuscitation, patient's vital signs gradually recovered, after the discussion of our of surgeons and anesthesiologists, intradural anesthesia leading to total spinal anesthesia induced by lidocaine leakage during local anesthesia was suspected. Meanwhile, we also hypothesized other possible reasons: (1) Allergic reaction of lidocaine. The prevalence of true IgE-mediated allergy to local anesthetics is estimated to be lower than 1%, immediate systemic hypersensitivity reaction (anaphylaxis) symptoms are observed in the first 30 min after the exposure to the anesthetic. Symptoms include dyspnea, cough, wheezing, hypotension and tachycardia, which are mostly inconsistent with our case; (2) Lidocaine overdose and poisoning, It occurs when the plasmatic level in the anesthetic rises to concentrations above the recommended. Although potentially severe, the systemic toxicity is extremely rare, patient's present signs of central nervous system activation, which tend to progress: perioral paresthesia, facial paresthesia, dysarthria, metallic taste, diplopia, auditory disturbances and seizures. High blood pressure and tachycardia can also be associated with such activation^[16]. In our case 200 mg lidocaine is theoretically safe to our patient, furthermore, symptoms presented in our patient were largely inconsistent; (3)

Extensively abnormal spinal nerve block, defined as a complication of epidural anesthesia. It sometimes can be very difficult to differentiate it from total spinal anesthesia, however it generally takes longer time in causing conscious instability, and it is also generally feasible to identify the spine level being anesthetized through symptoms^[17]. In our case this patient went to unconsciousness in a short time, and it was inapplicable to identify the anesthetized level; and (4) Anterior spinal artery syndrome. It is an extremely rare cause of acute ischemic cord infarction, which usually presents as an acute and painful myelopathy. Symptoms of our patient are inconsistent. It is generally caused by occlusion or hypoperfusion of the anterior spinal artery^[18]. Although it might be caused by iatrogenic reasons, causing irreversible damage, fortunately in our case, after about 15 min resuscitation, patient started moving her legs, sensations come back again, with BP: 135/85 mmHg, P: 68/min, R: 18/min, SpO₂ 96%. Therefore anterior spinal artery syndrome was excluded while as intradural anesthesia leading to total spinal anesthesia was eventually confirmed.

OUTCOME AND FOLLOW-UP

When the patient was stabilized, BP: 135/85 mmHg, P: 68/min, R: 18/min, SpO₂ 96%, we decided to finish the surgery, we carefully and correctly reinserted the puncture needle, PVP was again safely and smoothly performed with 3.5 mL cement injected (Figure 2). Patient was sent back to the ward for monitoring. Great pain relief was achieved postoperatively (VAS: 8 to 2), and she was safely discharged on postoperative day 4. Patient recovered normally at 3 mo follow up.

DISCUSSION

Vertebral compression fracture is one of the most common complication to patients with osteoporosis, conservative and non-operative treatments like various of analgesics, long time period of bed-resting, anti-osteoporotic medications, thoracolumbar bracing and other conventional therapy might be useful in acute fracture, but sometimes, patients with severe pain could not be alleviated with those conservative treatments, it is

worthwhile, therefore to implement some aggressive or invasive procedures to reduce pain^[19]. Among these invasive therapies, PVP and percutaneous kyphoplasty are commonly selected. PVP is a minimally invasive procedure widely applied in patients with OVCF, vertebral angioma, tumors, *ect.* since it was first performed by Galibert in 1987^[20]. Previous studies showed that PVP using local anesthesia can stabilize the spine, reduce pain, and improve quality of life^[21]. There are reported complications for the past years, however, to our knowledge, temporary paraplegia and unstable vital signs or total spinal anesthesia caused by local anesthetic drug leakage during PVP was never mentioned in the literature. Intradural anesthesia is more common in gynecology and obstetrics surgeries which were mostly performed under epidural anesthesia^[22]. Wu *et al*^[14] reported two case of intradural anesthesia during posterior percutaneous endoscopic cervical discectomy performed under local anesthesia. Albi-Feldzer *et al*^[23] and Beyaz *et al*^[24] reported total spinal anesthesia as a complication of thoracic paravertebral block. Dogan *et al*^[25] reported a total spinal anesthesia after lumbar plexus block. And there were several reports of total spinal anesthesia after intercostal nerve block^[26,27]. Similar to our case, Shi *et al*^[15] analyzed 12 cases of total spinal anesthesia during percutaneous vertebral augmentation performed under local anesthesia. Conventionally, intradural anesthesia is usually seen spontaneously or as complications in patients after medical procedures like lumbar puncture^[28]. Common symptoms of intradural anesthesia include paraplegia, vomiting, decreased blood pressure, depressed respiration and arrhythmia, unconsciousness, even cauda equina syndrome^[29]. If handled improperly, it is always life threatening. There are different diagnostic criteria of spontaneous intradural anesthesia, one of the most effectively and directly used way is to observe the movement of patients legs during the procedure, confirmation of the needle placement using C-arm is also helpful in differentiating, also ECG monitoring plays an essential part in detecting abnormal conditions. As for treatment, once detected, surgery should be promptly ceased, patient should be monitored carefully. As demonstrated in our case, oxygen inhalation, fluid supplementation, also most importantly, resuscitation medicines like adrenaline, *etc.* were all implemented. If it had been no recovery to our patients, we

would have recommended cardiopulmonary resuscitation, endotracheal intubation and mechanical ventilation to sustain basic life signs. One of the reasons increasing the chance of accidental subarachnoidal injection of lidocaine is that our patient had a history of PVP procedure which might induce pathological proliferation of granulation tissue and arachnoidal abnormality around the target area. Fortunately, in our case, with a successful resuscitation, we decided to finish the surgery, therefore, we were more careful during local anesthesia in case of inadvertent wrong puncture and lidocaine leakage leading to intradural anesthesia, PVP was again safely and smoothly performed. Great pain relief was achieved postoperatively, and she was safely discharged on postoperative day four. Patient recovered normally at 3 mo follow up.

CONCLUSION

Total spinal anesthesia secondary to PVP rarely occurs, in case of inadvertent intradural anesthesia when performing it under local anesthesia, surgeons should be highly vigilant during the whole procedure. An ECG monitoring, oxygen inhalation, intravenous cannula set prior to surgery, regular checking of motor activity and meticulous imaging monitoring with slower pushing of anesthetics, *etc.* should be highly recommended.

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