



## Case Report

## Does ozone autohemotherapy have positive effect on neurologic recovery in spontaneous spinal epidural hematoma?



### Abstract

Spontaneous spinal epidural hematoma is a rare disease. The clinical presentation usually features sudden onset back pain with accompanying motor or sensory deficits. We report a case of a 26-year-old patient who presented to the emergency department with sharp back pain, progressing to paralysis of the lower extremities. Magnetic resonance imaging (MRI) revealed an epidural hematoma of the thoracic spine with spinal cord compression. Emergent laminectomy was performed, but postoperative neurologic recovery was not ideal. The patient has recovered satisfactorily after 2 courses ozone autohemotherapy. Ozone autohemotherapy is an alternative treatment of spontaneous spinal epidural hematoma.

A 26-year-old man was brought to the emergency department due to sudden onset of severe sharp back pain for 4 hours. Two hours after the onset of pain, progressive weakness developed bilaterally over the lower extremities, followed by paraplegia. Three days before his admission, the patient felt numb in the back after heavy lifting. He denied a history of fall or trauma.

Clinical examination confirmed paraplegia; bilateral deep tendon reflexes and cremasteric reflex disappeared. No sensation was noted below the level of T4, and the patient's lower extremities exhibited 0/5 strength. Preliminary laboratory tests were all within normal limits.

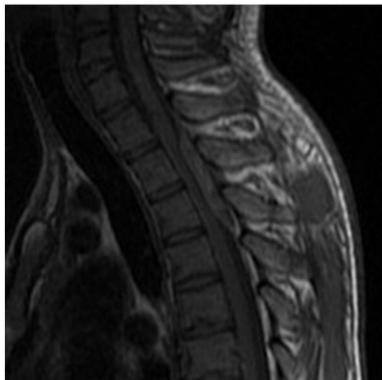
Computed tomographic imaging showed no remarkable contribution. Emergent magnetic resonance imaging demonstrated an acute epidural hematoma within the posterior epidural spinal canal from T1 to T3 with associated spinal cord compression. The lesion had an isointense signal on T1-weighted images and a mixed hyperintense

signal on T2-weighted images. No apparent enhancement was seen within the mass.

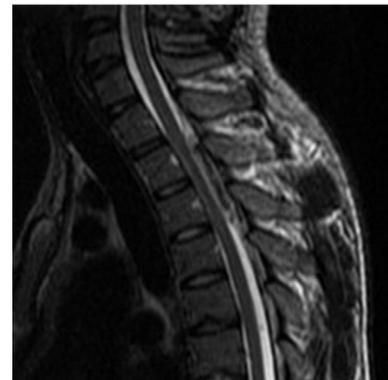
He received emergent laminectomy of the thoracic spine. We evacuated the epidural hematoma. Postoperative pathologic report showed hemorrhage with evidence of vascular malformation.

Postoperative power in the both lower extremities did not improve. Twelve days after operation, bilateral deep tendon reflexes and cremasteric reflex were noted. Sensation below the level of T4 was not improved. The patient's recovery was not ideal. For some reason, our hospital had no hyperbaric oxygen therapy. We considered the possibility of giving the ozone autohemotherapy (OA) to help patient's neurologic rehabilitation. We arranged once a day, 10 days for a course of treatment. When the treatment was in fifth day, we checked the right tibialis anterior muscle visible contraction; the bilateral toe could slightly flex. Proximal muscles were still powerless to activity. At the end of the first course, the sensation was decreased below the level of T4. The urine and stool could be discharged on its own but without control. At the end of the second course, urine and stool could be controlled. The patient's lower extremities exhibited 3/5 strength. Followed up for half a year, the patient could walk independently, and sensation restores to basically normal.

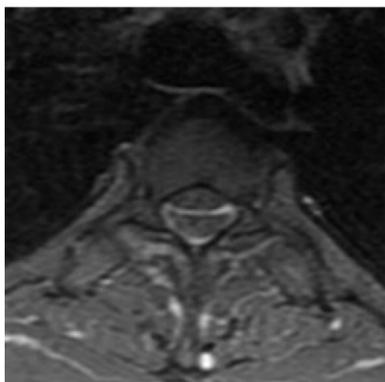
Spontaneous spinal epidural hematoma (SSEH) is a comparatively rare but important neurologic emergency. Early detection of SSEH is not easy because the early symptoms such as interscapular pain or back pain are often not typical. A hematoma mechanically compresses the spinal nerve tissues causing tissue hypoxia leading to nerve dysfunction.



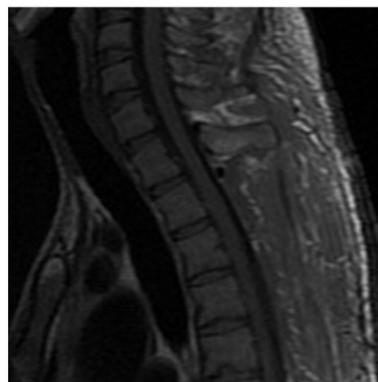
**Fig. 1.** T1-weighted sagittal MRI image of thoracic spine with posterior epidural hematoma.



**Fig. 2.** T2-weighted sagittal MRI image of thoracic spine with posterior epidural hematoma.



**Fig. 3.** Enhanced T1-weighted axial MRI image of thoracic spine with posterior epidural hematoma.



**Fig. 4.** Postoperative T1-weighted sagittal MRI image of thoracic spine.

Spontaneous spinal epidural hematoma is usually treated via decompression surgery, commonly featuring hematoma evacuation and decompressive laminectomy. The main determinants of outcome are preoperative neurologic deficits and time to surgical decompression [1]. Patients in whom neurologic deficits do not develop and whose clinical signs are stable may be followed up without surgical intervention.

Conventional postoperative treatments included dehydration, hemostatic, hyperbaric oxygen, and other comprehensive treatment. Nevertheless, sometimes, the recovery time is long, and the effect is not obvious.

Ozone autohemotherapy is available for more than 40 years. It is considered controversial for its toxicity by the medical profession. With the deepening of clinical applications, reasonability and effectiveness of OA are gradually being understood. Especially with the birth of dose-adjustable ozone generator and the proven biochemical mechanisms, OA is expanding its range of applications.

Ozone can produce effects on red blood cells and have the function of immune activation and regulation; it can also activate antioxidant enzymes, scavenge free radicals, and reduce organ injury induced by ischemia reperfusion. The vascular effect of OA is explained by an activation hexose monophosphate shunt with an increased production of 2,3-diphosphoglycerate in erythrocytes [2]. It makes a displacement of the oxygen dissociation curve to the right and an increase in the release of oxygen to the tissues. On brain metabolism and circulation, it showed a marked increase of the cytochrome-c-oxidase activity and concentration approximately 40 minutes after the end of the autohemotherapy [3]. Al-Dalain et al [4] indicated that ozone could reduce oxidative stress and improve endothelial function in animal models.

Ozone also has the effect of antioxidant enzymes and scavenging free radical. Prof Bocci indicated that ozone could activate antioxidant enzymes in the body, such as superoxide dismutase, and scavenge free radicals formed during chronic inflammation [5]. In the study of ischemia-reperfusion injury after renal transplantation, Calunga et al [6] implied that ozone could activate the body's antioxidant system and intracellular oxygen metabolism, and it minimized the damage induced by ischemia or reperfusion injury. Ozone can induce a number of dose-dependent cytokines, including interferon, interleukins, tumor necrosis factor, and others [7,8]. In addition, OA has to be based on individual differences. For different ages and tissues, ozone resistance is also different. It needs to adjust treatment protocols according to patient's condition.

Although the patients received a hematoma evacuation, the surgery is less effective because the onset to operation time has been more than 72 hours. To our knowledge, this is the first report of OA used to successfully treat SSEH. With the gradually proven mechanism of OA, applications will be more widely used. Moreover, OA is a simple, safe, and reliable operation. For patients who had failed surgery and had no operation indication, OA is supposed to have an unexpected effect. In addition, postoperative pathophysiological mechanisms merit further investigation (Figs. 1–4).

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