

CASE REPORT

Spinal Epidural Hematoma Due To Tyre-Blast Injury

A Case Report

Mehmet G. Boyaci, MD,* Adem Aslan, MD,* Kamil Tünay, MD,†
Mustafa Karademir, MD,‡ and Arda Aydoğmuş, MD*

Study Design. A retrospective case report.

Objective. The objective of this article is to report a spinal epidural hematoma (SEH) due to shock wave.

Summary of Background Data. SEH is an infrequent condition. Most of SEH's are spontaneous. We have reported an SEH traumatic case without bone lesions due to exploding truck tire. A different category of blast injuries is the one related with exploding tyres. Shock waves are the main mechanism that is responsible for blast injuries. We are presenting the first report of acute SEH due to shock wave.

Methods. A 33-year-old man was brought to the emergency department with complaints of weakness and numbness of the upper extremities. There was an epidural high-signal density without osseous lesion in computerized tomography from the level of C2 to C5, and there was a T2-weighted hyperintense lesion in magnetic resonance imaging from the level of C2 to C5 with compression of the spinal cord the anterior and posterior which proved to be an SEH.

Results. The patient was discharged from the hospital with complete neurologic recovery.

Conclusion. SEH should be considered possible in the blast injury. SEH condition carries a significant risk of morbidity and mortality without early recognition and rapid management.

Key words: blast injury, cervical trauma, shock wave, spinal epidural hematoma, tyre-blast injury.

Level of Evidence: 5

Spine 2017;42:E125–E127

From the *Faculty of Medicine, Department of Neurosurgery, Afyon Kocatepe University, Afyonkarahisar, Turkey; †Faculty of Medicine, Department of Emergency Medicine, Afyon Kocatepe University, Afyonkarahisar, Turkey; and ‡Department of Neurosurgery, Afyonkarahisar State Hospital, Afyonkarahisar, Turkey.

Acknowledgment date: March 16, 2016. First revision date: April 27, 2016. Acceptance date: May 17, 2016.

The manuscript submitted does not contain information about medical device(s)/drug(s).

No funds were received in support of this work.

No relevant financial activities outside the submitted work.

Address correspondence and reprint requests to Mehmet G. Boyaci, MD, Faculty of Medicine, Department of Neurosurgery, Afyon Kocatepe University, Afyon-İzmir yolu üzeri 7. km, Afyonkarahisar, Turkey; E-mail: mgazibyc@hotmail.com

DOI: 10.1097/BRS.0000000000001727

Spinal epidural hematoma (SEH) is an infrequent condition, but it represents an important cause of spinal cord or cauda equina compression.^{1–4} According to the pathogenesis of SEH, it can be classified as idiopathic spontaneous or secondary.^{5,6} Most of the SEHs are spontaneous.⁷ Post-traumatic SEH is relatively uncommon.⁸ Magnetic resonance imaging (MRI) is considered to be the technique of choice for diagnosis.³ We have reported an SEH traumatic case without bone lesions due to exploding truck tire. A different category of blast injuries is the one related with exploding tyres.⁹ Blast injuries of large tyres are similar to those resulting from landmine explosions but without thermal or chemical effects.¹⁰ Shock waves are the main mechanism that is responsible for blast injuries.¹¹ We present a case of unique SEH caused by shock wave.

CASE REPORT

A 33-year-old man was brought to the emergency department with complaints of weakness and numbness of the upper extremities. On physical examination, there was point abrasion upper body. Neurological examination revealed moderate paresthesia (muscle strength 3/5 bilaterally) at the upper extremities, deep tendon reflexes were absent at upper extremities, and there was hypoesthesia at the level of C4. Computerized tomography (CT) and MRI scans of his cervical spine were taken. There was an epidural high-signal density without osseous lesion in CT from the level of C2 to C5 (Figure 1), and there was a T2-weighted hyperintense lesion in MRI from the level of C2 to C5 with compression of the spinal cord the anterior and posterior which proved to be an SEH (Figure 2). Laboratory tests, including hematology, chemistry group, and coagulation studies were all within normal limits. The patient underwent emergency decompressive laminectomy at the level of C3 and C4 where most of the compression was present. We preserved facet joint during laminectomy. An epidural hematoma, 5 × 1 × 0.5 cm in size was noted. The hematoma was removed successfully. There was no active bleeding, no instability, and no vascular abnormalities. Postoperative CT and MRI study showed successful evacuation of the SEH (Figure 3).

Four weeks after admission to the hospital, the patient was discharged from the hospital with complete neurologic

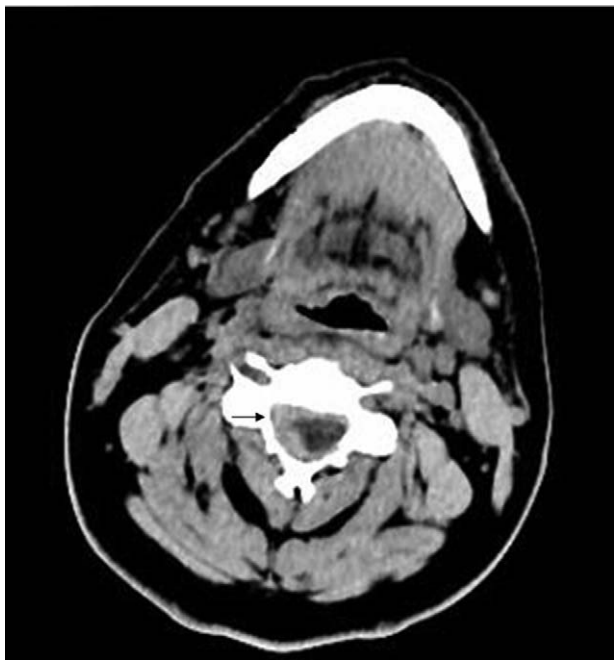


Figure 1. Axial computerized tomography (CT) showing epidural high-signal density to C4.

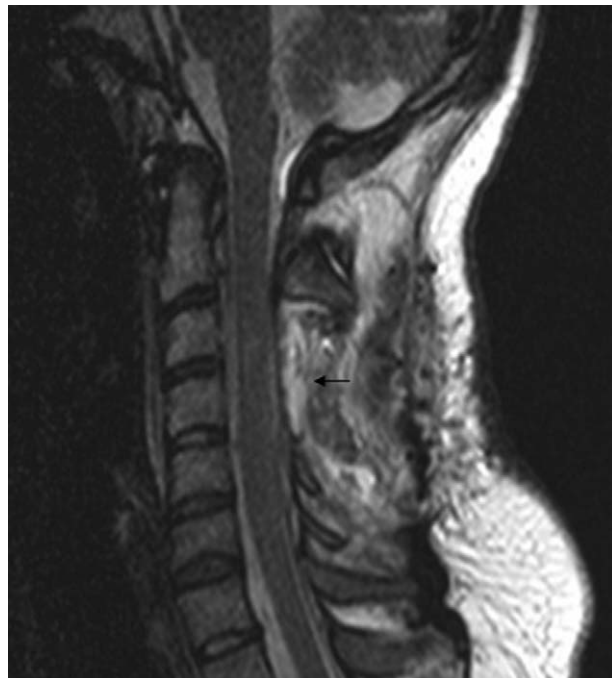


Figure 3. Postoperative sagittal T2-weighted cervical spine magnetic resonance imaging (MRI).

recovery with recommendation of rehabilitation therapy and control x-ray and MRI examinations to detect possible instability and kyphosis.

DISCUSSION

The high energy produced by large tyre blasts may cause severe injuries. Reported overall mortality rate following large tyre-blast injuries is 19% to 29%.^{9,10} The injuries can be due to primary, secondary, or tertiary effects of the blast.¹² The primary injury is caused by the initial pressure wave (shock wave), which particularly affects hollow organs. It causes lung injury, acute respiratory distress

syndrome, and bowel and eardrum perforations. In our case, we detected hemorrhage inside spinal canal at the epidural space.¹¹ Secondary injuries are caused by the flying objects from the exploded tyre hitting the victims at high speed and resulting in complex injuries. Tertiary contrecoup injuries are produced as the patient is thrown away against surrounding walls, the ground, or other objects causing serious injuries. In our case, we did not observe any signs of secondary or tertiary effects at cervical region. Although SEH can develop as a result of hyperflexion or hyperextension of cervical vertebrae, this is often accompanied by bone fracture, ligament injury, or disorders of the facet joint;



Figure 2. Sagittal (A) and axial (B) T2-weighted cervical spine magnetic resonance imaging (MRI) showing epidural high-signal intensity lesion from level C2 to C5 with compression of the spinal cord.

however, we did not observe any of these injuries in our case.

Primary injury can produce severe barotrauma leading to damage to air-containing tissues.¹⁰ The pneumatic pressure in a large tyre usually remains at an average 320 to 360 kPa, which has produced severe trauma in this case. In literature, there are only few references available regarding tyre-blast injuries and its effect on human body but there was no report of SEH.¹³ In their series including seven patients, Hefny *et al*¹⁰ reported scalp and facial lacerations, skull fractures, brain edema, cranial epidural hematoma, pneumothorax, hemothorax, and extremity fractures.

Murty¹³ reported a mortal case with lung and cranial injury after large tyre blast, and stated that eye and ear injuries could result from high pressure.

Most SEHs are spontaneous, and precipitating factors include coagulopathy, neoplasm, vascular malformation, and pregnancy.⁷ Our case had neither of these factors. This is the first reported case of SEH due to shock wave in the English literature.

➤ Key Points

- ❑ Most SEHs are spontaneous, and precipitating factors include coagulopathy, neoplasm, vascular malformation, and pregnancy.
- ❑ Post-traumatic SEH is relatively uncommon.
- ❑ Blast injuries of large tyres are similar to those resulting from landmine explosions but without thermal or chemical effects. Shock waves are the main mechanism that is responsible for blast injuries.
- ❑ SEH should be suspected in blast injuries. CT and MRI should be used for early diagnosis. These patients should undergo emergency surgery.

- ❑ This is the first report of SEH due to shock wave.

Acknowledgments

This manuscript was presented at proceeding book of 15th European Congress of Neurosurgery, 12–17 October 2014, Prague, Czech Republic.

References

1. Chen JC, Chen Y, Lin SM, et al. Acute spinal epidural hematoma after acupuncture. *J Trauma* 2006;60:414–6.
2. Dimou J, Jithoo R, Bush S. A patient with delayed traumatic cervical spinal epidural haematoma presenting with hemiparesis. *J Clin Neurosci* 2010;17:404–5.
3. Fukui MB, Swarnkar AS, Williams RL. Acute spontaneous spinal epidural hematomas. *AJNR Am J Neuroradiol* 1999;20:1365–72.
4. Pear BL. Spinal epidural hematoma. *Am J Roentgenol Radium Ther Nuclear Med* 1972;115:155–64.
5. Sarubbo S, Garofano F, Maida G, et al. Spontaneous and idiopathic chronic spinal epidural hematoma: two case reports and review of the literature. *Eur Spine J* 2009;18:1055–61.
6. Kato S, Seki H, Kosu K. Acute cervical spinal epidural hematoma with spontaneous resolution—case report. *Neurol Med Chir* 1994;34:23–6.
7. Lee JH, Lee H, Jo DJ. An acute cervical epidural hematoma as a complication of dry needling. *Spine* 2011;36:E891–3.
8. Cuenca PJ, Tulley EB, Devita D, et al. Delayed traumatic spinal epidural hematoma with spontaneous resolution of symptoms. *J Emerg Med* 2004;27:37–41.
9. Kumral B, Avşar A, Büyük Y, et al. An unusual fatal injury due to tyre blast. *Rom J Leg Med* 2014;22:5–7.
10. Hefny AF, Eid HO, Al-Bashir M, et al. Blast injuries of large tyres: case series. *Int J Surg* 2010;8:151–4.
11. Ozer MT, Coskun K, Ogunc GI, et al. The disguised face of blast injuries: shock waves [in Turkish]. *Ulus Travma Acil Cerrahi Derg* 2010;16:395–400.
12. Hefny AF, Eid HO, Abu-Zidan FM. Severe tyre blast injuries during servicing. *Injury* 2009;40:484–7.
13. Murty O. Tyre-blast injuries. *J Forensic Leg Med* 2009;16:224–7.