

Case Series

Case Series of Spinal Epidural Hematoma: A Single Center Experience



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ABSTRACT

Background and Importance: Spinal epidural hematoma (EDH) is a rare clinical condition that occurs spontaneously in patients with a spine injury. Most patients require laminectomy and evacuation of spinal EDH. Magnetic resonance imaging (MRI) of the spine with magnetic resonance angiography is the chosen radiological investigation. This study aims to review cases with spinal EDH and discuss its etiology, pathogenesis, investigations, and various management strategies.

Case Presentation: This is a retrospective analysis study of five spinal EDH cases admitted at our institute from August 2020 to August 2021. Four patients underwent laminectomy and evacuation, while one was managed conservatively because of rapid clinical improvement. The patients' functional outcomes were assessed by using American spinal cord injury association impairment scale (AIS) before and after treatment. Four of the five patients who participated in this study had significant neurological improvement. One of the patients who presented late to us had poor neurological recovery despite the surgical intervention.

Conclusion: Surgical evacuation of spinal EDH within 48 hours of the onset of symptoms ensures good clinical recovery. Spontaneous resolution is possible in some cases if patients have an improvement in their neurological status early in the course of the disease. Hence, we conclude that prompt treatment in spinal EDH patients ensures maximum functional recovery. Patients with spinal EDH need close follow-up and periodical neurological examination.

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Highlights

- Spinal EDH occurs spontaneously or following trauma.
- If not treated properly, rapid progression of spinal EDH leads to permanent neurological deficits.
- Magnetic resonance imaging (MRI) of the spine with magnetic resonance angiography are the radiological investigation tools used to diagnose spinal EDH.
- Immediate surgical intervention ensures good neurological recovery.
- Spontaneous resolution of spinal EDH occurs rarely.

Plain Language Summary

Spinal EDH is rarely encountered in clinical practice. It is a collection of blood in the vertebral column in the space between the dura mater which covers the spinal cord and vertebral body. It may occur spontaneously or following trauma. Spontaneous spinal EDH occurs in vascular malformations, hematological disorders, and patients taking blood thinner medications for stroke and heart attack. It results in rapid compression of the spinal cord which leads to weakness of the upper and lower limb depending on the level of vertebral column involved.

Magnetic resonance imaging (MRI) of the spine with a magnetic resonance angiography is the investigation of choice to diagnose spinal EDH and to rule out associated vascular malformations. In posttraumatic spinal EDH, a computed tomography scan of the spine gives information about associated vertebral column fractures. This condition rarely recovers spontaneously. Hence, immediate surgical evacuation of spinal EDH ensures rapid clinical recovery.

1. Background and Importance

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pinal epidural hematoma (EDH) is a rare clinical condition [1]. Only a few publications on spinal EDH have been reported.

Spinal EDH may occur spontaneously or following trauma [1, 2]. Spontaneous spinal EDH is seen mostly in the 4th or 5th decades of life [3]. It may occur in vascular malformations, antithrombotic therapy, coagulation disorders, and other hematological abnormalities [2, 4, 5]. Following hyperflexion or hyperextension, the rupture of the epidural venous plexus in the spinal extradural plane leads to the development of spinal EDH [5, 6]. It may occur anywhere along the anterior or posterior aspects of the spinal canal and it is classified as cervical, cervicodorsal, dorsal, dorsolumbar, and lumbar EDH based on the location.

Clinical features

Spinal EDH can severely impair the conduction of sensory and motor fibers, along with the functions of the autonomic nervous system. Although the clinical features initially vary from mild to severe, EDH may rapidly compress the spinal cord and lead to a permanent neu-

rological deficit [7]. American spinal cord injury association impairment scale (AIS) is the best assessment tool involving both sensory and motor examination to determine the sensory and motor level for each side of the body. Cervical and cervicodorsal EDH patients present neck pain and rapidly progressing quadriparesis, whereas dorsal, dorsolumbar, or lumbar EDH patients present upper or lower back ache with paraparesis [7, 8]. Few patients may experience urinary incontinence because of the compression of bladder and bowel fibers [8].

Investigations

MRI of the spine with magnetic resonance angiography (MRA) is the investigation of choice to diagnose spinal EDH [3]. In MRI, acute spinal EDH appears as a biconvex-shaped collection in the anterior or posterior spinal epidural space with a well-defined margin that tapers superiorly and inferiorly [9, 10]. It is iso- to hyperintense on T1W and hypointense on T2W images, and its intensity varies depending upon the duration of EDH [9, 10]. Another advantage of MRI is its ability to provide exact information regarding the extent of hematoma, the degree of spinal cord compression, the onset time of hematoma, and the secondary signal changes in the



spinal cord, which determines postoperative neurological recovery [3, 10]. A good quality MRI STEER and MRA can detect associated vascular malformations [4]. Digital subtraction angiography (DSA) is the best investigation tool to evaluate the anatomy and flow dynamics of the arterial feeders, arteriovenous fistulas, draining veins, and associated aneurysms in the spontaneous spinal EDH. Since there are no risks of exposure to ionizing radiation, MRI can be done often to assess the progression of the spinal EDH if the patient is managed on a conservative basis. Radiography and computed tomography (CT) scans of the spine can rule out an associated vertebral fracture.

Condition management

Early diagnosis and prompt treatment are required to prevent a permanent neurological deficit. Decompressive laminectomy and evacuation of EDH should be performed within 48 hours of the onset of symptoms before the disease compromises the blood supply of the spinal cord [11]. Hemoglobin levels in anemic patients should be immediately corrected to avoid hypoxic insult to the spinal cord [12]. Patients with associated spinal cord injuries may not have good neurological recovery even with early surgical interventions [8]. Posterolateral fusion can be done after assessing the integrity of facet joints on the CT scan of the spine [13]. Increasing case reports are seen favoring spontaneous resolution of spinal EDH [9, 14]. However, no diagnostic tool is available to identify the patients who recover spontaneously [14]. Conservative management with close neurologi-

cal observation can be attempted in selected cases that show significant improvement in the neurological status early in the clinical course [10, 15].

2. Case Presentation

We retrospectively analyzed four traumatic and one spontaneous case of spinal EDH admitted to the neurosurgery intensive care unit from August 2020 to August 2021.

Case 1

A 58-years-old woman presented to the emergency department with a sudden onset of severe neck pain while carrying a heavy weight of more than 20 kg on her head. She subsequently developed quadriparesis. She was not on any offending drugs. Neurological examination revealed quadriparesis (AIS Grade C) below the elbow level, with sensory level at C5 bilaterally. Cervical spine CT scan and radiography ruled out any associated vertebral fracture. The MRI of the cervical spine revealed posterior cervicodorsal EDH (Figure 1) extending from C3 to D5 vertebral level with thecal sac indentation and cervical cord compression. MRA revealed no vascular malformation.

She was immobilized with a cervical collar and planned for surgical evacuation. After 2-3 hours of admission, motor and sensory deficits started to improve gradually, and by 48 hours, her upper limb and lower limb power were close to normal. Repeated cervical MRI taken on the 3rd

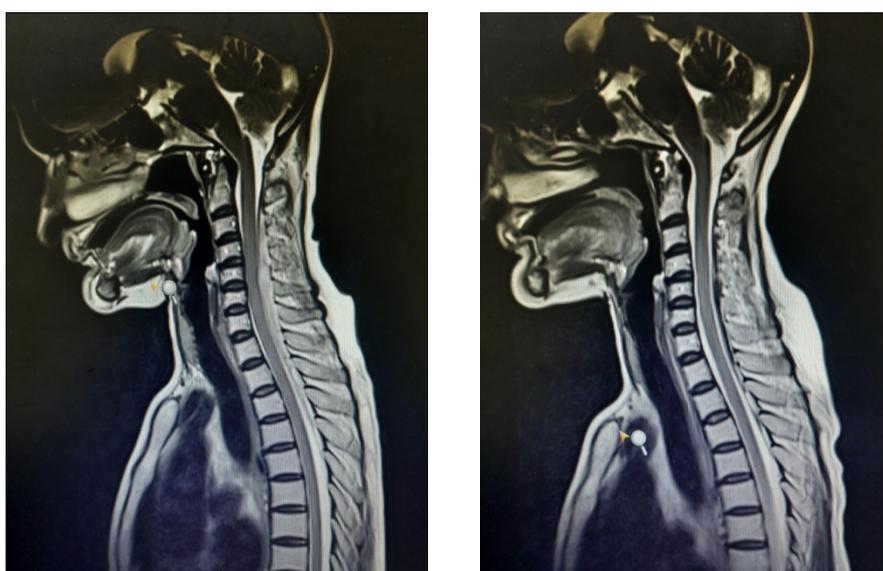


Figure 1. The 1st MRI image shows epidural hematoma at the posterior aspect of cervicodorsal region (C3-D5). The 2nd MRI image which was taken after 3 days of conservative management shows spontaneous resolution of epidural hematoma.



Figure 2. MRI cervical spine showing posterior cervical epidural hematoma extending from C2-C4 level



day (Figure 1) showed spontaneous resolution and hence surgery was deferred. She was mobilized on the 5th post-operative day with cervical collar support, and she was discharged on the tenth day with AIS Grade E.

Case 2

A 31-year-old man came with neck pain and quadriplegia (AIS Grade D) of 10 days duration, rapidly deteriorating to AIS Grade C in 24 hours. He was a chronic renal failure patient for which he had undergone cadaveric renal transplantation 3 years ago. He had been on oral anticoagulation therapy for renal artery thrombosis for the last 3 months. MRI cervical spine (Figure 2) revealed cervical EDH extending from C2-C4 level posteriorly with cord compression. We performed C2-C4 laminectomy and evacuation of EDH as an emergency

procedure. Quadriplegia gradually improved after surgery, and he was ambulated with a cervical collar on the 3rd post-operative day. He was discharged after 12 days with complete neurological recovery (AIS Grade E).

Case 3

A 39-year-old man came to the emergency department with severe neck pain and quadriplegia (AIS Grade B) following a motor vehicle accident. He was not on any offending medications and had no history of bleeding diathesis. MRI (Figure 3) revealed anterior cervical EDH extending from the C3-C6 level resulting in cord compression. C4-C6 laminectomy and evacuation of EDH were done as an emergency procedure, and he was discharged 9 days later with significant neurological recovery (AIS Grade D).



Figure 3. MRI cervical spine showing anterior cervical epidural hematoma extending from C3-C6





Figure 4. MRI lumbosacral region showing anterior epidural hematoma at the level of L4-S1 compressing cauda equina



Case 4

A 38-year-old man came to the outpatient department with low backache of one-week duration after sustaining a motor vehicle accident. He also had urinary incontinence, neurogenic claudication, and an increase in the severity of backache for the past 36 hours (AIS grade D). He was not on anticoagulation therapy and had no history of bleeding diathesis. MRI lumbosacral spine with MRA (Figure 4) showed anterior spinal EDH at the level of L4-L5 with compression of cauda equina. L4-L5 laminectomy and evacuation of EDH were done as an emergency procedure. He was mobilized on the 1st

post-operative day. His neurogenic claudication started to improve from the 2nd day of surgery. Bladder symptoms improved after 2 weeks of surgery.

Case 5

A 43-year-old woman came to the emergency department with a history of accidental fall in the bathroom 10 days ago. She developed quadriplegia (AIS Grade A) and experienced severe neck pain for the past 5 days. CT scan of the cervical spine was normal. MRI cervical region (Figure 5) showed posterior cervical EDH extending from C3-C6 with significant cervical cord compression.



Figure 5. MRI cervical spine showing posterior cervical epidural hematoma extending from C3-C6



Table 1. Observed clinical and radiological findings in the spinal EDH patients

No.	Age (y)	Gender	Etiology	Presenting Complaints	Location of EDH	AIS Grade During Admission	Offered Treatment	Time Interval Between Worsening Symptoms and Surgery	Posttreatment AIS Grade
1	58	Female	Trauma	Neck pain and quadriparesis	C3-D5 anterior cervicodorsal EDH	C	Conservative treatment	---	E
2	31	Male	Spontaneous	Severe neck pain and quadriparesis	C2-C4 posterior cervical EDH	C	Surgery	24 (h)	E
3	39	Male	Trauma	Neck pain and quadriparesis	C3-C6 anterior Cervical EDH	B	Surgery	12 (h)	D
4	38	Male	Trauma	Severe low backache, paraparesis, urinary incontinence	L4-L5 anterior lumbar EDH	D	Surgery	40 (h)	E
5	43	Female	Trauma	Neck pain and quadriparesis	C3-C6 posterior cervical EDH	A	Surgery	5 (d)	B

Abbreviations: EDH: epidural hematoma.



The MRA ruled out any vascular malformations. She was not on anticoagulation therapy, and her bleeding profile was normal. She underwent emergency cervical laminectomy and evacuation of EDH. She was discharged on the eighth post-operative day with a slight improvement in neurological deficit (AIS grade B).

3. Results

Spinal EDH may rapidly expand and compromise the blood supply to the spinal cord and produce permanent neurological deficits. Early surgery within 48 hours of deterioration of the symptoms favor good neurological outcome. However, conservative management seems to be enough if patients show clinical improvement early in the disease.

The limitation of the study is its retrospective nature with a limited number of cases in a single center. In the future, a large multicenter study with a heterogeneous population of a different geographic location is needed to compare the results among various centers.

4. Discussion

We have summarized the clinical and radiological findings and treatments offered to the patients in Table 1. All patients were in the age group of 30 to 60 years. Of

this population, five patients (60%) were male and 40% were female. Cervical and cervicodorsal EDH was seen in 80% of the cases and located posteriorly in 60% of the cases. Meanwhile, precedence of trauma was noted in 80% of the cases. Along with neurological deficit, neck pain in cervical EDH and low back ache in the lumbar EDH were the predominant presenting complaints in almost all patients. Only one patient (20%) presented with urinary incontinence. We used the AIS grading to assess the sensory and motor deficit before and after treatment. We investigated all patients with MRI spine with MRA. In addition, we performed laminectomy and evacuation of spinal EDH in 4 patients (80%). We managed one patient conservatively as she showed improvements in her neurological status within 2 to 3 hours of admission and evaluation. The MRI taken on the 3rd day of conservative management showed a decrease in the size of EDH and its mass effect over the cervical cord, probably because of the redistribution of blood along the spinal canal. Additionally, 80% of the patients showed significant neurological improvement as per AIS grading except for our 5th patient who presented very late.

5. Conclusion

Even though spinal EDH is a rare clinical condition, it is considered as a differential diagnosis in neck pain and



quadriplegia patients. Obtaining a history of trauma, coagulation disorders, anticoagulant therapy, and thorough neurological examination are the cornerstones for evaluating such patients. MRI spine is useful for diagnosis of the spinal EDH and associated spinal cord injury and MRA helps delineating its extension and ruling out the associated vascular malformations. Laminectomy and evacuation of EDH within 48 hours of the onset of symptoms ensures good neurological recovery. A decision on posterolateral fusion can be made after assessing the integrity of facet joints on the CT scan of the spine. Spontaneous resolution is possible in selected candidates who show improvement in the neurological status early in the clinical course. Patients with associated spinal cord injuries have poor neurological recovery even with surgical intervention. Early diagnosis, close observation, periodic neurological examination, and prompt treatment ensure maximum functional recovery in patients with spinal EDH.

Ethical Considerations

Compliance with ethical guidelines

Written informed consent was obtained from all patients. Meanwhile, the Institutional Ethics Committee approval was also obtained. This study complies with all ethical guidelines.

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Authors' contributions

Conception and Design: Jayaprakash Duraisamy; Data Collection: Jayaprakash Duraisamy; Data Analysis and Interpretation: Jayaprakash Duraisamy; Drafting, critically revising the article: All authors; Reviewed and approved the final version of the manuscript: All authors.

Conflict of interest

The authors declared no conflict of interest.

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