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Research Article

Neurological Outcome in Spinal Epidural Hematomas

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Abstract

Background: In this retrospective analysis, 18 patients with spontaneous and non-spontaneous spinal epidural hematomas (SEH) (Traumatic and iatrogenic) had surgical evacuation were assessed for the neurological outcome. The goal of the study was to see if the aetiology of SEH had an impact on the neurological outcome. **Methods:** This study included 18 patients with SEH. Patient clinical data were retrieved form the archive including the duration between symptoms and operation, as well as the size of the hematoma, neuroimaging, motor and Sensory function were assessed before surgery and for the first 3-6 months after discharge. **Results:** The study included 8 and 10 patients with spontaneous and non-spontaneous SEH respectively. Neurological impairments improved in 5 out of 8 patients with spontaneous type (62.5%) while in non-spontaneous type improvement was seen in 9 out of 10 patients (90%). The median duration between onset of symptoms and surgery was longer (74 hrs vs 8 hrs) and the median hematoma area was higher (3 vs 2 spinal segments) in spontaneous SEH patients than in non-spontaneous cases. **Conclusion**: The aetiology of the SEH appears to be linked to the neurological prognosis. Surgical treatment of non-spontaneous SEH had a better result. There are two possible reasons for this observation. The first reason, non-spontaneous SEH patients are mostly under earlier close monitoring and could be operated for decompression quicker. The second one, because of their size, non-spontaneous SEH may have less severe cord compression.

Keywords: Spinal, Epidural Hematomas**,** Neurological Outcome

Introduction

Spontaneous and non-spontaneous spinal epidural hematomas (SEH) {Traumatic or iatrogenic} are infrequent. So far, there have been a lot of case reports [1,2, 3, 4, 5] and a few reviews in the literature [6,7,8], but Lawton and co-workers[2] have reported on only one substantial, well-documented surgical series. In 87 percent of their 30 patients, these researchers had a better outcome. Rapid surgical intervention was linked to a favourable outcome. More than half of their patients, however, were receiving medical treatment because the hematoma occurred as a result of surgery or trauma. uncontrolled bias may interpret the relatively increased percentage of excellent outcomes, assuming that previously hospitalised patients undergo diagnostic and surgery more quickly.

We handled a large number of cases over the five-year period between 2014 and 2020. Due to the scarcity of big surgical series, we decided to share our experience with SEH operational treatment. The incidence of spontaneous and non-spontaneous SEH was near equal in this study, allowing researchers to evaluate whether the aetiology of SEH influences the neurological outcome.

Patients and Methods

Between March 2014 and December 2019, 8 patients with spontaneous SEH (4 men and 4 women, average age 49 years, ranging from 25 to 64) underwent surgery at the Department of Neurosurgery, Minia University Hospital, Al-Minia, Egypt. In six of the eight patients, bleeding diathesis owing to Haemophilia A and

anticoagulant medication may have led to clot formation, whereas no cause was found in the other two. During the same time period, surgery was performed on 10 patients with non-spontaneous SEH (6 males, 4 females, with a mean of 53 years, ranging from 32 to 71 years).

Non-spontaneous epidural hematoma developed in 9 patients postoperatively (iatrogenic), while the remaining case was related to trauma (traumatic). These patient's medical records, operation reports, and radiological investigations were all examined. The initial complaints, the time between development of symptoms and surgery, size of hematoma and the surgical approach were all determined. To measure the effect of surgery, assessment of motor function and sensory function was done preoperatively and immediatly postoperative, as well as at follow-up visits spanning from 3 to 6 months postoperatively. There was a distinction drawn between sensory and/or motor loss that was total or incomplete.

An informed written consent was taken from each patient prior to the operation. This consent was done according to the guidelines of Faculty of Medicine Research Ethics Committee (FMREC), Minia University, Al-Minia, Egypt.

Statistical Analysis

Analysis was performed using analysed using the statistical package of social science (SPSS) software version 20. Data was prepared and coded. Simple descriptive analyses were performed.

Results

Preliminary Complaint and Clinical Manifestation

In 6 of 8 (75%) patients with spontaneous SEH, radiculopathy or local pain at the location of the hematoma was the first symptom. The SEH developed symptoms in the remaining two individuals in the form of painless motor and sensory function loss. Only 2 out of 10 patients (20%) with traumatic or postoperative SEH had discomfort at the site of the hematoma at first. Neurological examination showed that, in patients with spontaneous SEH, 3 patients (37.5%) had a complete sensorimotor loss and the remaining 5 patients (62.5%) had incomeplete sensorimotor loss. While three patients (30%) with non-spontaneous SEH had a complete sensorimotor loss and seven (70%) had an incomplete sensorimotor loss.

Radiological Evaluation:

Magnetic resonance imaging (MRI), CT scan were used to confirm the suspected diagnosis of a spinal epidural hematoma. After the resection of an epidural metastatic tumour, one patient underwent surgery without any diagnostic tests due to quickly growing neurological impairments. The diagnosis of SEH was confirmed in all cases during surgery. The incidence of spontaneous SEH was as follows; 25% in the cervical region, 37.59% in the dorsal region, and 37.5% in the lumbar region. while in the second group Two patients (20%) had non-spontaneous hematomas in the cervical region, five patients (50%) had hematoma in the dorsal region, and three patients had hematoma in the lumbar region (30%). There was a difference in the length of the hematoma between spontaneous and non-spontaneous SEH. The iatrogenic and post-traumatic SEH involved one to three segments (median 2 segments) and were limited to the location of previous procedure or trauma, whereas spontaneous SEH involved 1 to 9 segments (median 3 segments) (table 1).

Surgery:

The hematoma was surgically removed after the radiological diagnosis was confirmed. The hematoma was reached by a laminectomy in cases with spontaneous SEH. In all cases with postoperative SEH, the previous incision and access was re-explored.

The period between start of symptoms and operation varied significantly. In patients with spontaneous SEH (median 74 hours), it ranged from 24 hours and 10 days, while in patients with iatrogenic or post-traumatic SEH, it ranged from immediately following symptom’s onset up to 72 hours from onset of symptoms (median 8 hours).

Outcome:

In spontaneous SEH, 5 of 8 patients (62.5%) showed improvement in their preoperative sensory and motor impairments. Even though two of the five patients had total sensory loss prior to surgery, they improved. During the follow-up period no patients restored normal sensorimotor function. The neurological state of the remaining three patients (37.5%) remained

unaltered. After surgical evacuation of the hematoma, motor and sensory deficits improved in 9 of 10 patients with non-spontaneous SEH (90 percent), however only 2 patients (20 percent) had complete recovery. All 3 patients with total sensorimotor impairment were able to regain some neurological function. The neurological deficiency in the remaining ten percent of patients did not improve following surgery. During the 18-month follow-up period, none of the 18 patients died.

Table 1: Patients demographic, clinical, and radiological data

	Spont. SEH	Non spont. SEH
No. of patients	8	10
Sex(male/female)	4/4	6/4
Age(years): Mean Range	 49 23-64	 53 32-71
Initial complaint Pain Neurological deficit (weakness or sensory loss)	 6 (75%) 2(25%)	 2(20%) 8(80%)
Clinical signs: Complete sensorimotor loss Incomplete sensorimotor loss	 3 (37.5%) 5 (62.5%)	 3(30%) 7 (70%)
Location: Cervical Thoracic Lumbar	 2 (25%) 3 (37.5%) 3 (37.5)	 2 (20%) 5 (50%) 3 (30%)
Extent of SEH (median) Time between symptoms and surgery (hrs)	2 74	3 8
Neurological recovery: Complete Incomplete No recovery	 0 (0%) 5 (62.5%) 3 (37.5%)	 2 (20%) 7 (70%) 1 (10%)

Fig (1):

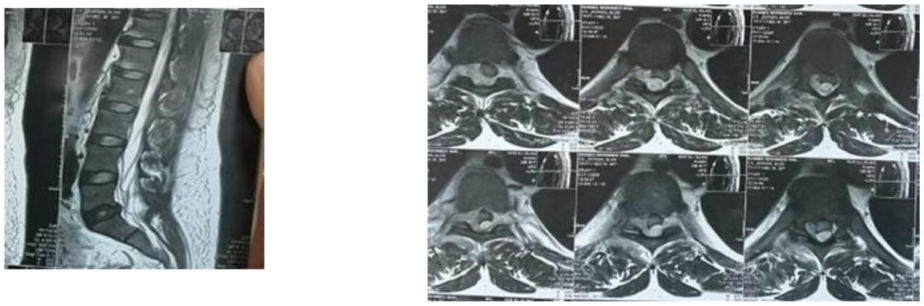

Figure (1): Saggital and axial T2 wieghted images of lumbar spine MRI showing posttraumatic hyperintense epidural mass causing mass effect on cauda equina

Fig (2);

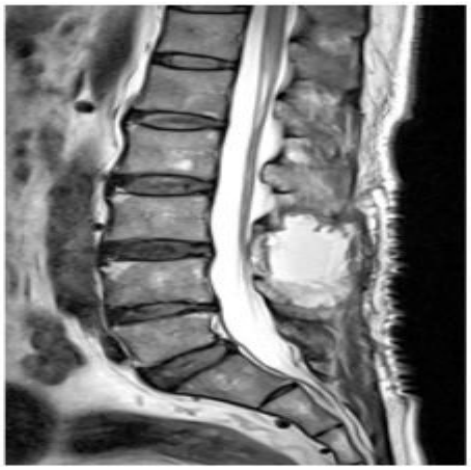

Figure (2): sagittal T2 weighted image of lumbar spine MRI postoperative to spinal epidural hematoma evacuation

Fig(3);

Figure (3): Saggital T2 weighted image of dorsal MRI showing posttraumatic heterogenous hyperintense epidural lesion (hematoma) opposite dorsal 9,10,11 vertebrea

(4);

Figure (4): saggital T1 wieghted image of dorsal MRI postoperative to spinal epidural hematoma evacuation showing laminectomy of D9,10,11 and complete evacuation of hematoma

Fig (5);

Fig (5): Saggital T2 Weighted image of dorsal Mri showing posttraumatic epidural hyperintense lesion (hematoma) opposite dorsal 5,6,7,8,9

Fig (6);

Fig (6): Postoperative saggital T2 weighted image of dorsal MRI showing laminectomy of dorsal vertebrae 5,6,7,8,9 and total evacuation of epidural hematoma.

Fig (7);

Fig (7): Saggital T2 weighted image of Cervico-dorsal MRI showing spontaneous hyperintense epidural lesion (hematoma) opposite C7, D1,2,3,4

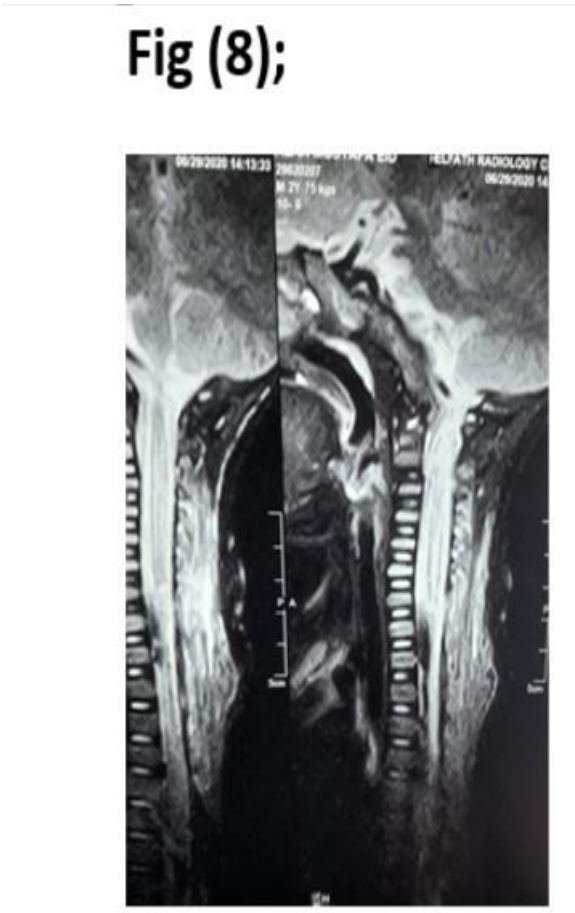

Fig (8): Postoperative saggital T2 weighted image of cervico-dorsal MRI showing laminectomy of affected levels and complete evacuation of hematoma

Discussion

Definition of spontaneous and non-spontaneous SEH.

Spine surgery, lumbar puncture, epidural anaesthesia, severe trauma, vascular malformation, and spinal tumours [3,4,9] are all linked to non-spontaneous SEHs. The term "spontaneous SEH" has a more ambiguous definition. It is widely known that spontaneous spinal epidural hematomas exist in the absence of iatrogenic operations or substantial trauma, but whether SEH linked with anticoagulants, coagulopathy, or moderate trauma are also spontaneous or not is a topic of controversy [3,10]. In our study, hematoma related to coagulation problems were considered spontaneous, as proposed by previous studies, due to their unclear pathophysiology [11]. As a result, there are 10 patients suffering of non-spontaneous SEH and 8 patients suffering of spontaneous SEH in this series.

SEH is still a rare condition, even in the age of sophisticated neuro-radiological imaging. The majority of articles are case reports, focusing on radiological features [2,5,12], cause [2,3,8,13,14], or novel operational procedures [15,16]. As a result, multiple authors examined the reported cases in order to assess the impact of surgery on neurological outcomes. From the literature, Foo and Rossier found 151 cases of spontaneous SEH and seven cases of non-spontaneous SEH[17]. In 75.3 percent of the 158 patients, motor recovery was noted.

In a previous review article [18], the postoperative neurological state was observed in 173 of 249 cases with spontaneous SEH, and only 64% of the cases showed improvement in preoperative neurological symptoms and signs. The most comprehensive review done was compiling 330 cases of spontaneous SEH. At least 78 percent of the patients showed improvement in their sensorimotor deficit.(17)

There have been few surgical series published. The surgical findings in 18 spontaneous SEHs of the lumbar spine were recorded by Gundry and Heithoff, but the neurological outcome was not reported [19]. As a result, Lawton and colleagues published their series with acceptable follow up data [20]. After surgical evacuation, 87% of 30 cases with SEH showed neurological improvement. The percentage of neurological improvement was 9 to 23% higher than the reviews in the literature. Lawton's surgical series implied that non-spontaneous hematoma has a better prognosis than spontaneous hematoma.

In this study, the neurological improvement following surgery had an overall percentage of 77%. (14 patients out of a total of 18) In 62.5 percent of patients with spontaneous SEH, but 90 percent of patients with non-spontaneous SEH, motor and/or sensory impairments improved. This finding backs up the theory that the aetiology of SEH influences the surgical outcome. In situations of non-spontaneous SEH, surgical outcomes are likely to be better. The high prevalence of non-spontaneous SEH in the research population may have contributed to Lawton and co-workers' positive results.

Factors Affecting Outcome:

Several criteria have been proposed to explain why patients with non-spontaneous SEH have a better result. Even if satisfactory recovery after delayed surgery has been recorded on occasion [7], the quickness of surgical intervention is considered to have a major effect [18,21]. Surgery performed within 36 hours of symptom beginning is linked to a better outcome [14,22,23], and the best surgical outcome is more likely if surgery is done within 12 hours of symptom onset.

The current study found that in already hospitalised patients who develop a post-operative or post-traumatic SEH, the time between symptom start and diagnosis and operation is significantly shorter. Epidural blood collection is a rare but well-known consequence of spinal surgery and trauma for spine surgeons, which raises awareness and allows for early detection. Additionally, routine postoperative neurological examinations may uncover symptoms or signs of cord or root compression. the diagnosis of spontaneous SEH requires the patient's awareness of symptoms and physician's alertness to consider SEH [24].

The shorter period between initial complaint and surgery could interpret the better outcome of postoperative and post-traumatic SEH than that of spontaneous SEH, and it's possible that the high percentage of favourable outcomes in Lawton et al. series is partly due to including a large number of iatrogenic and post-traumatic SEH in the study population. The second main element influencing the neurological outcome was discovered to be the preoperative neurological status [14,17,23,26].

Cases with spontaneous SEH with total sensory loss had a somewhat worse result than patients with non-spontaneous SEH in this research. When compared to non-spontaneous SEH, spontaneous SEH featured two more segments on average, Assuming that the more severe spinal cord compression and worse outcome were caused by the bigger extent of the spontaneous SEH. Foand Rossier, who analysed 58 patients with SEH in the literature, backs up this theory [27]. They found that motor recovery improved as the amount of the epidural collection decreased, with the best results occurring when the hematoma was limited to one region. Groen and Alphen, on the other hand, were not able to show such a link in their study [28,29]. The average period between the onset of symptoms and the peak deficiency is 12.8 hours [28,30]. Cases with non-spontaneous SEH had surgery within 8 hours, and cases with spontaneous SEH had surgery within 74 hours in our study. As a result, it cannot be ruled out completely that the less severe neurological deficits seen in non-spontaneous SEH are due to surgery prior to the onset of the maximum deficit.

Conclusion

Surgical excision of the hematoma improved some of the debilitating motor and sensory deficits in the majority of individuals with SEH. Patients with spontaneous SEH recover less frequently than those with non-spontaneous, postoperative, or post-traumatic SEH. Cases with non-spontaneous SEH, that are frequently already under medical treatment after spine procedure or trauma, had a shorter delay between symptom start and surgery. Non-spontaneous SEHs are also less widespread than

spontaneous SEHs. Both of these variables could explain why individuals with non-spontaneous SEH have a better prognosis.

References

1. Avrahami E, Tadmor R, Ram Z, FE Bel M, Itzhak Y. MR demonstration of spontaneous acute epidural hematoma of the thoracic spine. Neuroradiology 2009: 31 89-92.
2. Barker GL. Spinal epidural hematoma following spinal anaesthesias. Anaesthesia 2003; 43: 664-665.
3. Beatty rm, Winston KR. Spontaneous cervical epidural hematoma. A consideration of etiology. J Neurosurgery 2001, 61:143-148.
4. Bernson PL, Haan J, Vielvoye GJ, Peerlinek KM. Spinal epidural hematoma visualized by magnetic resonance imaging. Neuroradiology 2011; 30: 280-284.
5. Bruyn GW, Bosma NJ. Spinal extradural hematoma. In: Vinken PJ, Brugn GW (eds.), Handbook of Clinical Neurology 2001; pp.1-30.
6. Boukobza M, Guichard JP, Boisso-NET M, George B, Reizine D, Jelbertf, Merland JJ. Spinal epidural hematoma: report of 11 cases and review of the literature. Neuroradiology 2014 36: 456-459.
7. Buhl R, Kretschmer H. Spontaneous spinal epidural hematomas: good results after delayed treatment. Neurosurgery 2014 59: 109-112. 2 at
8. Calliauw l, Dhara M, Martens Vannerem L. Spinal epidural hematoma without lesion of the spine. Clinical Neurology and Neurosurgery 2011, 90: 131-136.
9. Crisis G, Sorgato P, Colombo A. Scarpa M, Falasca A, Angiari P. Gadolinium-DTPA-ENHANCED MR imaging in the diagnosis of spinal epidural hematoma. Neuroradiology 2003; 32: 64-66.
10. D'Angelo V, Bizzozero L, Tala-Monti G, Ferrara M, Colombo N. Value of magnetic resonance imagıng in spontaneous extradural spinal hematoma due to vascular malformation: case report. Surgical Neurology 2006; 34: 343-344.
11. Flaschka G, Sutter B, Ebner F,Klein GE, Tilz G. Spinal epidural hematomas long-term follow-up of four cases Neurology 2002; 61: 629-633.
12. Ghanem q, Ivan LP, Spontaneous spinal epidural hematoma in an 8-year-old boy. Neurology 2014; 28: 829-832.
13. Foo D, Chang YC, Rossier AB. Spontaneous cervical epidural hemorrhage, anterior cord syndrome and familiar vascular malformation: case report. Neurology 2003; 30:308-311.
14. Foo D, Rossier AB. Preoperative neurological status in predicting surgical outcome of spinal epidural hematomas. Surgical Neurology 2004; 15: 389-401
15. Foo d, Rossier AB. Post-traumatic spinal epidural hematoma. Neurosurgery 2001; 11:25-32.
16. Gouda JJ, Brown JA, Brinker RA. Delayed cervical epidural hemorrhage associated with silastic dural implant: case report. Neurosurgery 2007; 41:943-945.
17. Groen RJM, Vanalphen HAM. Operative treatment of spontaneous spinal epidural hematomas: a study of the factors determining postoperative Outcome. Neurosurgery 2002, 39: 494-509.
18. Grollmus J, Hoff J. Spontaneous spinal epidural haemorrhage: good results after 1y treatment. J Neurology Neurosurgery and Psychiatry 2001; 38: 89-90.
19. Gundry CR, Heithoff KB. Epidural hematoma of the lumbar spine: 18 surgically confirmed cases. Neurology 2003; 187: 427-431.
20. Gustaffson H, Rutberg H, Bengtsson M. Spinal hematoma following epidural analgesia. Report of a patient with ankylosing spondylitis and a bleeding diathesis. Anaesthesia 2008; 43: 220-222.
21. Kessel G, Bocher-Schwarz HG, Riegel K, Perneczky A. the role of endoscopy in the treatment of acute traumatic anterior epidural hematoma of the cervical spine: case report. Neurosurgery 2007; 41: 688-690.
22. Klossek H, H,LLER E. The problem of spontaneous spinal epidural hematoma. Acta Neurochirgica (Wien) 2004; 45:116-123.
23. Lawton MT, Porter RW, Heiserman JE, Jacobowitz R, Sonntag VKB, Dickman CA. Surgical management of spinal epidural hematoma: relationship between surgical timing and neurological outcome. J Neurosurgery 2005; 83: 1-7.

24. Lee KS, Mcworther JM, Angelo JN. Spinal epidural hematoma associated with Paget's disease. Surgical Neurology 2008; 30: 131-134.
25. Licata C, Zoppetti MC, Perini SS, Bazzan A, Gerosa M Dapian R. Spontaneous spinal haematomas. Acta Neurochirgica (Wien) 2007, 95: 126-130.
26. Lonjon MM, Paquis P, Chanalet S, Grellier P. Non traumatic spinal epidural hematoma: Report of four cases and review of the literature. Neurosurgery 2005; 41: 483-
27. Locke GE, Giorgio AJ, Biggers SL Johnson AP, Salem F. Acute spinal epidural hematoma secondary to aspirin induced prolonged bleeding. Surgical neurology 2006; 5: 293-296.
28. Mangione P, Mousselard H, Lesprit E, Rocha J, Sènègas J. Anterior evacuation of a spontaneous cervical epidural hematoma. Spine 2005; 4: 257-259.
29. Mattle H, Sieb JP, Rohner M, Mumenthaler M. Non traumatic spinal epidural and subdural hematomas. Neurology 2007;37: 1351-1356.
30. Mcouarrie IG. Recovery from paraplegia caused by spontaneous spinal epidural hematoma. Neurology 2001; 28: 224-228.