Case Report

Spontaneous complete recovery of paraplegia caused by epidural hematoma complicating epidural anesthesia: a case report and review of literature

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Study design: Case report.

Setting: Tertiary referral spinal surgery center in South India.

Objectives: To report a patient who developed epidural hematoma following epidural anesthesia causing acute paraplegia. Surgery was avoided due to concomitant gastrointestinal bleeding and poor general condition. Patient showed early signs of recovery with complete resolution of neurological deficits in 12 weeks.

Conclusion: Surgery can be avoided in patients who show early signs of neurological recovery following epidural hematoma.

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Introduction

Epidural anesthesia is one of the preferred modes of analgesia in limb surgeries for intraoperative and postoperative analgesia. Excellent pain relief after epidural analgesia facilitates early postoperative mobilization of the limbs, which in turn reduces the chances of postoperative deep vein thrombosis. Although considered very safe, serious complications can occur with 0.1–1 per 10 000 epidural injections.^{1–3} The Most frequently encountered complications are cardiovascular or neurological. The spectrum of neurological complications includes transient neurological deficits, permanent nerve root injury, myelopathy and arachnoiditis.⁴ Neurological injury can be caused mechanically at the time of placement of epidural catheter, or at the time of injection when medication is injected directly into the spinal cord or into the blood vessel causing toxic myelopathy⁵ or by an epidural hematoma following injection causing compressive myelopathy. Epidural hematoma is a rare cause of neurological injury following epidural injection and is associated with anticoagulant therapy, either for therapeutic or prophylactic reasons. Emergency decompression has been advocated for facilitating the best neurological outcome in these patients.⁶ Here, we present a patient who developed complete paraplegia due to epidural hematoma. Early recovery of neurological deficit was noticed

within a few hours after which there was complete recovery in 12 weeks time.

Case report

A 78-year-old lady with polyarticular rheumatoid arthritis for 11 years was admitted for total knee replacement. The patient was a known diabetic and hypertensive on regular therapy, and was diagnosed to have carcinoma lung 1 year earlier for which she underwent pulmonary lobectomy and had completed chemotherapy. Preoperative work up including coagulation profile and platelet count was normal. Surgery was performed under combined spinal and epidural analgesia at L2–L3 space. The procedure was uneventful and the patient did not report any parasthesia when the needle was introduced. The epidural catheter was inserted 10 cm and fixed, and was left in place for continuing postoperative analgesia. The patient received low molecular weight heparin (40 mg Enoxaparin sodium) subcutaneously 10 h after the surgery and a second dose 12 h later. As the patient was tested positive for occult blood in stool, further anticoagulation was suspended after the second dose and vitamin K injections were started. On the second postoperative day, the patient complained of severe back pain, which was relieved with oral analgesics. After 2 h, the patient complained of difficulty in moving the lower limbs and was found to have complete motor paralysis of the lower limbs and decreased sensation from L1. An epidural

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hematoma was suspected and an MRI scan revealed a linear mass in posterior epidural space from D10–L3, causing significant compressions of lower thoracic cord, conus medullaris and the cauda equina. It was isointense on T1 (Figure 1a) and heterogenous on T2 images (Figure 1b) suggestive of hyperacute hematoma. Coagulation profile revealed an INR of 1.04 and a platelet count of 170 000.

A decompression was planned but, while in the operation theatre, the patient showed signs of recovery and started moving her toes and ankle bilaterally. Hence, surgery was deferred and the patient was closely monitored for an evidence of deterioration. Epidural catheter was removed as the last dose of LMWH was given more than 11 h earlier. Next morning she had grade 2 power in hip and bilateral knee and in right ankle but was unable to move left ankle and foot. As the patient was considered a poor candidate for decompression due to general condition and GI bleeding it was decided to continue observation despite loss of recovery in left ankle and foot. There was no further deterioration and the patient's neurological status gradually improved. At the end of 2 months, the patient had grade 4 power in hip, knee and ankles and grade 2–3 power in the toes, persistent perianal hyposthesia, and was unable to pass urine normally and had walk to with support. Repeat MRI was done 2 months after the surgery showed a complete resolution of the hematoma (Figure 2). There was no evidence of myelopathy or arachnoiditis. At the end of 3 months, the patient had recovered full motor power and had regained bladder control.

Figure 1 (a) T1 scan revealing Isointense linear biconvex mass compressing on the lower thoracic spinal cord and cauda equina (arrow heads). (b) Same lesion showing heterogenous signal of hyperintensity (arrow heads) and hypointensity (arrow) on T2 scan

Discussion

Spinal hematoma, defined as symptomatic intraspinal bleeding,⁷ can occur spontaneously, following trauma or as a rare complication of intradural and epidural anesthesia. Spontaneous spinal hematoma is seen in association with anticoagulant treatment, disorders of coagulation, vascular malformations in the spinal canal and intraspinal tumors. In a significant number of patients with spontaneous hematoma, the exact cause is not known.⁸

Spinal epidural hematoma is a rare complication of epidural anesthesia.^{1–3} Moen *et al*³ found statistically significant differences in the incidence of epidural bleed when epidural injection was given for obstetric procedures (one in 200 000) and for knee replacements (one in 3600). Apparent risk factors for developing spinal hematoma following neuraxial anesthesia are female gender, old age, traumatic procedure, history of gastrointestinal bleeding, patients receiving anticoagulation and commencement of anticoagulation shortly after the spinal injection.^{7,9}

The risk of bleeding following epidural injection in persons receiving anticoagulation has been an issue of considerable debate. In a review of the literature, Vandermeulen *et al*¹⁰ found 68% of all spinal hematoma following neuraxial anesthesia to be associated with hemostatic abnormality. The incidence of hematoma formation increases with increasing dose of anticoagulation. Horlocker *et al*⁷ have outlined guidelines for

Figure 2 (a, b) Follow-up MRI 2 months later showing complete resolution of hematoma in T1 and T2 images

postoperative thromboprophylaxis following epidural anesthesia. They have recommended a single daily dose of low molecular weight heparin starting 6–8 h after the procedure with second dose given not less than 24 h after the procedure. If twice daily dosage is considered necessary, the first dose should be given 24 h post-operatively and that too after removal of all indwelling catheters including epidural catheter. In our case, although single daily dose was planned, the patient received two doses of anticoagulation within 24 h after the procedure which may have contributed to the precipitation of bleeding. This emphasizes the necessity to ensure the exact timing of anticoagulation.

The clinical features of spinal hematoma can vary. Some patients have severe local pain in the back as the first symptom, but occasionally the bleeding can be completely painless.¹¹ Local back pain has been attributed to the stretching of the dura by collected blood. Our patient had severe back pain 2 h before the onset of the weakness. Onset of weakness is generally preceded by parasthesia in the limbs, and usually progresses over the next few hours and may evolve into complete paraplegia. Occasionally, neurological involvement may be restricted to the loss of sensation or bladder involvement.

The clinical presentation of our patient emphasizes that any patient complaining of excessive back pain or continuing parasthesia following epidural injection needs to have a detailed neurological examination to detect early evidence of neurological deficit. The source of bleeding is difficult to pinpoint although most likely the source is from the epidural venous plexus. Mechanical damage caused by the presence of epidural catheter could have initiated the bleeding and LMWH therapy may have aided in the progression of bleeding. The delay in the onset of symptoms following the procedure supports the hypothesis that anticoagulation played an important role in the epidural bleed. The risk of spontaneous bleeding increases with increasing anticoagulation therapy, and regular INR monitoring is advised to monitor the coagulation status when using heparin and warfarin. However, INR and aPTT are not sensitive for monitoring coagulation status when using LMWH.¹² Anti-Xa factor assay has been recommended to monitor the activity of coagulation status following LMWH administration.^{13,14} Spontaneous bleeding tendency is correlated well with the presence of occult gastrointestinal bleed. A similar picture was seen in our patient with occult GI bleeding in the presence of normal INR.

Clinical diagnosis is usually straightforward but exact pathology can be determined only with MRI. MRI features of epidural hematoma have been well described.^{4,15} The hematoma is dorsally located and will span many spinal segments. In the sagittal section, the mass is biconvex shaped with tapering superior and inferior ends with well-defined margins. Within 24 h of the bleeding the mass is isointense with the spinal cord on T1 images and heterogeneous on T2 images. After 24 h, the mass becomes hyperintense on

both sequences due to breakdown of hemoglobin to methaemoglobin.

The prognosis following epidural hematoma is related to the duration of symptoms and neurological status before intervention. Lawton *et al*⁶ have reported on the outcome in 30 patients with epidural hematoma, which included 13 cases caused by epidural injection. Surgical decompression was carried out in all the patients with an average interval of 23 h between onset of deficit and surgery. Neurological improvement was seen in 26 patients and no worsening was seen. They found that outcome was good if decompression was carried out within 12 h of onset of symptoms. The outcome also correlated well with the preoperative neurological status with 83% of Frankel grade D recovering completely compared to 25% complete recovery in patients with Frankel grade A. Hence, the authors recommended emergency decompression of the cord for the best neurological outcome but suggested that substantial recovery can be expected even after delayed decompression.

In contrast to the general recommendation for early decompression, spontaneous recovery has been reported following spontaneous epidural hematoma. Stephen *et al*¹⁶ reported two patients who spontaneously developed a rapid onset of neurological deficits and an equally rapid resolution of symptoms. Duffill *et al*¹⁷ reported four patients with a rapid onset and early recovery of deficits caused by spontaneous epidural hematoma. Few cases of spontaneous recovery have been reported following post epidural hematoma. Schwarz *et al*¹¹ reported a 90-year-old patient who developed paraplegia following epidural injection but made complete recovery without decompression. Bogher and Ramage¹⁸ reported a case of epidural hematoma following combined spinal epidural anesthesia. The patient was observed despite worsening neurological deficits due to poor general condition, but went on to make near complete recovery in next 8 days.

In our patient, very early neurological recovery combined with the poor general condition of the patient for spinal decompression and onset of GI bleeding prompted us to have a conservative approach despite some loss of recovery. As the patient continued to improve neurologically, the need for surgery was obviated. By the end of 2 months, the patient had improved significantly to allow ambulation with minimal support. The recovery correlated well with the repeat MRI, which showed complete resolution of the hematoma. The repeat MRI showed a normal cord suggesting that there was no ischemic or drug-toxicity-related damage to the cord. So it can be safely presumed that the neurological deficits were solely caused by the extradural compression caused by the hematoma.

The cause for neurological deficits and why some of these patients recover spontaneously while others do not despite surgical decompression is not clear. Otsu and Merrill¹⁹ reported a case where epidural hematoma was identified on MRI despite absent neurological deficits. MRI in this case was done to evaluate persistent severe

back pain after epidural anesthesia. So it is likely that minor degrees of hematoma remain asymptomatic and go unrecognized. The neurological deficit could be caused by direct compression of the neural elements or due to ischemia caused by the pressure exerted by the hematoma on the blood vessels. Early resolution of symptoms has been attributed spontaneous decompression¹⁶ of the hematoma in the epidural space, and patients who do not respond to decompression probably have suffered permanent vascular injury or permanent compressive myelopathy of the cord.

It is interesting to note that a case of spontaneous hematoma has been reported where, after initial recovery, the patient deteriorated neurologically.²⁰ Chen *et al*²¹ reported a case where the patient had two episodes of spontaneous epidural hematoma treated conservatively. Unfortunately after the third episode the patient did not recover even after surgical decompression. Hence, when these patients are decided to be treated nonoperatively, they should be under the supervision of surgical team and decompression should be carried out on the earliest evidence of deterioration.

Conclusion

Spinal epidural anesthesia may be complicated by epidural hematoma in patients with predisposing factors. Clinical suspicion should be confirmed with MRI scan as early as possible. Early surgical decompression is necessary for best outcome. However, presence of early recovery within few hours appears to be a good prognostic indicator. In the presence of early recovery and continuing recovery, surgery can be avoided with patient under close observation for possible deterioration. This approach, we believe, will help in avoiding a major surgical procedure in high-risk patients.

References

- 1 Auroy Y, Narchi P, Messiah A, Litt L, Rouvier B, Samii K. Serious complications related to regional anesthesia: results of a prospective survey in France. *Anesthesiology* 1997; **87**: 479–486.
- 2 Aromaa U, Lahdensuu M, Cozanitis DA. Severe complications associated with epidural and spinal anaesthetics in Finland 1987–1993. A study based on patient insurance claims. *Acta Anaesthesiol Scand* 1997; **41**: 445–452.
- 3 Moen V, Dahlgren N, Irestedt L. Severe neurological complications after central neuraxial blockades in Sweden 1990–1999. *Anesthesiology* 2004; **101**: 950–959.
- 4 Chiapparini L, Sghirlanzoni A, Pareyson D, Savoardo M. Imaging and outcome in severe complications of lumbar epidural anaesthesia: report of 16 cases. *Neuroradiology* 2000; **42**: 564–571.
- 5 Wilkinson PA, Valentine A, Gibbs JM. Intrinsic spinal cord lesions complicating epidural anaesthesia and analgesia: report of three cases. *J Neurol Neurosurg Psychiatry* 2002; **72**: 537–539.
- 6 Lawton MT *et al*. Surgical management of spinal epidural haematoma: relationship between surgical timing and neurological outcome. *J Neurosurg* 1995; **83**: 1–7.
- 7 Horlocker TT *et al*. Regional anesthesia in the anticoagulated patient: defining the risks (The Second ASRA Consensus Conference on Neuraxial Anesthesia and Anticoagulation). *Reg Anesth Pain Med* 2003; **28**: 172–197.
- 8 Foo D, Rossier AB. Preoperative neurological status in predicting surgical outcome of spinal epidural haematomas. *Surg Neurol* 1988; **15**: 389–401.
- 9 Levine MN, Raskob G, Landefeld S, Kearon C. Hemorrhagic complications of anticoagulant treatment [Review]. *Chest* 2001; **119**: 108S–121S.
- 10 Vandermeulen EP, Van Aken H, Vermeylen J. Anticoagulants and spinal-epidural anesthesia. *Anesth Analg* 1994; **79**: 1165–1177.
- 11 Schwarz SK, Wong CL, McDonald WN. Spontaneous recovery from a spinal epidural hematoma with atypical presentation in a nonagenarian. *Can J Anaesth* 2004; **51**: 557–561.
- 12 Linkins LA, Julian JA, Rischke J, Hirsh J, Weitz JI. *In vitro* comparison of the effect of heparin, enoxaparin and fondaparinux on tests of coagulation. *Thromb Res* 2002; **107**: 241–244.
- 13 Hirsh J *et al*. Heparin and low-molecular-weight heparin mechanisms of action, pharmacokinetics, dosing, monitoring, efficacy, and safety. *Chest* 2001; **119**: 64–94.
- 14 Hirsh J, Raschke R. Heparin and low-molecular-weight heparin: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 2004; **126**: 188–203.
- 15 Boukobza M *et al*. Spinal epidural haematoma: report of 11 cases and review of the literature. *Neuroradiology* 1994; **36**: 456–459.
- 16 Hentschel SJ, Woolfenden AR, Fairholm DJ. Resolution of spontaneous spinal epidural hematoma without surgery: report of two cases. *Spine* 2001; **26**: E525–E527.
- 17 Duffill J, Sparrow OC, Millar J, Barker CS. Can spontaneous spinal epidural haematoma be managed safely without operation? A report of four cases. *J Neurol Neurosurg Psychiatry* 2000; **69**: 816–819.
- 18 Bougher RJ, Ramage D. Spinal epidural hematoma following combined spinal-epidural anesthesia. *Anaesth Intens Care* 1995; **23**: 111–113.
- 19 Otsu I, Merrill D. Non-surgical treatment of epidural hematoma: a case report of non operative management. *Acute pain* 2003; **4**: 117–120.
- 20 Davies DG, Weeks RD. Acute spontaneous spinal epidural haematoma with temporary resolution. *Br J Neurosurg* 1992; **6**: 63–66.
- 21 Chen CJ *et al*. Spontaneous spinal epidural haematoma with repeated remission and relapse. *Neuroradiology* 1997; **39**: 737–740.