**Case Report**

**Rivaroxaban-induced acute cervical spine epidural hematoma: Report of a case and review**

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**ABSTRACT**

**Background:** Spontaneous spinal epidural hematomas (SEHs) due to the utilization of factor Xa inhibitors are rare.

**Case Description:** A 66-year-old female presented with a Brown-Sequard syndrome attributed to a cervical epidural hematoma secondary to the utilization of rivaroxaban, one of the factor Xa inhibitors. Following a cervical laminectomy for the evacuation of the hematoma, the patient completely recovered.

**Conclusion:** A spinal hemorrhagic event should be suspected in patients receiving factor Xa inhibitor drugs. Here, we had an elderly female on rivaroxaban experienced the acute onset of neck/back pain associated with a Brown-Sequard syndrome. A literature review showed that this is the seventh example of SEH occurring as a result of the use of anticoagulation drugs (OACDs; e.g., including Xa inhibitors).

**Keywords:** Anticoagulant, Factor Xa inhibitors, Rivaroxaban, Spinal epidural hematoma

**INTRODUCTION**

Factor Xa inhibitor drugs, the newer oral anticoagulants, are increasingly utilized for the prevention of stroke in nonvalvular atrial fibrillation and the prevention/treatment of DVT and pulmonary emboli. The first example of a spinal epidural hematoma (SEH) due to these types of oral anticoagulants was reported by Jager et al., in 2012.

Since then, only five additional cases have been published. Here, we present the seventh example of a cervical SEH that required emergent evacuation.

**CASE REPORT**

A 66-year-old female presented acutely with neck pain/back pain and a classic Brown-Sequard syndrome of 1 day's duration. The patient was taking rivaroxaban (15 mg, daily) and low-dose aspirin for atrial fibrillation. An emergent cervical MRI disclosed a dorsal-lateral C3-C6 cervical epidural mass. It was isointense on T1 weighted and hyperintense on T2-weighted MRIs; these findings were compatible with an acute cervical/SHE [Figure 1]. Rivaroxaban was discontinued.
immediately, and she was given three units of fresh frozen plasma (FFP). She underwent a C3 to C5 laminectomy for the evacuation of a large right posterolateral epidural clot 36 h later [Figure 2]. Postoperatively, the patient made a dramatic recovery and was discharged on the 5th hospital day. The MRI performed on the 12th postoperative day showed resolution of the hematoma [Figure 3]. Two weeks later, rivaroxaban (10 mg daily) was restarted by her cardiologist; at the 6-month follow-up visit, she remained asymptomatic.

DISCUSSION

Etiology of SEH with Xa inhibitors

Factor Xa inhibitors are newer oral anticoagulant drugs which block thrombin formation, prevent conversion of fibrinogen to fibrin, and, hence, inhibit thrombus formation. These drugs include rivaroxaban, dabigatran, and edoxaban, along with several others; rivaroxaban is the most extensively prescribed. However, similar to other anticoagulants, they may cause bleeding, including SEH. The dose of rivaroxaban in which SEH may occur varies from 10 to 20 mg. Further, the risk of SEH is increased with the simultaneous use of aspirin as in this case. In addition, some think that lower doses of rivaroxaban should be utilized in elderly patients and/or in those receiving amiodarone.

Literature review of SEH occurring with factor Xa

A review of literature revealed that factor Xa inhibitor-induced SEH is mostly seen in the elderly and more so in females rather than males [Table 1]. The majority of SEH occurred in the cervical or cervicothoracic regions; purely, thoracic and lumbar SEH were each found in one patient. Clinically, patients present with neurological deficits correlating with the hematoma location. SEH is best diagnosed with MR that typically shows a long biconvex epidural mass with spinal cord compromise; hematomas appear isointense or hypointense on T1 and hyperintense on T2-weighted MRI images.

Treatment of SEH due to factor Xa

The management of SEH depends on the volume of the hematoma and the rapidity/severity of the neurological symptoms/signs. In patients with local pain but minimal clinical symptoms, conservative treatment may suffice. For those significant neurological deficits, emergent decompressive laminectomy for clot evacuation may be warranted.

Optimal surgical timing

Early recognition and surgical intervention for SEHs with neurologic compromise remain key to achieving a favorable outcome. The anticoagulation effect of rivaroxaban is expected to resolve fully within three to four half-lives. In young/middle-aged persons, rivaroxaban half-life is 8 h, while in the elderly, its half-life increases to approximately 12 h; therefore, the safe interval for surgery in the younger group will be 24–32 h after cessation of medication, but in...
the elder patients, it will be 36–48 h later.[10] Nevertheless, those patients experiencing rapid neurological deterioration often warrant urgent/emergent surgery. Here, rather than reversing the Xa effect with the transfusion of FFP and prothrombin complex concentrate, the Xa inhibitor antidote (Adnexa) may be emergently administered to avoid delaying surgery.

**Optimal time for restarting anticoagulant**

In one study, the optimal timing for readministration of Xa anticoagulants was 2–3 weeks postoperatively.[10]

**CONCLUSION**

For patients receiving factor Xa inhibitors, SEH should be included in the differential diagnosis where patients develop acute spinal/back pain and the onset of a significant neurological deficit. Performing immediate MR scans to document the location and severity of the SEH are critical. While those with lesser symptoms/signs may be managed conservatively, patients with significant neurological deficits may warrant urgent/emergent clot removal.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms.

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. *Bamps S, Decramer T, Vandenbussche N, Verhamme P, Thijs V, Van Loon J, et al.* Dabigatran-associated spontaneous acute cervical epidural hematoma. World Neurosurg 2015;83:257–8.

2. *Goldfine C, Glazer C, Ratzan RM.* Spontaneous spinal epidural hematoma from rivaroxaban. Clin Pract Cases Emerg Med 2018;2:151–4.

3. *Goyal G, Singh R, Raj KJ* Anticoagulant induced spontaneous spinal epidural hematoma, conservative management or surgical intervention a dilemma? J Optoelectron Adva Mater 2016;6:38–42.

4. *Groen RJ, van Alphen HA.* Operative treatment of spontaneous spinal epidural hematomas: A study of the factors determining postoperative outcome. Neurosurgery 1996;39:494–508.

5. *Ismail R, Zaghrini E, Hitti E.* Spontaneous spinal epidural hematoma in a patient on rivaroxaban: Case report and literature review. J Emerg Med 2017;53:536–9.

6. *Jaeger M, Jeanneret B, Schaeren S.* Spontaneous spinal epidural haematoma during factor xa inhibitor treatment (Rivaroxaban). Eur Spine J 2012;21 Suppl 4:S433–5.

7. *Kirazli Y, Akkoc Y, Kanyilmaz S.* Spinal epidural hematoma associated with oral anticoagulation therapy. Am J Phys Med Rehabil 2004;83:220–3.

8. *Ozel O, Demircay E, Kircelli A, Cansever T.* Atypical presentation of an epidural hematoma in a patient receiving rivaroxaban after total hip arthroplasty. Orthopedics 2016;39:e558–60.

9. *Radcliff KE, Ong A, Parvizi J, Post Z, Orozco F.* Rivaroxaban-induced epidural hematoma and cauda equina syndrome after total knee arthroplasty: A case report. Orthop Surg 2014;6:69–71.

10. *Trujillo T, Dobesh PP.* Clinical use of rivaroxaban: Pharmacokinetic and pharmacodynamic rationale for dosing regimen in different indications. Drugs 2014;74:1587–603.

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**Table 1: Thorough information about seven cases with spinal epidural hematoma due to factor Xa inhibitors.**

| Case | Author               | Year | Sex  | Age | Location       | Clinical picture | Management       | Outcome |
|------|----------------------|------|------|-----|----------------|------------------|------------------|---------|
| 1    | Jaeger et al.[6]     | 2012 | Female | 61  | Cervicothoracic | Paraparesis      | Conservative     | Good    |
| 2    | Radcliff et al.[9]   | 2014 | Female | 53  | Lumbar         | Cauda Equina     | Laminctomy       | Good    |
| 3    | Bamps et al.[1]      | 2015 | Male  | 70  | Cervical       | Quadriplegia     | Laminctomy       | Good    |
| 4    | Ozel et al.[8]       | 2016 | Female | 69  | Cervical       | Quadriplegia     | Conservative     | Good    |
| 5    | Ismael et al.[5]     | 2017 | Male  | 72  | Thoracic       | Paraparesis      | Laminctomy       | Good    |
| 6    | Goldfine et al.[2]   | 2018 | Male  | 74  | Cervical       | Quadriplegia     | Laminctomy       | Good    |
| 7    | Current case         | 2019 | Female | 66  | Cervical       | Brown-Sequard    | Laminctomy       | Good    |

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