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Management of Ruptured Intracranial Aneurysm with DVT: Case Report and Brief Review of Literature

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Abstract

Deep vein thrombosis (DVT) is a known complication of aneurysmal subarachnoid hemorrhage (aSAH), and anticoagulant therapy is crucial for its management. However, in case of a ruptured intracranial aneurysm in a patient of DVT, anticoagulant administration may lead to rebleeding. Anticoagulants are also associated with a risk of hematoma expansion. A systematic approach is required to weigh the risk and benefit ratio while managing such cases. We report the successful management of a 61-year-old female presenting with aSAH and associated DVT who had an intracranial vessel injury during intraoperative clipping of an aneurysm.

Keywords

- anticoagulation
- subarachnoid hemorrhage
- deep vein thrombosis

Introduction

Deep vein thrombosis (DVT) is a known complication of aneurysmal subarachnoid hemorrhage (aSAH). Anticoagulation therapy is vital for DVT management. Elevated D-dimer, motor deficit, presence of an intraparenchymal hemorrhage, and poor-grade aSAH are all independent risk factors for DVT in patients with aSAH. DVT can end up in complications like pulmonary embolism (PE) and postthrombotic syndrome which can be fatal and can affect the recovery of the patient, hence early and appropriate treatment is crucial. However, the administration of anticoagulants for DVT in the case of a ruptured intracranial aneurysm is problematic due to the high probability of rebleed. We discuss a case of aSAH with DVT who underwent clipping of aneurysm.

Case Report

A 61-year-old female with no known comorbidities, presented to the emergency department with sudden-onset severe headache and loss of consciousness for 1 day and a decline in cognitive function for 2 months. Her Glasgow Coma Scale (GCS) was E3V5M6 (drowsy), right pupil was dilated and nonreactive to light, and her left was mid-dilated and sluggishly reactive to light. Further investigations revealed aSAH secondary to a wide-neck anterior communicating artery ($4 \times 4 \times 4$ mm size) aneurysm and her modified Fischer grade was 3. She was planned for emergency craniotomy and clipping of an aneurysm. During the preoperative evaluation, her baseline vitals and investigations were normal and there was left-side motor deficit. Her left lower limb was swollen with no obvious tenderness. No further details of the left lower limb swelling could be elicited from the patient relatives. We did a lower limb ultrasound DVT screening which was inconclusive and there were no other clinical signs of PE. Due to urgency, the decision was taken to go ahead with the surgery. Intraoperatively, any intervention to the left lower limb was avoided. However, during surgery, left-sided anterior cerebral artery was injured which was repaired and the aneurysm was secured. The rest of the intraoperative course was uneventful.

Postoperatively, she was shifted to the intensive care unit (ICU), her postoperative routine labs were normal, and was extubated on the next day. On further evaluation of the leg swelling by the surgical team and the radiologist, left lower limb DVT was diagnosed with the help of ultrasonography

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(USG). As there were no other signs and symptoms related to PE, no further investigation was done. Since there was a high chance of bleeding from the injured intracranial vessel, anticoagulation could not be started and she underwent inferior vena cava (IVC) filter placement on the 2nd postoperative day. On the 5th postoperative day, low molecular weight heparin (LMWH) enoxaparin 60 mg twice daily was started and the IVC filter was removed on the 9th day. After the insertion of IVC and anticoagulation, daily GCS and neurological assessment and clinical signs of resolution of DVT was done in the ICU. Brain computed tomography scan and lower limb DVT scan were done once before discharging the patient. The patient was discharged with stable neurological status (GCS of E4V5M6) and clinically resolved DVT on the 15th day of surgery.

Discussion

aSAH accounts for nearly 10% of all strokes.[1] DVT is a known complication of SAH with incidence ranging from 9.7 to 24%.[2] The pathogenesis of DVT in aSAH is not entirely understood, but hemostasis and fibrinolytic activation, along with elevation of platelet-activating factor, and inflammatory cytokines which induce prothrombotic state and immobility may be accountable to its formation.[3,4] In aSAH, a study done by Geraldini et al recommends elevated D-dimer, motor deficit, and the presence of an intraparenchymal hemorrhage as independent risk factors for DVT.[5] In our case, the patient presented with left-sided motor deficit and intracranial bleed which makes the patient vulnerable to DVT. Timing of DVT formation in relation with aneurysm is still controversial, but DVT occurs most commonly in the first 2 weeks with peak occurrence between days 5 and 9.[6] Doppler USG is a commonly used technique for diagnosis of DVT. The National Institute for Health and Care Excellence suggests USG as the first screening investigation to rule out DVT in case of moderate to high cases.[7] However, the diagnosis of DVT on USG needs expertise. A meta-analysis by Goodacre et al suggested that the sensitivity of USG for the detection of proximal and distal DVT be 94.2 and 63.5%, respectively.[8] This probably explains why we could not diagnose DVT initially in the operating room and due to the high probability of rebleed of the aneurysm patient was taken up for surgery.

In our case, two questions need to be addressed. First, should neurosurgery proceed in suspected cases of DVT? Second, what is the ideal timing for initiating anticoagulation after neurosurgery in confirmed cases of DVT? The American Stroke Association (ASA)/American Heart Association (AHA) guidelines suggest surgical clipping should be performed as early as feasible in cases of aSAH to reduce the rate of rebleeding.[9] In our case, weighing the risk-benefit ratio we decided to go ahead with the surgery. Anticoagulation therapy is the cornerstone of DVT management and its use for the management of DVT after ischemic stroke is well established. However, its use in patients with DVT in the presence of aSAH is a matter of concern. Anticoagulants are associated with a risk of hematoma expansion and intracranial bleeding in aSAH patients. Anticoagulation increases the risk of intracranial hemorrhage 7- to 10-fold, to an absolute rate of nearly 1% per year.[10] Age $>$ 65 years, history of stroke, and recent surgery all are risk factors for bleeding following anticoagulation for DVT.[11] Our patient had a history of recent surgery and SAH (a type of hemorrhagic stroke). Along with this, an injured major intracranial blood vessel precluded initiation of anticoagulants in our case.

The issue of starting anticoagulants in cases of aSAH is controversial and there is a clear lack of consensus. In view of high chances of rebleeding, it is challenging to commence therapeutic anticoagulation therapy for DVT in aSAH patients as compared to other neurosurgical patients. The AHA/ASA guidelines suggest a lack of sufficient evidence for heparin use in aSAH patients.[9] The European Stroke Organization recommends LMWH should be used no earlier than 12 hours after surgical occlusion of the aneurysm.[12] The Korean Neurosurgical Society recommends only mechanical prophylaxis against DVT and PE.[13] IVC filters have been established as a substitute therapeutic option to anticoagulation in selected patients of DVT. It can be particularly useful in postsurgical patients where there is a risk of anticoagulant-related hemorrhage endangering neurological function. It perhaps reduces the immediate risk of an incident of PE and overcomes the undefined risk of intracranial bleeding with anticoagulation in cases like aSAH. However, there are very few studies addressing the issue of the safety and efficacy of IVC filters in aSAH patients. Case series by Wong et al and Streiff suggested the IVC filter as a feasible treatment option for the prevention of PE in selected patients with ruptured intracranial aneurysms.[14,15] In our case, LMWH was started on the 5th postoperative day and the IVC filter was subsequently removed.

Conclusion

Early detection of DVT following aSAH is imperative since it is a common but serious complication. Pharmacotherapy has not been demonstrated to be superior but due to the limited evidence, its practical use is limited in aSAH. Decisions regarding anticoagulation are usually made on a case-to-case individual basis. IVC filters are a suitable alternative in the management of DVT in aSAH patients.

Conflict of Interest
None declared.

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