

Protection from thromboembolism during general anaesthesia in a patient with Protein S deficiency

Sir,

Protein S is a vitamin K-dependent plasma glycoprotein synthesised in the liver.^[1] It functions as a cofactor to protein C in the inactivation of Factors Va and VIIIa in the anticoagulation pathway. Protein S deficiency predisposes individuals to deep vein thrombosis which may lead to pulmonary embolism. In humans, protein S is encoded by the *PROS1* gene and mutations in this gene lead to Protein S deficiency. Protein S deficiency may be acquired as a result of nephrotic syndrome, liver disease, pregnancy, oral contraceptive use and chemotherapy.

A 29 year old man was listed for right tympano-mastoidectomy. At the age of 23 years, he developed parietal haematoma and convulsions. He was managed conservatively and started on levetiracetam 500 mg. The following year he had superior mesenteric vein thrombosis. He was found to be Protein S deficient. Protein S activity was 68% with biological reference interval 77-143%. Protein C

activity was 93% (70-130%). Anti-thrombin III activity was 96% (80-120%). Phospholipid antibody was negative. Lupus anticoagulant was absent. He was started on rivaroxaban 15 mg. At the age of 26 years, the patient had deep vein thrombosis and pulmonary embolism. Catheter-directed thrombolysis was done and inferior vena cava (IVC) filter was placed which was removed after 2 years.

Presently, his haemoglobin was 17.6, haematocrit 50.4, platelet count 172,000 and serum creatinine was 0.80. Chest X-ray and 2D echo were normal. Rivaroxaban was stopped 48 hours preoperatively. Prothrombin time-international normalised ratio (INR) was 1.26 and activated partial thromboplastin time (APTT) was 32.9. He was not started on any form of heparin. In view of raised haemoglobin and haematocrit, the patient was started on intravenous fluids on admission. In the operation theatre, intermittent pneumatic compression of calves (Arjohuntleigh® flowtron excel DVT pump) was attached for thromboembolism prophylaxis. Standard monitors including non-invasive blood pressure, oxygen saturation and five lead electrocardiograms were attached. Anaesthetic medications included midazolam, fentanyl, propofol, atracurium and sevoflurane in air/oxygen mixture. Induction was done with graded aliquots of anaesthetic agents to prevent fall in blood pressure. Reduced cardiac output

and hypovolemia secondary to vasodilatation can lead to thrombosis in these patients. Vital signs on induction included a blood pressure of 130/70 mm Hg and a heart rate of 84 beats per minute. The vital parameters were stable throughout the surgery. Fresh frozen plasma was reserved but was not transfused as there was no excessive bleeding. After reversal of anaesthesia, the patient was assessed clinically for any thromboembolic event. The postoperative period was uneventful.

Three types of protein S deficiency have been described based on the levels of total protein S antigen, free protein S antigen and protein S activity in plasma.^[2] Protein S activity is low in all types. Free protein S antigen is low in Types I and III. Total protein S antigen is low in type I. Our patient was Type II as his protein S was normal (104%) but protein S activity was low. Protein S deficiency patients can be treated with warfarin.^[3] It decreases protein S levels thus potentially inducing a hypercoagulable state. Skin necrosis has been reported in these patients, which reverses on stopping warfarin. INR was slightly raised in our patient after stopping rivaroxaban, hence, low molecular weight heparin was not used as replacement therapy. In view of the nature of surgery, early mobilisation and restarting of rivaroxaban 24 hours after surgery was planned. Protein S is not available in a purified form for clinical use. FFP contains protein S and is known to increase its level.^[3] Thromboprophylaxis should be planned according to the nature of the surgery and the risk of thromboembolism.^[4] In surgeries where regional anaesthesia can be used, timings of heparin injection are important.^[5] FFP has been used in such patients undergoing coronary artery bypass grafting (CABG) where it has helped in preventing graft necrosis.^[3] Intraoperative hypothermia and hypovolaemia are avoided as they are associated with increased incidence of thrombosis. Postoperatively, early ambulation and adequate hydration is important.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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REFERENCES

1. Palta S, Saroha R, Palta A. Overview of the coagulation system. *Indian J Anaesth* 2014;58:515-23.
2. Huang X, Xu F, Assa CR, Shen L, Chen B, Liu Z. Recurrent pulmonary embolism associated with deep vein thrombosis diagnosed as protein s deficiency owing to novel mutation in PROS1. A case report. *Medicine (Baltimore)* 2018;97:e0714.
3. Sugimoto K, Kadosaki M, Egawa A, Tokitou R, Urayama M, Takeuchi M. Preventive management against thromboembolism using fresh frozen plasma in coronary artery bypass graft patient with protein S deficiency: A case report. *JA Clin Rep* 2018;4:17.
4. Nagre AS. Perioperative stroke- prediction, protection and prevention. *Indian J Anaesth* 2018;62:738-42.
5. Bande B, Bande S, Mohite S. The hypercoagulable states in anaesthesia and critical care. *Indian J Anaesth* 2014;58:665-71.

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