Postoperative dural sinus thrombosis in a patient in a hypercoagulable state

Case report

BRADLEY C. LEGA, B.A., AND DANIEL YOSHOR, M.D.

Department of Neurosurgery, Baylor College of Medicine, Houston, Texas

Spontaneous cerebral venous sinus thrombosis is a rare problem that may be encountered in patients with underlying thrombophilic disorders. It has also been reported as a postoperative complication following suboccipital, transpetrosal, and transcallosal approaches. The authors report on a 67-year-old man with two prior episodes of lower-extremity deep venous thrombosis who underwent transcallosal resection of a colloid cyst and in whom sagittal sinus thrombosis developed 2 weeks thereafter. Results of a subsequent hematological workup revealed both a factor V Leiden mutation and the presence of antiphospholipid antibodies, two thrombophilic risk factors that likely contributed to the development of delayed postoperative sinus thrombosis. Although the safety of low-molecular-weight heparin (LMWH) after craniotomy has not been established in a randomized, controlled study, there is sufficient evidence to justify its use for prophylactic anticoagulation therapy in patients at high risk for postoperative cerebral venous thrombosis. The authors propose using LMWH prophylaxis in patients with thrombophilic disorders who undergo neurosurgical procedures in proximity to dural sinuses in an effort to prevent catastrophic venous infarction.

KEY WORDS • sagittal sinus thrombosis • transcallosal approach • heparin • factor V Leiden mutation • lupus anticoagulant

Case Report

History and Examination. This 67-year-old right-handed man presented with a 2-year history of chronic headache, cognitive decline, ataxia, and incontinence. In the 2 months immediately before presentation, he suffered worsening headaches and dementia. A CT scan revealed a 3-cm third ventricular mass and chronic-appearing hydrocephalus (Fig. 1 left). His medical history was notable for two episodes of lower-extremity DVT and subsequent chronic anticoagulation therapy with warfarin. Lower-extremity venous Doppler ultrasonography scans were nondiagnostic. The Pulmonary Medicine Service of our institution was consulted preoperatively, and an IVCF was placed to prevent postoperative pulmonary embolism. The warfarin was then discontinued, and the patient was taken to the operating room for cyst removal once his coagulation parameters had normalized.

Operation. A parasagittal linear scalp incision was made just to the right of the midline, and a bone flap was elevated using the high-speed drill in a standard fashion. This bone flap extended 4 cm anterior and 2 cm posterior to the coronal suture and exposed the sagittal sinus without any damage to, or bleeding from, the sinus. The anatomy of the cortical venous drainage was favorable, and we were easily able toatraumatically dissect a corridor to the corpus callosum. Coagulation, stretching of the draining veins, or significant tension on the sagittal sinus did not occur during the procedure. An opening was made in the corpus callosum, and on entering the right lateral ventricle, a large yellow cystic mass was readily identified. The cyst wall and its firm, waxy contents were removed in piecemeal fashion while taking great care to avoid injury to the fornices. Microscissors were used to resect the entire cyst wall with the exception of a few small remnants that densely adhered to the fornices. The septum pellucidum was fenestrated, and a ventriculostomy catheter was left in the lateral ventricle for postoperative drainage. The estimated blood loss was 100 ml, and the operative time was less than 3 hours.

Postoperative Course. Initially, the patient had a smooth postoperative course with no evidence of a new neurological deficit. An early CT scan revealed changes without evidence of complications (Fig. 1 right). Despite multiple attempts, we were unable to wean the patient from external ventricular drainage. On postoperative Day 10 we inserted a ventriculoperitoneal shunt. A head CT was obtained on postoperative Day 12 to verify accurate placement of the shunt, and this scan also showed no evidence of complications. On postoperative Day 14 the patient experienced mild weakness in his distal left leg, and an urgent CT scan revealed a new small hypodensity in the right paracentral lobe. The following day his neurological condition worsened considerably. Both CT and MR images and an MR venogram (Fig. 2) now revealed a clear diagnosis of superior
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SST with extension into the transverse sinus. Interestingly, lower-extremity venous Doppler ultrasonography showed newly formed bilateral DVTs. Once the diagnosis of SST was made, aggressive anticoagulation therapy was undertaken with intravenous heparin. A hematological workup for underlying thrombophilic disorders showed the presence of both the factor V Leiden mutation and the lupus anticoagulant.

Discussion

Postoperative dural sinus thrombosis has been reported following several kinds of procedures performed in the vicinity of the sinuses. When it is described as a complication of transpetrosal or suboccipital approaches, the surgeons often blame laceration and excessive compression of the sinus for inducing thrombosis. The delayed postoperative development of arteriovenous fistulae, which can occur when sinus thrombosis stimulates the dilation of dural arteriovenous anastomoses, has also been attributed to intraoperative manipulation of the sinuses. In one reported case, however, the authors documented the delayed development of a postcraniotomy arteriovenous fistula and no compression, laceration, or other significant sinus injury. Instead, they found that the patient in their case, like ours, had an underlying hypercoagulable state, which was caused by a protein S deficiency in their case.

The transcallosal approach that was used in the present case involved a parasagittal craniotomy, and some authors warn that aggressive retraction, indiscriminate use of cautery near the sinus, or other technical indiscretions can lead to thrombosis. In a previously published case report, SST following the transcallosal resection of a colloid cyst was due to the sacrifice of a prominent parasagittal bridging vein. In our case, transcallosal surgery was performed without significant sinus retraction or injury. Although minor intraoperative manipulation of the sagittal sinus may have helped stimulate clot formation, we think it is likely that the patient’s hypercoagulable state played a prominent role.

The underlying hypercoagulability in the patient in the present case was related to the combined effects of a factor V Leiden mutation and the lupus anticoagulant. Evidence implicates both factors as risks for CVT, including SST. Factor V Leiden is a genetic mutation that alters the factor V protein, rendering it less susceptible to degradation by protein C. Patients with this mutation often suffer multiple episodes of DVT, but study data have also revealed the mutation in 10 to 40% of patients who suffer spontaneous CVT unrelated to neurosurgical procedures. Typically, patients with the factor V Leiden mutation must have a second thrombogenic risk factor before CVT develops, that is, a risk factor such as the currently described postoperative state or the lupus anticoagulant. The lupus anticoagulant is a type of aplAb. Although the exact mechanism by which aplAbs stimulate venous clotting is unknown, authors of several reports have linked them to CVT, and one group of researchers has identified them as the second most common CVT risk factor after the factor V Leiden mutation.

Given that he harbored the factor V Leiden mutation as well as aplAbs, our patient had a clear underlying hypercoagulable state. His history of two prior episodes of DVT and the risk for postoperative thrombosis were recognized preoperatively, and an IVCF was placed before surgery. The filter rather than the heparin prophylaxis was chosen because it avoided any potential hemorrhagic complications in the postoperative period. Although the IVCF was effective in preventing pulmonary embolism, only systemic pharmacological prophylaxis (with its associated risk of hemorrhage) could have helped avoid dural sinus thrombosis.

The results of one large randomized trial have demonstrated that pharmacological prophylaxis is effective in reducing the incidence of DVT after neurosurgical procedures, and data from several nonrandomized studies have suggested that it does not lead to higher rates of postoperative hemorrhage. Newer trials are ongoing; as yet, however, no randomized placebo-controlled trial data have proven the safety of heparin or LMWH prophylaxis in neurosurgical patients. Perhaps for this reason, many neurosurgeons are reluctant to use pharmacological prophylaxis after surgery, although its use has become routine at some centers. Data in the present case suggest that a particular subset of patients can especially benefit from LMWH. Specifically, if an intracranial procedure is planned in the vicinity of the dural sinuses in a patient with known thrombophilic risk factors, pharmacological anticoagulation has the...
additional benefit of preventing CVT as well as pulmonary embolus.

With these factors in mind, we have developed a set of recommendations to guide the postoperative use of LMWH for the prevention of postoperative CVT. The guidelines that follow were extrapolated from the literature about thromboembolic disease as well as the limited data about spontaneous CVT. If a neurosurgical procedure is planned in the vicinity of the dural sinuses in a patient who is actively receiving anticoagulation therapy, we now recommend LMWH perioperatively to prevent both DVT and CVT. This group includes patients receiving chronic anticoagulation agents for recurrent DVT as well as those in the midst of a standard 6-month course of anticoagulation treatment, and those who have experienced postoperative or spontaneous superficial thrombophlebitis for which they received no long-term therapy. If the planned procedure does not involve sinus manipulation, either pharmacological or mechanical (via an IVCF) prophylaxis would be appropriate. If a patient has a history of DVT but is not actively undergoing treatment, we recommend testing for the presence of thrombophilic risk factors, including the factor V Leiden mutation, lupus anticoagulant, and protein C or S deficiency. This group includes patients who have previously suffered postoperative DVTs but have finished a 6-month course of anticoagulation treatment, and those who have experienced postoperative or spontaneous superficial thrombophlebitis for which they received no long-term therapy. If the workup reveals the presence of an underlying thrombophilia, we believe the reported association between these risk factors and CVT warrants pharmacological prophylaxis when a procedure is planned near a dural sinus. Finally, we also recommend LMWH perioperatively in patients who have a history of spontaneous or idiopathic DVT (as opposed to postoperative or pregnancy-related DVT, for instance). The literature suggests that these patients have a higher risk of recurrent thrombotic events. Although testing for thrombophilic risk factors might be of interest, the thrombosis risk in these patients merits pharmacological prophylaxis regardless of the results of testing for thrombophilic risk factors. Once again, if the planned procedure will not occur near a dural sinus, vena cava interruption would be an acceptable alternative.

Conclusions

Cerebral venous thrombosis is a rare but potentially devastating event that can occur after intracranial surgery in the vicinity of a venous sinus. Patients with thrombophilic disorders have a heightened risk for CVT, and neurosurgeons should strongly consider pharmacological prophylaxis with LMWH when undertaking procedures near a cerebral venous sinus in such patients.

References


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