Sagittal Vein Thrombosis Caused by Central Vein Catheter

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Abstract- Cerebral venous thrombosis, including thrombosis of cerebral veins and major dural sinuses, is an uncommon disorder in the general population. However, it has a higher frequency among patients younger than 40 years of age, patients with thrombophilia, pregnant patients or those receiving hormonal contraceptive therapy or has foreign body such as catheter in their veins or arterial system. In this case report, we described clinical and radiological findings in a patient with protein C-S deficiency and malposition of central vein catheter.

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Keywords: Central vein catheter; Protein C-S deficiency; Sagittal vein thrombosis

Introduction

Central venous catheterization (CVC) via subclavian approach is a very common practice in cardiac surgery patients regarding its simplicity, for monitoring blood volume, cardiac status, and vasomotor tone, management of prolonged surgery and rapid compensation of blood loss that may occur during or after surgery. Langston (1) found that the most common malposition related to subclavian vein catheterization is entrance into the internal jugular vein. Malatisky *et al.,* (2) revealed that cannulation of subclavian vein by supraclavicular approach has the lowest risk and in Pikwer *et al.,* study (3) direct right subclavian vein cannulation was associated with the highest risk of malposition. Intraoperative positioning of central venous pressure (CVP) line can be confirmed by free aspiration, pressure waveform, and imaging.

The correct position is important and always be ensured to avoid severe complications of malposition such as, perforation, thrombosis. Here we report a patient with cerebral vein thrombosis and thrombophilia due to malposition of central venous catheter that was internally rotated inside the internal jugular vein to cerebral vein and caused neurologic complication.

Case Report

A 38-year-old, 80 kg male patient with past medical history of thrombophlebitis presented in cardiac surgery department with acute coronary syndrome, and was diagnosed to have left main coronary artery disease on angiocardiography. His routine investigations and vital parameters were found to be within normal limits. Neurological examination was also noted to be normal, and peripheral arterial pulses were palpable in all extremity areas. However, cervical murmur was not present in carotid auscultation.

There was no evidence suggestive of thrombus in the left ventricle, but a coronary arterial bypass grafting was indicated after the presentation of the coronary lesions. In the preoperative evaluation of the patient, there was no neurological pathology and routine laboratory findings were normal. After routine preoperative preparation, the patient was scheduled for CABG with general anesthesia, central venous catheterization, and arterial monitoring.

A subclavian vein central venous cannulation by infraclavicular route was planned as part of routine monitoring. A central venous catheter was inserted via right subclavian vein by Seldinger technique under aseptic precautions by the anesthesia registrar in the operating room with monitoring heart rate, SPO_2, and ECG. Passage of the catheter was smooth and unimpeded. There were a good CVP waveform and good backflow of blood on aspiration from all the three lumens. Anesthesia protocol was a combination, of fentanyl and pancuronium bromide supplemented with isoflurane, to permit early extubation. An arterial line,

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the standard off-pump coronary artery bypass grafting (OPCAB), was inserted through a sternotomy incision. Conduits for coronary artery bypass graft in (CABG), including left internal mammary artery and saphenous vein were harvested in the standard fashion. Deep pericardial traction sutures were placed to facilitate elevation of the apex of the heart and exposure of the lateral wall of the myocardium. The right pleural space was opened routinely to allow displacement of the heart to facilitate exposure of the circumflex artery. Revascularization of the left anterior descending artery with the left internal mammary was typically performed first, followed by revascularization of LCX and the right coronary artery distribution.

To provide good presentation of target arteries, especially the posterior and inferior wall, patient was placed in a right lateral decubitus Trendelenburg position. We used an optimal combination of pharmacological and mechanical methods to reduce the coronary artery movement. We used intravenous Esmolol to reduce heart rate. Stabilization of target arteries was accomplished with Octopus stabilizer (Medtronic, Ts 300).

Intravenous heparin (1 mg/kg) was given to maintain activated clotting time (ACT) between 200 and 300 seconds. The target coronary artery was occluded in proximal and distal sides to propose arteriotomy site by widely placing double-looped 5-0 Vilene sutures or bulldog. These sutures were snuggled, and arteriotomy was performed. We did not use any technique for preconditioning myocardium. Distal coronary anastomosis was performed using a running 7-0 monofilament Vilene or Prolene suture. Proximal anastomosis to the aorta was made on a punch aortotomy after applying a side clamp to the ascending aorta. Visualization of the anastomosis was enhanced with the use of humidified carbon dioxide blower. Before the application of octopus, amiodarone and esmolol were prescribed to patient and communication with the anesthesia team was maintained to monitor hemodynamic change and treat cardiac arrhythmias.

After distal anastomosis, proximal anastomoses were performed to ascending aorta with partially occluding clamp. After surgery, patient was admitted to the ICU. Serial electrocardiograms and measurement of serum creatinine phosphokinase and its MB fraction were performed to detect perioperative ischemia. The rest of the general anesthesia and surgeries were uneventful. CVP readings were taken 30 min apart and each time a good back flow was noted. As part of the routine protocol, a portable chest X-ray was performed before patient's extubation for detecting possible hemothorax or pneumothorax in the next morning. On reviewing the chest X-ray by the anesthesiologist, CVP catheter was found to be internally rotated inside the right proximal internal jugular vein to the cavernous sinus (Figure 1).

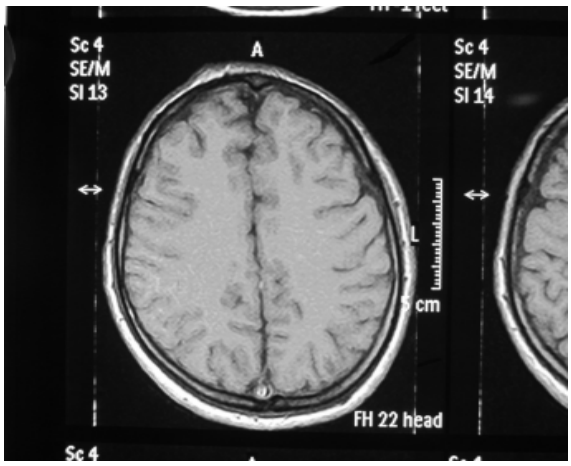

Figure 1. Thick downward arrow
Central venous catheter-directed into right internal jugular vein and cavernous sinus.

However blood could be aspirated from all the three lumen ports, central venous pressure was measured with a normal CVP waveform and IV fluids/drugs could be infused via the same catheter, we intended to pull out the line and re-route it to right atrium. Then, the left internal thoracic artery and right lower extremity great saphenous vein were harvested for grafts after sternotomy. Three reversed autogenous saphenous vein grafts were anastomosed to the right coronary artery, the second obtuse branches of the circumflex artery and to the diagonal artery distally which were followed by a left internal thoracic artery to the left anterior descending coronary anastomosis. The ascending aorta was non-thrombotic on intraoperative palpation and during proximal anastomosis of the saphenous vein graft and the proximal anastomosis was performed with a single application of a side-biting aortic clamp.

The operation was ended with sternal closure. In ICU, the patient had stable hemodynamic system without any hypotensive or tachycardia episodes and evaluation of his postoperative vital signs was normal in the intubation period. The patient's pupil examination revealed a normal shape and size. Bilaterally, the pupils were constrictive to light on both direct and consensual response. Although pupil examination was normal, he

did not have normal extremity movement and related awakening of the cerebral functions. However, there was spontaneous eye opening. The anti-edematous therapy (dexamethasone sodium 4 mg, qid) was started for the patient and cerebral pathology persisted to the fifth day of post operation. The patient's neurological status improved with medication gradually.

However, early extubation failed on the eighth postoperative day, but the patient was able to move his limbs, but he was drowsy. On the day 12 of the postoperative period, he opened his eyes and was able to obey commands; however, he was not able to move his left arm. The patient was extubated on 15th day of operation. History of thrombophlebitis, young age, rapid recovery of neurologic sign and symptom urged to reconsider an MRI venography and thrombophilia test for detection of pathology insult i.e. thrombosis of cerebral vein.

Complete blood count and blood biochemistry tests' were within normal limits, except for prolonged erythrocyte sedimentation rate and a reduced protein C and S level. The protein C level was 35% (normal: > 70) and protein S level was 55% (normal: 65%). Values of antithrombin III, lupus anticoagulant, and anticardiolipin antibodies, HLA-B5, HLA-B27, anti-nuclear antibody and rheumatoid factor were normal. Ophthalmological examination showed no significant finding. MRI venography in 18th day of hospital stay revealed thrombosis of cerebral vein with typical delta sign (Figure 2 and 3). Further course of the patient in the hospital was uneventful.

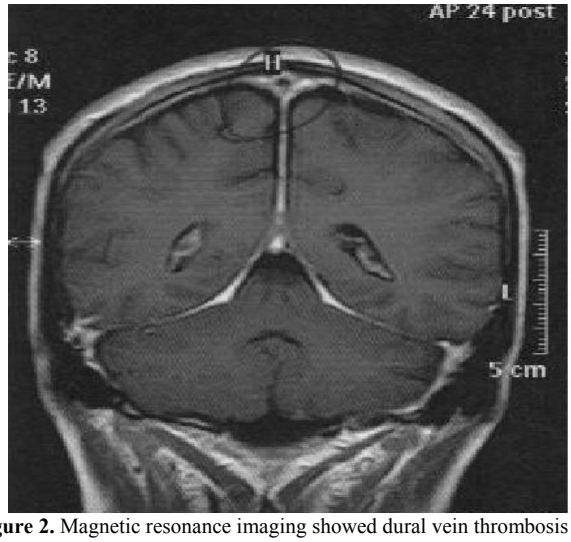

Figure 2. Magnetic resonance imaging showed dural vein thrombosis

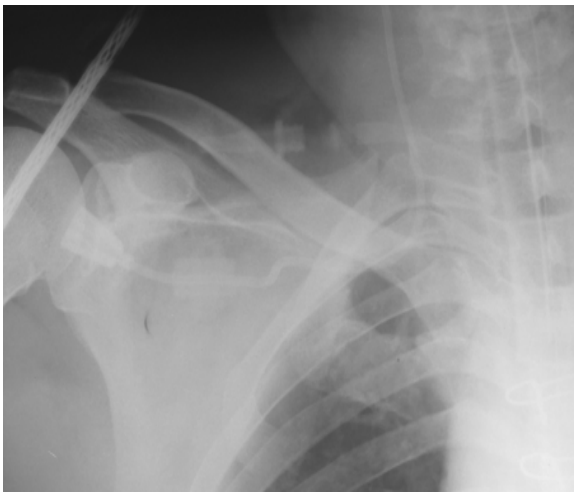

Figure 3. Chest X ray revealed position of central vein catheter in cerebral vein.

Discussion

Insertion of a central venous catheter (CVC) in a human was first reported by Werner Forssman, a surgical intern, who described canalizing his own right atrium via the cephalic vein in 1929. Sven-Ivar Seldinger subsequently introduced a technique that facilitates catheter placement into lumens and body cavities in 1953 (4). As Sykes described the commonest indications of central venous pressure line in post-surgery intake, output balance, is to measure CVP for the purpose of adequate fluid replacement in place of blood and fluid loss during perioperative period. In cardiac surgery unit, the preferred route of central line insertion is right subclavian vein because of the ease of insertion, low complication rate compared to internal jugular route cannulation (5). Lee for the first time described different types of malposition or fracture of CVP line as showed that most common complication of CVP line insertion is malposition (6). In Langston study, the most common site of malposition of CVP line was the entrance into the internal jugular vein. The variable angles of jugular and superior vena cava to the subclavian vein causes this malposition (1). Neck compression test innovated by Lumley is a useful test for diagnosing this complication because neck compression on the side of malposition with impeding flow in the vein causes rising of 10 cm H2O or more in CVP reading. In cardiac surgery patients, perioperative monitoring of CVP is deemed necessary in view of anticipated post operating bleeding, right ventricular failure, inferior myocardial infarction, pulmonary hypertension, vasomotor change and hemodynamic

instability (hypotension, tachycardia) that compromises cerebral perfusion pressure (7). Koundouris described clinical criteria for correct position of catheter tip in vein that includes satisfactory CVP waveform and good back bleeding (8) however Langston (1971) revealed that clinical criteria may not be reliable enough for confirming satisfactory catheter tip position. The only documented way for verification of correct placement in patients is radiology. In current patient, central line was exactly malpositioned into the internal jugular vein. Risk of thromboembolic sequels in temporary CVP malposition is probably very low in non-thrombophilic patients but in thrombophilic disorders such as protein C-S deficiency is high. Ferro reported that at least one risk factor such as internal jugular vein catheterism can be identified in >85% of patients with cerebral venous thrombosis and a thrombophilia was noted in 34%, and an inherited thrombophilia was detected in 22%. Inherited thrombophilias associated with cerebral venous thrombosis with or without foreign body, include deficiencies of antithrombin, protein C-S deficiency, factor V Leiden mutation, and the prothrombin gene mutation 20210. Antiphospholipid antibodies and hyperhomocysteinemia are acquired prothrombotic states associated with cerebral venous thrombosis (9). The most probable explanation of its unusual course could be either that the J-tip of Seldinger wire might have been positioned cephalad and thus the catheter 'went up directly into internal jugular vein before moving down the superior vena cava as originally intended or the catheter followed the path of the already internally rotated guide wire in situ. Since in current case the whole early perioperative period was uneventful with regular normal CVP monitoring and IV fluids access, we continued with our CVP line without consideration that there can be a possibility of thrombosis formation with such malposition of central venous catheter inside the jugular and cavernous veins in this thrombophilic patient.

In conclusion, this case report aimed to bring to the attention the possibility of sagittal vein thrombosis associated with malposition and internal rotation of CVP line inside vessels in thrombophilic patient. Although the frequent (every 10-15) post-operative CVP waveform monitoring is important in detecting catheter migration or malposition, we reiterate the importance of radiological verification of CVP catheter position just after or at the time of cannulation of central line not at 12 hour later as in our patient.

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