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PROLONGED FEMORAL COMPRESSION POST PERCUTANEOUS CORONARY INTERVENTION LEADING TO DEEP VEIN THROMBOSIS

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ABSTRACT

Deep vein thrombosis is an uncommon yet significant complication of percutaneous coronary interventions. Prolonged manual compression at the access site, a common practice for achieving hemostasis, can inadvertently exacerbate thrombosis risks, including venous stasis and endothelial injury. We present the case of an 84-year-old female with coronary artery disease who underwent staged percutaneous coronary intervention with stent placement in the left circumflex and left anterior descending arteries. After the procedure, manual pressure was applied to the femoral access site for over 30 minutes, after which the patient developed hypotension and leg pain. Point-of-care ultrasound revealed a large deep vein thrombosis in the right femoral vein, extending into the profunda and saphenous veins. The patient was treated with a heparin drip and monitored without surgical intervention. Her condition improved, and follow-up imaging confirmed resolution of the deep vein thrombosis. This case underscores the risks associated with extended manual compression and highlights the importance of adhering to guidelines for post percutaneous coronary intervention care. The use of vascular closure devices may reduce the likelihood of such complications. Additionally, early recognition and management of deep vein thrombosis is critical in preventing further thromboembolic events and improving patient outcomes.

KEYWORDS

Deep vein thrombosis (DVT), percutaneous coronary intervention (PCI), femoral access complications, manual compression, vascular closure devices

LEARNING POINTS

- *Recognizing the risks of prolonged compression:* This case highlights that manual compression exceeding recommended durations can lead to complications like deep vein thrombosis, reinforcing the importance of adhering to established guidelines.
- *Considering vascular closure devices:* The use of vascular closure devices as an alternative to manual compression can significantly reduce the risk of thrombosis and other access site complications, enhancing post-procedure safety.
- *Recognizing risks in routine procedures:* Even common procedures like percutaneous coronary intervention can sometimes lead to serious complications, such as deep vein thrombosis. This case highlights the need to stay vigilant and manage these risks effectively when they occur.

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INTRODUCTION

Deep vein thrombosis (DVT) is a serious vascular complication that can arise following various medical procedures, including percutaneous coronary interventions (PCI)[1]. While PCI is a well-established treatment for coronary artery disease (CAD), it carries inherent risks, such as bleeding and thrombosis, particularly at the access site. Prolonged manual pressure applied to the access site post-procedure is a common practice intended to achieve hemostasis; however, excessive or prolonged application can inadvertently lead to thrombotic events. This case report presents a unique instance of DVT induced by extended manual pressure following staged PCI in an elderly female patient, highlighting the clinical challenges and implications of this complication.

CASE DESCRIPTION

An 84-year-old female with a medical history of hypertension, hyperlipidemia, and coronary CAD, status post-PCI to the left circumflex artery (LCx) and proximal left anterior descending (LAD) artery, presented for an elective, scheduled staged PCI of the LCx with stent placement.

Eight months prior, the patient presented with shortness of breath and lower limb swelling. An echocardiogram revealed a normal ejection fraction of 55-60% with mild mitral and tricuspid regurgitation. During this earlier admission, she underwent a percutaneous intervention, which identified a complete blockage of the mid-left circumflex artery (LCx) and 80% occlusion of the left anterior descending (LAD) artery. A stent was placed in the LCx, with plans for a staged PCI to follow. She initially showed improvement but subsequently experienced a recurrence of shortness of breath. One week before this admission, she visited the cardiology clinic for ongoing symptoms, and was scheduled for the second stage of the PCI.

During this admission, the patient successfully underwent stent placement in both the LAD and LCx ostium. During the procedure, she received 5000 units of heparin. Following the procedure, the patient was recovering in the cardiac cath-lab, where a nurse applied pressure to the right femoral insertion site. After 30 minutes of pressure application, the nurse observed that the patient became hypotensive, with a blood pressure of 55/29 mmHg and experienced shortness of breath. The nurse immediately alerted the physician.

On evaluation, the patient reported mild shortness of breath and tension-like pain in the right leg, but denied chest pain, palpitations, abdominal pain, or dizziness. There was no obvious hematoma at the groin. The patient received 300 µg of phenylephrine and 2 liters of IV fluids to address the hypotension. Point-of-care ultrasound revealed DVT, but no obvious hematoma. A STAT bedside ultrasound confirmed a large occlusive thrombus in the right femoral and common femoral veins, extending into the proximal profunda vein and the greater saphenous vein at the common femoral vein junction.

Vascular surgery was consulted, and the patient was started on a heparin drip and admitted to the floor. She was also kept on clopidogrel and aspirin due to the newly placed stents. A chest computed tomography (CT) scan ruled out pulmonary embolism. Vascular surgery monitored the patient without further intervention. An abdominal, pelvic, and lower extremity CT scan showed a 5.4 cm hematoma medial and deep to the right common femoral artery, extending into the right adductor muscles. Overtime, the patient showed improvement, and a follow-up CT scan demonstrated resolution of the hematoma. She was discharged in stable condition and remains stable during follow-up visits.

DISCUSSION

This case presents a rare and significant complication of DVT following a PCI, where prolonged manual pressure at the femoral access site likely contributed to the thrombotic event. The 84-year-old female patient developed a large thrombus in the right femoral vein, despite receiving heparin during the procedure. Prolonged manual compression, an essential component of post-PCI care for hemostasis, can lead to complications by exacerbating the factors described in Virchow's triad, which includes endothelial injury, venous stasis, and a hypercoagulable state. Continuous manual pressure on the femoral artery can damage the endothelial lining of the adjacent veins. This injury disrupts the vessel wall, exposing collagen and other pro-thrombotic factors that promote platelet aggregation and thrombus formation[1]. Manual pressure may impede venous outflow, contributing

to venous stasis. The use of heparin during the PCI procedure is intended to prevent clot formation; however, prolonged manual pressure may counteract the anticoagulant effects of heparin, especially if the anticoagulation is not adequately managed.

In other reported cases, risk factors were commonly identified as contributors to DVT following femoral arterial access. For example, Min et al. described a patient who developed DVT in the context of antidepressant and anxiolytic use, emphasizing the hyperthrombotic risk associated with these medications[2]. Disler et al. reported a case where both a vascular closure device (VCD) and manual compression were utilized, which may have collectively contributed to the development of DVT[3]. Additionally, these reported cases documented the onset of DVT days to a week after the procedure, whereas in this case, DVT occurred immediately following the intervention.

In our case, the patient was lying down for hours, from the time of arrival until being transferred to the recovery unit. The prolonged strong compression over the inguinal insertion site also contributed to significant stasis and endothelial damage in the right lower extremity veins. During the procedure, she received 5,000 units of heparin, but this may not have been enough to counteract the manual pressure stasis effect. The incidence of DVT following femoral catheterization is low, reported to be about 0.05%[4]. However, this figure may underestimate the true incidence, as many subclinical cases go undetected. Prolonged compression, inadequate anticoagulation, or the presence of hematomas can increase this risk, as observed in this case.

Arterial access for PCI is commonly achieved through the radial or the femoral artery. Radial artery access may lead to complications such as arterial spasm, occlusion, perforation, hematoma, or bleeding. While femoral access can result in complications like arteriovenous fistula formation, femoral artery pseudoaneurysm, lower limb ischemia, arterial thrombosis, along with hematoma formation or bleeding[5].

There are different methods to manage the vascular access after PCI, including manual compression and VCDs. VCDs such as Perclose, Angio-seal, Starclose and Mynx were designed to induced hemostasis after vascular manipulation. These devices are often preferred over manual compression after PCI due to their ability to achieve faster hemostasis and facilitate earlier patient ambulation[5,6]. Furthermore, there is clear evidence that these VCDs can reduce access site complications compared to manual or mechanical compression[6]. When manual compression is used, the recommendation duration varies depending on the type of procedure. For interventional procedures, continuous compression for up to 30 minutes or until hemostasis is achieved is advised, whichever is shorter. For diagnostic procedures, direct compression for 15-20 minutes is recommended. Prolonged compression beyond this period increases the risk of complications like DVT and hematoma[7]. In our patient's case, compression was applied for over 30 minutes.

Accurate diagnosis and management of DVT are crucial, particularly in patients with recent PCI and stent placement, as they are at heightened risk for thromboembolic and bleeding complication. Ultrasound is the first-line imaging modality for diagnosing DVT. Point-of-care ultrasound is effective for rapid bedside assessment, while a detailed venous ultrasound can confirm the presence and extent of the thrombus[8]. In the setting of recent PCI and anticoagulation therapy, the presence of symptoms such as leg swelling and pain, combined with imaging findings, are essential for diagnosing complications like DVT or hematoma. Our patient initially presented with right lower extremity pain, a sensation of heaviness along with hypotension.

Initial treatment often involves heparin to quickly manage thrombus formation, followed by transition to oral anticoagulants like rivaroxaban or apixaban, especially in patients with recent stent placement[9]. In this case, the patient was treated with a heparin drip to address the DVT, while clopidogrel and aspirin were continued to prevent stent thrombosis. The choice of anticoagulants should balance the risk of thromboembolic events against the potential for bleeding, especially in patients who may require direct oral anticoagulants for conditions other than DVT.

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