

Cannulation of the Popliteal Vein as an Intraoperative Emergency Access in Prone Position: A Case Report

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ABSTRACT

Intravenous cannulation can be a challenging issue in hospitalized patients, especially during the perioperative period. Objectives: In this study we will present our experience about an emergency popliteal vein cannulation during surgery. We successfully cannulated the popliteal vein in a prone position with an ultrasound guide in an emergency situation. Conclusion: The popliteal vein can be a safe intravenous access during surgeries in a prone position without significant adverse events.

Introduction

Peripheral intravenous (IV) cannulation refers to the insertion of a single-lumen plastic conduit through the skin into a peripheral vein for the purpose of injecting fluids, medications, and blood products directly into the cardiovascular system.

The popliteal vein is not typically a primary site for cannulation; however, some studies have reported its use for central venous access [1-3]. Especially in a prone position, insertion of a popliteal vein catheter will help in emergent situations [4-5]. Some of the previous reports support the use of this method in treating patients with special conditions such as surgeries in a prone position and ICU-admitted patients with respiratory failure [6-9]. This report describes cannulation of the popliteal vein with an arterial catheter guided by ultrasound as an intravenous access in a patient in a prone position during a surgical procedure.

Case Report

A 47-year-old female patient with an occipital lobe brain tumor entered our operation unit. The patient had a history of hypothyroidism and thyroidectomy surgery and two previous brain surgeries (the last time 5 months ago) with adjuvant chemotherapy and radiotherapy sessions. She presented with chronic headache, true vertigo, balance impairment, and quadriparesis and a history of taking levothyroxine and sodium valproate.

Before induction of anesthesia, she had a hemoglobin amount of 11.4 g/dL, BP=145/85 mmHg, PR=90/min, and SPO2=90%. Induction of anesthesia was achieved using a 20-gauge IV line, and after intubation, a left radial arterial line catheter and a 16-gauge left dorsal hand IV line were inserted. Anesthesia maintained by propofol and remifentanyl infusion. After placement of the patient in a prone position with adducted upper limbs and locking the patient's skull in a neurosurgical Mayfield, both IV access points became malfunctional. After trying to replace IV lines, two 20-gauge and 18-gauge IV accesses were inserted in the dorsum of the right hand and the dorsum of the left foot, and surgery started. After 45

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minutes, our 18-gauge IV access became nonfunctional, and the next several attempts using ultrasound were unsuccessful due to the prone position and damaged vascular system of the patient.

Due to failure in maintenance of anesthesia using IV anesthetics and placement of the skull in Mayfield, 0.6% isoflurane was used for temporary maintenance of anesthesia, and by using ultrasound, an 18-cm arterial catheter was inserted in the right popliteal vein in a completely sterile situation (Seldinger method). The surgical procedure resumed, and at the end of the procedure, the popliteal catheter was removed, and a right jugular vein catheter was placed in a supine position, and the patient was discharged from the operating room.

Discussion

Placement of peripheral IV lines is the most common invasive procedure in acute settings, with nearly 80-90% of hospitalized patients requiring IV access at some point during their admission [10-11]. Over 1 billion lines are utilized each year across the globe [12]. However, insertion is challenging, with two-thirds of first attempts failing and some patients requiring more than 10 attempts [13-16].

Difficult Intravenous Access (DIVA) affects 30–50% of admitted patients [17-18]. Some examples for risk factors for DIVA include extreme borders of age [19-20], excess adipose tissue [21], and chronic disease (vascular diseases or requiring several hospitalization) [19, 22].

The implications of DIVA are substantial, with association of treatment delays [17], increased healthcare system costs [23] and significant unsatisfaction for patients [24-25]. Ultrasound guidance is especially advantageous for individuals with suspected difficult access, multiple unsuccessful attempts at cannulation, and challenging positioning [26]. However, international guidelines to support ultrasound guidance during this procedure as the first approach are lacking [27-29].

Prone positioning is a common surgical position in neurosurgical procedures [30-31]. In certain unpredictable situations, emergent intravenous line access may be required while the patient is already in the prone position [2, 9]. Popliteal vein has been used as a temporary cannulation site for central venous access in prone position [1-3], especially in emergent situations [4-5]. Some of the previous works support his method for surgeries in prone position and ICU admitted patients with respiratory failure [6-9].

One of the main complications of popliteal vein catheterization is the development of thrombosis and this may manifest as venous or mural thrombosis, or as a clot within the central venous catheters [32-33]. The incidence of these events for central lines may reach as high as 18% [34]. Studies have showed that femoral vein cannulation central lines carry a higher risk of thrombosis compared to upper extremity approaches [35]. However, additional researches may be needed to obtain exact risk for popliteal vein. Additionally, the insertion of any type

of cannula heightens the risk of infection. Given the proximity of the catheter tip to the heart, central venous catheters pose a greater risk of bacteremia and sepsis [36]. Currently, no data have been found regarding the relative risk of using the popliteal vein for systemic infections.

Conclusion

In this report, we performed an emergent popliteal vein cannulation in a prone-positioned brain tumor patient with real-time ultrasound guidance. Despite the need for possible side effects to be investigated, we showed that popliteal vein catheterization can be utilized in emergency surgical situations as a temporary line for treatment and transfusion.

Informed Consent

The patient was given consent before collecting the data for reporting the clinical situation.

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