

Ultrasound-Guided Stellate Ganglion Block to Treat Accidental Injection of Propofol in an Anomalous Radial Artery

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Anormal Radyal Artere Kazara Propofol Enjeksiyonunu Tedavi Etmek İçin Ultrasonografi Kılavuzluğunda Stellat Ganglion Bloğu

ABSTRACT

Intra-arterial drug administration is a rare but potentially dreadful condition which can result in ischemia and gangrene of the hand. In the present case we accidentally injected propofol in an anomalous radial artery during anesthesia induction. Serial ultrasound-guided stellate ganglion blocks were applied to salvage the limb of the patient by promoting arterial blood flow. This is probably the first reported case of accidental intra-arterial injection of propofol being managed with stellate ganglion block.

Keywords: Stellate ganglion block, intra-arterial, propofol, radial artery

Öz

İntraarteriyel ilaç uygulaması, elin iskemisine ve kangrenine neden olabilen, nadir fakat potansiyel olarak korkutucu bir durumdur. Anestezi indüksiyonu sırasında anormal bir radyal artere yanlışlıkla propofol enjekte ettik. Hastanın kolunu kurtarmak ve arteriyel kan akımını sağlamak için ultrasonografi eşliğinde tekrarlayan stellat ganglion bloklar uyguladık. Olgumuz muhtemelen kazara intraarteriyel propofol enjeksiyonunun stellat ganglion bloğu ile tedavi edildiğinin bildirildiği ilk vakadır.

Anahtar kelimeler: Stellate ganglion bloğu, intraarteriyel, propofol, radyal arter

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INTRODUCTION

Intra-arterial drug administration is predominantly an iatrogenic complication, mostly encountered in operation theatres or in intensive care unit. Irrespective of the cause, intra-arterial drug injection results in a wide range of complications such as skin changes (purpura, skin rash, and pustule), erythema, edema, ischemia, necrosis, distal limb loss and even death⁽¹⁾. Therapeutic dilemma exists since there is no recommendation in the literature. Here we discuss a case of inadvertent cannulation of an anomalous radial artery located in the anatomical site of

cephalic vein, its potential treatment and review of the literature.

CASE PRESENTATION

A right-handed 41-year-old male, weighing 63 kg, with hemorrhagic right vocal cord polyp was posted for microlaryngeal surgery (MLS) under general anesthesia. The patient had no associated medical comorbidities or any previous anesthetic exposure. All the routine investigations were within normal limits and vital signs were stable on admission. One 18 gauge intravenous (IV) cannula was inserted into



a vein 3 cm proximal to wrist joint over lateral aspect of the left hand and blocked with a stopper. After attaching the routine monitors (electrocardiogram, pulse oximeter, noninvasive blood pressure) 10 mL of 1% propofol, 100 mcg fentanyl, 30 mg atracurium were given intravenously through the side-port of the catheter. Patient complained of severe pain at the catheter insertion site, which was thought to be due to IV injection of propofol. After 3 minutes of mask ventilation, trachea was intubated with 6 mm endotracheal tube and anesthesia was maintained with 50% mixture of O₂ and air and isoflurane. Meanwhile 500 mL of lactated Ringer's solution was attached to this IV cannula and it was noticed that fluid was not flowing. On inspection of the fluid transfusion set, a pulsatile retrograde blood flow in the tubing was observed. An intra-arterial placement of cannula was suspected. To confirm this, blood sample from the same cannula was sent for arterial blood gas (ABG) analysis which showed arterial blood sample pattern. An invasive line pressure dome was attached and connected to the monitor which revealed pressure tracing of arterial pulse with dicrotic notch and invasive blood pressure values similar to the noninvasive blood pressure values. Inadvertent arterial cannulation was thus confirmed. The cannula was flushed with 5 mL of 2% lignocaine. Another IV line was secured in the right hand to administer other necessary drugs and the operation thereafter continued uneventfully. Since the operative procedure was of short duration it was continued as scheduled.

Outcome and follow up

Postoperatively the patient was shifted to the intensive care unit (ICU) for monitoring and further management. An ultrasound-guided, left-sided stellate ganglion block was applied at the level of C6 transverse process with 5 mL of 0.25% bupivacaine (Figure 1). Subsequently, Horner's syndrome developed and an increase in temperature of left upper limb was observed. Doppler US studies of left upper limb vessels showed no diminution of flow or the calibre of the left radial artery compared to its right sided counterpart. Doppler US revealed an anomalous course of the left radial artery. While coursing through the forearm 5 cm proximal to wrist, the left radial artery was superficial and superior to extensor

pollicis tendon, indicating anatomical variation of arterial pattern. The patient was observed overnight in the ICU and did not further complaint of pain in the left hand. There was no change in colour or swelling distal to the catheter placement side. A pulse oximeter probe was attached in the left thumb and saturation was maintained at 100% overnight. Ultrasound-guided stellate ganglion block was repeated every day in the morning for another three days. Radial artery pulse rate, rhythm, volume and oxygen saturation of his left hand was compared with the right hand for any discrepancy every two hours for the next three days. Patient was shifted to the ward there after and asked to report immediately if there was any pain, swelling or change in colour in left hand.

Three months later patient was followed up in our pain clinic and had full range of motion and power of left hand with no abnormality.

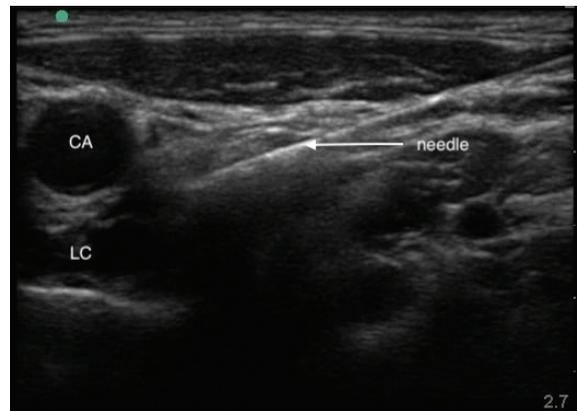


Figure 1. Ultrasound stellate ganglion block at level of transverse process with needle direction being between longus colli (LC) muscle and carotid artery (CA)

DISCUSSION

Incidences of intra-arterial drug administration have been reported in the literature since 1940s⁽²⁾. Drugs used were mainly anesthetic induction agents namely barbiturates and benzodiazepines, among them most commonly thiopentone and propofol. In the year 1988, Nicolson et al.⁽³⁾ suggested intra-arterial route as an alternative to IV access. Anesthetic drugs that have been injected without any adverse effects were fentanyl, midazolam, scoline, pancuronium and atropine^(4,5). The authors concluded that all water soluble drugs and acidic drugs can be used

intra-arterially. Water insoluble drugs (diazepam, propofol, etomidate) and alkaline drugs (thiopentone, penytoine) should be avoided. Atracurium is water soluble, nonalkaline in nature. Hence we consider propofol is the only offending agent which caused symptoms in our patient. The risk factors associated with inadvertent arterial cannulation are difficult to identify. Some predisposing factors are morbidly obese patients, dark pigmented skin, thoracic outlet syndrome (vanishing radial pulse with abduction and internal rotation of hand), sclerosed vein difficult to cannulate, closed proximity of artery and vein and most importantly vascular anomaly⁽⁵⁾.

Among the vascular anomalies, superficial ulnar artery (SUA) is the most commonly observed aberrant artery in the forearm and hand with an incidence of 4% compared to superficial radial artery (SRA) with an incidence of <0.2%⁽⁶⁾. SRA is a radial artery which is more superficial and course over tendons (such as extensor pollicis) which makes the boundary of anatomical snuff box. Clinically SRA is most commonly encountered than SUA as it is commonly present by the side of large cephalic vein commonly known as intern's vein. In this case probably we accidentally cannulated the superficial radial artery which was later confirmed by postoperative Doppler US. In the literature accidental intra-arterial injection of propofol has been reported, however we could not find any reports mentioning the use of stellate ganglion block to treat this^(7,8).

Intra-arterial injection during induction of anesthesia is difficult to diagnose as the patient is semiconscious and unable to report pain. Even if the patient reports pain, it may often be attributed to painful IV injection of anesthetic drugs (propofol) as was the case in our patient. Hence in case of severe pain on propofol injection possibility of an inadvertent intra-arterial injection should be kept in mind, and should be suspected if the vein is either lying in an anatomical location which is close to the artery or found to be pulsatile on manual palpation with a pulsatile backflow of bright red blood in the IV tubings. This inadvertent arterial placement can be confirmed by a blood gas analysis and by attaching a pressure transducer which will show tracing of arterial pulse with a dicrotic notch⁽⁵⁾.

As there is no specific recommendation, multiple treatment options have been tried to prevent thrombosis and vasospasm in the literature. Infiltration of local anesthetics and stellate ganglion block can be done for sympatholysis to prevent reflex vasospasm, as was done in our case. Stellate ganglion block has been used in the treatment of ischemia that may be encountered in intra-arterial injection of thiopentone, heroine and diazepam⁽⁹⁾. We are probably first to describe successful use of stellate ganglion block in propofol induced vasospasm. Vasodilation with alpha blockade, phentolamine, papaverine⁽¹⁰⁾, anticoagulation with heparin⁽¹¹⁾ and thrombolysis with streptokinase⁽¹²⁾ have been also tried.

CONCLUSION

Inadvertent intra-arterial administration of propofol can be a possibility during induction of anesthesia in a patient with an anomalous radial artery located in the anatomical site of the cephalic vein. Serial stellate ganglion blocks can be applied to prevent vasospasm and thrombosis so as to be able to salvage the limb. Connecting the fluid transfusion set to the intravenous cannula before administering drugs and noting the pulsatile retrograde blood flow in the fluid transfusion set tubings are the simplest measures to prevent such accident.

Conflict of Interest: None

Informed Consent: Written informed consent was obtained from the patient

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