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Axillary Plexus Block for Anesthesia Management in Patients with Acute Compartment Syndrome after Primary Percutaneous Coronary Intervention (PCI) Transradial Approach: A Case Report

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ABSTRACT

Background: Acute compartment syndrome is a rare complication of the percutaneous Coronary Intervention (PCI) transradial approach but it is very hand-threatening. Treatment for acute compartment syndrome is emergent fasciotomy of the affected compartments to reduce intracompartmental pressure. Axillary plexus block is an excellent choice of anesthesia technique for elbow, forearm, and hand surgery. **Case presentation:** An 80-year-old, 60 kg, 168 cm man was consulted to our department with a painful swelling on his right upper arm and hand that began three hours after a primary PCI procedure. Previously, the patient had a history of hypertension and diabetes mellitus. The supporting examination results were notable for anemia (Hemoglobin 7,5 g/dL), thrombocytopenia (78 x10³/uL), elevated hemostasis function (International Normalized Ratio 1.43), and high blood sugar (360 mg/dL) from echocardiography results anteroseptal and lateral hypokinetic. Before we did block, the patient was given ketamine 10 mcg IV and fentanyl 25 mcg IV for sedation. Axillary plexus block, as a type of regional anesthesia under ultrasound guidance, is a reliable substitute for general anesthesia in high-risk patients, and we do it with a dose of 20 ml of solution (50 mg (10 ml) isobaric bupivacaine 0.5% + 200 mg lidocaine 2% diluted with 20 ml normal saline). During the surgery, the patient was hemodynamically stable. After the operation, the patient was readmitted to the intensive cardiac care unit (ICCU). **Conclusion:** Axillary plexus block can be an alternative to general anesthesia in patients who will undergo fasciotomy surgery after percutaneous coronary intervention transradial approach with stable hemodynamics during surgery and well-controlled pain after the surgery.

1. Introduction

Acute compartment syndrome is a rare complication of the percutaneous Coronary Intervention (PCI) transradial approach, but it is very hand-threatening.¹ One of the reports shows only 0,4% of patients suffer acute compartment syndrome complications after transradial angiography.² Acute compartment syndrome is characterized by an increase in pressure within a fascial compartment and results in a decrease in venous outflow, and

eventually, arterial inflow may be prevented, leading to ischemia and necrosis.³ The transradial approach to cardiac catheterization is commonly referred to as the transfemoral approach due to lower risks of access site bleeding and major vascular complications.^{1,3} Treatment for acute compartment syndrome is emergent fasciotomy of the affected compartments to reduce intracompartmental pressure.¹ Up to 15–23% of the patients with (PCI) implantation need a surgical procedure <12 months from PCI.⁴ Non-cardiac surgery

within 4 weeks of PCI and dual anti-platelet use has a high risk of acute coronary events and bleeding.⁵

Axillary plexus block is an excellent choice of anesthesia technique for elbow, forearm, and hand surgery.⁶ In some studies, axillary plexus blocks show a high success rate, reaching 92,5%, and can also be effective in rural areas.^{7,8} Using ultrasound guidance gives a higher success rate, and safety for the patients.⁹ Axillary plexus block has several advantages such as superior postoperative analgesia,¹⁰ reduced perioperative opiate consumption, reduced postoperative nausea and vomiting, shorter stay in the post-anesthesia care unit, and shorter hospital stay.¹¹ This case report aims to discuss the use of axillary plexus block in a patient who undergoes emergency fasciotomy after suffering acute compartment syndrome complication of PCI transradial approach as an alternative to general anesthesia.

2. Case Presentation

An 80-year-old, 60 kg, 168 cm man was consulted to our department with a painful swelling on his right upper arm and hand that began three hours after a primary PCI procedure. Surgical tape was removed at 6 hours after PCI, after which an elastic bandage was applied until the next four hours. He was consulted for preoperative evaluation for urgent fasciotomy. He also has had hypertension and diabetes mellitus for more than 10 years and has been using insulin regularly.

Upon physical examination, he was fully conscious, with vital signs showing slight hypertension (140/60 mmHg) and slight hyperpnea (22/minute). The peripheral oxygen saturation (SpO₂) was 99% on 3 LPM nasal cannula. The numerical rating scale was 3/10. The supporting examination results were notable for anemia (Hemoglobin 7,5 g/dL), thrombocytopenia (78 x10³/uL), elevated hemostasis function (International Normalized Ratio 1.43), and high blood sugar (360 mg/dL). Furthermore, we found no remarkable findings on his latest chest X-ray and electrocardiogram (ECG).

However, the latest echocardiogram revealed a dilated left atrium with concentric remodeling of the left ventricle, with decreased diastolic function, an ejection fraction of 49%, and hypokinetic anteroseptal and lateral segments of the heart.

We decided to perform an axillary plexus block for this case 1 hour after being consulted by the surgeon. As per our hospital's protocol, the procedure was scheduled in the operating theater. Upon arrival at the theater, we attached a standard ASA monitoring device that showed normal vital signs. Premedication of ketamine 10 mg and fentanyl 25 mcg, both intravenously (IV), were administered. The patient was positioned in a supine position, with the left arm flexed at 90°. An ultrasound (US) probe is placed in the axilla for identification of the axillary artery. We inserted a 22-24G needle, in-plane with the probe, into the axillary artery. The axillary plexus block was carried out using 20 ml of bupivacaine 0.5% and lidocaine 2% 200 mg. Also, we administered tranexamic acid 1 g IV.

Upon exploration, the surgeon also found a rupture of the radial artery and repaired the artery. The whole procedure lasted for 70 minutes and went uneventful. Postoperatively, we transferred him back to the ICCU. The patient was treated for 2 days in the ICCU, moved to the regular ward on day 3, and finally discharged from the hospital on day 5.

3. Discussion

Acute compartment syndrome after PCI transradial approach is a rare condition but very dangerous for the patient and needs emergent fasciotomy surgery.² In this case, the patient did not have any clear risk factors other than the procedure itself. The first reported case of CS following transradial angiography was reported in 1997.¹ Three-quarters of reported cases emerged within 12 h of intervention with 4- or 5-French catheters, and all involved laceration of the radial or brachial arteries. All patients were managed with early decompressive fasciotomy under general anesthesia.³



Figure 1. Clinical sign.

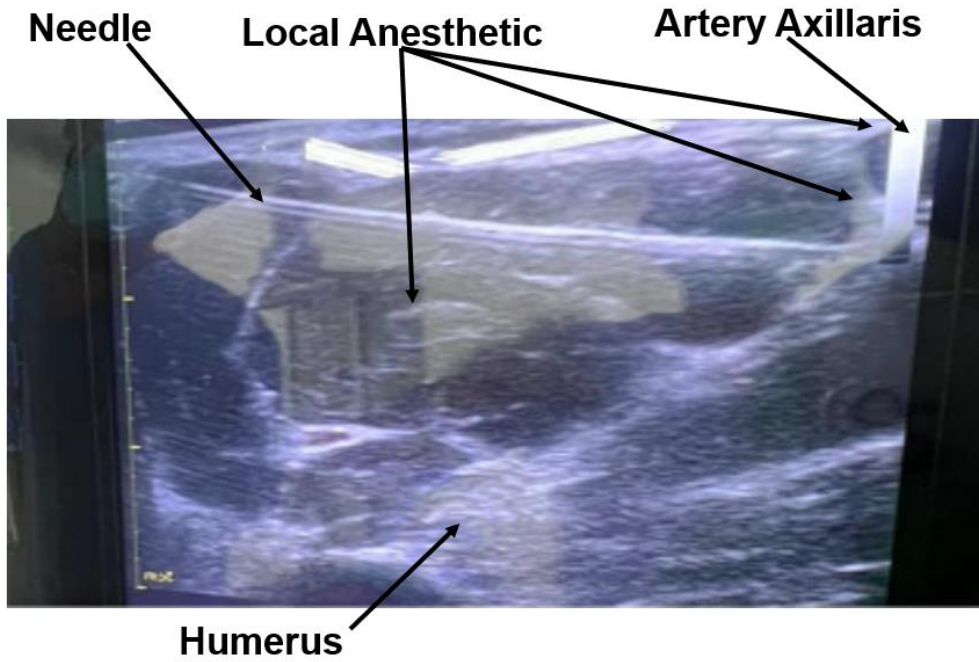


Figure 2. USG needle path.

There are several advantages of regional anesthesia compared to general anesthesia, such as reducing the body's usual response to stress in the presence of low cortisol and catecholamine levels, improving blood flow and peripheral vasodilatation, reducing hypercoagulability, lowering the risk of arterial and venous thrombosis and helping to prevent endotracheal intubation and mechanical ventilation.¹⁰ Axillary plexus block use also decreases the use of perioperative analgesics like opioids and nonsteroidal anti-inflammatory drugs (NSAIDs), which also reduces postoperative pain better than general anesthesia. Regional anesthesia has been found to be superior compared to general anesthesia for reducing acute postoperative pain, and effective postoperative pain control is an important component of surgical patient care, as inadequate pain control results in increased morbidity or mortality.¹¹

Patients with a history of cardiac stenting are particularly at risk of surgery and require good perioperative management by an anesthetist. Discontinuation of antiplatelet therapy immediately after PCI with stenting will result in significant morbidity and mortality during non-cardiac surgery. Because stent endothelialisation may not be complete at the time of surgery, abruptly discontinuing the combination of clopidogrel and aspirin with a surgically induced prothrombotic state increases the risk of acute perioperative stent thrombosis and sudden vessel closure, leading to significant morbidity and mortality.¹³ Despite the American Heart Association's (AHA) recommendation of a 4-6 week interval between cardiac stenting and non-cardiac surgery, morbidity and mortality have been reported.¹³

The risk of perioperative cardiac complications under general anesthesia is higher than the risk of bleeding associated with peripheral nerve blockade in patients post-cardiac stenting with dual anti-platelet treatment.⁵ Brachial plexus block under US guidance can be used instead of general anesthesia in high-risk patients. A dose of 20 mL of solution containing 50 mg isobaric bupivacaine 0.5% and 200 mg lidocaine 2% gives satisfactory results with stable hemodynamics

during surgery.¹⁰ In this case, we used the same regimen from the previous study and had satisfactory results during the surgery.

4. Conclusion

Axillary plexus block can be an alternative to general anesthesia in a patient who will undergo fasciotomy surgery after percutaneous coronary intervention transradial approach with stable hemodynamics during surgery and well-controlled pain after the surgery.

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