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*RESEARCH ARTICLE*

# GANGRENE FOLLOWING RADIAL ARTERY CANNULATION: A CASE PRESENTATION

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## *Abstract*

Radial artery cannulation is a common procedure for measuring invasive blood pressure, blood sampling and frequent blood gas analysis. Though considered safe, this procedure can lead to many complications which can be minor or of a serious nature. Minor complications include bleeding from the entry site and temporary occlusion of the artery. Serious complications may include permanent occlusion of the blood flow and resultant gangrene of the digits of the hand. It is very important to recognize the ischemic changes in the initial stage and manage them accordingly so as to minimize the tissue damage. Here we present a case where a patient developed sign symptoms of gangrene in the hand after the arterial cannula was removed. Apart from the medical management, surgical intervention was required to remove the thrombus.



## Introduction:-

Arterial cannulation, a common invasive procedure performed in clinical settings, plays a crucial role in monitoring hemodynamic parameters, blood gas analysis, and facilitating blood sampling. [1] While arterial cannulation is generally considered safe and well-tolerated, complications, although infrequent, can be severe and even life-threatening. Bleeding, thrombosis, vessel injury and rarely permanent occlusion can occur [2].

One such rare but potentially devastating complication is gangrene, where tissue necrosis occurs due to inadequate blood supply. Gangrene following arterial cannulation is an uncommon occurrence, but its consequences can be catastrophic, leading to limb loss [3] or even mortality if not promptly recognized and managed[4].

Arterial cannulation is primarily indicated in critical care and surgical settings for various clinical purposes, including:

1. Continuous Blood Pressure Monitoring: Arterial lines are indispensable for accurate and real-time blood pressure monitoring, especially in critically ill patients or those undergoing major surgeries [5].
2. Frequent Blood Gas Analysis: Arterial blood samples obtained through the cannula provide essential data for evaluating oxygenation and acid-base balance [6].
3. Frequent Blood Sampling: In scenarios requiring frequent blood sampling, such as the monitoring of electrolytes or hemoglobin levels, arterial cannulation is preferred over repeated peripheral venipunctures [7].
4. Hemodynamic Monitoring: Continuous monitoring of arterial pressure waveforms helps assess cardiac performance and guide therapeutic interventions [8].

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Complications related to arterial cannulation are relatively infrequent, but when they do occur, they can lead to significant morbidity and mortality. The incidence of these complications may vary based on patient factors, procedural technique, and operator experience. Common complications associated with arterial cannulation include:

1. Hematoma Formation: Hematoma formation at the cannulation site is one of the minor complications, usually resulting from vessel injury during the procedure [9].
2. Infection: Local site infections can occur, although they are less common due to stringent aseptic techniques [10].
3. Thrombosis: Arterial thrombosis can develop as a result of the catheter's presence in the artery and may require specialized therapy [11].
4. Ischemia and Gangrene: Perhaps the most severe complication, ischemia, and gangrene can occur if the cannula impedes arterial blood flow, leading to tissue necrosis [12].
5. Embolization: Rarely, catheter fragments can embolize, leading to vascular occlusion in distant sites.

**Case Presentation:-**

This case presentation highlights the occurrence of gangrene following arterial cannulation in a patient, emphasizing the critical importance of early recognition, prompt intervention, and a multidisciplinary approach to optimize patient outcomes.

A 63 year old male patient was admitted in the ICU in semiconscious, disoriented state with alleged history of Road traffic accident.He had hemorrhagic contusions in left temporal lobe with minimal intraventricular haemorrhage, bilateral pneumothorax and fracture of multiple ribs. The patientwas electively intubated and put on ventilatory support. He was put on inotropic support as he was in shock. Arterial line was inserted to monitor the blood pressure after performing ALLENS test. Capillary filling time was checked which was normal.After two days the patient was maintaining blood pressure, the inotropic support was discontinued and the arterial line was removed. On day 4 of arterial cannula removal, gangrenous changes were noted on digits of the hand.The digits were cold and had decreased sensation. Medical treatment for thrombosis was started immediately. Blackish discoloration developed on the index finger which became gangrenous. As the changes were not resolving,colour doppler of the radial artery was performed which detected radial artery thrombosis. After consulting Cardiovascular surgeon,surgical intervention was considered and radial artery embolectomy was performed.Post-operatively blood flow improved in the radial artery. The digits became warm and of normal color. Residual gangrenous tissue remained on the tip of the index finger and had to be surgically removed.

## Discussion:-

The presented case of gangrene following arterial cannulation underscores the critical importance of vigilance, early recognition, and appropriate management of complications associated with this commonly performed invasive procedure. While arterial cannulation is generally considered safe and indispensable in various clinical settings, it is not without risks, and healthcare providers must be aware of potential complications to mitigate adverse outcomes.

In this case, the patient developed gangrene as a consequence of arterial cannulation, a rare but severe complication. Gangrene is characterized by tissue necrosis due to an inadequate blood supply. Though temporary inclusion is common, rarely it can progress and lead to tissue ischemia. [13]. The development of gangrene underscores the critical importance of meticulous technique during cannulation and careful monitoring of the cannulated site for any signs of ischemia or compromised circulation.

Several risk factors may contribute to the development of gangrene following arterial cannulation. These factors can include the duration of catheterization, the size of the catheter, the presence of underlying vascular disease, and the experience of the healthcare provider performing the procedure [14].

Early recognition of gangrene is paramount to prevent further tissue damage and improve outcomes. The signs and symptoms of gangrene include cold fingers, discoloration of the affected area, pain, and loss of motor function. In this case, the healthcare team's ability to promptly recognize these signs and initiate appropriate interventions likely played a crucial role in preventing further complications, such as systemic infection or limb loss.

The management of gangrene following arterial cannulation necessitates a multidisciplinary approach involving vascular surgeons, infectious disease specialists, and critical care physicians. Treatment often involves the removal

of the cannula, debridement of necrotic tissue, administration of broad-spectrum antibiotics to prevent infection, and, in some cases, surgical intervention to restore blood flow to the affected area.

To reduce the risk of complications like gangrene, healthcare providers must adhere to strict aseptic techniques during arterial cannulation, choose appropriate catheter sizes, and consider the duration of catheterization. Additionally, employing ultrasound guidance can significantly reduce the number of attempts at cannulation and minimize complications related to multiple punctures [15].

## Conclusion:-

The case of gangrene following arterial cannulation serves as a poignant reminder of the need for cautious and vigilant management of invasive procedures. While arterial cannulation is indispensable in critical care and surgical settings, it is not without risks. Healthcare providers should be well-versed in recognizing potential complications, such as gangrene, and be prepared to initiate prompt and collaborative interventions to optimize patient outcomes.

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