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Severe Upper Limb Ischemia Following Accidental Intra-Arterial Amikacin Administration in A One-Month-Old Infant: A Case Report

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Abstract **Case Reportt**

Accidental intra-arterial drug administration is a rare but potentially devastating iatrogenic event, particularly in infants in whom early symptoms may be difficult to recognize. We report a one-month-old male infant hospitalized for a multidrug-resistant respiratory infection and treated with amikacin and a third-generation cephalosporin. During placement of a peripheral vascular access in the right upper limb, the catheter was inadvertently positioned in the brachial artery and amikacin was administered intra-arterially. The arterial malposition was recognized approximately seven hours later, after the development of diffuse cyanosis of the hand and forearm, absence of spontaneous movement of the limb, and loss of brachial, radial, and ulnar pulses. The ischemia progressed rapidly to extensive necrosis of the hand and forearm. Because the limb was considered nonviable, a right transhumeral amputation was performed. The postoperative course was uncomplicated; treatment of the respiratory infection was completed over 14 days, and the amputation stump was completely healed at two-month follow-up. This case emphasizes the severe consequences of delayed recognition of accidental intra-arterial drug administration and the importance of careful verification and close monitoring of peripheral vascular access in infants.

Keywords: Accidental intra-arterial injection; Amikacin; Acute limb ischemia; Infant; Gangrene; Amputation.

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INTRODUCTION

Acute limb ischemia in neonates and young infants is uncommon but may lead to major tissue loss and permanent disability. Iatrogenic vascular injury related to arterial puncture or catheterization is an important cause in this age group [1,2]. Accidental intra-arterial administration of medication is particularly concerning because vasospasm, endothelial injury, platelet activation, and thrombosis may rapidly compromise distal perfusion [1]. We report a one-month-old infant who developed irreversible right upper limb ischemia after accidental intra-arterial administration of amikacin through a catheter inadvertently placed in the brachial artery.

CASE REPORT

A one-month-old male infant, the first child of non-consanguineous parents, was hospitalized for management of a multidrug-resistant respiratory infection. He had been born by uncomplicated vaginal delivery with a birth weight of 3.5 kg, a normal Apgar score, and good adaptation to extrauterine life. Antibiotic therapy consisted of amikacin combined with a third-generation cephalosporin.

During an on-call period, a peripheral vascular access was placed in the right upper limb. The catheter was inadvertently introduced into the brachial artery and was initially considered to be venous. Amikacin was subsequently administered through this access. The arterial malposition was not recognized until approximately seven hours later, when progressive discoloration of the right upper limb became evident.

At vascular assessment, the infant was afebrile and hemodynamically stable, receiving oxygen at 3 L/min for the underlying respiratory infection. Examination of the right upper limb showed marked cyanosis of the hand and forearm, absence of spontaneous movement, and absent brachial, radial, and ulnar pulses. Distal digital ischemic changes were already present (Figure 1).

The local condition progressed rapidly, with extensive necrosis of the hand and forearm and severe cutaneous compromise (Figure 2). Given the delayed

presentation and the clinically irreversible nature of the ischemia, limb salvage was not considered feasible. A right transhumeral amputation was therefore performed.

The postoperative course was uncomplicated. The infant completed a total of 14 days of antibiotic therapy for the respiratory infection, and the amputation stump remained clean. At two months after discharge, the stump was completely healed without reported local complications.



Figure 1: Initial clinical appearance of acute right upper limb ischemia. (A) Diffuse cyanosis of the hand and forearm with marked digital ischemia. (B) Persistent cyanosis of the right upper limb with early distal necrotic changes



Figure 2: Progression to irreversible ischemic necrosis of the right upper limb. (A) Extensive necrosis involving the hand and distal forearm with areas of cutaneous demarcation. (B) Advanced necrosis of the hand and forearm, consistent with a clinically nonviable limb

DISCUSSION

Acute limb ischemia in neonates and young infants is rare but can result in devastating functional consequences. In this population, iatrogenic causes related to vascular access are particularly important. Accidental intra-arterial drug administration may produce severe ischemia through a combination of arterial vasospasm, direct endothelial or chemical injury, platelet activation, and local thrombosis [1]. The severity of tissue injury is influenced by the drug and its physicochemical properties, the arterial territory involved, and, importantly, the interval between the event and its recognition. Although a specific direct arterial toxicity of amikacin has not been clearly established, its inadvertent intra-arterial administration may contribute to this multifactorial vascular injury.

Several pediatric reports illustrate the potential severity of this complication. Wynne *et al.,* described three infants with accidental intra-arterial administration of antibiotic preparations; arteriolar obstruction

dominated the clinical picture and gangrene occurred in the most severely affected limbs [3]. Aghoutane *et al.,* reported a 7-year-old girl who developed forearm pain, cyanosis, loss of the radial pulse, and subsequent gangrene of all five fingers after accidental intra-arterial flucloxacillin administration, despite urgent brachial embolectomy, fasciotomy, and postoperative heparin [4]. Similarly, Salama *et al.,* reported a 6-year-old boy in whom accidental intra-arterial floxacillin administration was followed by acute hand ischemia, radial artery obstruction, and ultimately gangrene of the entire hand despite fasciotomy and anticoagulation [5].

In contrast, early recognition can allow limb preservation. Shaniv *et al.,* recently reported a term neonate in whom a peripheral catheter was inadvertently positioned in the brachial artery. Immediate recognition and catheter removal, followed by anticoagulation and vasodilator therapy, resulted in near-complete recovery and subsequent restoration of limb perfusion [2]. This contrasts with our patient, in whom arterial malposition was recognized approximately seven hours after amikacin administration, when cyanosis, motor impairment, loss of pulses, and evolving necrosis were already present. The prolonged ischemic interval was therefore likely a major determinant of irreversible tissue injury and the need for amputation.

Prevention and early detection are crucial. In infants, peripheral access should be carefully assessed before drug administration, particularly when access is technically difficult. Unexpected blood pulsatility, unusual resistance to injection, rapid discoloration, cooling of the distal limb, delayed capillary refill, or loss of pulses should immediately raise suspicion of arterial cannulation. Because infants cannot report pain or paresthesia, frequent inspection of the cannulated limb is essential.

This case highlights the potentially catastrophic consequences of accidental intra-arterial medication administration in infancy. Prompt recognition of vascular malposition and immediate assessment of distal perfusion are key factors that may determine whether the limb can be salvaged.

CONCLUSION

Accidental intra-arterial administration of medication is a rare but serious complication of peripheral vascular access in infants. In the present case, delayed recognition of brachial arterial cannulation after amikacin administration was followed by rapidly progressive upper limb ischemia, extensive necrosis, and transhumeral amputation. Careful verification of vascular access and close post-injection monitoring of the limb are essential to permit early diagnosis and improve the chances of limb salvage.

Declarations

Consent for publication: Written informed consent for publication of the clinical details and photographs was obtained from the patient's parents

Ethical approval: Ethical approval was obtained for this case report.

Conflict of interest: The authors declare no conflicts of interest.

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