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CASE REPORT

Digital Ischemia After Peripheral Intravenous Cannulation in Advanced Gastric Cancer: Successful Limb Salvage With Early Recognition and Multidisciplinary Management

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Abstract

Background

Digital ischemia following peripheral intravenous (IV) cannulation is a rare but serious vascular complication that can lead to tissue necrosis and limb loss if not recognised early. Patients with cancer have an increased risk of arterial thrombotic events, owing to cancer-associated prothrombotic mechanisms and, in some patients, treatment-related vascular injury.

Case Presentation

A 51-year-old woman with advanced gastric adenocarcinoma with Krukenberg tumour developed acute severe pain, swelling, and dusky discolouration of the left hand, predominantly involving the index, middle, and ring fingers, within 30–45 minutes of peripheral IV cannulation. The middle finger developed the most severe ischemic changes with focal fingertip necrosis. Examination showed a cold, tender, swollen hand with delayed capillary refill, while radial and ulnar pulses remained palpable and symmetrical. Bedside Doppler ultrasonography demonstrated reduced digital arterial flow without proximal arterial occlusion. The individual digital artery or arteries were not specified in the available clinical record, and repeat Doppler imaging was not documented. The cannula was removed immediately, external compression was relieved, the limb was elevated, and conservative pharmacological therapy was instituted. Progressive ischemic changes in the middle finger subsequently prompted limited fasciotomy. The index and ring fingers were managed conservatively. Clinical perfusion improved within 24–72 hours, and at 2–3 weeks there was no reported functional deficit or progression to gangrene/tissue loss. Formal goniometric range-of-motion measurements, quantitative sensory testing, pain scores, and exact measurements of the residual healing area were not documented.

Discussion

The temporal relationship, distal perfusion abnormality with preserved proximal pulses, and response to early intervention support a diagnosis of cannulation-associated distal digital ischemia. The exact mechanism could not be definitively established. A combination of local vascular injury, vasospasm, microvascular thrombosis, and/or infiltration-related tissue pressure

may have contributed. No angiographic confirmation or repeat Doppler study was available to distinguish vasospasm from thrombosis.

Conclusion

Sudden severe pain, swelling, and distal discolouration after peripheral IV cannulation should prompt immediate assessment for vascular compromise. Early removal of the cannula, relief of external compression, limb elevation, close neurovascular monitoring, and timely multidisciplinary review may limit tissue injury. In this case, the available evidence supports cannulation-related distal ischemia, but the precise mechanism remains uncertain.

Keywords

Peripheral intravenous cannulation; Digital ischemia; Oncology; Limb salvage; Palliative care; Fasciotomy

Introduction

Intravenous (IV) cannulation is one of the most frequently performed procedures in hospital practice and is associated with complications ranging from phlebitis and infiltration to clinically important vascular and tissue injury.[1-3]

Major complications involving the hand and forearm have been described, including skin necrosis, nerve injury and, rarely, compartment syndrome.[4]

Digital ischemia after peripheral IV cannulation is uncommon and may result from several mechanisms, including arterial spasm, thrombosis, inadvertent intra-arterial or peri-arterial injection, endothelial injury, and extravasation-related compression.[5-7]

Cancer is associated with an increased risk of arterial thromboembolic disease, and the risk is influenced by tumour burden, malignancy type, conventional cardiovascular risk factors, and cancer therapy.[8,11] Acute limb ischemia in patients with cancer is associated with substantial morbidity and mortality.[9]

There is insufficient evidence to establish repeated peripheral venous access or vascular fragility as specific risk factors for digital ischemia in patients with malignancy. The present event was temporally associated with peripheral IV cannulation in a patient with advanced gastric cancer, highlighting the importance of early recognition and multidisciplinary management.

Case Presentation

Patient information

A 51-year-old woman with biopsy-proven advanced gastric adenocarcinoma with Krukenberg tumour was admitted to the Pain and Palliative Care ward of a tertiary care centre for optimisation of cancer-related abdominal pain and supportive care. She had significant weight loss, poor oral intake, and required repeated peripheral IV access for administration of analgesics, fluids, and blood transfusions. The palliative care team was primarily responsible for her symptom management and bedside procedures.

Clinical event

A 20 G peripheral IV cannula was inserted on the dorsum of the left hand under aseptic precautions for routine medication administration. Within 30–45 minutes of cannulation, the patient developed severe burning pain followed by diffuse swelling of the entire left hand and

progressive discolouration involving the index, middle, and ring fingers, with the middle finger showing the most pronounced changes.

The bedside palliative care nurse noticed early cyanosis of the digits and immediately informed the palliative care physician. On urgent evaluation, the physician suspected evolving vascular compromise related to the recent cannulation.

Examination

The left hand was diffusely swollen. The index, middle, and ring fingers were cold, swollen, and tender, with dusky discolouration and early cyanosis. The middle finger demonstrated more severe ischemic changes with focal necrosis at the fingertip. Capillary refill time was delayed (>3 seconds) in the affected digits. Radial and ulnar pulses were palpable and symmetrical bilaterally, indicating preserved proximal arterial flow.

Investigations

Based on the clear temporal association with recent peripheral IV cannulation and the presence of distal perfusion deficits, a provisional diagnosis of acute digital ischemia was made clinically by the palliative care physician. Bedside Doppler ultrasonography demonstrated reduced digital arterial flow without proximal arterial occlusion. The individual digital artery or arteries were not specified in the available clinical record, and repeat Doppler imaging was not documented. Therefore, the Doppler findings could establish distal arterial flow reduction but could not reliably distinguish vasospasm from thrombosis. Routine laboratory investigations, including complete blood count, coagulation profile, and inflammatory markers, were within normal limits.

Management

The palliative care physician immediately removed the IV cannula, and the affected limb was elevated on pillows. Constrictive dressings and adhesive tapes were loosened to eliminate any external compression. Conservative pharmacological therapy was initiated, including:

- Aspirin 75 mg once daily.
- Pentoxifylline 400 mg three times daily.
- Topical nitroglycerin 2% ointment applied locally over the affected area.
- Enoxaparin 40 mg subcutaneously once daily, used empirically in view of the suspected microvascular thrombotic component and the patient's underlying malignancy-associated thrombotic risk; thrombosis was not independently confirmed.
- Multimodal analgesia, including paracetamol and titrated opioids, for ischemic pain relief.

The palliative care team ensured close bedside monitoring with serial neurovascular assessments, including skin colour, temperature, capillary refill time, swelling, and pain severity.

Despite initial stabilization, progressive ischemic changes and swelling remained most pronounced in the middle finger, prompting plastic surgery consultation. A limited fasciotomy of the middle finger was performed after this clinical deterioration. The available record does not document compartment-pressure measurement or a formally confirmed compartment syndrome; therefore, the indication is described as progressive localised swelling and ischemic compromise rather than a definitively established compartment syndrome. The exact interval between detection of swelling and fasciotomy was not recorded.

The index and ring fingers were managed conservatively because their perfusion improved without the progressive localised changes observed in the middle finger. The ring finger did not

develop documented necrosis or tissue loss. A vascular surgery opinion was obtained to exclude proximal arterial compromise and to guide further management.

Follow-up and outcomes

Clinical improvement was noted within 24 hours, with progressive improvement in distal perfusion over the following 72 hours. The index finger recovered with conservative management. The middle finger improved following limited fasciotomy, without progression to gangrene. The ring finger also showed restoration of perfusion and did not require surgical intervention. At 2–3 weeks, the available clinical assessment documented restoration of digital perfusion without clinically apparent functional impairment or progression to tissue loss. The post-recovery clinical image demonstrated substantial resolution of hand swelling and restoration of digital perfusion, with residual healing changes over the middle fingertip.

The original clinical record did not contain formal goniometric range-of-motion measurements, quantitative sensory testing, serial pain scores, or a measured area of residual necrosis. These parameters were therefore not available for quantitative assessment.



Figure 1. Clinical photograph demonstrating residual ischemic discoloration and distal tissue necrosis involving the fingertips of the index and middle fingers following peripheral intravenous cannulation. The photograph was taken during the clinical course after initiation of treatment.

Discussion

Peripheral IV cannulation is routine, but complications can range from minor infiltration and phlebitis to major hand and forearm injuries. In a retrospective series of IV catheter complications involving the hand and forearm, major complications included skin necrosis, compressive nerve lesions and compartment syndrome, demonstrating that clinically important tissue injury can follow peripheral IV access.[4]

The present case is notable for the rapid onset of severe burning pain and diffuse hand swelling within 30–45 minutes of cannulation, followed by cyanosis, delayed capillary refill, and focal

fingertip necrosis. Preserved radial and ulnar pulses with reduced distal digital arterial flow favoured a distal arterial or digital vascular process rather than proximal arterial occlusion. Similar patterns of hand ischemia can arise from vasospasm, thrombosis, endothelial injury, embolic phenomena, or external compression, and clinical findings alone may not distinguish these mechanisms.[5,6]

The exact mechanism in this patient could not be definitively established. The temporal relationship to cannulation makes a cannulation-related vascular insult likely, but the available investigations were insufficient to identify whether the dominant process was vasospasm, thrombosis, peri-arterial injury, or extravasation/infiltration. In particular, no angiography was performed and the individual digital arteries were not documented on Doppler. The rapid onset and subsequent improvement could be compatible with a reversible vasomotor or pressure-related component, whereas the empiric use of antiplatelet and anticoagulant therapy reflected concern for a possible thrombotic contribution rather than proof of thrombosis.

Diffuse swelling involving the hand after peripheral IV access may occur with infiltration or extravasation. Severe extravasation-related swelling can cause substantial tissue swelling and, in reported cases, has been associated with compartment syndrome requiring surgical decompression.[7,10] In the present case, the diffuse swelling and multi-digit involvement therefore raise extravasation/infiltration-related pressure as a possible contributor, but extravasation was not objectively demonstrated and the mechanism cannot be considered proven.

The patient's advanced malignancy is relevant because cancer is associated with an increased risk of arterial thrombotic disease through tumour-associated procoagulant activity, platelet activation, endothelial dysfunction, and treatment-related vascular effects.[8,11] Acute limb ischemia in patients with cancer also carries substantial morbidity and mortality.[9] However, these data do not establish that malignancy caused the digital ischemia in this case.

The decision to limit surgery to the middle finger was based on the localised progression of ischemic and swelling changes in that digit despite initial conservative treatment. The index and ring fingers improved with conservative management. Because a formal compartment-pressure measurement was not recorded, the fasciotomy should not be interpreted as confirmation of compartment syndrome; rather, it was a targeted decompressive intervention undertaken in the setting of progressive localised compromise. The principal strength of this case is the early bedside recognition of distal vascular compromise and rapid removal of the cannula, followed by close serial neurovascular assessment and multidisciplinary escalation. Its principal limitations are the absence of angiographic confirmation, lack of documented repeat Doppler imaging, incomplete documentation of the duration of pharmacological therapy, absence of formal compartment-pressure measurement, and limited objective functional outcome measurements. These limitations preclude definitive assignment of mechanism and should be considered when interpreting the favourable outcome.

Conclusion

Digital ischemia after peripheral IV cannulation is rare but potentially limb-threatening. Sudden severe pain, diffuse swelling, cyanosis, and delayed capillary refill after cannulation should prompt immediate assessment for distal vascular compromise. Early removal of the cannula, relief of external compression, limb elevation, close neurovascular monitoring, and timely multidisciplinary review may limit tissue injury. In this case, the clinical course supports cannulation-associated distal digital ischemia; however, the precise mechanism could not be definitively established and may have involved more than one vascular or pressure-related process.

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Declarations

Ethics Approval

A separate institutional ethics committee approval statement was not present in the submitted manuscript. Per IJPC policy, formal ethics committee clearance is not required for case reports; see Patient Consent below for the consent statement provided by the authors.

Consent for Publication

Written informed consent was obtained from the patient (or her legally authorised representative) for publication of the clinical details and images in anonymised form, in accordance with institutional policy and the Declaration of Helsinki.

Conflict of Interest

Not disclosed by the authors.

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Author Contributions

SS and SK contributed to conception and manuscript drafting. MS and RAK contributed to literature review and clinical management of the case. All authors contributed to critical revision and approved the final manuscript.