

# Dry Gangrene of Hand Secondary to Repetitive Intravenous Drug Abuse: A Case Series

Jagdeep Singh<sup>1</sup>, Jashandeep Singh Kulaar<sup>1</sup>, Sukhmanjit Brar<sup>2</sup>, Ajay Kumar<sup>1</sup>

## Learning Point of the Article:

- Intra-arterial drug injection is a common but under-recognized complication of intravenous drug abuse that can lead to severe vascular damage.
  - Early diagnosis and intervention are crucial to prevent irreversible tissue damage and limb loss.
- Healthcare providers must be aware of the vascular risks in intravenous drug users and should act quickly to identify and manage complications, even when symptoms initially appear mild.

## Abstract

**Introduction:** Inadvertent intra-arterial drug injection is a serious complication of intravenous (IV) drug use that can lead to severe vascular damage, including ischemia, gangrene, and amputation. Although such cases are well-documented, there is limited emphasis on the importance of early diagnosis and intervention in preventing severe outcomes. This case series reports on patients who experienced gangrene of the upper limbs as a result of IV intravenous drug use, highlighting the significant clinical consequences of delayed treatment.

**Case Report:** We present a series of five male patients aged 21 to –30 years who presented with upper limb gangrene caused by repetitive IV intravenous drug use. The patients, all of whom were positive for human immunodeficiency virus HIV or Hepatitis C, had varying durations of drug abuse, with their symptoms ranging from 10 to 30 days before presentation. The clinical findings included dry gangrene, pain, and blackening of fingers, requiring surgical interventions such as partial or complete amputation. Diagnostic imaging such as Doppler ultrasound and computed tomography CT angiography was not performed in some cases due to patient refusal or financial constraints.

**Conclusion:** This case series emphasizes the critical need for early recognition and timely intervention in cases of IV intravenous drug-induced ischemia. Surgical management was necessary in all cases, but earlier medical treatments, including vasodilators and thrombolytics, may have improved outcomes. This report serves to increase awareness of the complications associated with IV intravenous drug use. It underscores the need for healthcare providers to be vigilant in promptly diagnosing and managing such cases. The clinical impact extends beyond orthopaedics, contributing to the broader understanding of vascular complications related to IV intravenous drug abuse.

**Keywords:** Intra-arterial drug injection, gangrene, amputation, intravenous drug abuse, vascular compromise.

## Introduction

Recreational drug use, mainly through intravenous (IV) administration, poses a significant global health challenge, leading to both systemic and local vascular complications. While

systemic issues such as infections and overdoses are well-documented, severe local vascular damage caused by IV intravenous drug use remains underreported despite its potential for severe outcomes.

## Author's Photo Gallery



Dr. Jagdeep Singh



Dr. Jashandeep Singh Kulaar



Dr. Sukhmanjit Brar



Dr. Ajay Kumar

Access this article online

Website:  
www.jocr.co.in

DOI:  
<https://doi.org/10.13107/jocr.2025.v15.i05.5614>

<sup>1</sup>Department of Orthopaedics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India,  
<sup>2</sup>Department of Orthopaedics, AIIMS Bhopal, Bhopal, Madhya Pradesh, India.

### Address of Correspondence:

Dr. Jashandeep Singh Kulaar,  
Department of Orthopaedics, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India.  
E-mail: jashankulaar20@gamil.com

Submitted: 25/02/2025; Review: 05/03/2025; Accepted: April 2025; Published: May 2025

DOI: <https://doi.org/10.13107/jocr.2025.v15.i05.5614>

© The Author(s). 2025 Open Access. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Event	Case 1	Case 2	Case 3	Case 4	Case 5
Age (year)	29	23	21	27	22
Symptom onset	30 days before presentation	15 days before presentation	10 days before presentation	15 days before presentation	12 days
Primary concern	Pain and blackening of left-hand fingers and palm	Pain and discoloration of right palm, fingers and forearm	Pain and blackening of right-hand fingers	Blackening of fingers till MCP joint	Blackening of fingers and thumb tips
Duration of drug abuse	2 years	1.5 years	1 year	5 years	6 months
Site of drug abuse	Left elbow	Right elbow	Right elbow	Right elbow and forearm	Right elbow
Comorbidity	HIV, HCV	HCV	HCV	HIV, HCV	HCV, HIV
Smoking History	Non smoker	Non smoker	Non smoker	Non smoker	Non smoker
Diabetic	NO	NO	NO	NO	NO
Past interventions	None	None	None	Amputation of little finger following blackening	None
Imaging conducted	None (refused)	Doppler revealed ulnar thrombosis and radial artery stenosis	Doppler revealed thrombophlebitis of cephalic vein	None (refused)	CT angiography
Surgical intervention	Below-elbow amputation	Below-elbow amputation	Partial finger amputation	Ray amputation	Below elbow amputation
Postoperative outcomes	Discharged, no follow-up	Discharged, no follow-up	Discharged	Discharged	Discharged
<b>HIV: Human immunodeficiency virus, HCV: Hepatitis C virus, MCP: Metacarpophalangeal, CT: Computed tomography</b>					

**Table 1:** Summary of Data of Five Patients

Intra-arterial drug injection (IADI), a familiar yet often unintentional phenomenon first described by Van Der Post in 1942, can lead to life and limb-threatening conditions such as acute ischemia, gangrene, pseudoaneurysms, rhabdomyolysis, and compartment syndrome [1, 2]. These complications, if not promptly identified and treated, may result in irreversible tissue loss, amputation, or death.

Due to the complex pathogenesis and variety of injected substances, there are no universal evidence-based guidelines regarding the management of inadvertent IADI [3]. Current management strategies prevent further vascular compromise and restore blood flow. Early interventions, including anticoagulation, vasodilation, thrombolysis, hyperbaric oxygen therapy, and embolectomy, can help prevent tissue necrosis. [2]. In a case study involving IADI, a multi-drug regimen of anticoagulants, vasodilators, and thrombolytic agents effectively resolved ischemic effects, while fasciotomy contributed to successful limb salvage. [4]. However, the

effectiveness of these interventions is highly reliant on timely diagnosis and rapid treatment. When medical consultation is delayed, and necrosis and gangrene have already set in, surgical intervention, such as excision of necrotic tissue or amputation, is often the only viable treatment option. [5]. A study evaluated 48 patients over 17 years, all receiving the same treatment protocol, and found that 12 of the 13 patients who developed tissue necrosis ultimately required amputation. [6].

In this retrospective case series, we present five patients who reported at a tertiary care hospital with upper limb gangrene following repetitive IVintravenous drug use. These cases underscore the severe vascular complications that can arise from IVintravenous drug use, particularly when there is delayed medical intervention. By detailing the clinical presentations, management strategies, and outcomes of these cases, we aim to increase awareness among healthcare providers about the risks of IVintravenous drug use and highlight the necessity of early diagnosis and intervention to prevent irreversible tissue loss.



## Case Report

### Case 1: 29-year-old male with left-hand gangrene

#### Presentation:

A 29-year-old male presented with a 30-day history of progressive blackening and pain in his left hand, fingers and palm. He reported repetitive IV use of heroin and methadone over two years, with injection sites around the left wrist, forearm, and elbow. The patient was human immunodeficiency virus (HIV) and Hepatitis C virus (HCV) positive, with no significant family history of vascular or genetic disorders.

On physical examination, dry necrosis extended from the fingers to the wrist joint, with no detectable distal pulses. Clinical findings suggested vascular occlusion at the distal forearm level.

#### Investigations:

Imaging studies were not performed due to the patient's financial constraints.

#### Intervention:

A below-elbow amputation was performed based on clinical judgment. Postoperatively, the patient received IV intravenous antibiotics for five days.

#### Outcome:

The patient was discharged in stable condition but did not attend follow-up visits.

### Case 2: 23-year-old male with right-hand gangrene

#### Presentation:

A 23-year-old male presented with a 15-day history of worsening pain and discoloration in his right hand, progressing to dry gangrene. He reported a history of oral buprenorphine use that transitioned to IV use 1.5 months prior. Injection sites were primarily on both forearms near the elbow, with greater involvement on the right side.

On examination, dry gangrene extended from the fingertips to the metacarpophalangeal (MCP) joints, with cyanosis and mottling up to the mid-forearm.

#### Investigations:

Doppler ultrasonography/ultrasound (USG) and computed tomography (CT) angiography confirmed significant vascular compromise, including ulnar artery thrombosis and radial artery stenosis, contributing to distal blood flow loss.

#### Intervention:

A below-elbow amputation was performed. Postoperatively, the patient received IV intravenous antibiotics for five days.

#### Outcome:

The patient was discharged in stable condition but did not return for follow-up.

### Case 3: 21-year-old male with right-hand gangrene

#### Presentation:

A 21-year-old male presented with a 10-day history of blackened fingers and palm of his right hand following repetitive IV use of heroin, buprenorphine, methadone, and butorphanol over one year. The patient had no known infections such as HIV or HCV.

On examination, dry gangrene involved the MCP joints of the index finger and the proximal interphalangeal (PIP) joints of the thumb, middle, and little fingers, with discoloration over the dorsum of the hand.

#### Investigations:

Doppler ultrasound USG revealed thrombophlebitis of the cephalic vein without significant arterial involvement. CT angiography was not performed due to financial constraints.

#### Intervention:

Partial amputation of the gangrenous fingers was performed, including nibbling and closure at the PIP joint of the thumb, middle, and little fingers, and the MCP joint of the index finger. Postoperative care included IV intravenous antibiotics for five days.

#### Outcome:

The patient recovered well post-surgery but did not attend follow-up visits.

### Case 4: 27-year-old male with recurrent finger gangrene

#### Presentation:

A 27-year-old male presented with a 15-day history of progressive blackening of the right index and middle fingers, extending to the MCP joint. He reported repetitive IV drug use for five years, including fentanyl. Three months prior, he underwent amputation of the little finger at the PIP joint following gangrene.

On examination, dry gangrene affected the index and middle fingers, with skin changes on the palmar aspect of the hand.

#### Investigations:

USG A-V Doppler was recommended, but the patient declined imaging studies.

#### Intervention:

Ray amputation was performed. Postoperatively, the patient received IV intravenous antibiotics for five 5 days.

#### Outcome:

The patient was discharged in stable condition but did not return for follow-up visits.

### Case 5: 22-year-old male with early early-stage gangrene

#### Presentation:

A 30-year-old male presented with a 10-12-day history of blackening of the fingertips and thumb of his right hand. He admitted to repetitive IV drug use over six months, primarily injecting buprenorphine near the right wrist. The patient was HCV and HIV positive.

On examination, dry necrosis was limited to the tips of the fingers, thumb, and palm and dorsum of the right hand.

#### Investigations:

CT angiography was done, and it showed blockage of the Ulnar artery at its origin.

#### Intervention:

Below elbow amputation was done at the level of the mid forearm.

#### Outcome:

Patient The patient was discharged in good condition and loose to follow follow-up.

### Summary of key findings

In Case 1, the patient's refusal of Doppler imaging and CT angiography due to financial limitations complicated the assessment of vascular compromise and may have delayed optimal intervention. Similarly, CT angiography could not be performed in Case 3. All patients were discharged in stable condition following surgery. However, the lack of follow-up

made it impossible to fully assess the long-term success of the interventions and potential complications, including infection or further disease progression. as shown in Table 1.

### Discussion

Inadvertent IADI is a well-documented complication, especially in long-term addicts with sclerosed superficial veins. Such injections can lead to vasospasm, thrombosis, ischemia, compartment syndrome, and eventually gangrene. This case series highlights the vascular complications arising from IV intravenous drug use, particularly when medical intervention is delayed. All five patients presented with severe gangrene of the upper extremities, necessitating surgical intervention in the form of partial or complete limb amputations.

Literature indicates that the average amputation rate among patients experiencing ischemic complications following IADI intra-arterial drug injections is 29%. [7]. Consistent with previous studies, the amputation rate in this case series was significant.

### Pathogenesis of vascular injury

The vascular complications associated with IADI are multifactorial. Direct endothelial damage occurs due to the chemical properties of the injected substances and their metabolites. This is compounded by secondary effects, such as:

- Vasospasm: Triggered by irritants in the drug formulation.
- Toxic vasculitis: Caused by contaminants or additives.
- Thrombosis: Resulting from mechanical trauma and chemical irritation, leading to arterial obstruction and tissue ischemia.

Studies indicate that unintentional intra-arterial injection leads to a cascade of ischemic events characterized by vasospasm, inflammation, and thrombosis, ultimately resulting in irreversible tissue necrosis if not treated promptly [7].

### Management strategies in literature

The management of ischemic complications from IV intravenous drug use, particularly intra-arterial injections, requires rapid intervention to restore blood flow and prevent tissue necrosis. Following an intensive treatment protocol combining vasodilators, anticoagulants, antibiotics, steroids, and thrombolysis, 13 out of 16 patients developing limb ischemia had normal extremities with no morphological or functional alterations [8]. Ipaktchi et al. also reported successful thrombolytic management of an ischemic hand 18 hours after an accidental intra-arterial injection into the ulnar artery. [3].

IADI patients who received treatment within 24 hours after injection have significantly better outcomes, while delays in





treatment lead to higher rates of amputation. [6,8]. Unfortunately, these patients often hide their history of drug abuse and delay seeking medical attention. [5]. The damage is frequently advanced when they present to healthcare services. The rapid progression of gangrene in the patients included in this case series underscores the need for early intervention to prevent irreversible damage. In these cases, the opportunity to restore blood flow and avoid tissue death was likely missed due to late presentation and extensive tissue damage.

### Case series findings and comparison with literature

This case series emphasizes the critical need for early recognition and management of IV drug-induced ischemia to prevent irreversible damage. Healthcare providers should be vigilant in identifying early signs of vascular compromise, even when symptoms appear mild. Prompt imaging, such as Doppler ultrasound USG or CT angiography, can provide diagnostic and therapeutic benefits by assessing disease progression and aiding in prognosis. [3,5].

This study is limited by its small sample size. In addition, the absence of follow-up in these cases is a significant limitation, preventing the assessment of long-term outcomes, including infection risk, stump healing, and overall limb function. This highlights broader socioeconomic factors that played a significant role in the delayed presentation, refusal of diagnostic evaluations, and lack of follow-up common issues in managing IV drug users. Future studies should explore structured follow-up programs and outreach efforts to ensure that IV drug users receive the care they need to prevent catastrophic outcomes such as limb amputation.

### Challenges in the management of IV drug users

This study highlighted several challenges in the management of IV drug users:

1. Delayed presentation: Patients often conceal their drug abuse history, leading to delays in seeking medical care until complications are severe.
2. Limited diagnostic resources: Financial and logistical barriers frequently hinder access to imaging and advanced interventions.
3. Lack of follow-up: None of the patients in this series returned for postoperative follow-up, reflecting a significant gap in continuity of care.

These challenges emphasise emphasize the need for tailored healthcare approaches, including early outreach, patient education on the risks of IV drug use, and structured follow-up programs to mitigate long-term complications.

### Other causes of dry gangrene

1. Diabetic vasculopathy
2. Peripheral arterial disease
3. Buerger's disease
4. Cellulitis
5. Trauma
6. Raynaud's disease.

### Conclusion

Inadvertent intra-arterial injection in IV drug users can result in severe complications such as ischemia, gangrene, and the need for amputation. While surgical intervention is often necessary when catastrophic complications develop, early recognition and medical treatment - including anticoagulants, vasodilators, and thrombolytic therapy may improve outcomes and prevent tissue damage and limb loss. This case series serves as a reminder of the critical importance of early diagnosis and intervention in these cases to reduce the likelihood of severe adverse sequelae.

### Diagnostic Criteria for early diagnosis to prevent gangrenous changes

1. Clinical symptoms : Numbness, pain , swelling, discoloration , breaks in the skin, cold peripheries, discharge
2. Clinical signs : Delayed or absent capillary refill, reduced or absent distal pulses
3. Clinical test : Allen test - to check patency of radial and ulnar arteryarteries.
  1. The patient is asked to clench both fists tightly for 1 minute at the same time.
  2. Pressure is applied over the radial and ulnar arteries simultaneously so as to occlude them.
  3. The patient then opens the fingers of both hands rapidly, and the examiner compares the colour of both. The initial pallor should be replaced quickly by rubor.
  4. The test may be repeated, this time occluding the ulnar arteries.
4. Imaging test :
  - A. (A) Ultrasound USG color Doppler (arteriovenous)
  - B. (B) CT scan (angiography).

## Clinical Message

This case series highlights the importance of early detection and intervention in managing vascular complications resulting from IV intravenous drug abuse. Although severe complications, including gangrene and amputation, were necessary outcomes in these cases, timely medical management such as vasodilators and thrombolytics could prevent irreversible tissue loss and improve the prognosis. The report underscores the need for healthcare providers to remain vigilant in diagnosing and managing ischemic conditions in drug users to avoid catastrophic outcomes.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil    **Source of support:** None

## References

1. Van Der Post CW. Report of a case of mistaken injection of pentothal sodium into an aberrant ulnar artery. *Anesth Analg* 1942;21:58-9.
2. Sen S, Chini EN, Brown MJ. Complications after unintentional intra-arterial injection of drugs: Risks, outcomes, and management strategies. *Mayo Clin Proc* 2005;80:783-95.
3. Ipaktchi K, Ipaktchi R, Niederbichler AD, Vogt PM, Knobloch K. Unrecognized hand ischemia after intraarterial drug injection: Successful management of a "near miss" event. *Patient Saf Surg* 2008;2:32.
4. Silverman SH, Turner WW Jr. Intraarterial drug abuse: New treatment options. *J Vasc Surg* 1991;14:111-6.
5. Foster SD, Lyons MS, Runyan CM, Otten EJ. A mimic of soft tissue infection: Intra-arterial injection drug use producing hand swelling and digital ischemia. *World J Emerg Med* 2015;6:233-6.
6. Treiman GS, Yellin AE, Weaver FA, Barlow WE, Treiman RL, Gaspar MR. An effective treatment protocol for intraarterial drug injection. *J Vasc Surg* 1990;12:456-65; discussion 465-6.
7. Devulapalli C, Han KD, Bello RJ, LaPorte DM, Hepper CT, Katz RD. Inadvertent intra-arterial drug injections in the upper extremity: Systematic review. *J Hand Surg Am* 2015;40:2262-8.e5.
8. Rohm S, Staab H, Schulz H, Richter O, Aust G. Good clinical outcome after accidental intra-arterial injection of flunitrazepam tablets in 16 drug abusers with critical limb ischaemia. *Eur J Vasc Endovasc Surg* 2014;47:61-7.
9. Goldberg I, Bahar A, Yosipovitch Z. Gangrene of the upper extremity following intra-arterial injection of drugs. A case report and review of the literature. *Clin Orthop Relat Res* 1984;188:223-9.
10. Rai KM, Rao KS, Maudar KK. Accidental intra-arterial drug injection: A case report. *Med J Armed Forces India* 1997;53:137-9.

**Conflict of Interest:** Nil

**Source of Support:** Nil

**Consent:** The authors confirm that informed consent was obtained from the patient for publication of this case report

### How to Cite this Article

Singh J, Kulaar JS, Brar S, Kumar A. Dry Gangrene of Hand Secondary to Repetitive Intravenous Drug Abuse: A Case Series. *Journal of Orthopaedic Case Reports* 2025 May;15(5): 212-217.

