A mimic of soft tissue infection: intra-arterial injection drug use producing hand swelling and digital ischemia

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BACKGROUND: Inadvertent intra-arterial injection of illicit substances is a known complication of injection drug use and can lead to severe complications, including infection, ischemia and compartment syndrome. Identifying complications of intra-arterial injection can be difficult, as clinical manifestations overlap with other more common conditions such as cellulitis and soft tissue infection, and a history of injection drug use is frequently not disclosed.

METHODS: A 37-year-old male patient presented with 24 hours of right hand pain, erythema and swelling. Despite classic “track marks”, he denied a history of injection drug use, and vascular insults were not initially considered. After failing to respond to three days of aggressive treatment for suspected deep-space infection, an arteriogram demonstrated findings consistent with digital ischemia of embolic etiology.

RESULTS: As a result of the delay in diagnosis, the lesion was not amenable to reperfusion and the patient required amputation of the distal digit.

CONCLUSION: Practitioners should be alert to the possibility of intra-arterial injection and resulting complications when evaluating unusual extremity infections or unexplained ischemic symptoms, even in the absence of a definite history of injection drug use.

KEY WORDS: Intra-arterial injection; Opioid abuse; Injection drug use; Digital ischemia

INTRODUCTION

Inadvertent intra-arterial injection of illicit substances is a known complication of injection drug use, particularly in later stages of abuse when venous sclerosis makes parenteral access more difficult. Intra-arterial injection can lead to severe complications, including infection, ischemia and compartment syndrome.¹⁻³ Complications may be even more severe when oral agents are injected parenterally,¹⁻²,⁴ an increasingly common practice⁴⁻⁶ that seems likely to increase further given the current epidemic of prescription drug abuse occurring internationally.⁷ Identifying complications of intra-arterial injection can be difficult, as clinical manifestations (e.g. edema, erythema, and pain) overlap with other more common conditions such as cellulitis and soft tissue infections, the prevalence of which are also increasing.⁸ To date, there are few reports of intra-arterial injection complications within the emergency medicine literature⁹⁻¹¹ and none reporting initial misdiagnosis as infection. Herein, we present a case where ischemic complications of intra-arterial injection were misinterpreted as deep space hand infection, resulting in delayed diagnosis and therapy. Clinicians should be aware of the likely impending increase in intra-arterial injection complications, the breadth of complications which may result, and the potential for misdiagnosis.
CASE REPORT

A 37-year-old man was transferred to a tertiary care facility for evaluation of right hand pain and swelling that had developed over the previous 48 hours. He had presented twice to a community emergency department over the prior 24 hours and had been treated with cephalexin for a diagnosis of cellulitis. Rapid progression despite therapy eventually led the referring center to suspect deep space hand infection, begin vancomycin and pipericillin/tazobactam, and request transfer for consultation by hand surgery.

Upon arrival at the receiving center, the patient demonstrated a blood pressure of 187/73 mmHg, pulse of 73 beats per minute, and temperature of 97.9 °F. Examination of the right upper extremity revealed diffuse mottling and scattered areas of erythema. Punctate, linear skin lesions along vascular distributions were noted (Figure 1), though he denied a history of injection drug use. His thenar compartment was moderately tense, with significant pain on passive extension and flexion at the first metacarpal joint. Initial diagnostics revealed a white blood cell count of 19 700/µL and serum creatine kinase total of 5 494 U/L. The compartment pressures were normal. Computed tomography demonstrated hypoattenuation of the thenar eminence and surrounding musculature without abnormal enhancement or soft tissue gas. At this point, the patient was diagnosed with an advanced cellulitis and possible early involvement of the deep space. He was hospitalized with plans for extremity elevation and continuation of broad spectrum IV antibiotics.

Over the ensuing 36 hours, the patient was taken to the operating room twice for incision and drainage due to clinical progression. Neither procedures revealed purulent or necrotic material, and eventually an ischemic etiology was considered. Angiography demonstrated a congenitally absent superficial arch and an abrupt filling defect within the proximal radial aspect of the deep palmar arch, with no filling of the princeps pollicis artery supplying the thumb, consistent with an embolic insult (Figure 2). Combined with the classic appearance of “track marks” overlying the affected radial artery (Figure 1), this strongly supported inadvertent intra-arterial injection as the etiology though the injected substance remained unknown. Vascular bypass was considered but not pursued, as success was thought to be unlikely and there was a concern that the attempt might further compromise remaining collateral flow. As such, the ischemic area was allowed to demarcate (Figure 3). Nine weeks after symptom onset, the patient underwent amputation of the distal first digit.

DISCUSSION

The prompt diagnosis of complications from inadvertent intra-arterial drug injection, particularly when not iatrogenic, may be challenging for a variety of reasons. In this case, non-specific physical exam findings and omitted history of intravenous drug abuse were major contributors to diagnostic delay. Also, since the clinical presentation of skin and soft tissue infection can
be similar to the presentation of vascular complications of drug abuse, we suggest that the higher frequency of the former and lower frequency of the latter may bias the clinician toward initial misdiagnosis. Maintaining a high index of suspicion for vascular complications of injection drug use may help to reverse this tendency.

In circumstances where the history of parenteral drug abuse is known or highly suspected, we suggest that intra-arterial injection-related complications be readily included in the differential diagnosis of any significant skin or soft tissue lesion, particularly those involving the extremities. When the history is less clear, however, there are a variety of manifestations which may suggest such a complication. In the acute setting, these may include intense pain, neuromuscular symptoms such as paresthesias or impaired motor function, and cutaneous findings such as flushing, mottling or lividity. In the subacute presentation, findings suggestive of compartment syndrome or vascular compromise, such as pulselessness or tissue necrosis, may be present.

When clinical findings are highly suggestive of a vascular process, traditional angiography may offer both diagnostic and therapeutic potential. However, when the diagnosis is uncertain, computed tomography (CT) angiography may be more helpful in discriminating between a vascular process and entities such as soft tissue infection or deep-space abscess. Additionally, where the clinical presentation raises concern for developing compartment syndrome, the initial evaluation should include the measurement of compartment pressures.

The pathophysiology of ischemia following intra-arterial injection remains poorly understood. Current evidence suggests a multifactorial etiology, including elements of arterial spasm, direct intimal trauma, toxic or hypersensitivity vasculitis, and embolism of insoluble particulate matter. Additives to oral drugs, such as coloring agents, binders and fillers may cause or contribute to the vascular injury, as may cutting agents or contaminants found in illicit substances. Overall morbidity of intra-arterial injection is high, though likely variable depending on which agent is injected. Amputation is often necessary even with aggressive therapy.

Optimal therapy remains controversial given the absence of controlled efficacy studies. While identification of the injected agent is desirable, current evidence supports a broad and multimodal therapeutic approach rather than one tailored to the offending substance. Commonly reported interventions include anticoagulation, localized thrombolysis, fasciotomy, arterial vasodilation, corticosteroids and volume expansion with infusions of low molecular weight dextran solutions. Extremity sympathectomy and hyperbaric oxygen therapy have also been reported. Ultimately, desirable outcomes may require multiple treatment modalities and intensive treatment algorithms, such as recently described by Rohm et al. Among a cohort of 16 patients with limb ischemia following intra-arterial injection of crushed benzodiazepine tablets, 13 demonstrated complete resolution through the combination of anticoagulation, pain control, and alternating localized infusions of recombinant tissue plasminogen activator and prostaglandin E1. Although unknown, it seems intuitive that delay to therapy would reduce treatment benefit regardless of approach.

While virtually all narcotics have been reported to cause severe complications, one substance that has gained particular attention in recent case series is the partial opioid agonist buprenorphine. Frequently prescribed to treat opioid dependence and prevent withdrawal, this substance is the most commonly injected drug in Finland, the most common cause of vascular complication in India, and has been injected by up to 40% of those who are prescribed the medication in Australia and France. Since its FDA approval in 2002 for the treatment of opioid dependence, use in the United States has been rapidly expanding, and there have already been reports of widespread abuse.

In conclusion, given rising rates of prescription drug abuse, it is likely that the incidence of ischemia following intra-arterial injection will continue to rise. While intra-arterial injection can be dramatic in presentation, the history of parental drug use is often omitted and clinical presentations have features overlapping other conditions such as necrotizing fasciitis, cellulitis, and deep space infection. Although optimal treatment remains unknown, successful limb salvage likely relies on prompt diagnosis. Clinicians should be alert to the possibility of intra-arterial injection and resulting complications when evaluating unusual extremity infections or unexplained ischemic symptoms, even in the absence of a definite history of injection drug abuse.

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