

## Gangrene of the Fingers after Accidental Intra-Arterial Injection of Diazepam in Mali: Case Report and Review of the Literature

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### ABSTRACT

*Accidental intra-arterial injection of medicine although rare is a serious complication of the intravenous treatment. The first clinical observations of iatrogenic intra-arterial injection were published since 1940. Major incident in health care, its consequences can be devastators such as skin necrosis, severe acute ischemia and amputation. This accident is less known by the caregivers. We report a case of distal gangrene of the fingers occurred after an accidental intra-arterial injection of Diazepam in a 21-year-old young man in a psychiatric context. The aim of this case report was to determine some risk factors, to identify immediate symptoms and treatments available in order to inform medical staff for this unhappy and serious incident.*

### Keywords

Digital necrosis, Accidental, Iatrogenic intra-arterial injection, Drugs.

### Introduction

The intra-arterial accidental injection of some drugs to the upper limbs is a serious complication of intravenous treatment but rarely described. The incidence and first clinical cases of iatrogenic intra-arterial injection have been published since the 1940s [1]. Historically the majority of the observed morbidity were related to accidental intra-arterial injection of barbiturates and benzodiazepines widely used for sedation in general anaesthesia [2]. Major incident in health care, its consequences can be devastating, ranging from skin necrosis to severe acute ischemia or the amputation of the limb. It remains however less known in healthcare services. We report a case of distal gangrene of fingers occurred after an iatrogenic intra-arterial injection of Diazepam in a medical service of our institution. The aim of this work was to determine some risk factors, to identify the immediate symptoms and available treatments in order to educate caregivers about this unfortunate and serious incident.

### Case Presentation

A. D, 21 years old, student in 1st year of university, without specific

medical history, was admitted in emergency to the department of Psychiatry of the teaching hospital of Point G for behavioural disorders with aggressiveness. His psychiatric disorders would have started 2 months ago by a sudden appearance of hallucinatory disorders, confusion and reciting Koranic verses. The parents of the patient after having qualified the symptoms as the "Devil" started unsuccessful traditional treatment. Due to the aggressiveness of the patient, the parents decided to consult the psychiatric department on May 23rd, 2014. After the clinical examination and due to the persisting aggressiveness, the patient was injected 20 mg of Diazepam by intravenous route. The injection was made a little above the crease of the right elbow. Within minutes of this intravenous injection, the patient experienced severe pain at the point of injection subsequently spreading to the forearm and hand. The pain was so atrocious so that the patient tapped his hand against the wall to be able to relieve it. In this psychiatric context, other medications like (Largactil® and Nozinan®) were associated by intra muscular route. After 72 hours, a severe swelling of the hand, numbness of the fingers, weakness of the right upper limb and cyanotic spots were observed. These symptoms were related according to caregivers to the trauma of the hand. At the 10th day after the injection, necrotic areas on the fingers and a distal gangrene of the thumb were observed, and a Doppler ultrasound of upper limb has detected a defect intimal at

the brachial artery flow with damping blood in the radial and ulnar arteries downstream. Heparin therapy with low-molecular-weight heparin type Enoxaparin 4000 IU every 12 hours was instituted associated with an elevation of the limb. A surgery consultation was performed in the 2nd week after injection. At the physical examination, the vascular surgeon observed a necrosis of the distal phalanx of the thumb, the beaches of palmar and digital necrosis associated with an abolition of the radial pulse, a weak ulnar and humeral pulse (Figure 1). The diagnosis of iatrogenic intra-arterial injection of Diazepam was established. Antibiotic therapy and passive mobilization of fingers were associated with treatment. The anticoagulant treatment lasted seven days then relayed by aspirin at antiplatelet dose (100mg). Three weeks after the injection, we performed a distal amputation of the thumb with digital necrosectomy (Figure 2). The post-surgery outcome was simple no requiring a skin graft but functional and psychological sequels persist after 12 months in the young student.



**Figure 1:** Necrosis of the distal phalanx of the thumb.



**Figure 2:** Distal amputation of the thumb with digital necrosectomy.

### Comments

The incidence of accidents related to intra-arterial injection of drugs reported in the literature remains low. All emergency care actors frequently using intravenous injections should know the signs or symptoms, consequences and treatment of intra-arterial injection accidents.

The list of the drugs most commonly implicated has grown from a few sedatives (diazepam, thiopental, Promethazine, Propofol)

to a diverse group of substances (floxacilline, depo-Medrone, narcotics) [2,3]. Nowadays, the subgroup of drug addicts is a high-risk population due to their practice of self-injection of narcotics [4].

The clinical symptomatology remains dominated by acute pain occurring 20-30 seconds after the start of injection followed by signs of ischemia. The onset of sensory-motor neurological disorders such as numbness, paraesthesia, anaesthesia, paralysis must evoke the diagnosis. Skin lesions type of necrosis or gangrene will appear secondarily in the absence of appropriate treatment. Beyond one week the vasculature of the limb is highly compromised with often disabling sequels.

The mechanisms involved into the lesions following an accidental intra-arterial drug injection are uncertain. Several theories have been advanced. The signs or symptoms observed are related to arterial spasm caused by norepinephrine release, thrombosis caused by haemolysis and relegation of adenosine diphosphate, source of platelet aggregation, inflammation of the endothelium or direct toxicity of certain products leading to a destruction of the endothelium, the precipitation and the formation of microcrystals with obstruction of small vessels, liposolubility and a high osmolality [2].

Some factors may increase the risk of accidental intra-arterial injection. Anatomical variations in arterial vascularization of the upper limb with superficial radial artery in the forearm and the back of the hand sometimes not known are often encountered [2]. The brachial artery can be easily punctured instead of the basilica vein just above the elbow in the ulnar fossa due to the proximity of the two vessels [5]. This could explain the present case. As the pain is the main symptom; patients with coma, patients under general anaesthesia, unbalanced or mental disabilities and children unable to exteriorize their pain are groups at high risk of accidental intra-arterial injection. Given the psychiatric context with aggressiveness associated with other antipsychotic medications, pain was unnoticed in this case. Obesity, some skin diseases, history of difficult venous access, and the presence of radial catheter for invasive pressure can be high-risk factors. Big sedated patients in the ICU, intubated, ventilated and monitored with several infusion lines are often sources of error of accidental intra-arterial injection.

The Doppler ultrasound with colour is a relevant and indispensable tool in the diagnosis but it should not delay the patient's treatment as observed in this case. The arteriography when available facilitates the diagnosis and therapeutic management locally by performing intra-arterial fibrinolysis.

No validated treatment protocol exists actually to minimize the consequences of accidental intra-arterial injection of drug products. The proposed combination therapies range from pain relief with opioids to local anaesthetic infiltration for its vasodilator effect, or regional nerve block or sympathectomy associated with heparin [5]. Other treatment modalities have been tested such as

corticosteroid at high dose associated with low molecular weight heparin and dextran and the intra-arterial injection of a vasodilator such as reserpine, iloprost or papaverine [6] with various results. Some authors like in the present case have recommended elevation of the limb combined to passive mobilization or a massage of limb, and heparin treatment. The hyper-bar oxygen therapy has been successfully used by Adir et al. [7]. Under some conditions a surgery thrombectomy with the Fogarty catheter associated with heparin treatment restores blood flow and limit tissue necrosis. According to other authors the combination of local thrombolysis alternating with heparin and arterial vasodilators such as prostaglandins give better results in saving the limb salvage up to 80% [8] However, these good results depend to early diagnosis and the implementation of treatment. A delay in the therapeutic management as in noted in this observation leads in general to tissue necrosis with indications of finger amputations [9]. Unfortunately, the prognosis remains serious [5] with debilitating physical and psychological effects as in the reported case.

Although rare, this accidental complication makes it necessary to make medical personnel aware about the risk of gangrene following an intra-arterial injection of drug products. To prevent this complication we recommend compliance with the basic simple steps before intravenous injection: having a good light in the treatment room, well dilute the product with sufficient amount of distilled water, when possible avoid hazardous areas where the artery and vein are closest (back of the hand and elbow), aspirate after the puncture and check the colour of blood drawn and his pulsability, inject a bolus of drug first, and then slowly inject the remaining product, monitor the patient for pain during the injection as well as his fingers.

### Conclusion

Patients at risk, symptoms, consequences and therapeutic management of accidental intra-arterial injection need to be taught to medical staff (doctors, nurses and paramedics) in order to prevent this dreaded complication.

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