

DEATH DUE TO AN OPIATE OVERDOSE THROUGH BILATERAL FEMORAL VEIN SINUSES: A CASE REPORT WITH A MULTI-PARAMETER EVALUATION

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ABSTRACT

Although both arterial and venous injection for drug abuse is not uncommon, yet it is rare to meet a case using a chronic patent venous sinus for prolonged injection. Repeated injection in the same place for long period of time initiated a sinus bilaterally in a chronic drug abuser and the abuser continued injection in these two sinuses using syringes without needles. Opioid overdose is the single leading cause of death among injection drug users (IDUs) in the United States and in many developed countries. Opioid overdose accounts for more than half the deaths of heroin IDUs. We are reporting a case of chronic drug abuser who persisted using syringes without needles for taking his frequent drug doses for long periods and lastly found collapsed from opioid over-dosage. For our best knowledge, it is a rare case and there are no other similar cases recorded.

Key Words: Injection, Drug abusers, femoral sinus, opioid overdose

INTRODUCTION

Due to its serious complications, injection drug abuse is a chief health problem worldwide. These complications may vary from minor local and dermal effects up to becoming a life threatening condition (**Cherubin and Sapira, 1993**). Due to the long term use of all accessible surface veins among chronic opiate, heroin, cocaine and amphetamine abusers, groin injecting is recently a much more common site (**Rhodes et al., 2007**). Groins are a hidden place for receiving injections as well as having a superior and rapid drug effect, and because of its ease access, the femoral vein has gained a wide popularity as an injection site among younger abusers (**Miller et al., 2007**). Additional risks are linked to homeless abusers who receive mixtures of heroin and cocaine (known as snowball) and injections in public places (**Wilkins et al, 2010**).

Injection abusers lack enough knowledge about associated risks of vascular damage, blood-borne infections and risks of overdose that may be fatal (**Hacking and West, 2009**). The groin was found to be more suitable (quick access, little mess and a less painful site). On the other hand, common drawbacks encountered include vein occlusion by scar formation, peripheral limb swelling, infections and repeated deep vein thrombosis. Surprisingly, abusers find an advantage in the formation of sinuses around this dried scarring as it provides continuous and easy access, despite the hardness which may carry the risk of needle breakage (**Darke et al, 2001**). Using non-sterile instruments that are not subjected to quality control are the leading cause of damage to the vascular structure. Vascular damage commonly begins with thrombophlebitis leading to vein

sclerosis and occlusion where it becomes unusable; as a result, abusers seek other usable points of intravenous access (Stein, 1990).

Opioid overdose is the most common leading cause of death among injection drug abusers in the US and other developed countries. Fatal opiate overdose accounts for more than 50% of deaths of heroin abusers (Sporer, 1999). Non-fatal opiate overdose is associated with multiple serious health consequences, of which, pulmonary edema, pneumonia, cardiac arrhythmia, compartment syndrome, necrotizing fasciitis (gangrene), rhabdomyolysis, renal failure and cognitive impairment

may occur (Smith et al, 2001). Accidental deaths due to drug overdose are not rare to meet in practice. Almost all cases of drug abuse present at a time with different complications and are sometimes found dead, yet the routes of drug intake vary depending on many things (Tyndall et al, 2001).

In odd cases, visiting the crime scene is crucial for reaching a conclusion as it helps forensic experts reach an opinion about the identification of the dead person, the cause of death, the origin of various injuries, determining time passed since death and many other issues (Kanth and Mohan, 2011).



Figure (1): Inserting the needle and injecting. (Femoral injecting, 2006)

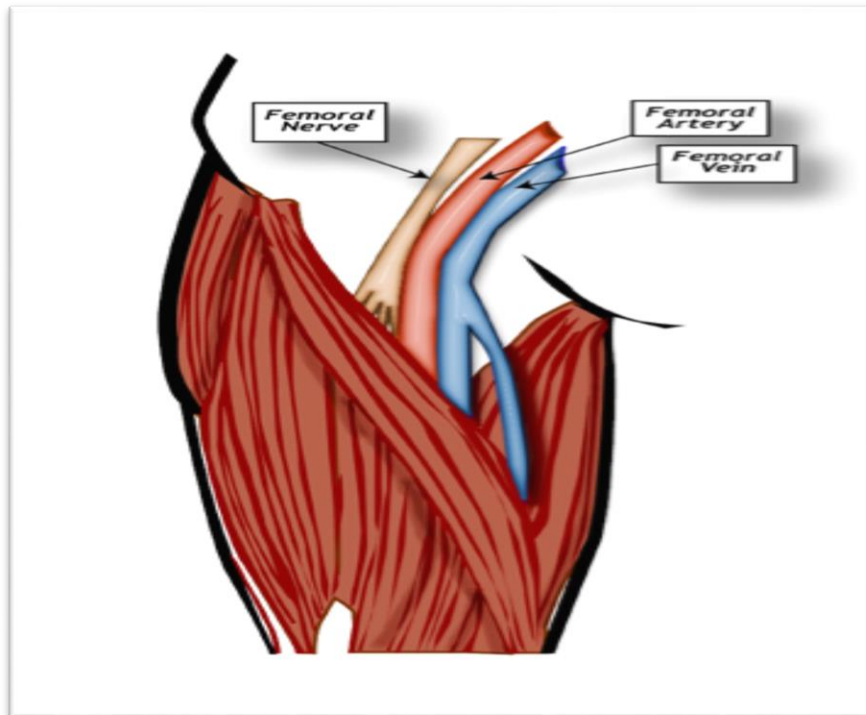


Figure. (2): A diagrammatic representation of the femoral nerve, artery and vein – right leg (front view (Femoral injecting, 2006)

CASE DESCRIPTION

A deceased male, 27 years old, was reported dead in his bedroom. He had been admitted many times before for treatment in drug addiction section in his regional hospital with history of abusing many kinds of addicting drugs over the preceding five years. The inquesting authorities did not indicate anything about the death except mentioning finding him surrounded with a big blood stain in his bed and the case was initially considered a homicide. Circumstantial history given by the accompanying relatives was vague with no indicators for the cause or manner of death. They said that the deceased was found in his bed inside his own bedroom with no chest movement and deeply cyanosed and that he didn't wake up even with vigorous shaking. Later on, his medical records gave the information that he had been an opiate abuser.

AUTOPSY FINDINGS:

External findings:

The dead body was for a male in his mid-twenties, with average body built, 168cm in length and about 65kg in weight.

Multiple puncture marks of previous injections were seen over the skin of the upper limbs along with the course of the superficial veins with injection marks in the cubital fossae on both sides. The presence of clearly visible old puncture marks scattered all over the body suggested that the injection was a long time habit.

A pair of round to oval brownish-black colored open wounds, each measuring about 1x1.5cm, were situated on the anterior aspect of the upper third of both thighs, nearly midway between the anterior superior iliac spine and the pubic symphysis.

No other external injuries or any evidence of violence had been detected.



Figure (3) Two femoral veins sinuses

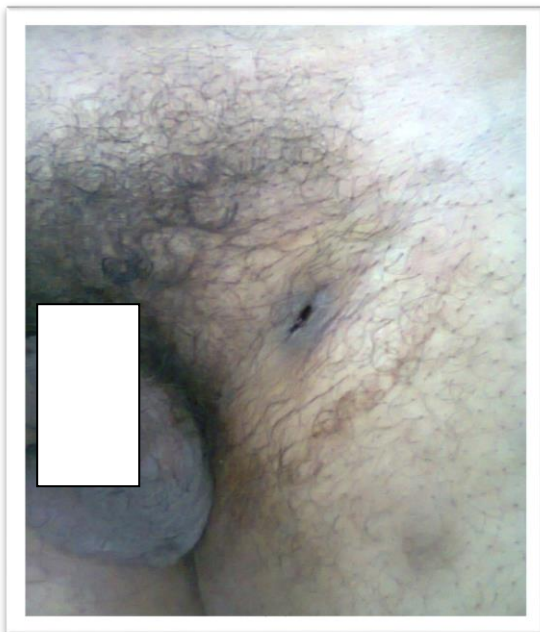


Figure (4) Left femoral vein sinus



Figure (5): Right femoral vein sinus

Internal Findings:

Head, face and neck autopsy revealed no suspicious injuries and no relevant pathological findings, meninges and brain were found congested and edematous. Both lungs were found congested. Heart was normal. Liver, spleen and both kidneys

were found congested. Stomach was intact with around 200ml of thick turbid light brown fluid without emitting any characteristic odor.

Extravasations of thick clotted blood was found around puncture sites at the groin regions, upper anterior part of thigh muscles with adhesions of

clotted blood inside the femoral sheaths. Bilaterally, a thick fibrous tract was found connecting a defect in the anterior surface of the femoral vein wall to the skin.

Histopathological examination of the tract (H&E stained sections) revealed the presence of fibro-connective tissue with variable scarring, inflammatory granulation tissue with reactive endothelial cells, fibroblastic proliferation and foreign body type giant cells.

Detection and confirmation of drugs:

A pair of peripheral venous blood samples as well as a single urine sample were collected from the deceased at the scene of the crime and sent for toxicological analysis. Blood samples were placed in two 10-mL grey top BD Vacutainer tubes (Franklin Lakes, NJ) each containing preservatives of 100mg sodium fluoride and 20mg potassium oxalate. Positive results from the screening procedure were confirmed and quantitated by Gas Chromatography-Mass Spectrometry (GC-MS) analysis by means of Agilent Technologies (Wilmington, DE) 7890A/5975C GC-MS detector and an Agilent 7683B auto-injector for separation and identification of the opiate traces.

By using solid-phase extraction with UCT Clean Screen® ZSDAU020 extraction columns (State College, PA, USA), opiate traces were extracted from 1mL aliquots of blood. The opiate drug extraction procedure was obtained from the Manual of Solid Phase Extraction Applications established by United Chemical Technologies, 2011 Bristol, PA UCT (pg. 143-144). Both calibrators and controls were prepared in a certified, drug-free blood matrix. After drying down, extracted samples

were re-suspended and derivatized in a heating block (75°C) for 20 min.

Analyst traces were detected by their distinguished retention times and were quantitated from a calibration curve. Additionally, qualitative identification was made by ion ratio criteria with qualifying ions. Retention times for analyses had a reference window of ± 0.1 min.

RESULTS

The deceased blood exhibited a positive ELISA response using the Immualysis® MTA-12 ELISA kit. The sample was tested for amphetamine, methamphetamine, opiates, cocaine, phencyclidine, cannabinoids, methadone, barbiturates, benzodiazepines, and tricyclic antidepressant screen. Morphine and 6-acetylmorphine were confirmed at concentrations of 384ng/ml and 36ng/ml, respectively. Other screened drugs gave negative results.

DISCUSSION

Attending crime scenes helps forensic experts to evaluate different circumstances related to the dead body. In many instances the mode of death can easily be determined before the body is transferred to the morgue. A thorough complete scene investigation should include photographic documentation of any findings suggestive of drug use, misuse, or abuse (e.g. opioid medications, illicit drugs, cut straws, needles, needle puncture marks, mixed pills, medications of the same type from multiple prescribers, medication bottles with no labels, history of methadone use) and photographic documentation of an inventory of all medications found at the scene.

Frequent injection in the same blood vessel carries the risk of complications and can cause vessel collapse. This usually occurs late in the groin than others (e.g. arm veins) because the femoral vein is a wide vein, but the subsequent outcomes are much more serious. Its use while in the groin is of concern as it is associated with increased risk of a variety of complications of which vascular insufficiency is the most serious (Woodburn & Murie, 1996). In England, not less than a third of injecting drug abusers reportedly use the femoral vein as their main site for receiving their shots (Hay et al, 2006).

In medicolegal practice, it is surprising to see a syringe without its needle beside an abuser and it is quite difficult to explain how it would be used as the injecting tool especially when no needle is found elsewhere. In such cases, the forensic examiner must find an explanation for the route of drug intake. Toxicological analysis must be requested by the forensic examiner in dead cases with suspected drug overdose and the interpretation of laboratory tests is challenging given the wide variety of analytical techniques available.

In the present case, an unusual route for drug abuse intake was detected. The study demonstrates strange circumstances around a male who had been found dead in his bedroom who had a long history of drug abuse. The deceased had been used to receiving drug injections in all accessible peripheral vessels; both venous and arterial. Later on, it was obvious that he had discovered that femoral veins are more accessible and easier sites for receiving injections within his reach.

Examination and autopsy findings revealed that repeated injection in the same place with its underlying complications initiated a sinus tract between the femoral vein and the overlying skin on each side; each sinus was occupied by non-adhesive non-occluding blood clots and both had histo-pathological features of chronicity. The deceased continued to receive injections repeatedly in these sinuses, and because tracts were patent, he had discovered that there was no need for the use of the syringe needles and he could inject without the accompanying pain.

Routine blood immunoassays were positive for opiates and negative for other most common toxicants. A general unknown screening using ELISA-Immunoanalysis confirmed the presence of opiates in plasma. Furthermore, urine screening revealed the presence of 6 acetyl- morphine (a heroin metabolite).

Drug overdose mortality accounted for 52404 deaths in the US in the year 2015 which exceeded the deaths from AIDS, at its peak, in the year 1995 (Rudd et al, 2016).

The present case is a multi-parameter based, starting with examination at the death scene, then external body examination, postmortem autopsy and finally toxicological analysis data. Such integrated data ensured accurate evaluation and served for clarification of the unusual route of intake and to reach the cause and manner of death.

CONCLUSION

Forensic examiners and forensic toxicologists may be challenged with dead cases where surrounding circumstances suggest drug overdose. Therefore, autopsy examination in

addition to toxicology analysis is considered the best practice for accurate determination of the cause of death for potential drug-related deaths.

This case report described an extraordinary bilateral femoral vein sinus as an unusual drug abuse injecting route.

In combination with the patient's history, circumstantial evidences and postmortem picture, results of toxicological analysis have not only given a significant positive reactivity on opiates ELISA drug screen, but also quantified the acute opioid overdose with heroin as a result of drug abuse at home.

This case displays the important contribution of toxicological investigations in doubtful cases and the significant role of interactions between forensic experts and forensic toxicologists.

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وفاة أحد متعاطي المواد المخدرة عن طريق الحقن بسبب جرعة زائدة من مخدر الأفيون من خلال طريقة وألية غير تقليدية ، خلال ناصور إربي على الجهتين : تقرير عن الحالة مع تقييم متعدد المعايير
أيمن حسين محمد قمر ، عبد الرحمن تركي
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الملخص العربي

على الرغم من أن إساءة استخدام المواد المخدرة عن طريق الحقن سواء الشرياني أو الوريدي هو أمر شائع الحدوث، إلا أنه من النادر أن يتم تسجيل حالة لناصر مزن مفتوح يتم استخدامه لتلقي الجرعات المخدرة بصورة مستمرة.

فقد تسبب تكرار الحقن في نفس الموضع بالمنطقة الإربية في تخليق ناصر على كلا الجانبين في أحد المتعاطيين المزمين ، واستمر المتعاطي في تلقي الحقن بهذين الناصورين الإربيين باستخدام محقن من دون السن الإبري الخاص به.

ويعد تعاطي المورفين بجرعات زائدة أحد الأسباب المؤدية للوفاة بين المتعاطيين عن طريق الحقن في الولايات المتحدة الأمريكية وعدد من البلدان المتقدمة. ويشكل تعاطي المورفين بجرعات زائدة أكثر من نصف عدد المتعاطيين لمخدر الهيروين.

ونحن هنا نقوم برصد حالة لأحد مسيئ استخدام المواد المخدرة والذي ظل يتلقى جرعات الحقن باستخدام محقن دون سن إبري لمدة زمنية طويلة ، وبالنهاية توفي نتيجة جرعة زائدة من مخدر المورفين. ووفق ما قد تناهى إلى علمنا ، فهي صورة نادرة من طرق التعاطي ولم نجد تسجيل لحالة مشابهة.