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CASE REPORT

The untold truth about “bath salt” highs: A case series demonstrating local tissue injury[☆]

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Summary The epidemic of injecting cathinone derivatives, marketed as “bath salts”, by intravenous drug users among inner city Dubliners led to an associated rise in soft tissue complications. The spectrum of the cases encountered, ranging from self-limiting cellulitis to extensive abscess formation, at a single institution is described.

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Introduction

Chemically related to the internationally controlled substance cathinone, cathinone derivatives such as mephedrone first emerged in 2007 as a substitute for illicit stimulant drugs such as cocaine and ecstasy.¹ Advertised as “bath salts” and available in a powder form at €15 per 0.5 g, they can be taken orally, insufflated or injected intravenously. Prior to the introduction of legislation in May 2010 controlling a broad range of psychoactive substances,

these products were readily available in head shops across Ireland. These inexpensive substances were increasingly used by intravenous drug abusers and led to a significant increase in local complications around the injection site.

We discuss four cases that presented to a single institution in Dublin from February to May 2010 with soft tissue complications as a direct result of this practice. Patient demographics, mechanism of injury, presentation, management and outcomes were recorded (Table 1) with accompanying images.

Discussion

Cathinone (2-amino-1-phenyl propanone), extracted from the fresh leaves of *Catha edulis* (khat plant) is traditionally chewed in Arab and East Africa for their stimulant and euphoric effects. Most cathinones seized in Europe are synthetic in origin. Cathinone is the β-keto analogue of

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Table 1 Summary of Cases.

Case No	Age	Sex	Portal of Entry	Co- Morbidities	Presentation	Clinical Parameters	Investigations	Management	Diagnosis	Outcome
1	38	M	Ulnar border left wrist	Hepatitis C Current IV drug user	2 day history of progressive cellulitis ascending proximally along the forearm following injecting "Blow"	<i>Blood Profile:</i> WCC $20.7 \times 10^9/l$ Neut $14.3 \times 10^9/l$ <i>Examination:</i> -No palpable collection -Extensive oedema of hand and forearm -Reduced wrist movement	<i>X-Ray of wrist and forearm:</i> Normal <i>Ultrasound:</i> Extensive cellulitis. No abscess. <i>Blood culture:</i> S.aureus	Conservative-failed after 4 days (Figure 1) Proceeded to <i>Surgical debridement</i> IV antibiotics for 10 days, discharged on oral antibiotics for 1 week	<i>Clinical:</i> Concealed abscesses tracking proximally along forearm <i>Histology (segment of vein):</i> Acute phlebitis with adjacent panniculitis and inflammation of fascia (Figure 2)	Wound managed conservatively Significant improvement in wrist movement
2	33	M	Left arm	Current IV drug user Schizophrenia	3 day history of extensive cellulitis enveloping left upper arm and chest after injecting powder substance into left antecubital fossa	<i>Blood Profile:</i> WCC $24.8 \times 10^9/l$ <i>Examination:</i> -No palpable collection -Superficial skin blisters	<i>Ultrasound:</i> Thickened left pectoralis major and deltoid, no abscess <i>CT scan:</i> $3.5 \times 7 \times 21$ cm abscess in anterior compartment extending from 4cm above flexor skin crease to the deltoid superficially and left AC joint, no subcutaneous/intramuscular gas <i>Tissue culture:</i> Group C streptococcus, S.constellatus	<i>Surgical debridement (Figure 3)- 3 visits to theatre</i> IV antibiotics for 2 weeks, further 20 days of oral antibiotics	Extensive abscess, skin and muscle necrosis	Wound defect closed with split thickness skin graft.
3	35	M	Dorsum of right hand	Hepatitis C Asthma Deliberate self-harm	1 week history of increasing cellulitis following injecting "Blow" Partially treated with 5 days of oral antibiotics	<i>Blood Profile:</i> Normal <i>Examination:</i> -Mild/moderate restriction of active finger flexion - No collection/evidence of tenosynovitis	<i>Ultrasound:</i> No collection, but inflammation of extensor tenosynovium observed	Conservative IV antibiotics for 4 days, discharged on 10 days of oral antibiotics	Localised cellulitis	Gained full functional outcome

4	40	F	Right antecubital fossa	HIV Current user	Hepatitis C 1 day history of drug cellulitis at injection site following injecting “Wildcat” into right cephalic vein.	<p>Blood Profile: WCC $17.7 \times 10^9/l$ Neut $15.2 \times 10^9/l$</p> <p>Examination: On Admission: No collection, restricted elbow movement Day 1: Ruptured abscess</p>	<p>Ultrasound (on admission): Superficial abscess measuring 6.5×4.4 cm at injection site Pus swab culture: <i>Streptococcus anginosus</i></p>	<p>Surgical debridement: IV antibiotics for 1 day (restricted IV access), discharged on 2 weeks oral antibiotics</p>	<p>Localised abscess</p>	<p>Wound managed conservatively Improvement in elbow movement to baseline</p>
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amphetamine (1-phenylpropan-2-amine) and alteration in the basic structure of cathinone results in formation of cathinone derivatives such as mephedrone, methylone, and flephedrone (known by their street names as “Blow”, “Snow” and “Wildcat” respectively).

Limited data is available on the pharmacokinetics of cathinone derivatives, but like amphetamines, they are thought to act on the central nervous system as stimulants. Subjective desired effects include feelings of empathy, stimulation and alertness.^{2,3} Common clinical effects reported in mephedrone users, which are thought to be dose dependant include tachycardia, palpitations, agitation, chest pain, dyspnoea, nausea, vomiting, headache, hypertension, hallucinations, peripheral vasoconstriction and convulsions.⁴ While cathinone derivatives have been implicated in deaths across the UK and Sweden, the majority of deaths linked to these substances have not been proven to be a direct result of substance overdose.⁵

To date there is no published description of the local complications associated with intravenous or subcutaneous injection of cathinones derivatives. In our series, soft tissue complications predominate with cellulitis, thrombophlebitis, localised and extensive abscess formation observed. In this patient population, the exact aetiology is frequently multifactorial; contamination of the substances,⁶ absence of skin asepsis, unsterile equipment, poor hygiene and concurrent immune-deficiency status contribute to soft tissue complications. Extravasation of these substances either intentionally or accidentally appear to result in local cutaneous reactions similar to that seen with cytotoxic drug use.⁷ The reactions caused by irritants are short-lived and associated with a tender, warm, erythematous reaction along the site of intravenous administration. Vesicants reactions, also known as chemical cellulitis is usually dose dependent and is characterized by poor healing and necrosis.⁸

Conservative treatment with intravenous antimicrobials (as guided by local Microbiology policy), high elevation and splintage is indicated in the absence of clinical evidence of compartment syndrome, necrotizing fasciitis or abscess formation. However frequently re-examination is necessary and evidence of progression or localizing signs should prompt surgical debridement.

Having only recently been recognized as a substance of abuse, prevalence estimates of the use of psychoactive substances among the Irish population and internationally are not yet available. In a knee-jerk reaction toward the increasing availability of cathinone derivatives, mephedrone and other similar substances were made illegal across the EU in December 2010 and in Australia and New Zealand by January 2011. In the US, several cities and states such as New York have passed legislation to ban mephedrone, but in most areas, cathinone derivatives are still thought to be legal as the Federal Analog Act which is a blanket legislation banning substances which are chemically similar to controlled substances is only applicable to substances intended for human consumption.

In a recent report by the National Advisory Committee on Drugs (NACD) analyzing the constituents of 37 products purchased from head shops in Ireland after the May 2010 ban, two products were found to contain MDPV



Figure 1 Pre-operative image of Patient 1 on Day 4 of admission. Incision was made along ulnar border of forearm exposing multiple subcutaneous abscesses tracking proximally.

(a controlled cathinone derivative). Similarly, analyses of five products purchased online (delivered from Belgium and Czech Republic) were all found to contain controlled substances including MDPV and mephedrone. Although the

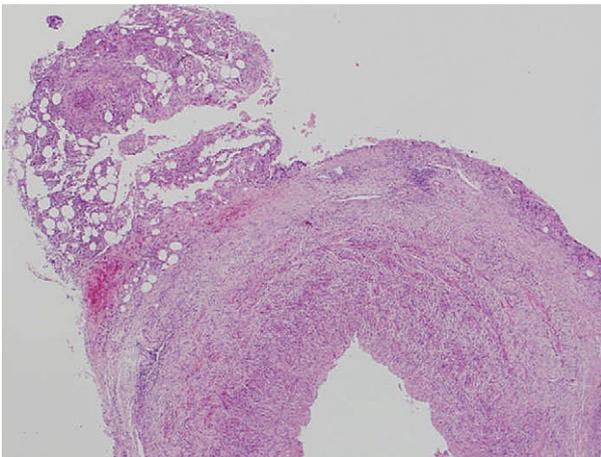


Figure 2 Section of excised vein (from Patient 1) showing acutely inflamed vein and adjacent acute panniculitis. No polarizable foreign material or acute thrombus present.



Figure 3 Image of left upper limb of Patient 3 post debridement.

exact figures are unavailable, it has been anecdotally reported that despite banning these psychoactive substances, patients are continuing to present to the Emergency Department at our institution with complications following “bath salt” use albeit at a dramatically reduce rate. This suggests that the supply and sale of these substances still remain an issue and may result in continued presentation of these self-inflicted injuries. It is crucial that careful history taking, examination and close observation continue to guide individual treatment plans as failure to do so could indeed be life or limb threatening.

Conflict of interest

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Appendix. Supplementary material

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.bjps.2011.10.004](https://doi.org/10.1016/j.bjps.2011.10.004).

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