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IMAGES IN FORENSICS

Dermatologic features of chronic intramuscular use of ketamine: a case report

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Abstract
A 33-year-old female presented with lethargy due to multidrug toxicity. At physical examination, both gluteal regions showed brown patchy scars. The atrophic scars surrounding necrotic lesions were round and brown in appearance, and gluteal mass had gradually been lost. The patient disclosed using intramuscular ketamine injections for 3.5 years along with smoking hashish, alcohol use, intranasal use of methamphetamine (sniffing), and oral use of methadone. Since recreational drug use can affect multiple organs, dermatologists should be familiar with the dermatologic features of intravenous or intramuscular injecting drug use.

Keywords Injecting · Injection · Skin · Necrosis · Lesions · Anesthesia

Case report

A 33-year-old female presented with lethargy due to toxicity from the co-use of propranolol, quetiapine, clonazepam, and chlordiazepoxide. On physical examination, her vital signs were stable, but there were multiple brown atrophic (punched out) scars in the context of symmetrical bilateral sclerosis and atrophy of the superolateral buttocks. No other lesions were detected. The patient reported injecting ketamine intramuscularly for 3.5 years. She also disclosed sniffing methamphetamine, smoking marijuana, and ingesting methadone for 10 years as well as the occasional use of cocaine, psylocibin mushrooms, tramadol, and lysergic acid diethylamide.

The patient described injecting 150 mg of ketamine in three separate 1-ml shots, initially using an insulin syringe which she later changed to a 2-mL syringe due to skin thickening in the gluteal area. According to the patient, after 2 years of ketamine use, necrotic lesions appeared on thickened skin that could be easily removed. The scars of the necrotic lesions were visible as round brown atrophies at physical examination (Figs. 1, 2 and 3). Gluteal mass had gradually been lost in the superolateral aspect and was replaced by bilateral hyperpigmented sclerotic plaques. No other drugs/substances other than ketamine had been injected into the buttocks, and she had not undergone any buttock augmentation procedure.

A psychiatrist was consulted, and the patient was advised to cease polydrug use. She was discharged free of symptoms 1-day post-admission.

Discussion

Ketamine was discovered in 1960 as a safer alternative for the anesthetic phenylcyclidine. It is a non-competitive antagonist of the glutamate N-methyl-D-aspartic acid (NMDA) receptor that is mainly involved in analgesia, sedation, and amnesia with minimal impact on the cardiovascular and respiratory systems. Other medical

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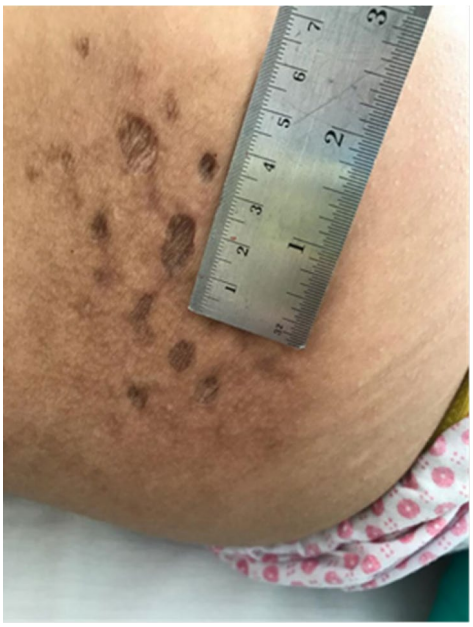

Fig. 1 Punched-out, brown, atrophic scars in the pigmented sclerotic context

indications for its use are pain management, anxiety control before surgery, and treatment of severe depression [1, 2].

The delirium and dissociation associated with ketamine use have led to its recreational abuse. It is said that long-term ketamine abuse may increase morbidities including impairment of memory, persistent dissociative, depressive, and delusional thinking, lower urinary tract symptoms, gastric complications, abnormal liver function tests, and choledochal cysts [1].

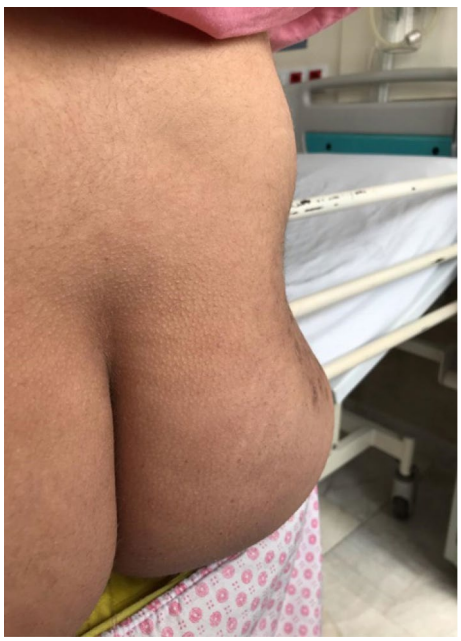

Fig. 2 Loss of the superolateral gluteal subcutaneous fat and muscle mass

Ketamine is euphoric and dissociative in low doses, whereas at high doses it is immobilizing and hallucinogenic, with the incidence of emergence delirium being reported as high as 30% [3]. Ketamine is sold illicitly in pill, powder, and liquid forms and may be swallowed, drunk, smoked, sniffed, and injected intravenously or intramuscularly [4].

The long-term neurologic effects of ketamine abuse are well known. They include impaired color perception, memory, attention, cognition, reaction time, and sense of time. Ketamine abuse is also known to cause gastric, hepatic, and gallbladder complications [5]. Pain, erythema, and swelling can occur as acute adverse effects with intramuscular injection of ketamine like any other drug; however, dermatologic effects of long-term intramuscular injection of ketamine have not been reported, to date. In a recently published review by Short et al. on 60 studies of ketamine poisoning in humans, no case of dermatologic complications was reported by the authors even in the three studies which involved patients using intramuscular ketamine injections [6].

With repeated intravenous injections, the veins become thrombosed, preventing further use, and the skin shows itself with irregular and puckering scars overlying veins. When veins are not available, some individuals with substance use disorder resort to subcutaneous injection and skin popping, which can result in small circular and ovoid scars [7]. Injection site sclerosis has been reported with some medications including vitamin K, vitamin B12, silicone or paraffin implants, interferon-β, bleomycin (intralesional therapy), and opioids (e.g., pentazocine, ketobemidone, methadone) [8], but to the best of our knowledge, there are no reports of sclerosis or scarring at the injection site of ketamine.

Microscopy of injection marks may also provide some information. Sites of recent injection will only show acute hemorrhage. After a few hours, an inflammatory response may be seen. The presence of hemosiderin at an injection site takes 2–3 days to develop [7]. If foreign material has been injected, a granulomatous reaction may also be detected [9].

Secondary infections may occur at injection sites. There may be abscess formation from pyogenic bacteria, and necrotizing fasciitis, botulism, and anthrax have all been recorded as complications of skin popping and intravenous injection but may also happen after intramuscular injection [10]. Cutaneous ulcers due to bacterial and fungal infections may occur at the injection site and can lead to abscess formation. Chronic suppurative skin infections may lead to secondary systemic amyloidosis [7, 11]. Cutaneous ulcers may complicate chronic injections because of damage to the venous and lymphatic systems as well as infection [12].

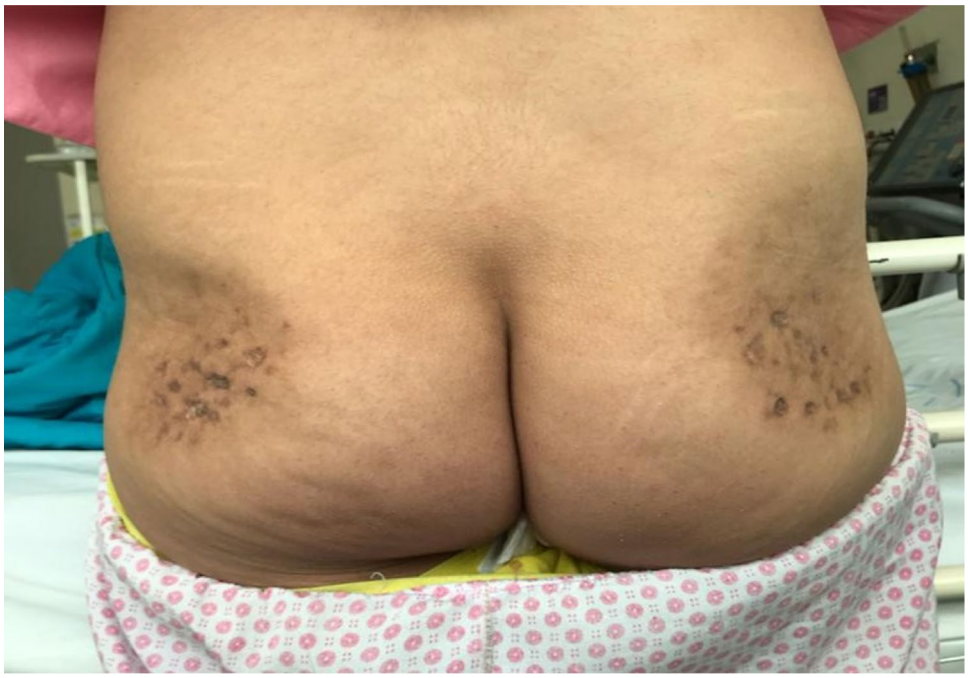

Fig. 3 Bilateral punched-out, brown, atrophic scars in the pigmented sclerotic context and loss of the superolateral gluteal subcutaneous fat and muscle mass

Urticaria is another complication that has been reported in a small proportion (< 5%) of people who inject drugs [13].

The use of drugs for recreational purposes results in effects on multiple organs. Dermatologists should be familiar with the dermatologic features of intravascular or intramuscular drug injections.

Abbreviations NMDA: N-methyl-D-aspartic acid

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Author contribution HHM treated the patient. ME and SSDA consulted the patient in terms of drug abuse. MG advised on dermatological aspects. ME and NZ drafted the manuscript. RM did an extensive revision of the manuscript. All authors were involved in the analysis and interpretation of findings. They proofread the manuscript and contributed important intellectual content. All authors contributed to the writing and approved the final manuscript.

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Data availability Data are available on request. To have access to the data please contact hassanian@sbmu.ac.ir, Tel: +982,155,409,534.

Declarations

Ethics approval and consent to participate This study was conducted in accordance with the fundamental principles of the Declaration of Helsinki. This report is part of a larger study approved by the Research Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.RETECH.REC.1400.938).

Consent for publication Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editors-in-Chief of this journal.

Conflict of interests The authors declare no competing interests.

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