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Case report: prehospital use of intranasal ketamine for paediatric burn injury

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ABSTRACT

In this study, the administration of an intravenous ketamine formulation to the nasal mucosa of a paediatric burn victim is described in the prehospital environment. Effective analgesia was achieved without the need for vascular or osseous access. Intranasal ketamine has been previously described for chronic pain and anaesthetic premedication. This case highlights its potential as an option for prehospital analgesia.

We report the prehospital use of intranasal ketamine in a paediatric burns case.

A 9-year-old boy rode a motorcycle into a pipe from a water heating system, fracturing the pipe and causing his lower torso to be exposed to a jet of steam. A physician-paramedic-staffed helicopter emergency medical service was activated for clinical and access reasons.

Locating the patient required a 120 km flight, winching of the crew because of lack of a safe landing area, and a 1 km ride in a four-wheel-drive utility vehicle. The child was consequently first examined 67 min after the medical team activation and had been held under a cold shower for >1 h.

Examination revealed a patent airway, 20 respirations per minute with normal symmetrical breath sounds, heart rate of 94 beats per minute and non-invasive blood pressure of 110/60 mm Hg. Oxygen saturations were 98% breathing room air, and the central capillary refill time was 2.5 s. He was alert and cooperative although anxious and complaining of severe pain and requesting "no needles." He was shivering and peripherally very cold, with no visible or palpable peripheral veins suitable for cannulation. He had partial-thickness scalds to his left flank, hip and buttock, covering an estimated 3% body surface area.

The clinical combination of pain, distress, requirement for burn dressing and rewarming, and lack of vascular access resulted in the choice of nasal ketamine. A 1 ml syringe was used to draw 0.15 ml of racemic ketamine 100 mg/ml (Ketalar, Mayne Pharma Limited, Melbourne, Australia). This was diluted in 0.9% saline to a total of 0.2 ml and delivered to the nasal mucosa using a mucosal atomisation device. The dose administered was thus 15 mg, or 0.5 mg/kg at an estimated weight of 30 kg.

Within 3 min, the patient described resolution of his pain and demonstrated effective anxiolysis, reporting that he felt "swimmy." He remained alert and was able to stand with support, while a polyethylene plastic wrap was applied to the burns. He was accompanied by the helicopter emergency medical service team for the duration of the 95 min road ambulance journey to hospital. His vital signs including heart rate, respiratory rate and pulse oximetry remained normal for his age, and he remained orientated and responsive to verbal stimuli throughout although reporting drowsiness and a desire to sleep. There was no evidence of dysphoria, hypersalivation, or signs of laryngospasm. At handover in hospital, he was alert and free of pain.

To our knowledge, the use of intranasal ketamine in prehospital emergency medicine has not been previously reported in the literature, although we are aware of its use in military combat settings (R Dawes, personal communication). The safety and effectiveness of ketamine as an intravenous analgesic in prehospital care is well described,[1] and the nasal route of administration is commonly used for opioid delivery to adults and children in the emergency department and prehospital settings.[2 3] Ketamine is a potent analgesic at subanaesthetic doses, and alternative routes of administration including oral, transdermal, subcutaneous, nasal, rectal, intrathecal and epidural routes may provide systemic levels of ketamine sufficient for analgesia.[4 5] Intranasal ketamine has been shown to be effective for paediatric sedation in anaesthetic premedication[6] at a dose of 6 mg/kg. As an analgesic, intranasal ketamine in doses of 10–50 mg was superior to placebo in controlling breakthrough pain in adult patients with chronic pain, with no serious adverse effects.[7] Ketamine has many favourable characteristics that make it a preferred agent to facilitate wound care in burns patients.[8–10]

The Mucosal Atomisation Device (MAD, Wolfe Tory Medical, Inc) is routinely carried by Ambulance Service of New South Wales ambulance officers for the delivery of intranasal fentanyl. The protocols for its use advise that the MAD requires 0.1 ml of drug to prime the dead space in the device.[11] Thus, it may be that only 0.1 ml of the ketamine-saline mixture, containing 7.5 mg (0.25 mg/kg) ketamine, made contact with the nasal mucosa of our patient. As with all parenteral analgesia, however, the dose should be titrated to effect. Although formal pain scoring was not performed in the case described, a satisfactory level of analgesia and anxiolysis appeared to be achieved sufficient to allow the comfortable application of a burns dressing and patient transport.

This case describes the effective intranasal administration of an analgesic dose of racemic ketamine in the range 0.25–0.5 mg/kg for prehospital paediatric thermal trauma and is possibly the first recorded case of analgesia with intranasal ketamine in the civilian prehospital literature. We recommend further study of intranasal ketamine in

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the prehospital emergency environment to further delineate optimal dose range and side effect profile.

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Competing interests None.

Patient consent Obtained.

Ethics approval This study was conducted with the approval of the Ethics of Clinical Practice Subcommittee, Sydney South West Area Health Service, NSW Health.

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