

Digital ischaemia in the digital age

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Citation: Elmussareh M, Hart CA, Khanna A, Nasim A. Digital ischaemia in the digital age. JSCR 2011. 8:10

ABSTRACT

After the accidental injection of epinephrine into a digit, various techniques to try and reverse the ensuing ischaemia were unsuccessful. To identify a further treatment strategy and as members of the admitting team were unfamiliar with digital injection of epinephrine a Google search was performed. Previous cases were described and separate sources indicated appropriate management protocols utilising phentolamine. After administration, an almost immediate reversal of ischaemic symptoms occurred. This highlights the role of the internet as an adjunct in managing unfamiliar situations and practising evidence based medicine.

INTRODUCTION

Attendances to Emergency Departments due to accidental digital auto-injection of adrenaline seem to be on the rise. For every 50000 EpiPen units administered correctly, one is accidentally performed into a digit, usually the thumb (1).

CASE REPORT

We present the case of a 32 year old GP who unwittingly deployed an epinephrine pen into the palmar aspect of her distal phalanx of her right thumb. She reported immediate colour loss, pain and paraesthesia. She bathed the affected digit in hot water with no relief and attended the Accident and Emergency Department an hour later where the Medical staff were unsure how to proceed with treatment. 120 minutes post-incident, she was referred to the Vascular Surgery Unit and after examination, the distal phalanx of the thumb was still ischaemic, lacked sensation and was difficult to move. Capillary refill was absent. In the first instance, a GTN patch was applied to the radial artery just below the thenar eminence. There was no benefit after 30 minutes or two hours post incident. Following a Google search for similar cases, various case reports and a series looking at digital epinephrine injection were found online. Instructions regarding phentolamine administration were followed and 2 millilitres of 0.5% phentolamine were administered subcutaneously along the same tract taken by the epinephrine pen. As per advice online, the patient was continually monitored for hypotension or cardiac arrhythmias on the ward. Within two minutes, blood supply to the digit was fully restored, with normal movement, sensation and capillary refill and the patient was discharged home.

DISCUSSION

Epinephrine is indicated in the emergency treatment of severe anaphylactic reactions to

insect stings, bites, food, drugs and other allergens as well as idiopathic or exercise-induced anaphylaxis. The EpiPen (1:1000 or 0.3mgs in 0.3mls) and EpiPen Jr (1:2000 or 0.15mgs in 0.3mls) auto-injectors administer a single dose of epinephrine intended to be delivered intramuscularly in cases of severe anaphylaxis. For stability purposes, approximately 1.7 mls remains in the auto-injector after activation and cannot be used. Since preliminary work by Zucker in the 1950s into adrenaline analogue reversal (3) and later a case report by Jordan in 1969 whereby a dental assistant had self administered epinephrine to a cut finger to reduce bleeding (10), phentolamine reversal of epinephrine has been suggested in the literature repeatedly as the most suitable method of reversal for accidental digital epinephrine injection. Phentolamine is a competitive α -receptor antagonist that has similar affinities for α -1 and α -2 receptors. It can be used in large doses for the short term control of hypertension in patients with pheochromocytoma or in the treatment of hypertensive crisis following the abrupt withdrawal of clonidine. Previous case studies have demonstrated that various methods of reversal have been ineffectual. Warm water immersions, the administration of systemic or topical nitroglycerin preparations and even topical terbutaline infiltration have been used to treat the accompanying vasospasm that occurs in the digit with limited success (4,5). Despite this, using phentolamine in this manner remains poorly publicised and lacks a license for use in the UK for the reversal of end artery vasospasm caused by EpiPen administration. In fact it is only available as Rogitine (Ciba), containing 10 mg of phentolamine in 1 ml of clear solution. Since administration of around 2-5 mls of 0.1% phentolamine appears in most reported cases to be completely effective in reversing the effects of 0.3mgs of epinephrine, the greatest danger in administering phentolamine surely comes from drug errors in calculating the correct dilution. Many case reports in fact report the reversal of epinephrine after 12 hours with no harmful sequelae at all (6,7). This raises the possibility that the ischaemia induced is not complete or that the digital arteries are augmented by another blood supply. Indeed, the Dalhousie Project Clinical Phase Trial recorded 1340 fingers electively injected with low dose adrenaline (1:100,000) without a single case of digital skin, or fat loss, let alone digital infarction (1,2,6-8). Treatment with phentolamine is nevertheless worthwhile due to the distressing ischaemic pain and parasthesia suffered by the patient (9). Previously reported cases of digital infarction in the literature, dating from the pre 1950s were all associated with co-administered procaine or cocaine, both well known to cause massive arterial spasm and digital infarction on their own. Of note, there have been no case reports of digital gangrene using commercial lidocaine and epinephrine since its introduction in 1948. Multiple studies involving thousands of patients support the premise that the use of lidocaine with epinephrine is safe in the digits (1). Hinterberger compared various methods of phentolamine dilution and administration, suggested a 0.5% solution administered by direct local infiltration to the initial puncture region is the most effective as this concentration provides sufficient phentolamine for reversal of ischaemia, without the need to present an inordinate amount of fluid to the pulp spaces of the finger, accessing the affected receptors and any residual epinephrine directly. A digital block technique was found to be less effective as it has to diffuse through tissue and a later study suggested that introduction of large amounts of diluted phentolamine itself could cause an iatrogenic "hydrostatic ischaemia" (9). There are no reports of systemic side effects related to the local use of small doses of subcutaneous phentolamine for the treatment of adrenaline induced digital ischaemia (4,5) nonetheless, due to the small risk of systemic absorption or accidental intravascular administration of phentolamine it has been standard practise to monitor ECG and blood

pressure readings although evidence points to this being unnecessary. This case further highlights the importance of instant access to the internet and the need for available phentolamine in A&E, Surgical Assessment Units or any department where Minor Surgery takes place. Despite the lack of previous experience in the management of such cases, the patient was successfully treated after performing a quick search on Google search, demonstrating the need for online resources to augment our practice.

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