

Treatment of accidental digital injection of adrenaline from an auto-injector device

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Abstract

Following an increase in the number of patients attending the accident and emergency department because of accidental injection of adrenaline from autoinjector devices prescribed for patients with severe allergic reactions, a review of published reports was undertaken to identify the best form of treatment. Local injection of phentolamine is effective for up to 13 hours after the inadvertent digital instillation of adrenaline.

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Autoinjector devices (0.3 ml of 1:1000 adrenaline (Epi-pen)), which allow patients who experience acute allergic reactions to inject themselves subcutaneously, have been available since 1980. Since then there has been a number of case reports of accidental digital instillation of adrenaline from autoinjectors, with a reported incidence estimated as one accidental injection per 50 000 Epi-pen units.¹⁻⁸ Adrenaline causes intense vasoconstriction which is mediated by stimulation of postsynaptic α_1 and α_2 receptors in the perivascular smooth muscle, resulting in ischaemic necrosis.⁹⁻¹¹ Empirical methods of reversing adrenaline induced digital ischaemia that have been tried unsuccessfully include immersion of the digit in warm water, application of topical glyceryl trinitrate, metacarpal nerve block, intravenous heparin/praxilene, and amyl nitrate inhalation.

In 1957 Zucker showed a reversal of the effects of an adrenaline analogue by phentolamine.¹² Phentolamine is a competitive non-selective α_1 and α_2 adrenergic receptor blocker of relatively short duration.¹³ It produces vasodilatation by antagonising the vasoconstrictor effects of adrenaline. In 1969 Jordan first demonstrated the efficacy of phentolamine in a clinical situation.¹⁴ This case involved a dental assistant who had deliberately injected adrenaline into her finger to stop arterial bleeding from a laceration and developed an ischaemic digit. After the administration of 5 ml of 0.1% phentolamine to the finger there was reversal of the digital ischaemia. Since then there have been several case reports documenting the efficacy of phentolamine for this purpose.²⁻⁸

It has also been reported that phentolamine prevents necrosis after infiltration of dopamine and noradrenaline.^{15,16} In these case reports,

phentolamine caused an immediate change in skin colour and temperature, from cold and white to pink and warm within seven minutes.

Use of phentolamine

Phentolamine is currently available in the United Kingdom as Rogitine (Ciba), containing 10 mg of phentolamine in 1 ml of clear solution. Rogitine does not have a license for the reversal of adrenaline induced vasoconstriction in the United Kingdom; however, it is the only commercially available form of this drug. When using phentolamine to reverse the vasoconstrictor effects of adrenaline, care must be taken not to use too large a dose. Thus injections of phentolamine should be given locally at the site of adrenaline injection in 0.05 ml (0.5 mg) doses (10 mg/1 ml of solution), up to a maximum of 0.15 ml, with 20-30 minutes elapsing between doses. The phentolamine may be diluted with 1% lignocaine. Potential side effects of phentolamine include arrhythmias and profound hypotension; however, when phentolamine has been injected locally for the reversal of adrenaline induced vasoconstriction there have been no reported side effects.¹³ All patients should have blood pressure and electrocardiographic monitoring for a short period after administration of phentolamine.

Discussion

A question raised by the success of phentolamine was how long after the inadvertent instillation of adrenaline would phentolamine be effective at reversing the vasoconstrictor effects. Berben *et al* in 1957 were able to show reversal of the ischaemic effects of adrenaline by phentolamine up to 12 hours after the adrenaline injection,¹⁷ while in 1992 Burkhart reported a case of a nurse who had her thumb saved following the local administration of phentolamine after an interval of 13 hours.¹⁸

Phentolamine should be used for the clearly defined situation of accidental digital injection of adrenaline and should not be used in the situation of high pressure injection injuries, for which the treatment remains immediate referral for surgery.

CONCLUSIONS

Local injection of phentolamine is an effective treatment for the inadvertent digital instillation of adrenaline after an interval of up to 13 hours. All accident and emergency departments should have an agreed protocol for this unusual event, as it is likely to occur more often with the increased availability of autoinjector devices.

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