somewhat and her blood pressure is still low at 80/40. You have heard that tricyclic overdoses may respond to glucagon and wonder whether there is any evidence for this.

Three part question

In [overdose with tricyclic antidepressants] does [the addition of glucagon to standard treatments] improve [clinical outcome]?

Search strategy

Medline 1966–02/03 using the OVID interface. [(exp antidepressive agents OR exp antidepressive agents, tricyclic OR exp desipramine OR exp amitriptyline OR tricyc$.af. OR amitriptyline.af. OR amoxapine.af. OR clomipramine.af. OR doxepin.af. OR dothiepin.af. OR imipramine.af. OR lofepramine.af. OR nortriptyline.af. OR trimipramine.af.) AND (exp glucagon OR glucagon.af.)] LIMIT to human AND English.

Search outcome

Altogether 31 papers found, 28 failed to answer the three part question, the three relevant papers are case reports summarised in table 2.

Comment(s)

Although all three patients received multiple treatments the authors state the improvement in condition was immediately after high dose glucagon administration. No reports of failure to respond to glucagon are found in the literature. This is most probably attributable to reporting and publication bias. Further research is required.

▸ CLINICAL BOTTOM LINE

There is not enough evidence currently available to support the use of glucagon in tricyclic overdose.

Ruddy JM, Seymour JL, Anderson NG. Management of tricyclic antidepressant ingestion in children with special reference to the use of glucagon. *Med J Aust* 1972;**1**:630–3.
Sener EK, Gabe S, Henry JA. Response to glucagon in imipramine overdose. *J Toxicol Clin Toxicol* 1995;**33**:51–3.
Sensky PR, Olczak SA. High dose intravenous glucagon in severe tricyclic poisoning. *Postgrad Med J* 1999;**75**:611–12.

Colourimetric CO_2 detector compared with capnography for confirming ET tube placement

Report by K Hogg, *Clinical Research Fellow*
Checked by S Teece, *Clinical Research Fellow*

Abstract

A short cut review was carried out to establish whether colourimetric carbon dioxide detectors are as reliable as capnometry at verifying tracheal placement of endotracheal tubes after emergency intubation. A total of 69 papers were found using the reported search, of which four presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Goldberg JS *et al*, 1990, UK	62 men aged 18–70 years old, ASA I, II and III. Simulated difficult intubation drill, using laryngoscope to increase larynoscopy grade.	Prospective observational study	3 separate observers recorded time to recognition of tracheal and oesophageal intubation, by observing IR capnography, FEF end-tidal colourimeter, and auscultaion respectively.	All three methods confirmed correct positioning in 100% (n=51) cases. Colourimeter and capnograph were faster than chest auscultation. All oesophageal intubations (n=11) confirmed by all 3 methods. One oesophageal intubation gave mild colour change but correctly interpreted.	Study only used haemodynamically stable patients Observers were specialist anaesthetic staff as were those intubating Observers not blinded to other detection methods
Anton WR *et al*, 1991, USA	60 emergency intubations, out with theatre – respiratory failure n=29, CPR n=9, self-extubation n=7, ET tube change n=6, airway protection n=3. ? other 6	Prospective observational study	Observation of colour change in FEF colourimeter within 6 breaths post intubation. Observation of a positive signal from portable TRIMED IR CO_2 detector within 6 breaths post intubation	Positive signal of exhaled CO_2 produced within 6 breaths by 59 of 60 by FEF detector, and 58 of 60 by TRIMED.Of the 9 CPR patients 5 showed a colour change that was "subtle", into the brown range.One patient receiving CPR took 20 breaths before a positive signal was received in either	Doctors were presumably anaesthetists There were no oesophageal intubations
Kelly JS *et al*, 1992, USA	20 children age 6 months to 8 years undergoing elective anaesthesia	Prospective observational study	Colour change in Fenem CO_2 detector versus IR capnographer reading in 1.spontaneous mask ventilation 2.post tracheal intubation10 breaths during each point were monitored	Of total 400 breaths, 398 registered yellow colour in the FEF colourimeter with expiration. This correlated with capnography readings. 2 breaths fell into brown range–both of these during mask ventilation, corrected by mask adjustment	All patients haemodynamically stable, with optimal intubating conditions There were no oesophageal intubations Participants were specialist anaesthetists
Puntervoll SA *et al*, 2002, Norway	14 female patients undergoing general anaesthesia All had both tracheal and oesophageal tubes passed CO_2 *v* capnography	Experimental study	Detection of tracheal placement Detection of oesophageal misplacement	100% in both devices In 5 patients with expired air placed in the oesophagus the colourimeter changed colour	Small numbers Not emergency intubation

Clinical scenario
A 30 year old man is brought to the emergency department with a Glasgow Coma Scale score of 8 after falling down stone steps while drunk. Although he has not vomited, you are concerned that he cannot protect his airway. You decide to do a rapid sequence induction. As you organise and check your equipment, you ask the nurse to bring the departmental capnograph to the bedside. She tells you that it is still in ITU where it was left after transferring the last intubated patient. She does, however, suggest you use a disposable colourimetric CO_2 detector found in the paediatric arrest trolley. You wonder whether you should wait five minutes while the capnograph is brought from ITU, or whether the colourimetric indicator will be just as accurate?

Three part question
In an [emergency intubation] is [a colourimetric carbon dioxide detector as reliable as capnography] at [verifying endotracheal tube placement]?

Search strategy
Medline 1966–02/03 using the OVID interface. [(exp Carbon Dioxide OR end-tidal.mp OR exp Capnography OR carbon dioxide.mp OR capnograph$.mp) AND (colorimetric.mp OR exp Colorimetry OR colourimetric.mp)] LIMIT to human AND English language.

Search outcome
Altogether 69 papers were found of which four were relevant to the question. Details of these papers are shown in table 3.

Comment(s)
There have been no studies investigating the use of these devices exclusively within the emergency department.

▸ CLINICAL BOTTOM LINE
The colourimetric CO_2 detector is as accurate as IR capnography at detecting tracheal intubation, but is potentially less accurate at detecting oesophageal intubation.

Goldberg JS, Rawle PR, Zehnder JL, *et al*. Colorimetric end-tidal carbon dioxide monitoring for tracheal intubation. *Anesth Analg* 1990;**70**:191–4.
Anton WR, Gordon RW, Jordon TM, *et al*. A disposable end-tidal CO2 detector to verify endotracheal intubation. *Ann Emerg Med* 1991;**20**:271–5.
Kelly JS, Wilhoit RD, Brown RE, *et al*. Efficacy of the FEF colourimetric end-tidal carbon dioxide detector in children. *Aneth Analg* 1992;**75**:45–50.
Puntervoll SA, Soreide E, Jacewicz W, *et al*. Rapid detection of oesophageal intubation: take care when using colourimetric capnometry. *Acta Anaethesiol Scand* 2002;**46**:455–7.

Glucagon for the treatment of symptomatic β blocker overdose

Report by R Boyd, *Consultant*
Checked by A Ghosh, *Senior Clinical Fellow*

Abstract
A short cut review was carried out to establish whether the intravenous glucagon can support blood pressure in β blocker overdose. A total of 51 papers were found using the reported search, of which six presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Clinical scenario
A 25 year old patient presents to the emergency department two hours after taking a significant overdose of propanolol. She is bradycardic and hypotensive despite initial resuscitation with oxygen and intravenous fluids. An ECG shows a sinus bradycardia of 50 bpm. You have heard of treatment with intravenous glucagon but wonder if it has been of any proved benefit.

Three part question
In [symptomatic significant beta-blocker overdose] is [intravenous glucagon] effective at [reversing the induced hypotension]?

Search strategy
Medline 1966–02/03 using the OVID interface. [exp glucagon Or glucagon.mp] AND [{exp adrenergic beta antagonist} AND {exp poisoning OR exp overdose OR poisoning.mp OR intoxication.mp overdose.mp} OR {beta blocker overdose.mp OR beta blocker poisoning.mp}]

Search outcome
Altogether 51 papers were found of which six were deemed relevant. No clinical trials were identified and all the papers available were case reports. Details of these papers are shown in table 4.

Comment(s)
No clinical trials or even case controlled studies have been published. There is therefore only anecdotal evidence for the use of glucagon. The doses of glucagon suggested are higher than the usual therapeutic doses given in hypoglycaemia and

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Peterson CD *et al*, 1984, USA	2 cases of mixed overdose including β blockers	Case report	Survival	Bolus of 12 mg and 4 mg used to reverse cardiogenic shock	Case report
Weinstein RS *et al*, 1985, USA	1 case of propanolol overdose	Case report	Survival	80 mg glucagon intravenous given over 18 hours to reverse cardiogenic shock	Case report
Khan MI and Miller MT, 1985, South Africa	1 case of propanolol overdose	Case report	Survival	Use of 20 mg glucagon to reverse cardiogenic shock	Case report
Tai YT *et al*, 1990, Hong Kong	Single case of metoprolol overdose	Case report	Survival	1 mg of glucagon is claimed to have reversed cardiogenic shock	Case report
O'Mahony D *et al*, 1990, Eire	One patient after oxprenolol overdose	Case report	Survival	30 mg bolus with 10 mg/h infusion of glucagon, successful resuscitation from beta blocker induced cardiogenic shock	Case report
Mansell PI, 1990, Australia	Single mixed overdose including propanolol	Case report	Survival	Bolus of 4 mg glucagon with an infusion of 10 mg in 3 hours	Case report