



Therapeutic hypothermia after out of hospital cardiac arrest

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BEST EVIDENCE TOPIC REPORTS

Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary

Edited by K Mackway-Jones

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Best evidence topic reports (BETs) summarise the evidence pertaining to particular clinical questions. They are not systematic reviews, but rather contain the best (highest level) evidence that can be practically obtained by busy practising clinicians. The search strategies used to find the best evidence are reported in detail in order to allow clinicians to update searches whenever necessary. The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary¹ or placed on the BestBETs web site. Each BET has been constructed in the four stages that have been described elsewhere.² The BETs shown here together with those published previously and those currently under construction can be seen at <http://www.bestbets.org>.³ Six BETs are included in this issue of the journal, the last two of which are negative.

- ▶ Nebulised magnesium in asthma
- ▶ Role of flexion/extension radiography in neck injuries in adults
- ▶ Peripheral pulses to exclude thoracic aortic dissection
- ▶ Wound closure in animal bites
- ▶ Therapeutic hypothermia after out of hospital cardiac arrest
- ▶ Gastric lavage in aspirin and non-steroidal anti-inflammatory drug overdose

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- 1 Carley SD, Mackway-Jones K, Jones A, et al. Moving towards evidence based emergency medicine: use of a structured critical appraisal journal club. *J Accid Emerg Med* 1998;15:220–2.
- 2 Mackway-Jones K, Carley SD, Marton RJ, et al. The best evidence topic report: a modified CAT for summarising the available evidence in emergency medicine. *J Accid Emerg Med* 1998;15:222–6.
- 3 Mackway-Jones K, Carley SD. bestbets.org: Odds on favourite for evidence in emergency medicine reaches the worldwide web. *J Accid Emerg Med* 2000;17:235–6.

Nebulised magnesium in asthma

Report by Jonathan Costello, *Specialist Registrar*
Checked by Marten Howes, *Specialist Registrar*

doi: 10.1136/emj.2004.017939

Abstract

A short cut review was carried out to establish whether the addition of nebulised magnesium sulphate to β agonist therapy improves outcome in acute asthma. Altogether 69 papers were found using the reported search, of which five 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 known asthmatic patient is brought into the emergency department with signs consistent with acute asthma. Little improvement is noted with nebulised β agonist therapy. You wonder if adjunctive nebulised magnesium sulphate would provide any benefit.

Three part question

In [an adult with asthma] is [nebulised β agonist with nebulised magnesium sulphate better than nebulised β agonist alone] at [improving airflow and reducing morbidity]?

Search strategy

Medline 1966-05/04 using the Ovid interface. [(Exp magnesium OR magnesium\$.mp OR exp magnesium sulfate OR magnesium sul\$.mp OR exp magnesium compounds OR magnesium compound\$.mp) AND (nebulise\$.mp OR nebulize\$.mp OR vaporise\$.mp OR vaporize\$.mp OR inhal\$.mp) AND (Exp asthma OR asthma\$.mp OR exp bronchial spasm OR bronchial spasm.mp OR bronchospasm.mp)] Limit to human AND English language.

Search outcome

Altogether 69 articles found of which five were relevant to the original question (see table 1).

Comment(s)

Extensive evidence exists regarding efficacy of intravenous magnesium in bronchospasm reversal. Of the few studies that relate to nebulised magnesium in bronchospasm reversal, samples remain small and conflicting results regarding optimal dose magnesium and sole agent efficacy persist. It is empirically suggested such mode of magnesium delivery be considered in cases of severe asthma only.

▶ CLINICAL BOTTOM LINE

There is currently insufficient evidence to support the routine addition of nebulised magnesium to standard β agonist therapy in acute asthma exacerbation.

Meral A, Coker M, Tanac R. Inhalation therapy with magnesium sulfate and salbutamol in bronchial asthma. *Turk J Pediatr* 1996;38:169–75.

Mangat HS, D'Souza GA, Jacob MS. Nebulized magnesium sulphate versus nebulized salbutamol in acute bronchial asthma: a clinical trial. *Eur Respir J* 1998;12:341–4.

Nannini LJ Jr, Pendino JC, Corna RA. Magnesium sulfate as a vehicle for nebulized salbutamol in acute asthma. *Am J Med* 2000;108:193–7.

Bessmertny O, DiGregorio RV, Cohen H. A randomized clinical trial of nebulized magnesium sulfate in addition to albuterol in the treatment of acute mild-to-moderate asthma exacerbations in adults. *Ann Emerg Med* 2002;39:585–91.

Hughes R, Goldkom A, Masoli M. Use of isotonic nebulised magnesium sulphate as an adjuvant to salbutamol in treatment of severe asthma in adults: randomised placebo-controlled trial. *Lancet* 2003;361:2114–17.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Meral A <i>et al</i> , 1996, Turkey	40 paediatric patients (age 8–13) with asthmatic exacerbation randomised to nebulised salbutamol or nebulised magnesium sulphate	Prospective observational	PEFR Respiratory distress score	Higher PEFR values in the β agonist group at 5 min ($p<0.01$), 60 min ($p<0.05$) and at 360 min ($p<0.01$)	Small sample Unclear randomisation and blinding procedure Questionable outcome measure reliability and reproducibility Unknown exclusion inclusion criteria
Mangat HS <i>et al</i> , 1998, India	33 patients (age 12–60) with asthma (new onset or exacerbation) randomised to nebulised salbutamol or nebulised magnesium sulphate	PRCT	PEFR Fischl index admission rate	No statistical difference between both groups (PEFR increase $p=0.34$; Fischl index improvement $p=0.76$)	Small sample size No power calculation Pre-treatment with corticosteroids Uncertain randomisation and blinding procedure
Nannini LJ, <i>et al</i> 2000, Argentina	35 patients (aged >18 , Av 40) with asthmatic exacerbation randomised to nebulised salbutamol/normal saline (placebo) or to nebulised salbutamol/magnesium sulphate	PRCT	PEFR (relative change)	Percentage increase in PEFR 30% and 60% higher in magnesium treated group at 10min ($p<0.03$) and 20min ($p<0.04$) respectively	Small sample size Unclear blinding procedure
Bessmertry O <i>et al</i> , 2002, USA	80 patients (age 18–65) with asthma exacerbation randomised to nebulised salbutamol/normal saline (placebo) or nebulised salbutamol/magnesium sulphate 80 patients (age 18–65) with asthma exacerbation randomised to nebulised salbutamol/normal saline (placebo) or nebulised salbutamol/magnesium sulphate	PRCT	FEV ₁ FEV ₁	No significant difference found between the groups No significant difference found between the groups	Sample group pre treatment Selection bias Sample group pre-treatment. Selection bias
Hughes R <i>et al</i> , 2003, New Zealand	52 patients (age 16–65) with severe asthma exacerbation randomised to nebulised salbutamol/normal saline (placebo) or nebulised salbutamol/magnesium sulphate	PRCT	FEV ₁	Significant FEV ₁ improvement in magnesium treated group ($p=0.003$)	Sample group pre-treatment. Selection bias. Uncertain randomisation procedure

Role of flexion/extension radiography in neck injuries in adults

Report by Elspeth Pitt, *Specialist Registrar*
Checked by Shobhan Thakore, *Consultant*

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Abstract

A short cut review was carried out to establish whether flexion-extension radiography is indicated in the investigation of a neurologically intact adult patient with midline neck tenderness and normal 3-view cervical spinal radiographs. Altogether 101 papers were found using the reported search, of which five 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 man attends the emergency department having been involved in a high speed road traffic accident. He complains of neck pain and midline neck spinal tenderness but has no neurological signs or symptoms. Standard 3-view cervical spine radiology (lateral, anteroposterior, and odontoid views) shows no abnormality. You wonder if a flexion/extension radiograph would show any significant injury/instability.

Three part question

In [a neurologically intact adult patient with neck pain following trauma but normal plain radiographs] do [flexion/extension xrays] aid [diagnosis of ligamentous or soft tissue injury with instability]?

Search strategy

Medline 1966-05/04 and Embase 1980-05/04 using the Ovid interface. [exp neck injuries/OR neck trauma.mp OR cervical spine trauma.mp OR exp spinal injuries/OR exp spinal cord injuries/OR exp spinal fractures/OR exp fractures/OR cervical spine injur\$.mp OR exp dislocations/OR exp cervical vertebrae/OR cervical spinal cord trauma.mp OR exp spinal cord compression/] AND [flexion-extension.ti OR dynamic cervical spine radiograph\$.mp OR flexion-extension radiograph\$.mp OR flexion-extension cervical spine radiograph\$.mp OR flexion-extension x-ray\$.mp] AND [exp joint instability/OR ligamentous injury.mp OR ligament injury.mp OR cervical vertebrae/OR exp fractures/OR ligamentous instability.mp OR exp soft tissue injuries/OR soft tissue injury.mp] LIMIT to human AND English.

Search outcome

Altogether 101 papers from Medline and 79 from Embase were found of which five were relevant (see table 2).

Comment(s)

Most studies are retrospective so the evidence base is limited. Flexion-extension cervical spine radiography (FECSR) is safe in the properly selected patient. If the patient has adequate

Table 2

Author, date and country	Patient group	Study type(level of evidence)	Outcomes	Key results	Study weaknesses
Lewis LM <i>et al</i> , 1991, USA	141 consecutive adult trauma patients who had flexion extension cervical spine radiography (FECSR) after static cervical spine radiography (SCSR) series	Retrospective review	Radiological abnormality on SCSR	11 of 141 instability on FECSR of which four had normal SCSR. Four had equivocal SCSR and three had fractures on SCSR	Retrospective No comment on blinding or not of radiologist
			Instability on FECSR	FECSR (compared with SCSR alone) increased the sensitivity and specificity for recognising injury from 71% to 99% and 89% to 93% respectively but this was not statistically significant because of small numbers	If abnormal SCSR, CT as well as FECSR done but sometimes before FECSR. Not clear if diagnosis made on CT or FECSR
			Neurological sequelae from performing radiographs	No neurological complications from FECSR	Adequacy of radiography not defined
Wang JC <i>et al</i> 1999, USA	290 patients after trauma—with neck pain, alert, neurologically intact had FECSR	Retrospective review	Instability on FECSR	1 of 290 (0.34%) instability on FECSR	Retrospective
			Adequacy of FECSR	97 of 290 (33.45%) FECSR were inadequate and could not be assessed for instability so evaluated clinically later	Assessment of adequacy—qualitative
			Neurological problems because of FECSR	No neurological changes during FECSR	SCSR not mentioned in study
Brady WJ <i>et al</i> , 1999, USA	451 patients over age 18 years with blunt trauma undergoing SCSR and FECSR	Retrospective descriptive review	Abnormality on FECSR	372 (82.5%) normal SCSR of whom five (1.3%) had abnormal FECSR	Retrospective Convenience Sample—referral bias Clinical outcome of patients not really addressed
			Complications of FECSR	Patients with blunt trauma and neck complaints and an abnormal SCSR are more likely to have abnormal FECSR showing cervical injury requiring stabilisation than if they had normal SCSR No complications from FECSR	No comment on adequacy of radiographs
Pollack CV Jr <i>et al</i> , 2001, USA	86 patients who had FECSR with radiographically demonstrated cervical spine injury from blunt trauma from NEXUS database (patients also had SCSR and CT/MR as deemed necessary)	Subgroup analysis on prospective observational database	Incidence of diagnostic FECSR in patients with normal SCSR	6 of 86 had normal SCSR but abnormal FECSR but none of these were deemed to be clinically significant	No statistics performed No comment on adequacy of radiographs Post hoc subgroup analysis CT/MR used—confounding results Small numbers
Insko EK <i>et al</i> , 2002, USA	106 cases aged 17–85, within 12 hours of blunt trauma, evaluated with FECSR—awake, had pain and normal SCSR	Retrospective review	Interpretation and adequacy of CSR radiographs. Clinical outcome on follow up	9 of 106 patients had cervical spine injury (CSI) on basis of radiograph, clinical diagnosis, and follow up. 74 of 106 (70%) had adequate FECSR of whom five had CSI (no false negatives). 32 (30%) had inadequate FECSR of whom four (12.5%) had CSI subsequently found on CT or MRI	Retrospective No statistics performed Not all patients had the same imaging—varied number and types of plain radiography and CT/MR Excluded 228 patients because of inadequate follow up or radiograph taken after 12 hours

movement FECSR rarely adds to investigation if standard cervical spine radiography (SCSR) is normal. FECSR after an abnormal SCSR is of limited value because of the possibility of inadequate studies (because of pain or muscle spasm) and the risk of false negatives.

► CLINICAL BOTTOM LINE

In the acute setting FECSR adds little if CT/MR can be used to seek fractures or ligamentous instability.

Lewis LM, Docherty M, Ruoff BE, *et al*. Flexion-extension views in the evaluation of cervical spine injuries. *Ann Emerg Med* 1991;**20**:117–21.

Wang JC, Hatch JD, Sandhu HS, *et al*. Cervical flexion and extension radiographs in acutely injured patients. *Clin Orthop Related Res* 1999;**365**:111–16.

Brady WJ, Moghtader J, Cutcher D, *et al*. Ed use of flexion-extension cervical spine radiography in the evaluation of blunt trauma. *Am J Emerg Med* 1999;**17**:504–8.

Pollack CV Jr, Hendey GW, Martin DR, *et al*. Use of flexion-extension radiographs of the cervical spine in blunt trauma. *Ann Emerg Med* 2001;**38**:8–11.

Insko EK, Gracias VH, Gupta R, *et al*. Utility of flexion and extension radiographs of the cervical spine in the acute evaluation of blunt trauma. *J Trauma* 2002;**53**:426–9.

Peripheral pulses to exclude thoracic aortic dissection

Report by Stewart Teece, *Clinical Research Fellow*
 Checked by Kerstin Hogg, *Clinical Research Fellow*

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Abstract

A short cut review was carried out to establish whether the absence of a clinical pulse deficit can be used to exclude dissecting thoracic aneurysm in patients with chest pain. Altogether 89 papers were found using the reported search, of which one was a previous systematic literature review. A further two papers published since the review were also found. These three papers 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 63 year old man presents to the emergency department with a one hour history of central chest pain of sudden onset. ECG shows ST elevation in his inferior leads. He has no obvious contraindications to thrombolysis in his history but you wish to ensure he has no evidence of a dissecting thoracic aneurysm before giving streptokinase. To keep your door to needle time below 20 minutes you wonder whether excluding a pulse deficit clinically is sensitive enough to avoid waiting for radiography.

Three part question

In [patients with acute chest pain] what [is the sensitivity of abnormal peripheral pulses] for [diagnosing acute dissection of the thoracic aorta]?

Search strategy

Medline 1966-05/04 using the Ovid interface. ([dissect\$.af. OR dissect\$.af] AND [aorta.af OR aortic.af] AND [thoracic.af OR chest.af OR thorax.af OR ascend\$.af OR arch.af OR descend\$.af] AND [pulse.af OR puls\$.af]) LIMIT to human AND English language

Search outcome

Altogether 89 papers found. One was a systematic review of the literature up to 2000. All relevant papers except two that post-dated it were included in this review. These three papers are summarised in the table 3.

Comment(s)

Few studies use a control group and use a top-down approach of assessing only patients with a dissection. This makes calculation of likelihood ratios difficult. There is yet to be a blinded bottom up trial of pulse deficit in thoracic aorta dissection. Interestingly it appears that pulse deficit may have use in the risk assessment of dissection.

► CLINICAL BOTTOM LINE

Pulse deficit has a sensitivity of around 30% in dissecting thoracic aortic aneurysm. This is far too low to be considered suitable as a SnOut and other investigations are required.

Klompas M. Does this patient have an acute thoracic aortic dissection? *JAMA* 2002;**287**:2262-72.

Bossone E, Rampoldi V, Nienaber CA, et al. Usefulness of pulse deficit to predict in-hospital complications and mortality in patients with acute type A aortic dissection. *Am J Cardiol* 2002;**89**:851-5.

Mehta RH, O'Gara PT, Bossone E, et al. Acute type A aortic dissection in the elderly: Clinical characteristics, management, and outcomes in the current era. *J Am Coll Cardiol* 2002;**40**:685-92.

Wound closure in animal bites

Report by Freya Garbutt, *Specialist Registrar*
 Checked by Rachel Jenner, *Specialist Registrar*

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Abstract

A short cut review was carried out to establish whether primary closure of animal bites increases wound infection rates. Altogether 74 papers were found using the reported search, of which one 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 this best paper are tabulated. A clinical bottom line is stated

Clinical scenario

A patient presents to the emergency department having been attacked by a dog. He has sustained lacerations to his hand and face. You provide oral analgesia, ensure he is covered for tetanus, and thoroughly clean and irrigate the wounds under local anaesthesia. The patient asks you to close the wounds and you wonder if there is any evidence that this would increase the rate of infection.

Three part question

In [adult patients with animal bites] does [wound closure] increase the [risk of infection]?

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Klompas M, 2000, USA	16 papers pooling sensitivity of pulse deficit in 1586 patients	Meta-analysis	Sensitivity	31% (95% CI 24% to 39%)	Most studies lacked control group Most retrospective analysis of signs in patients with known dissection
Bossone E <i>et al</i> , 2002, Italy	513 patients with type A aortic dissection confirmed on imaging, surgery, or postmortem examination	Mix of prospective diagnostic trial and retrospective review of case notes	Sensitivity Mortality	30% 24.7% no pulse deficit	
Mehta RH <i>et al</i> , 2002, International	550 patients with type A dissection in an international registry	Retrospective analysis of registry	Sensitivity	30.1%	Small study considering five countries Retrospective review of diagnosed patients May include patients from Bossone <i>et al</i> paper.

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Maimaris C and Quinton DN, 1988, UK	96 ED patients with 169 dog bite lacerations (punctures excluded) randomised to primary closure or leaving wound open No antibiotics	PRCT	Infection Cosmesis	Seven infections in sutured group (7.6%), compared with six in open group (7.7%) (not significant) Significantly more infections in hand wounds in both groups than elsewhere ($p < 0.01$) 5 of 30 infections of hand wounds sutured (16%), 4 of 45 infections of hand wounds left open (8%) Cosmesis good or fair in both groups (scar width 2–6 mm in open compared with 1–5 mm in closed)	Randomisation method not stated Uncertainty about the adherence to standard wound toilet in early stages of study

Search strategy

Medline 1966-05/04 using the OVID interface. [exp“bites and stings” OR bite.mp] AND [suture.mp OR exp sutures OR steristrip.mp OR exp adhesives OR glue.mp] LIMIT to human AND English language.

Search outcome

Altogether 74 papers were found of which one provided the best evidence to answer the clinical question (see table 4).

Comment(s)

Only one PRCT has been performed to directly investigate infection rates in animal bite wounds treated by primary closure compared with non-closure. No antibiotics were used in this study. It excludes puncture wounds, wounds infected at presentation, wounds with other structures involved, and those requiring plastic surgery. The study concludes that there is no significant difference in infection rates between the two groups except in those wounds occurring to the hands. Significantly more hand wounds became infected than wounds elsewhere, and of all hand wounds significantly more became infected in the group treated by closure. The study also noted that a delay to presentation of more than 10 hours was associated with an increased risk of infection but the relevant raw data are not presented.

► CLINICAL BOTTOM LINE

Bite wounds to the hand should be left open. Non-puncture wounds elsewhere may be safely treated by primary closure after thorough cleaning.

Maimaris C, Quinton DN. Dog-bite lacerations: a controlled trial of primary wound closure. *Arch Emerg Med* 1988;5:156–61.

Therapeutic hypothermia after out of hospital cardiac arrest

Report by Bernard A Foëx, *Consultant*

Checked by John Butler, *Consultant*

doi: 10.1136/emj.2004.017970

Abstract

A short cut review was carried out to establish whether therapeutic hypothermia improves outcome in comatose post cardiac arrest patients. Altogether 176 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.

Clinical scenario

A 46 year old father of three collapses in the street with a cardiorespiratory arrest. He receives five minutes of bystander CPR. When the ambulance crew arrives he is in ventricular fibrillation. Return of spontaneous circulation is achieved after defibrillation. On arrival in the emergency department he is still in coma. You wonder if his chances of survival or of a good neurological outcome would be improved by therapeutic hypothermia?

Three part question

In [adults who have sustained an out of hospital cardiac arrest] does [therapeutic hypothermia] [improve outcome]?

Search strategy

Medline 1966-05/04 using the Ovid interface, The Cochrane Library, Issue 2, 2004 and Bandolier to 05/04. Medline: [exp Hypothermia, Induced/OR hypothermia, therapeutic.mp.] AND [exp Heart Arrest/OR cardiac arrest.mp.] LIMIT to human AND English language. Cochrane Library: “hypothermia”.

Search outcome

Altogether 176 papers were found in Medline, only four described any sort of comparative study. Four papers were found in Cochrane, none of which were relevant to the three part question (see table 5).

Comment(s)

There are only four trials of mild hypothermia after cardiac arrest, and only two are randomised controlled trials. Treatment could not be blinded. All show a neurological benefit from mild hypothermia. Only two showed a survival benefit. The main inclusion criterion for these two trials was that patients had been in ventricular fibrillation. In study number 3 patients with a non-perfusing ventricular tachycardia were also included. There is no uniform protocol for how long hypothermia should be maintained, or the rate of rewarming.

► CLINICAL BOTTOM LINE

Patients remaining unconscious after out of hospital cardiac arrest, from ventricular fibrillation or non-perfusing ventricular tachycardia, should be cooled to 32–34°C for at least 12 hours as part of their post-arrest intensive care to optimise neurological recovery. This therapeutic strategy has been

Table 5

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Bernard SA <i>et al</i> , 1997, Australia	22 adults who remained unconscious after return of spontaneous circulation after out of hospital cardiac arrest Hypothermia group cooled to 33°C for 12 h and rewarmed over 6 h to 36°C	Prospective study with historical control group.	Good neurological recovery (Glasgow outcome scale 1 or 2) Survival	Hypothermia gp 11/22 versus Normothermia gp 3/22, p<0.05 Hypothermia gp 12/22 versus Normothermia gp 5/22, p<0.05	Prospective study with 22 historical controls rather than a randomised control trial
Yanagawa Y <i>et al</i> , 1998, Japan	13 adults with out of hospital cardiac arrest and return of spontaneous circulation Core temperature 33–34°C for 48 h. Rewarmed to 37°C at 1 °C/day. Control group 15 patients treated before the hypothermia protocol was started	Prospective study	Good neurological recovery (GOS 1) Survival	Hypothermia gp 3/13 versus Normothermia gp 1/15 Hypothermia gp 7/13 versus Normothermia gp 5/15, p=0.27	Historical controls rather than randomised study
Bernard SA <i>et al</i> , 2002, Australia	77 adults who remained unconscious after resuscitation from out of hospital cardiac arrest hypothermia to 33°C for 12 h versus normothermia	Randomised control trial	Good neurological recovery (GOS 1–2) Survival	Hypothermia gp 21/43 versus normothermia gp 9/34, p=0.046 Hypothermia gp 21/43 versus normothermia 11/34, p=0.145	Odd and even day prehospital randomisation
The Hypothermia after Cardiac Arrest Study Group, 2002, Europe	275 adults with out of hospital cardiac arrest and return of spontaneous circulation Hypothermia to 32–34°C for 24 h then passive rewarming over 8 h versus normothermia	Randomised controlled trial with blinded assessment of outcome.	Good neurological outcome at 6 months (GOS 1 or 2) Survival at 6 months	Hypothermia gp 75/136 versus normothermia gp 54/137, p =0.009 80/136 versus normothermia gp 61/137, p=0.02	Enrolment rate slower than expected. Study ended when funds ran out

endorsed by the International Liaison Committee on Resuscitation.

Bernard SA, Jones BM, Horne MK. Clinical trial of induced hypothermia in comatose survivors of out-of-hospital cardiac arrest. *Ann Emerg Med* 1997;**30**:146–53.

Yanagawa Y, Ishihara S, Norio H, *et al*. Preliminary clinical outcome study of mild resuscitative hypothermia after out-of-hospital cardiopulmonary arrest. *Resuscitation* 1998;**39**:61–6.

Bernard SA, Gray TW, Buist MD, *et al*. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. *N Engl J Med* 2002;**346**:557–63.

The Hypothermia after Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *N Engl J Med* 2002;**346**:549–56.

Nolan JP, Morley PT, Vanden Hoek TL, *et al*. Therapeutic hypothermia after cardiac arrest. An advisory statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation. *Resuscitation* 2003;**57**:231–5.

Nolan JP, Morley PT, Vanden Hoek TL, *et al*. Therapeutic hypothermia after cardiac arrest. An advisory statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation. *Circulation* 2003;**108**:118–21.

Gastric lavage in aspirin and non-steroidal anti-inflammatory drug overdose

Report by Stewart Teece, *Clinical Research Fellow*
Checked by Ian Crawford, *Clinical Research Fellow*

doi: 10.1136/emj.2004.017988

Abstract

A short cut review was carried out to establish whether gastric lavage was better than activated charcoal alone at reducing toxicity after aspirin or other non-steroidal

anti-inflammatory drug (NSAID) overdose. Altogether 72 papers were found using the reported search, of which one presented the best evidence to answer the clinical question. A further relevant paper was found on scanning the references of papers identified. 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 53 year old widow attends the emergency department having taken 20 aspirin and 20 ibuprofen 1.5 hours previously. You remember that NSAIDs slow gastric emptying and wonder whether gastric lavage would be of use in toxicity reduction..

Three part question

[In overdose with aspirin or other non-steroidal anti-inflammatory drugs] is [gastric lavage better than activated charcoal] at [reducing toxicity]?

Search strategy

Medline 1966-05/04 using the Ovid interface. [{exp gastric lavage OR gastric lavage.mp OR exp gastric emptying OR gastric emptying.mp OR exp irrigation OR lavage.mp OR emtp\$.mp OR irrigat\$.af OR washout.af OR wash-out.af} AND {exp poisoning OR exp overdose OR exp suicide OR exp Self-Injurious Behavior/ OR poiso\$.af OR overdos\$.af OR suicid\$.af OR (deliberate adj5 self adj5 harm).af OR dsh.af} AND {exp aspirin OR exp anti-inflammatory agents, non-steroidal OR salic\$.af OR nsaid.mp OR ketoprofen.af OR diclofenac.af OR aceclofenac.af OR acemetacin.af OR

Table 6

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Danel V <i>et al</i> , 1988, UK	12 healthy volunteers given 1.5 g aspirin acting as own controls treated with nothing, charcoal and lavage	Prospective controlled study	Salicylate recovered in urine over 24 h	Control 13.3% lavage 8.8% charcoal 7.0%	Statistical significance not assessed Dose fairly small Number of patients small
Lapatto-Reiniluoto O <i>et al</i> , 1999, Finland	Nine healthy volunteers as own controls given 400 mg ibuprofen. Treated with water (control), charcoal or charcoal followed by lavage	Prospective controlled trial	AUC plasma ibuprofen as % of control	Control 100% charcoal alone 70% ($p < 0.05$) charcoal + lavage 51% ($p < 0.05$). No statistical significance between control groups	Small numbers Therapeutic ibuprofen dose

azapropazone.af OR celecoxib.af OR dexketoprofen.af OR diflunisal.af OR etodolac.af OR fenbrufen.af OR fenoprofen.af OR flurbiprofen.af OR indometacin.af OR indomethacin.af OR ketoprofen.af OR mefenamic acid.af OR meloxicam.af OR nabumetone.af OR naproxen.af OR phenylbutazone.af OR piroxicam.mp OR exp piroxicam OR rofecoxib.af OR sulindac.af OR tenoxicam.af OR tiaprofenic acid.af}] LIMIT to human AND English language.

Search outcome

Altogether 72 papers were found 71 of which failed to answer the three part question. A further reference was found after scanning of paper references. The two papers are shown in the table 6.

Comment(s)

There are no large scale trials performed in this area, however those that exist show that at best lavage is no better if not slightly worse than charcoal at reducing salicylate toxicity. Lavage although better than nothing has an element of risk involved in its practice and charcoal must therefore be treatment of choice.

► CLINICAL BOTTOM LINE

Gastric lavage is no better than charcoal alone at reducing toxicity after aspirin or NSAID overdose.

Danel V, Henry JA, Gluckman E. Activated charcoal, emesis and gastric lavage in aspirin overdose. *BMJ Clin Res Ed* 1988;**296**:1507.

Lapatto-Reiniluoto O, Kivisto KT, Neuvonen PJ. Effect of activated charcoal alone or given after gastric lavage in reducing the absorption of diazepam, ibuprofen and citalopram. *Br J Clin Pharmacol* 1999;**48**:148–53.