

BEST EVIDENCE TOPIC REPORTS

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

Edited by K Mackway-Jones

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. Each BET is based on a clinical scenario and ends with a clinical bottom line that indicates, in the light of the evidence found, what the reporting clinician would do if faced with the same scenario again. 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 Five BETs are included in this issue of the journal, the last of which is negative.

- ▶ Timing of lumbar puncture in suspected subarachnoid haemorrhage
- ▶ Proteolytic enzymes for oesophageal meat impaction
- ▶ Effervescent agents for oesophageal food bolus impaction
- ▶ Humeral fractures and non-accidental injury in children
- ▶ Torn frenulum and non-accidental injury in children

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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, Morton 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.

Timing of lumbar puncture in suspected subarachnoid haemorrhage

Report by Simon Carley, Consultant
Checked by Magnus Harrison, Specialist Registrar

doi: 10.1136/emj.2004.022038

Abstract

A short cut review was carried out to establish how long after onset of headache a lumbar puncture should be carried out to rule out subarachnoid haemorrhage. Altogether 142 papers were found using the reported search, of which one presented the best evidence to answer the clinical question.

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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 24 year old man presents to the emergency department (ED) with a sudden, severe occipital headache. He collapsed at the time of the initial headache but now feels better. He had computed tomography performed in the ED, which was negative. He was subsequently referred to the medical team who performed a lumbar puncture (LP) one hour after admission (two hours after the initial headache). This was negative and he was permitted home. One week later he re-presents to the ED by ambulance after another collapse. He is GCS 3 on arrival and dies shortly afterwards. Computed tomography and postmortem examination show the cause of death to be subarachnoid haemorrhage. You wonder if the LP was done too early to spot the original bleed.

Three part question

In [patients with suspected SAH but a negative CT scan] is [late LP (>12 hours) better than early LP] at [definitively diagnosing SAH]?

Search strategy

Medline 1966-10/04 using the Ovid interface. [(exp subarachnoid hemorrhage OR subarachnoid.mp OR subarachnoid haemorrhage.mp) AND (exp cerebrospinal fluid OR spinal fluid.mp OR exp spinal puncture OR lumbar puncture.mp OR xanthochromia.mp) AND (time.mp OR tim\$.mp)] LIMIT to human, English AND abstracts.

Search outcome

Altogether 142 papers were found of which one was relevant to the clinical question (table 1).

Comment(s)

It is common practice to withhold LP until 12 hours after the headache onset. This is based on limited evidence from a small number of papers in this review. Most patients in studies of bilirubin biokinetics had positive CT scans. As LP is normally reserved for those patients with a negative CT scan they are arguably a different group. Despite these limitations current laboratory work suggests that bilirubin will remain undetectable until 12 hours after symptom onset. This should remain the current practice. What is not shown from the literature is that any patient who had negative initial findings (on early LP) followed by positive findings (on late LP). Such cases would provide a convincing argument, but none were found.

▶ CLINICAL BOTTOM LINE

In patients with suspected subarachnoid bleeds, LP is not an adequate rule out strategy until 12 hours after the headache onset.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
UK National External Quality Assessment Scheme for Immunochemistry Working Group, 2003, UK	Review of current recommendations for clinical biochemists in the UK	Review article	Time for formation of bilirubin in CSF. Selection of bilirubin as key determinant	This occurs 9–15 hours after a bleed. Bilirubin is the only product of red cell lysis that occurs solely in vivo	Not systematic review. Basic data on which recommendation not given.

UK National External Quality Assessment Scheme for Immunochemistry Working Group. National guidelines for analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid haemorrhage. *Ann Clin Biochem* 2003;40:481–8.

Proteolytic enzymes for oesophageal meat impaction

Report by Jason Lee, *Specialist Registrar*
Checked by Ross Anderson, *Senior House Officer*

doi: 10.1136/emj.2004.022046

Abstract

A short cut review was carried out to establish whether proteolytic enzymes are effective at resolving oesophageal meat impaction. Altogether 98 papers were found using the reported search, of which three 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 35 year old man attends the emergency department with a history of oesophageal obstruction after an attempt at the 20 ounce house-special at the local steak house restaurant. The ENT doctor on-call will be in theatre for some time and suggests sips of fresh pineapple juice, which he informs you contains a proteolytic enzyme, bromelain. You recall the vet prescribing papain for your cat's furball last year and decide to look for fresh pineapple juice in the department. Finding

none, you admit the patient but wonder if it would have been effective.

Three part question

In [a patient with oesophageal meat impaction] are [proteolytic enzymes effective] at [inducing resolution and minimising complications]?

Search strategy

Medline 1966–10/04 and Embase 1980–10/04 using the OVID interface. Medline: [(pineapple\$.mp OR bromelain.mp OR exp papain OR papain.mp OR trypsin.mp OR chymotrypsin.mp OR enzyme\$.mp OR proteolytic.mp OR Adolph's meat tenderizer\$.mp OR caroid.mp) AND (exp esophagus OR oesophag\$.mp OR esophag\$.mp) AND (food.mp OR bolus.mp OR exp foreign bodies OR foreign bod\$.mp OR exp meat OR meat.mp OR impact\$.mp OR obstruct\$.mp OR dysphagia.mp OR steak\$.mp)] LIMIT to human AND English language. Embase: [(pineapple\$.mp OR bromelain.mp OR exp papain OR papain.mp OR trypsin.mp OR chymotrypsin.mp OR enzyme\$.mp OR proteolytic.mp OR Adolph's meat tenderizer\$.mp OR caroid.mp) AND [exp esophagus obstruction OR {(oesophag\$.mp OR esophag\$.mp) AND (food.mp OR bolus.mp OR exp foreign body OR foreign bod\$.mp OR exp meat OR meat.mp OR impact\$.mp OR obstruct\$.mp OR dysphagia.mp OR steak\$.mp)}] LIMIT to human AND English language.

Search outcome

Altogether 98 papers were found in Medline and 80 in Embase, three of which were relevant to the question posed (table 2).

Table 2

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Cavo JW Jr <i>et al</i> , 1977, US	90 patients with oesophageal meat impaction: 44 patients received caroid solution (papain) 37 patients received papain 8 patients received various enzymes 1 patient received Adolph's meat tenderiser (papain)	Case review	Passage of the impacted meat Complications	Bolus successfully passed in 89 cases Bolus not passed in 1 case 2 patients died (oesophageal perforation, mediastinitis, and great vessel perforation)	Most cases given barium before enzymes. Dose of enzyme given varied between studies Some studies retrospective. Not all studies treated consecutive patients. One of the patients who died from perforation had meat impaction for 10 days before presentation.
Hall ML and Huseby JS, 1988, USA	1 patient with oesophageal meat impaction Adolph's meat tenderiser (papain)	Case report	Passage of the impacted meat Complications	Meat bolus not passed Haemorrhagic pulmonary oedema	Given barium before enzymes Given meperidine, glucagon and diazepam after enzyme, then intubated
Maini S <i>et al</i> , 2001, UK	1 patient with oesophageal meat impaction Papain	Case report	Passage of the impacted meat Complications	Successfully passed Aspiration pneumonitis	

Comment(s)

Papers evaluating the effectiveness of proteolytic enzymes consist of case reports or case series only. Almost all used sips of a solution containing papain. Published cases up to 1977 report successful passage of the bolus in 89 of 90 cases treated with enzymes but with two fatalities. Since 1977, only two case reports of proteolytic enzyme use for meat oesophageal impaction have been published. One reported haemorrhagic pulmonary oedema (Hall) while the most recent (Maini) reported aspiration pneumonitis from papain use in a patient at a UK hospital in 2000. No reference to pineapple juice use was found in the literature.

► CLINICAL BOTTOM LINE

There is no evidence to support the effectiveness of fresh pineapple juice in resolving meat impaction in the oesophagus. Proteolytic enzymes have been successful but afford an unacceptable risk of serious complications. Their use should be avoided by doctors in the emergency department.

Cavo JW Jr, Koops HJ, Gryboski RA. Use of enzymes for meat impactions in the esophagus. *Laryngoscope* 1977;**87**:630-4.

Hall ML, Huseby JS. Hemorrhagic pulmonary edema associated with meat tenderizer treatment for esophageal meat impaction. *Chest* 1988;**94**:640-2.

Maini S, Rudralingam M, Zeitoun H, et al. Aspiration pneumonitis following papain enzyme treatment for oesophageal meat impaction. *J Laryngol Otol* 2001;**115**:585-6.

Effervescent agents for oesophageal food bolus impaction

Report by Jason Lee, *Specialist Registrar*

Checked by Ross Anderson, *Senior House Officer*

doi: 10.1136/emj.2004.022053

Abstract

A short cut review was carried out to establish whether fizzy drinks alone are effective at resolving food bolus impaction. Altogether 46 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

It is Christmas day when a 70 year old woman is brought to the emergency department by her family with a history of oesophageal obstruction after eating her turkey dinner. You wonder if a fizzy drink might resolve the obstruction.

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Rice BT <i>et al</i> , 1983, USA	8 patients with oesophageal meat impaction Tartaric acid and sodium bicarbonate	Case series	Passage of the impacted food bolus Complications	Successfully passed in all cases No complications	Patients given barium before the effervescent agent
Campbell N and Sykes P, 1986, UK	2 patients with oesophageal food impaction Carbex	Case reports	Passage of the impacted food bolus Complications	Successfully passed in both cases No complications	Patients given barium before the effervescent agent
Mohammed SH and Hegedus V, 1986, Denmark	28 patients with impacted oesophageal foreign body	Case series	Passage of the impacted food bolus Complications	8 resolved by barium alone, 16 resolved by barium and soda 4 not resolved Laryngeal aspiration of barium in 1 patient	Patients given barium before the effervescent agent Retrospective In 1 case the foreign body was a coin
Zimmers TE <i>et al</i> , 1988, USA	All episodes (26) of oesophageal food impaction treated with effervescent agents over a 4 year period Tartaric acid and sodium bicarbonate	Case series	Passage of the impacted food bolus Complications	Successfully passed in 17 cases. Unsuccessful in 9 cases "Most vomited" Oesophageal tear in 1 patient	Patients given barium before the effervescent agent Retrospective
Karanjia ND and Rees M, 1993, UK	13 episodes (8 patients) requiring endoscopy for oesophageal food impaction	Case series	Presence or absence impacted food in oesophagus at endoscopy Complications	No foreign body seen in 8 of 8 patient events receiving prior treatment with Coca-Cola. Foreign body seen in 5 of 5 patient events receiving no prior treatment No complications in either group	1 patient given 3 days of Coca-Cola before resolution occurred (after extensive bolus noted at endoscopy) ?Selection bias
Spinou E <i>et al</i> , 2003, UK	Coca-Cola or nothing 1 patient with oesophageal meat impaction Carbex (=sodium bicarbonate, simethicone and citric acid)	Case report	Passage of the impacted food bolus Complications	Successfully passed No complications	Patient given barium before the effervescent agent Buscopan given to the patient 24 hours earlier with no success

Three part question

In [a patient with food bolus impaction] are [effervescent agents effective] at [inducing resolution and minimising complications]?

Search strategy

Medline 1966-10/04 and Embase 1966-10/04 using the Ovid interface. Medline: [effervescent.mp OR fizzy.mp OR exp carbonated beverages OR coke.mp OR cola.mp OR coca-cola.mp OR sodium bicarbonate.mp OR exp sodium bicarbonate OR exp citric acid OR citrate.mp OR citric acid.mp OR tartaric acid.mp OR carbex.mp OR gas-forming.mp] AND [exp Esophageal Stenosis OR {(oesophag\$.mp OR esophag\$.mp) AND (food.mp OR bolus.mp OR exp foreign bodies OR foreign bod\$.mp OR meat.mp OR impact\$.mp OR obstruct\$.mp OR dysphagia.mp OR steak\$.mp)}] LIMIT to human AND English language. Embase: [(effervescent.mp OR fizzy.mp OR exp carbonated beverages OR coke.mp OR cola.mp OR coca-cola.mp OR sodium bicarbonate.mp OR citrate.mp OR exp citric acid OR citric acid.mp OR exp tartaric acid OR tartaric acid.mp OR exp carbex OR carbex.mp OR gas-forming.mp) AND [exp esophagus obstruction OR {(oesophag\$.mp OR esophag\$.mp) AND (food.mp OR bolus.mp OR exp Foreign body OR foreign bod\$.mp OR meat.mp OR impact\$.mp OR obstruct\$.mp OR dysphagia.mp OR steak\$.mp)}] LIMIT to human AND English language.

Search outcome

Altogether 35 papers were found in Medline and 46 papers in Embase. After exclusion of papers using a combination of glucagon or buscopan with effervescent agents, six papers remained that were relevant to the question posed (table 3).

Comment(s)

Effervescent agents have successfully resolved oesophageal food impaction in a number of cases. However, these studies represent only low level of evidence (case reports, case series, or case-control studies) and in most studies the patients had undergone prior barium swallow to conclude the diagnosis. It is feasible that these cases resolved through the "weight of

column effect" of the barium. A wealth of correspondence exists in journals from clinicians stating that they have used effervescent agents "many times" safely and successfully. They do not, however, provide data. Overall, the published success rate of effervescent agents is 80% (52 of 65 cases). The complication rate, 3% (2 of 65 cases), is low but exceeds the figures quoted in the literature for endoscopic removal. More research is needed in this area.

► CLINICAL BOTTOM LINE

Effervescent agents seem to be effective at resolving oesophageal food obstruction but their use is not without risk of complications. Consultation with ENT before their use is recommended.

Rice BT, Spiegel PK, Dombrowski PJ. Acute esophageal food impaction treated by gas-forming agents. *Radiology* 1983;**146**:299-301.

Campbell N, Sykes P. Non-endoscopic relief of oesophageal obstruction. *Lancet* 1986;ii:1405.

Mohammed SH, Hegedus V. Dislodgement of impacted oesophageal foreign bodies with carbonated beverages. *Clin Radiol* 1986;**37**:589-92.

Zimmers TE, Chan SB, Kouchoukos PL, *et al.* Use of gas-forming agents in esophageal food impactions. *Ann Emerg Med* 1988;**17**:693-5.

Karanjia ND, Rees M. The use of Coca-Cola in the management of bolus obstruction in benign oesophageal stricture. *Ann R Coll Surg Engl* 1993;**75**:94-5.

Spinou E, Kubba H, Guse J, *et al.* The radiological management of oesophageal food bolus obstruction using a gas-forming agent and barium. *Auris Nasus Larynx* 2003;**30**:103-5.

Humeral fractures and non-accidental injury in children

Report by Robert Williams, *Specialist Registrar*
Checked by N Hardcastle, *Senior House Officer*

doi: 10.1136/emj.2004.022061

Abstract

A short cut review was carried out to establish whether proximal humeral fractures in children are indicative of non-accidental injury. Altogether 44 papers were found using the reported search, of which two presented the best evidence to answer the clinical question. The author, date and country of

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Strait RT <i>et al</i> , 1995, USA	124 children under 36 months with humeral shaft fractures identified by retrospective chart review. Subdivided into age less than 15 months and those aged 15 to 36 months. Diagnosis of abuse, indeterminate, or not abuse made by consensus.	Diagnostic retrospective test study	Abuse diagnosed—overall Supracondylar fractures Spiral/oblique fractures	<15 months: 36%; 15–36 months: 1% <15 months: 2/10 (20%) <15 months: 7/12 (58%)	Small numbers Single hospital "Gold standard" of diagnosis of abuse inadequate - based on retrospective chart review, with no standard criteria for the definition of abuse "Abuse"/ "not abuse" not determined in 23 cases. If all these were "abuse", figures change dramatically. In case of Salter Harris I and II and lateral condylar group only single fracture of each type, skewing the validity of the calculations Retrospective
Shaw BA <i>et al</i> , 1997, USA	34 unselected children (<3 years) with humeral shaft fractures	Retrospective diagnostic test study	Transverse Oblique Spiral	Specificity 57% (57%) LR+ 0.39 (0.72) Spec 79% (71%) LR+ 0.78 (0.27) Specificity 68% (76%) LR+ 2.07 (2.58)	Gold standard problem—diagnosis of abuse based on retrospective case note review and information from child protection services; no standard criteria for the definition of abuse Small numbers Single hospital

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 22 month old child attends the department and is reported not to be using her arm. You question the mother of the child who explains the child seems to have injured herself at nursery, although no one can corroborate the story. Radiography shows an undisplaced humeral fracture. Further inquiry is unrewarding, and you wonder whether the presence of the fracture alone is sufficient to support a diagnosis of non-accidental injury.

Three part question

In [children in whom non-accidental injury is suspected] what [is the specificity of] an [isolated proximal humeral fracture]?

Search strategy

Medline 1969–10/04 using the OVID interface. [Exp battered child syndrome OR battered child syndrome.mp OR exp child abuse OR non-accidental injury.mp OR NAI.mp] AND [exp humeral fractures OR {(exp fractures OR fracture\$.mp OR exp fractures, closed OR exp fractures, open) AND (exp humerus OR humer\$.mp)}].

Search outcome

Altogether 44 papers were found of which 42 did not address the question directly. The remaining two papers are shown in table 4.

Comment(s)

The detection and diagnosis of child abuse is difficult and requires a holistic approach. However, traditional teaching has suggested that certain injuries are pathognomic of abuse. These papers attempt to define the specificity for child abuse of various types of humeral fracture. However, both studies lack an adequate “gold standard” that abuse was the cause. It is possible that abused children may have been missed and also the converse could be true. Despite this, the reported incidence of abuse associated with these fractures seems high. In particular spiral or oblique fractures, in children under the age of 3 more often occur as a result of abuse.

► CLINICAL BOTTOM LINE

Although not pathognomonic of child abuse, the presence of a humeral fracture in a young child should lead to further investigation of its cause.

Strait RT, Siegel RM, Shapiro RA. Humeral fractures without obvious etiologies in children less than 3 years of age: when is it abuse? *Paediatrics* 1995;**96**:677–71.

Shaw BA, Murphy KM, Shaw A, et al. Humerus shaft fractures in young children: accident or abuse? *J Pediatr Orthop* 1997;**17**:293–7.

Torn frenulum and non-accidental injury in children

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

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Abstract

A short cut review was carried out to establish whether a torn frenulum in a child is indicative of non-accidental injury. Altogether 104 papers were found using the reported search, of which none presented any evidence to answer the clinical question. It is concluded that there is no evidence available to answer this question. Further research is needed.

Clinical scenario

A 2 year old boy is brought to the department with bleeding from a mouth injury. His father states that he fell over pushing his dummy into his mouth. The child has no other obvious injury and although the mechanism of injury sounds plausible you find a torn frenulum on examining his mouth. Remembering this as an indicator of non-accidental injury you wonder whether this injury alone is sensitive/specific enough to support this diagnosis.

Three part question

In [a child] with [a torn frenulum] what [is the sensitivity and sensitivity of this sign as an indicator of non-accidental injury]?

Search strategy

Medline 1966-10/04 using the Ovid interface. [exp Labial Frenum OR exp lingual frenum OR frenum.af. OR frenulum.af OR exp lip OR lip.af] AND [exp Child abuse, sexual OR exp Child abuse OR abuse.af OR exp Battered child syndrome OR batter\$.af OR exp Violence OR violen\$.af OR assault.af OR non-accidental.af OR dummy.af OR dummies.af OR exp Sucking Behavior/OR exp Pacifiers OR pacifier.af] LIMIT to human AND English language.

Search outcome

Altogether 104 papers found none of which answer the three part question.

► CLINICAL BOTTOM LINE

There seems to be no evidence for the sensitivity/specificity of torn frenulum in the investigation of non-accidental injury.