



Detection of pneumoperitoneum on erect chest radiograph

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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 Infirmary.¹ 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 Four positive and three negative BETs are included in this issue of the journal.

- ▶ Detection of pneumoperitoneum on erect chest radiograph
- ▶ Cervical spine radiography in alert asymptomatic blunt trauma patients
- ▶ The use of antibiotics in venomous snake bite
- ▶ Activated charcoal and gastric absorption of iron compounds
- ▶ Antibiotics after puncture wounds to the foot
- ▶ Phenytoin or paraldehyde as the second drug for convulsions in children
- ▶ Aspiration of acute traumatic knee haemarthrosis

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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](http://www.bestbets.org): Odds on favourite for evidence in emergency medicine reaches the worldwide web. *J Accid Emerg Med* 2000;**17**:235–6.

Detection of pneumoperitoneum on erect chest radiograph

Report by John Butler, *Specialist Registrar*

Checked by Bruce Martin, *Specialist Registrar*

Abstract

A short cut review was carried out to establish whether a normal erect chest radiograph excludes the diagnosis of perforated abdominal viscus. Altogether 37 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 publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these best papers are shown in table 1. A clinical bottom line is stated.

Clinical scenario

A 37 year old female patient attends the emergency department with a four hour history of epigastric pain. The patient has been taking non-steroidal anti-inflammatory tablets for backache for the past few months. On examination she has mild tenderness in the epigastric region but no peritonism. You wonder whether an erect chest radiograph is sensitive enough to exclude a perforation of an abdominal viscus.

Three part question

In [patients with a possible perforated abdominal viscus] does [a normal erect chest radiograph] exclude [pneumoperitoneum]?

Search strategy

Medline 1966–11/01 using the OVID interface. ({exp pneumoperitoneum OR exp intestinal perforation OR exp abdominal pain OR exp abdomen acute} AND {exp radiography, thoracic}) LIMIT to human AND English.

Search outcome

Altogether 37 papers found of which two papers were relevant to the original question.

Comment(s)

The available evidence on the sensitivity of upright abdominal chest radiographs at detecting pneumoperitoneum is poor. No studies looked at patients attending the emergency department with abdominal pain. However, the available evidence suggests that an erect posteroanterior chest radiograph is not sufficiently sensitive to be used as a sNout for pneumoperitoneum in such patients. Sensitivity might be improved by performing either an erect lateral chest radiograph or computed tomography.

▶ CLINICAL BOTTOM LINE

An erect posteroanterior chest radiograph is not sufficiently sensitive to rule out pneumoperitoneum in patients attending emergency departments with abdominal pain.

Stapakis JC, Thickman D. Diagnosis of pneumoperitoneum: abdominal CT vs. upright chest film. *J Comput Assist Tomogr* 1992;**16**:713–16.

Woodring JH, Heiser MJ. Detection of pneumoperitoneum on chest radiographs: comparison of upright lateral and posteroanterior projections. *Am J Roentgenol* 1995;**165**:45–7.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Stapakis JC <i>et al</i> , 1992, USA	13 patients with known pneumoperitoneum after diagnostic peritoneal lavage	Diagnostic study of upright PA chest radiograph against CT of abdomen	Sensitivity of chest radiograph and CT for detection of pneumoperitoneum	CT demonstrated free gas in all cases	Iatrogenic pneumoperitoneum Small numbers of cases What size collection is clinically relevant?
Woodring JH <i>et al</i> , 1995, USA	100 consecutive patients with pneumoperitoneum from a variety of causes	Diagnostic study	Sensitivity of upright PA chest radiograph Sensitivity of lateral upright chest radiograph Difference between upright and lateral Sensitivity of both radiographs	80% 98% 18% p<0.01 100%	Pneumoperitoneum from a variety of causes Only 7 patients presenting as emergencies with acute perforated abdominal viscus Gold standard for pneumoperitoneum variable

Cervical spine radiography in alert asymptomatic blunt trauma patients

Report by Damian Bates, *Specialist Registrar*

Checked by John Butler, *Specialist Registrar*

Abstract

A short cut review was carried out to establish whether a normal cervical spine radiograph excludes bony cervical spine injury in alert, asymptomatic trauma patients. Altogether 232 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 shown in table 2. A clinical bottom line is stated.

Clinical scenario

A 46 year old man is brought to the emergency department after a road traffic accident, involving a rear end shunt, to "get checked out". He is fully alert and cooperative. You are aware that many people advise radiographs in all patients to exclude cervical spine injury. You wonder whether this is really necessary.

Three part question

In [alert asymptomatic blunt trauma patients] is [cervical spine radiography] necessary to [exclude bony injury to the cervical spine]?

Search strategy

Medline 1966–10/01 using the OVID interface. [exp cervical vertebrae OR exp spinal cord injuries OR exp spinal fractures OR exp spinal injuries OR cervical spine injury.mp] AND [exp x-rays OR x-rays.mp OR exp radiography OR radiograph\$.mp OR cervical radiograph\$.mp] AND [exp prospective studies OR prospective studies.mp]. LIMIT to human and English.

Table 2

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Roberge RJ <i>et al</i> , 1988, USA	467 blunt trauma patients undergoing c-spine radiograph	Prospective	Cervical spine injury	In alert patients cervical spine pain. Sensitivity 100% (54–100). Cervical spine tenderness, sensitivity 100% (54–100)	
Roberge RJ and Wears RC, 1992, USA	480 blunt trauma patients undergoing c-spine radiograph	Prospective	Cervical spine injury	Clinical examination in alert patients, sensitivity 93% (75–100). Negative predictive value 98.7% (94.9–100)	Not all patients included Total number of blunt trauma victims not known No search for misses
Hoffman JR <i>et al</i> , 1992, USA	974 blunt trauma patients who had radiograph performed and data sheet filled in	Prospective	Cervical spine fracture	Alert patient with no intoxication, midline neck tenderness or distracting injury, sensitivity=100%	Not all patients included in the study No search for misses
Velhamos GC <i>et al</i> , 1996, USA	549 blunt trauma patients Alert, not intoxicated and no neck pain Brought to hospital in hard collar	Prospective	Cervical spine injury or fracture	All patients had normal c-spine examination. No c-spine fractures or cord injuries found	
Gonzalez RP <i>et al</i> , 1999, USA	2176 consecutive blunt trauma patients GCs 14 or 15	Prospective	Cervical spine injury	Clinical examination 91% sensitivity for CSI; lateral c-spine screen (xr, swimmers CT) 61% sensitivity for CSI	Includes intoxicated patients No power calculation No search for misses
Hoffman JR <i>et al</i> , 2000, USA	34069 patients having cervical spine radiograph after blunt trauma 21 centres	Prospective	Clinically significant cervical spine injury	Decision instrument (alert with no evidence of intoxication, no midline cervical tenderness and no neurological deficit or distracting injury). Sensitivity of 99.6% (98.6–100) for significant injury, negative predictive value 99.9% (98.8–100)	

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Clark RF <i>et al</i> , 1993, USA	54 patients who attended with crotalid (rattlesnake) envenomations observed for signs of infection Data available for 41	Prospective observational study	Presence of infection	3% patients without antibiotics developed an infection, compared with 22% (2/9) who were receiving antibiotics	Follow up involved telephone consultation as well as direct observation Very small numbers
Kerrigan KR <i>et al</i> , 1997, Ecuador	114 patients—59 randomly assigned to receive antibiotics	PRCT	Presence of infection as shown by abscess formation	10.2% of treated patients developed abscesses compared with 5.5% of the untreated $p=0.558$	No blinding Not controlled for other variables, for example, antivenin administration or surgical debridement Initiation of antibiotic treatment delayed
Blaylock RS, 1999, South Africa	363 patients presenting with snake bites—both venomous and non-venomous (12%) (310 files available) requiring admission to hospital with swelling	Prospective trial	% receiving antibiotics Compared the length of stay in the two groups, (antibiotics v no antibiotics) further subdivided and analysed depending on main symptomatology—swelling, weakness	84.8% of patients received no antibiotics No difference in length of stay between the groups—this is interpreted as reflecting no difference in infection rate	Not PRCT ?Comparable groups Extrapolation and interpretation of results is controversial Very little raw result data provided

Search outcome

Altogether 232 papers were identified of which six were relevant.

Comment(s)

Several prospective studies have been done on this topic, and all reach roughly the same conclusion. However, in this potentially disastrous situation all authors are keen to point out that any clinical decision strategy can never be 100% sensitive and should be used on an individual patient basis rather than as an unbendable rule.

► CLINICAL BOTTOM LINE

Victims of blunt trauma who are fully alert and show no signs of intoxication can safely forego cervical spine radiography if they have no midline neck tenderness, no neurological deficit and no distracting injury.

Roberge RJ, Wears RC, Kelly M, *et al*. Selective application of cervical spine radiography in alert victims of blunt trauma: a prospective study. *J Trauma* 1988;**28**:784–8.

Roberge RJ, Wears RC. Evaluation of neck discomfort, neck tenderness and neurological deficits as indicators for radiography in blunt trauma victims. *J Emerg Med* 1992;**10**:539–44.

Hoffman JR, Schriger DL, Mower W, *et al*. Low risk criteria for cervical spine radiography in blunt trauma. *Ann Emerg Med* 1992;**21**:1454–60.

Velhams GC, Theodorou D, Tatevossian R, *et al*. Radiographic cervical spine evaluation in the alert asymptomatic blunt trauma victim: much ado about nothing. *J Trauma* 1996;**40**:768–74.

Gonzalez RP, Fried PO, Bukhalo M, *et al*. Role of clinical examination in screening for blunt cervical spine injury. *J Am Coll Surg* 1999;**189**:152–7.

Hoffman JR, Mower WR, Wolfson AB, *et al*. Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. National Emergency X-Radiography Utilisation Study Group. *NEJM* 2000;**343**:94–9.

The use of antibiotics in venomous snake bite

Report by Polly Terry, Specialist Registrar

Checked by Kevin Mackway-Jones, Professor

Abstract

A short cut review was carried out to establish whether antibiotics reduce the incidence of infection after venomous snake bite. Altogether 60 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 papers are shown in table 3. A clinical bottom line is stated.

Clinical scenario

A 26 year old man attends the emergency department having been bitten on his right hand 30 minutes previously by his pet a venomous snake. Examination reveals extensive swelling of his forearm with lymphangitis, hypotension and gingival bleeding. He has no relevant previous medical history and is fully immunised against tetanus. You know there is the potential for infection from the snakes fangs and oropharynx, as well as contamination from the victim's skin and clothing. You thoroughly clean the wound with local wound toilet, and are happy that there is no fang left in situ. You wonder if prophylactic antibiotics are indicated to reduce the risk of infection.

Three part question

In [well adults who have been bitten by a venomous snake] do [prophylactic antibiotics] reduce [the incidence of infection]?

Search strategy

Medline 1966–10/01 using the OVID interface. {(exp snake bites OR snake bite\$.mp) AND (exp antibiotics OR anti-biotics OR antibiotic\$.mp)} LIMIT to human AND English.

Search outcome

Altogether 60 papers of which three were relevant to the original question.

Comment(s)

Most of the trials involved small numbers and were affected by the use of antivenin, which in itself has antibactericidal activity. There is concern that use of antibiotics prophylactically will have little impact on further infection but may give rise to side effects, is not cost effective and may select out more resistant organisms. These studies again confirm the low event rate for infection after snake bite from venomous snakes.

► CLINICAL BOTTOM LINE

Prophylactic antibiotics are not required in snake bites from venomous snakes.

Clark RF, Selden BS, Furbie B. The incidence of wound infection following crocotalid envenomation. *J Emerg Med* 1993;**11**:583–6.

Kerrigan KR, Meritz BL, Nelson SJ, *et al*. Antibiotic prophylaxis for pit viper envenomation: prospective, controlled trial. *World J Surg* 1997;**21**:369–73.

Blaylock RS. Antibiotic use and infection in snakebite victims. *South African Med J* 1999;**89**:874–6.

Activated charcoal and gastric absorption of iron compounds

Report by **Steve Jones**, *Specialist Registrar*

Checked by **Baha Ali**, *Senior Clinical Fellow*

Abstract

A short cut review was carried out to establish whether activated charcoal is effective in iron overdose. Altogether 17 papers were found using the reported search, of which only one was relevant. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of this paper are shown in table 4. A clinical bottom line is stated.

Clinical scenario

A young woman presents to the emergency department having taken an overdose of her iron tablets. She is in an emotionally distressed state but is cardiovascularly stable and requests treatment. It has been less than two hours since she took the tablets and you prescribe activated charcoal. You wonder whether this will actually do her any good.

Three part question

In [a patient with an iron overdose] is [activated charcoal better than nothing] at [reducing gastric absorption, mortality or morbidity]?

Search strategy

Medline 1966–10/01 using the OVID interface. {(exp poisoning OR poisoning.mp OR exp overdose OR overdose.mp)} AND (exp iron OR exp iron compounds OR iron.mp) AND (exp charcoal OR charcoal.mp OR activated charcoal.mp) LIMIT to human AND English.

Search outcome

Altogether 17 papers found of which only one was relevant to the original question.

Comment(s)

This study partially answers the question and concludes that more work needs to be done. In the doses given to these healthy patients, activated charcoal reduced absorption; this was reduced further by adding desferrioxamine to the oral solution. Toxic doses are considered to be fourfold higher than the doses used in the study and treatment in this group of patients depends on clinical features.

► CLINICAL BOTTOM LINE

Giving oral activated charcoal may well reduce gastric absorption after iron overdose.

Gomez HF, McClafferty HH, Flory D, *et al*. Prevention of gastrointestinal iron absorption by chelation from an orally administered premixed deferoxamine/charcoal slurry. *Ann Emerg Med* 1997;**30**:587–92.

Antibiotics after puncture wounds to the foot

Report by **Magnus Harrison**, *Clinical Research Fellow*

Checked by **Martin Thomas**, *Research Fellow*

Abstract

A short cut review was carried out to establish whether antibiotics reduce infective complications after puncture wounds to the foot. A total of 29 papers were found using the reported search, of which none answered the question posed. Further research is needed in this area.

Clinical scenario

A 32 year old man presents with a pedal puncture wound, which was sustained four hours before attending the emergency department. You wonder whether antibiotics should be prescribed to reduce infective complications.

Three part question

In [patients presenting with pedal puncture wounds] does the [administration of antibiotics] reduce [infective complications]?

Search strategy

Medline 1966–10/01 using the OVID interface. [(exp foot injuries OR exp foot OR feet.mp OR foot.mp OR pedal.mp OR plantar.mp) AND {(exp wounds and injuries OR injur\$.mp) AND (penetrate\$.mp or penetrating.mp OR exp punctures OR puncture\$.mp) OR exp wounds, penetrating)}] AND (exp antibiotics OR antibiotic\$.mp) LIMIT to human AND English.

Search outcome

Altogether 29 papers found of which none were relevant to the original question.

Comment(s)

While there are many review articles in this area, there appears to be no published evidence to underpin the views expressed.

► CLINICAL BOTTOM LINE

Local advice should be followed.

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Gomez HF <i>et al</i> , 1997, USA	11 healthy adult volunteers	Controlled, prospective crossover study	Maximum serum iron concentration: - iron only - iron plus activated charcoal (AC) - iron plus AC plus desferrioxamine	150 µg/dl 36 94 µg/dl 23 37 µg/dl 13 (p 0.0017)	Healthy volunteers Strict exclusion criteria Physiological doses of iron rather than toxic doses
			Time to maximum serum iron concentration: - iron only - iron plus AC - iron plus AC plus desferrioxamine	3.5 h 0.3 3.6 h 0.5 3.0 h 1.0	

Phenytoin or paraldehyde as the second drug for convulsions in children

Report by Will Townend, *Specialist Registrar*

Checked by Kevin Mackway-Jones, *Professor*

Abstract

A short cut review was carried out to establish whether phenytoin or paraldehyde should be given as the second drug for resistant fits in children. Altogether 41 papers were found using the reported search, of which none answered the question posed. Further research is needed in this area.

Clinical scenario

A fitting three year old child presents to the emergency department. The child has received an appropriate dose of rectal diazepam from the prehospital team. After administration of a dose of intravenous lorazepam the child continues to fit. You wonder whether there is any evidence to suggest whether paraldehyde or phenytoin should be given next.

Three part question

In a [child continuing to fit after two doses of benzodiazepines] is [phenytoin or paraldehyde] more effective in [controlling seizure activity]?

Search strategy

Medline 1966–10/01 using the OVID interface. ({exp seizures OR seizure\$.mp OR fit\$.mp OR exp convulsions OR epilep\$.mp OR exp epilepsy} AND {exp paraldehyde OR paraldehyde.mp} AND {phenytoin.mp OR fosphenytoin.mp OR exp phenytoin}) LIMIT to human AND English.

Search outcome

Altogether 41 papers found of which none were relevant to the original question.

Comment(s)

There is no research in this area.

► CLINICAL BOTTOM LINE

Consensus guidelines should be followed.

Aspiration of acute traumatic knee haemarthrosis

Report by Paul Wallman, *Senior Clinical Fellow*

Checked by Simon Carley, *Specialist Registrar*

Abstract

A short cut review was carried out to establish whether aspiration of a traumatic knee haemarthrosis improved the patient's symptoms. Altogether 267 papers were found using the reported search, of which none answered the question posed. Further research is needed in this area.

Clinical scenario

A 40 year old man presents to the emergency department one day after suffering an injury to his knee. There is no evidence of bony injury on radiography and a diagnosis of a traumatic haemarthrosis is made. You are unsure whether aspiration of the tense haemarthrosis will benefit him symptomatically.

Three part question

In [patients with an acute traumatic haemarthrosis of the knee] does [aspiration] [improve symptoms]?

Search strategy

Medline 1966–10/01 using the OVID interface. (exp knee OR exp knee injuries OR exp knee joint OR exp medial collateral ligament,knee OR knee.mp) AND (exp hemarthrosis OR haemarthrosis.mp OR hemarthrosis.mp OR effusion.mp OR exp synovial fluid OR synovial fluid.mp) AND (exp aspiration OR aspiration.mp. OR aspirate\$.mp OR exp drainage OR drain.mp OR drains.mp OR exp emergency treatment OR exp treatment failure OR exp treatment outcome OR treatment.mp. OR treat\$.mp) AND maximally sensitive RCT filter LIMIT to human AND English.

Search outcome

Altogether 267 papers found of which none were relevant to the original question.

Comment(s)

Despite the fact that many clinicians hold firm views about this matter, there is no published evidence to inform a decision.

► CLINICAL BOTTOM LINE

Local advice should be followed.