

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.

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 Six topics are covered in this issue of the journal.

- The accuracy of abdominal ultrasound in paediatric trauma
- EMLA or amethocaine (tetracaine) for topical analgesia in children
- Cautery or cream for epistaxis in children
- Standard bone marrow needles or special needles for intraosseous access
- Abdominal ultrasound in the diagnosis of childhood appendicitis
- Erythrocyte sedimentation rate and septic arthritis in children

- 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.

The accuracy of abdominal ultrasound in paediatric trauma

Report by Ross Murphy, *Senior Clinical Fellow*
Search checked by Angaj Ghosh, *Senior Clinical Fellow*

Clinical scenario

An 8 year old boy is taken to the emergency department after falling out of a tree. He has no signs of injury apart from abrasions and tenderness across his upper abdomen; he is haemodynamically stable. He undergoes an abdominal ultrasound that is normal but you wonder how accurate this is at identifying intra-abdominal injury compared with the current gold standard, abdominal computed tomography.

Three part question

In [a paediatric patient with blunt abdominal trauma] how [accurate is an ultrasound scan] at [identifying intra-abdominal injury]?

Search strategy

Medline 1966–12/00 using the OVID interface. {[(exp child OR children.mp OR exp pediatrics OR pediatric.mp OR paediatric.mp) AND (exp abdominal injuries OR abdominal trauma.mp)] AND (exp tomography, x-ray

computed OR CT.mp OR computerised tomography.mp OR exp ultrasonography OR ultrasonography.mp OR exp ultrasonics OR ultrasonics.mp OR ultrasound.mp)} LIMIT to human AND english.

Search outcome

Altogether 511 papers found of which 505 were irrelevant or of insufficient quality. The remaining six papers are shown in table 1.

Comments

The evidence indicates a variability in the accuracy of ultrasound at identifying intra-abdominal injury in children. This is probably related to the skill of the ultrasonographer. Ultrasound can have a high diagnostic specificity and it may be useful as part of a rule in strategy in these situations. Focused abdominal sonography for trauma (FAST) seems to be neither sensitive nor specific enough.

Clinical bottom line

Abdominal ultrasound can be used to rule in intra-abdominal fluid or organ damage in children. Negative ultrasound does not rule out intra-abdominal injury and, if clinical suspicion persists, abdominal computed tomography with contrast should be performed.

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Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Krupnick AS <i>et al</i> , 1996, USA	32 children with blunt abdominal trauma and splenic injury diagnosed on abdominal CT with contrast. 32 controls.	Diagnostic test study	Splenic injury detected by USS	Sensitivity 69% Specificity 100% NPV 76%	Ultrasound done on average within 5.5 days of CT and 6.5 days of the injury. All data not given. Specificity calculated from control group, none of whom had been victims of trauma. No power study
Richardson MC <i>et al</i> , 1997, UK	26 children who had scans performed within 48 hours of blunt abdominal trauma. Abdominal CT with contrast as gold standard	Diagnostic test study	Intra-abdominal fluid or organ injury detected by USS	Sensitivity 87.5% Specificity 100% NPV 40%	Retrospective. Only 2 patients had no intra-abdominal injury implying that this sample group may have been more severely injured than most children with blunt abdominal trauma
Partrick DA <i>et al</i> , 1998, USA	100 children with blunt abdominal trauma who has abdominal ultrasound performed by an emergency physician. Abdominal CT as gold standard	Diagnostic test study	Intra-abdominal fluid or organ injury detected by USS	Sensitivity 42% Specificity 100% NPV 93%	Retrospective. Sample group selective
Mutabagani KH <i>et al</i> , 1999, USA	46 children with suspected intra-abdominal injury undergoing focussed abdominal sonography for trauma (FAST) Abdominal CT as gold standard	Diagnostic test study	Intra-abdominal fluid or organ injury detected by FAST	Sensitivity 30% Specificity 100% NPV 71%	No power study.
Benya EC <i>et al</i> , 2000, USA	51 children with blunt abdominal trauma. Abdominal CT with contrast as gold standard	Diagnostic test study	Intra-abdominal fluid or organ injury detected by USS	Sensitivity 64.7–70.6% Specificity 70.6–79.4% NPV 81.8–82.6%	Intervals between scans up to 24 hours with CT scan performed first. All data not given. No power study.
Coley BD <i>et al</i> , 2000, USA	107 children with blunt abdominal trauma undergoing focussed abdominal sonography for trauma (FAST)	Diagnostic test study	Intra-abdominal fluid or organ injury detected by FAST	Sensitivity 55% Specificity 18% NPV 50%	

- 1 Krupnick AS, Teitelbaum DH, Geiger JD, *et al*. Use of abdominal ultrasonography to assess paediatric splenic trauma. Potential pitfalls in the diagnosis. *Ann Surg* 1997;225:408–14.
- 2 Richardson MC, Hollman AS, Davis CF. Comparison of computed tomography and ultrasonographic imaging in the assessment of blunt abdominal trauma in children. *Br J Surg* 1997;84:1144–6.
- 3 Partrick DA, Bensard DD, Moore EE, *et al*. Ultrasound is an effective triage tool to evaluate blunt abdominal trauma in the pediatric population. *J Trauma* 1998;45:57–63.

- 4 Mutabagani KH, Coley BD, Zumberge N, *et al*. Preliminary experience with focussed abdominal sonography for trauma (FAST) in children: Is it useful? *J Paediatr Surg* 1999;34:48–52.
- 5 Benya EC, Lim-Dunham JE, Landrum O, *et al*. Abdominal sonography in examination of children with blunt abdominal trauma. *Am J Roentol* 2000;174:1613–6.
- 6 Coley BD, Mutabagani KH, Martin LC, *et al*. Focused abdominal sonography for trauma (FAST) in children with blunt abdominal trauma. *J Trauma* 2000;48:902–6.

EMLA or amethocaine (tetracaine) or topical analgesia in children

Report by Russell Boyd, *Consultant*
Search checked by Michelle Jacobs, *Specialist Registrar*

Clinical scenario

A 5 year old child is to undergo venepuncture for a diagnostic blood test. You wonder if the application of Ametop (4% amethocaine gel) or EMLA (eutectic mixture of local anaesthetics (2.5% lignocaine (lidocaine) with 2.5% prilocaine)) will be better at reducing the pain of venepuncture.

Three part question

In [a 5 year old child] is [EMLA or amethocaine gel] better at [reducing the pain of venepuncture].

Search strategy

Medline 1966–12/00 using the OVID interface. [(exp tetracaine OR tetracaine.mp OR amethocaine.mp) AND (exp prilocaine OR prilocaine.mp OR EMLA.mp OR exp lidocaine OR lidocaine.mp)] AND (exp anaesthetics, combined OR exp anaesthetics, local} LIMIT to human AND english.

Search outcome

Altogether 72 papers found of which 67 were irrelevant or of insufficient quality. The remaining five papers are shown in table 2.

Comments

The studies listed are of variable quality but the trend seems to favour Ametop as the superior anaesthetic. This product may also have advantages in terms of speed of onset and vasodilatation.

Clinical bottom line

Ametop is superior to EMLA for topical anaesthesia before venepuncture in children

- 1 Lawson RA, Smart NG, Gudgeon AC, *et al*. Evaluation of an amethocaine gel preparation for percutaneous analgesia before venous cannulation in children *Br J Anaesth* 1995;75:282–5.
- 2 Van Kam HJM, Egberts ACG, Rijnvos WPM, *et al*. Tetracaine versus lidocaine-prilocaine for preventing venepuncture-induced pain in children. *Am J Health Syst Pharm* 1997;54:388–92.
- 3 Romsing J, Henneberg SW, Walther-Larson S, *et al*. Tetracaine vs EMLA cream for percutaneous anaesthesia in children. *Br J Anaesth* 1999;82:637–8.
- 4 Choy L, Collier J, Watson AR. Comparison of lignocaine-prilocaine cream and amethocaine gel for local analgesia before venepuncture in children. *Acta Paediatr* 1999;88:961–44.
- 5 Arrowsmith J, Campbell C. A comparison of local anaesthetics for venepuncture. *Arch Dis Child* 2000;82:309–10.

Table 2

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Lawson RA <i>et al</i> , 1995, UK	Convenience sample of 94 children age 3–12 years undergoing pre-op cannulation Amethocaine <i>v</i> EMLA	PRCT	Self reported absence of pain	62% (34/55) <i>v</i> 32% (18/55) (p<0.05)	40 minute application time for EMLA too short
Van Kam HJM <i>et al</i> , 1997, Netherlands	Convenience sample of 68 children age 1–15 years undergoing cannulation or venepuncture Tetracaine <i>v</i> EMLA	PRCT	Adequacy of analgesia reported by phlebotomists	76% (26/34) <i>v</i> 97% (31/32) (p=0.02)	No standardised method of pain scoring.
Romsing J <i>et al</i> , 1999, UK	Convenience sample of 60 children age 3–15 years undergoing pre-op cannulation Tetracaine <i>v</i> EMLA	PRCT	Self reported pain score	Significantly lower in tetracaine group (p<0.05)	Variable time from removal to cannulation in tetracaine group.
Choy L <i>et al</i> , 1999, UK	Convenience sample of 34 children aged over 1 year undergoing outpatient venepuncture Amethocaine <i>v</i> EMLA	PRCT	Self reported pain score	No significant difference	Very small numbers and no power calculation
Arrowsmith J and Campbell C, 2000, UK	Convenience sample of 120 children age 1–15 years undergoing cannulation Amethocaine <i>v</i> EMLA	PRCT	Observational behaviour pain score Observational behaviour pain score	No significant difference 72% (43/60) nil or mild <i>v</i> 55% (33/60)	

Cautery or cream for epistaxis in children

Report by Angaj Ghosh, *Senior Clinical Fellow*
Search checked by Rupert Jackson, *Specialist Registrar*

Clinical scenario

A child presents to the emergency department with a nosebleed that came on spontaneously and that has not responded to simple first aid measures. The bleed appears to be from the front of the nose and the patient has no underlying disease. You wonder whether silver nitrate cautery or application of nasal antiseptic cream is the best method of obtaining haemostasis.

Three part question

In [children with spontaneous epistaxis and no underlying disease] is [silver nitrate cautery better than nasal antiseptic cream] at [stopping bleeding and preventing recurrences]?

Search strategy

Medline 1966–12/00 using the OVID interface.
{(exp epistaxis OR epistaxis.mp OR nose-bleed\$.mp) OR [(exp hemorrhage OR hemorrhage.mp OR haemorrhage.mp OR bleed\$.mp) AND (exp nose OR nose.mp OR exp nasal mucosa OR nasal mucosa.mp OR nasal.mp OR

nares.mp)]} AND (exp cautery OR cauter\$.mp OR exp silver nitrate OR nasal cautery.mp OR exp anti-infective agents OR anti-infective agents.mp) LIMIT to human AND english.

Search outcome

Altogether 198 papers found of which 196 were irrelevant or of insufficient quality. The remaining two papers are shown in table 3.

Comments

This BET combines two patient groups—children with primary anterior epistaxis at first presentation and children with recurrent epistaxis. The final outcome being the same—stopping any further bleeds.

Clinical bottom line

Cautery and naseptin are equally effective. Given the ease of application naseptin is the treatment of choice.

- Ruddy J, Proops DW, Pearman K, *et al*. Management of epistaxis in children. *Int J Pediatr Otorhinolaryngol* 1991;21:139–42.
- Murthy P, Nilssen EL, Rao S, *et al*. A randomised clinical trial of antiseptic nasal carrier cream and silver nitrate cautery in the treatment of recurrent anterior epistaxis. *Clin Otolaryngol Allied Sci* 1999;24:228–31.

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Ruddy J <i>et al</i> , 1991, UK	48 consecutive children with anterior epistaxis attending an emergency department. Antiseptic nasal carrier cream (Naseptin) <i>v</i> silver nitrate cautery	PRCT	Recurrent epistaxis rate	50% <i>v</i> 46% (no significant difference)	Low power
Murthy P <i>et al</i> , 1999, UK	64 consecutive patients with recurrent epistaxis attending an outpatient clinic. Antiseptic nasal carrier cream (Naseptin) alone <i>v</i> silver nitrate cautery and antiseptic cream	PRCT	Recurrent epistaxis rate	9% <i>v</i> 11% (p=0.7569)	14 lost to follow up

Standard bone marrow needles or special needles for intraosseous access

Report by Simon Carley, *Specialist Registrar*
Search checked by Russel Boyd, *Consultant*

Clinical scenario

A 5 year old shocked child is presented to the emergency department via ambulance. Intra-venous access is not possible and you decide to place an intraosseous needle. You find that the trolley has been stocked with standard bone marrow aspiration needles rather than the special intraosseous (IO) needles that you are used to. You swear loudly and eventually gain access with great difficulty using a cutdown technique. You later wonder whether you could have used the standard bone marrow needle instead.

Three part question

[In patients requiring IO access] are [specifically designed IO needles better than standard bone marrow aspiration needles] at [obtaining safe and speedy IO access]?

Search strategy

Medline 1966–01/01 using the OVID interface. [(exp infusions, intraosseous OR intraosseous.mp) AND (exp bone marrow OR bone marrow.mp OR biopsy, needle OR jamshidi.mp)] LIMIT to human AND english AND abstracts.

Search outcome

Altogether 75 papers found of which 74 were irrelevant or of insufficient quality. The remaining paper is shown in table 4.

Comments

The standard type of bone marrow aspiration needle appears to be better than the Cook IO needle in this study. However, the model is a poor one for clinical practice. Currently specific IO needles are more expensive than the standard bone marrow aspiration needle.

Clinical bottom line

Standard bone marrow aspiration needles should be used for IO infusion.

1 Halm B, Yamamoto LG. Comparing ease of intraosseous needle placement: Jamshidi vs Cook. *Am J Emerg Med* 1998;16:420–2.

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Halm B and Yamamoto LG, 1998, USA	8 paramedics and 26 paediatric residents using a turkey thigh model. Jamshidi v Cook	Experimental	Operator assessment of difficulty of insertion (10 cm VAS) Time to placement Incorrect placement rate	3 v 7.1 (p<0.001) 25.5s v 56.2s (p<0.001) 2 v 1 (non-significant)	Model was bone only rather than bone and flesh

Abdominal ultrasound in the diagnosis of childhood appendicitis

Report by Rob Williams, *Specialist Registrar*
Search checked by Kevin Mackway-Jones, *Consultant*

Clinical scenario

An 8 year old patient presents to the emergency department with a six hour history of right iliac fossa pain; examination is suggestive of acute appendicitis. You wonder whether an ultrasound scan would be helpful for diagnosis.

Three part question

In [a paediatric patient with clinical signs of appendicitis] how [useful is an ultrasound scan] at [confirming or refuting the diagnosis]?

Search strategy

Medline 1966–12/00 using the OVID interface. {[(exp child OR children.mp OR exp pediatrics OR pediatric.mp OR paediatric.mp) AND (exp appendicitis OR acute appendicitis.mp)] AND (exp ultrasonography OR ultrasonography.mp OR exp ultrasonics OR ultrasonics.mp OR ultrasound.mp)}; LIMIT to human AND english.

Search outcome

Altogether 173 papers found of which 170 were irrelevant or of insufficient quality. The remaining three papers are shown in table 5.

Comments

These studies show that ultrasound has a high sensitivity and specificity for the diagnosis of appendicitis. While specificity is high enough to SpIn, sensitivity is too low to SnOut. Further work investigating the diagnostic utility in high, moderate and low risk groups is warranted.

Clinical bottom line

A positive ultrasound is highly specific and can be used to rule in acute appendicitis in children. Sensitivity of this test is too low to rule out the diagnosis.

- 1 Hahn HB, Hoepner FU, Kalle T, *et al.* Sonography of acute appendicitis in children: 7 years experience. *Paediatr Radiol* 1998;28:147–51.
- 2 Schulte B, Beyer D, Kaiser C, *et al.* Ultrasonography in suspected acute appendicitis in childhood—report of 1285 cases. *Eur J Ultrasound* 1998;8:177–82.
- 3 Sivit CJ, Kimberly AE, Stallion A, *et al.* Imaging evaluation of suspected appendicitis in a paediatric population: effectiveness of sonography versus CT. *Am J Radiol* 2000;175:977–80.

Table 5

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Hahn HB <i>et al</i> , 1998, Germany	3859 children age 1–17 years with suspected acute appendicitis. Gold standard was operative findings or result of clinical observation and repeat ultrasound	Diagnostic cohort	Appendicitis	Sensitivity 90% Specificity 97% LR +30 LR -0.1	Inhospital follow up only.
Schulte B <i>et al</i> , 1998, Germany	1285 children age 1–15 years with acute appendicitis. Gold standard was operative findings or result of clinical follow up	Diagnostic cohort	Appendicitis	Sensitivity 92% Specificity 98% LR +42 LR -0.08	Follow up rate unclear. Follow up time not specified.
Sivit CJ <i>et al</i> , 2000, USA	386 patients age 1–21 years with suspected acute appendicitis. Analysed for under and over 10 years old. Gold standard was operative findings or result of clinical follow up	Diagnostic cohort	Appendicitis <10 years old Appendicitis > 10 years old	Sensitivity 71% Specificity 96% LR +5.1 LR -0.34 Sensitivity 84% Specificity 86% LR +6 LR -0.18	Unblinded. Excludes an unknown number of “obvious” appendicitis cases.

Erythrocyte sedimentation rate and septic arthritis in children

Report by Russell Boyd, *Consultant*

Search checked by Bruce Martin, *Specialist Registrar*

Clinical scenario

A 3 year old child presents to the emergency department with a short history of limp, temperature and difficulty in weight bearing on the left leg. The pain is principally located at the hip joint and you fear this may be a septic arthritis. You wonder if an erythrocyte sedimentation rate (ESR) will help in excluding the diagnosis of septic arthritis.

Three part question

In [children presenting with acute hip pain] is [a raised ESR] useful in [diagnosing septic arthritis].

Search strategy

Medline 1966–12/00 using the OVID interface. {[(exp child OR children.mp OR pediatrics OR paediatric.mp OR pediatric.mp) AND (exp hip OR exp hip joint OR hip.mp OR exp

arthritis, infectious OR exp osteomyelitis OR septic arthritis.mp)] AND (exp laboratory techniques and procedures OR laboratory techniques.mp OR exp ultrasonography OR exp blood cell count OR exp c-reactive protein)} AND maximally sensitive diagnostic filter LIMIT to human and english.

Search outcome

Altogether 334 papers found of which 329 were irrelevant or of insufficient quality. The remaining five papers are shown in table 6.

Comments

An isolated ESR is of variable sensitivity and not suitable to rule out septic arthritis, however in combination with an increased temperature and inability to weight bear or reduced mobility it becomes a useful rule out tool with sensitivities consistently above 95%.

Clinical bottom line

An isolated ESR test cannot exclude septic arthritis. In combination with temperature and ability to weight bear it can be used as a SnOut.

Table 6

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Del Beccaro MA <i>et al</i> , 1992, USA	138 children age 2.5 weeks to 12 years admitted with acute hip pain	Diagnostic test study	Septic arthritis of the hip Raised ESR alone Raised ESR and temperature	Sensitivity 79% Sensitivity 97%	Retrospective chart review including neonates. Gold standard not universally applied.
Taylor GR and Clarke NMP, 1994, UK	417 consecutive paediatric admissions with hip pain identified on retrospective chart review	Diagnostic test study	Septic arthritis of the hip Raised ESR alone Raised ESR and temperature or severe spasm/tenderness	Sensitivity 90.5% Sensitivity 97%	Diagnostic tests were not universally applied. Numbers do not appear to add up
Fink MA <i>et al</i> , 1995,	50 consecutive children age 1–10 years with acute hip pain	Diagnostic test study	Septic arthritis of the hip Raised ESR alone	Sensitivity 100%	Number too small to be meaningful. Only 1 case of septic arthritis found
Eich GF <i>et al</i> , 1999, Switzerland	114 children with acute hip pain	Diagnostic test study	Septic arthritis of the hip Raised ESR alone Raised ESR and temperature or CRP	Sensitivity not given Sensitivity 100%	14 patients excluded due to loss of data. Retrospective identification of cases.
Kocher M <i>et al</i> , 1999, USA	282 children with diagnosis of irritable hip	Diagnostic test study	Septic arthritis of the hip Raised ESR alone Raised ESR and temperature and WCC and inability to weight bear	Sensitivity not given Sensitivity 99.6%	Cohort identified retrospectively

- 1 Del Beccaro MA, Champoux AN, Bockers T, *et al.* Septic arthritis versus transient synovitis of the hip. *Ann Emerg Med* 1992;21:1418–22.
 - 2 Taylor GR, Clarke NMP. Management of irritable hip. *Arch Dis Child* 1994;71:59–63.
 - 3 Fink MA, Berman L, Edwards D, *et al.* The irritable hip: immediate ultrasound guided aspiration and prevention of hospital admission. *Arch Dis Child* 1995;72:110–14.
 - 4 Eich GF, Superti-Furga A, Umbricht FS, *et al.* The painful hip: evaluation of criteria for clinical decision making. *Eur J Pediatr* 1999;158:923–8.
 - 5 Kocher M, Zurakowski D, Kasser JR. Differentiating between septic arthritis and transient synovitis of the hip in children. *J Bone Joint Surg (Am)* 1999;81:1662–70.
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