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:

- Vomiting and serious head injury in children
- Low molecular weight heparin or unfractionated heparin in the treatment of patients with uncomplicated deep vein thrombosis
- Outpatient treatment for patients with uncomplicated above knee deep vein thrombosis
- SimpliRed D-dimer assay in suspected pulmonary embolus
- Elastic compression stockings and the risk of post-thrombotic syndrome in patients with symptomatic proximal vein thrombosis
- Prior injection of local anaesthetic and the pain and success of intravenous cannulation

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.

Vomiting and serious head injury in children

Report by Jim Barnard, *Senior House Officer*
Search checked by Simon Carley, *Specialist Registrar*

Department of Emergency Medicine, Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL

Correspondence to: Kevin Mackway-Jones, Consultant (kevin.mackway-jones@man.ac.uk)

Clinical scenario
A 4 year old boy presents to the emergency department after a one metre fall onto a carpeted floor. The child has vomited three times in the past hour but is otherwise well. Clinical examination is unremarkable. You wonder how significant the vomiting is.

Three part question
In [a child with a minor head injury] does [vomiting] predict [intracranial injury]?

Search strategy
Medline 1966–07/00 using the OVID interface. ([exp brain injury OR exp craniocerebral trauma OR exp haematoma, epidural OR exp haematoma, subdural OR intracranial haematoma.mp OR head injury.mp.] AND [exp vomiting OR vomiting.mp. OR emesis.mp.] AND [child OR pediatrics OR paediatric$.mp. OR paediatric$.mp]) LIMIT to human AND English AND abstracts.

Search outcome
Altogether 53 papers were found of which 41 were irrelevant to the question or of insufficient quality for inclusion. The remaining 13 papers are shown in table 1. An additional paper of relevance was recently published in this journal, but was not currently indexed on Medline.

Comments
The papers listed in table 1 give varied opinions on the significance of vomiting following paediatric head injury, and it is difficult to draw firm conclusions. Some of the studies combine paediatric and adult cases, this is likely to lead to some bias in the reported significance of vomiting. Distinction should be

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Gorman DF, 1987, England[1]	5768 head injuries in all age groups	Retrospective case note review	Presence of skull fracture	More common in vomiting children (p<0.005)	Not specific to children
	6685 head injuries in all age groups	Prospective patient study		7% of all patients vomited 25.7% of patients with skull fracture vomited	Skull fracture is only a proxy outcome for intracranial problems
Hugenholtz H, *et al*, 1987, Canada[2]	96 children (GCS 13–15) <16 years	Prospective consecutive case series	Presence of skull fracture with GCS >12	No difference	Small sample size
	29 children (GCS 8–12) <16 years	retrospective study of case notes over the previous two years	Presence of skull fracture GCS 8–12	Less common in vomiting children	Skull fracture is only a proxy outcome for intracranial problems
Chan KH, *et al*, 1989, Hong Kong[3]	12 072 paediatric head injury cases <16 years	Retrospective case note review	Probability of IC complication with impaired conciousness + skull fracture +	62% if vomiting *v* 74% if not vomiting	Retrospective audit.
	Development of intracranial complications manifested during the first 48 hours of injury		Probability of IC complication with normal consciousness + no skull fracture +	0.08% if vomiting *v* 0.14% if vomiting	Identification of risk factors is dependant on accurate documentation (which is unlikely)
			Probability of IC complication with impaired conciousness + no skull fracture +	12% if vomiting *v* 18% if no vomiting	
			Probability of IC complication with no impaired conciousness + skull fracture +	1% if vomiting *v* 2% if no vomiting	
Ando S, *et al*, 1992, Japan[4]	147 patients with head injury, all ages analysed by age group	Prospective cohort study	Presence of skull fracture	No difference between children vomiting and not vomiting	Small study
			Presence of IC haematoma on CT	No difference between children vomiting and not vomiting	Results not specific to paediatric patients
Dietrich AM, *et al*, 1993, USA[5]	324 consecutive trauma patients in an urban childrens hospital requiring CT. Mean age 7.1 years	Prospective cohort study	Risk of IC haematoma age <2	76/191 patients with no IC lesion had vomited 10/36 patients with IC lesion had vomited	Small cohort, low event rate
			Risk of IC haematoma age >2	12/39 patients with no IC lesion had vomited 0/3 patients with IC lesion had vomited	
Duus BR, 1993, Denmark[6]	1876 patients mean age 27.5 (19.9 years)	Retrospective case note review	Presence of IC complication	1.2% if vomiting *v* 0.2% if not vomiting	Intracranial complication not defined. Retrospective All age groups
Schunk JE, *et al*, 1996, USA[7]	508 patients aged <18 undergoing CT for head trauma. 179 excluded for decreased GCS, depressed skull space, bleeding diathesis or developmental delay	Retropsective case note review	Abnormal CT findings	5.5% if vomiting *v* 3.4% if not vomiting	No protocol for CT request, inclusion based on physician request. Referral bias (major trauma centre)
Arienta C, *et al*, 1997, Italy[8]	10 000 patients with head injury aged between 6 and 95 years (median age 31)	Prospective cohort study	Abnormal CT result	4 of 213 patients with single episode of vomiting had abnormal CT result 6 of 14 patients with repeated vomiting had an abnormal CT result	Not specific to the paediatric population Low event rate
Hsiang JN, *et al*, 1997, Hong Kong[9]	1360 patients with mild head injury older than 11 years of age	Prospective cohort study	Radiographic abnormailty in GCS 13 group	4 patients with vomiting *v* 11 patients with no vomiting (p=1)	Not specific to paediatric population
			Radiographic abnormality in GCS 14 group	8 patients with vomiting *v* 16 patients with no vomiting (p=0.68)	
			Radiographic abnormailty in GCS 15 group	30 patients with vomiting *v* 93 with no vomiting (p=0.924)	
Miller EC, *et al*, 1997, United States[10]	2143 patients of all ages with a history of head injury within 2 hours of arrival at the emergency department	Prospective cohort study	Abnormal CT	15% if vomiting *v* 5% if not (p<0.001) 20% if nauseous *v* 9% if not (p<0.001)	Not specific to paediatric population
Quayle KS, *et al*, 1997, USA[11]	322 consecutive paediatric patients with head injury All patients had radiography and CT	Prospective cohort study	Odds ratio for vomiting predicting intracranial injury	1.51 (95% CI=0.67, 3.37)	Non-trivial injuries excluded. Resultant event rate for IC injury is therefore increased. Not all patients had the gold standard investigations
			Postive predictive value for vomiting predicting intracranial injury	10.9%	
			Negative predictive value for vomiting predicting intracranial injury	92.5%	

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 1 continued

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Nee P, *et al*, 1999, UK[12]	5416 consecutive patients with head injury, over one year period	Prospective cohort study	Incidence of vomiting in children	12%	Skull fracture is only a proxy outcome for intracranial problems. Methods suggest that additional follow up data were collected, but it is not reported.
			Sensitivity of detecting skull fracture if child and vomiting	33.3%	
			Specificity of detecting skull fracture if child and vomiting	93.3%	
			Likelihood ratio for child and vomiting*	4.9	
Brown FD, *et al*, 2000, UK[13]	563 patients aged 0–13 with minor head injury presenting to a paediatric A+E	Prospective cohort study	Incidence of vomiting	15.8%	Only minor head injury patients included. Not all patients were radiographed or scanned. Very few patients with significant intracranial pathology
			Incidence of skull fracture	<1%	
			Incidence of skull fracture + vomiting	0%	

*Our calculation.

drawn between the identification of skull fracture and intracranial lesions. The identification of skull fracture is in itself a proxy marker for serious injury and cannot be considered a gold standard outcome. Those papers specifically looking at intracranial lesions rather than just skull fractures are also inconclusive.

Clinical bottom line

Vomiting does not seem to be an independent risk factor for skull fracture or intracranial haematoma in the paediatric population.

1 Gorman DF. The utility of post-traumatic skull X-rays. *Arch Emerg Med* 1987;**4**:141–50.
2 Hugenholtz H, Izukawa D, Shear P, *et al*. Vomiting in children following head injury. *Childs Nerv Syst* 1987;**3**:266–70.
3 Chan KH, Yue CP, Mann KS. The risks of intracranial complications in paediatric head injury. *Childs Nerv Syst* 1990;**6**:27–9
4 Ando S, Otani M, Moritake K. Clinical analysis of post-traumatic vomiting. *Acta Neurochir (Wien)* 1992;**119**: 97–100.
5 Dietrich AM, Bowman MJ, Ginn-Pease ME, *et al*. Pediatric head injuries: can clinical factors reliably predict an abnormality on computed tomography. *Ann Emerg Med* 1993;**22**: 1535–40.
6 Duus BR, Boesen T, Kruse KV, *et al*. Prognostic signs in the evaluation of patients with minor head injury. *Br J Surg* 1990;**80**:988–91.
7 Schunk JE, Rodgerson JD, Woodward GA. The utility of head computed tomogrpahic scranning in paediatric patients with normal neurological examination in the emergency department. *Paed Emerg Care* 1996;**12**:160–5.
8 Arienta C, Caroli M, Balbi S. Management of head injured patients in the emergency department: a practical protocol. *Surg Neurol* 1997;**48**:213–19.
9 Hsiang JN, Yeung T, Yu AL, *et al*. High risk mild head injury. *J Neurosurg* 1997;**87**:234–8.
10 Miller EC, Homes JF, Derlet RW. Utilizing clinical factors to reduce head CT scan ordering for minor head trauma patients. *J Emerg Med* 1997;**15**:453–7.
11 Quayle KS, Jaffe DM, Kupperman N, *et al*. Diagnostic testing for acute head injury in children: when are head computed tomography and skull radiographs indicated? *Pediatrics* 1997;**99**:E11.
12 Nee P, Hadfield JM, Yates DW, *et al*. Signficance of vomiting after head injury. *J Neurol Neurosurg Psychiatry* 1999;**66**: 470–3.
13 Brown FD, Brown J, Beattie TF. Why do children vomit after minor head injury? *J Accid Emerg Med* 2000;**17**:268–71.

Low molecular weight heparin or unfractionated heparin in the treatment of patients with uncomplicated deep vein thrombosis

Report by Beverley Lane, *Research Nurse*
Search checked by Magnus Harrison, *Research Fellow*

Clinical scenario

A 60 year old man presents with a three day history of pain in his left calf. You suspect an above knee deep vein thrombosis (DVT), which is later confirmed by ultrasound. You are considering admitting this man for treatment with unfractionated heparin (UH), when one of your colleagues mentions that low weight molecular weight heparins (LMWH) have been proven to be as good at treating thromboembolic disease and its complications. You wonder whether this is true.

Three part question

In [patients with deep vein thrombosis] is [low molecular weight heparin as good as unfractionated heparin} at {treating uncomplicated proximal DVT]?

Search strategy

Medline 1966–07/00 using the OVID interface. (Exp venous thrombosis OR deep vein thrombosis.mp) OR dvt.mp) OR [(exp thrombosis or thrombosis.mp) AND (exp veins OR Vein$.mp)] AND (exp. heparin, low molecular weight OR low molecular weight heparin.mp) NOT (prophylaxis.mp OR primary prevention.mp) LIMIT to human AND english language.

Search outcome

Altogether 373 papers identified of which 369 were irrelevant or of insufficient quality for inclusion. The remaining four papers are shown in table 2.

Comments

There are four well designed trials in this area. All come to the same conclusion.

Clinical bottom line

Low molecular weight heparin is as effective and safe as unfractionated heparin and should be the form of treatment for patients with uncomplicated proximal deep vein thrombosis.

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 2

Author, date and country	Patient group	Study level	Outcomes	Key results	Study weaknesses
Hull RD, *et al*, 1992, USA[1]	432 patients with proximal DVT UH (219) *v* LMWH (213)	Multi-centre randomised double blind clinical trial	Recurrence of VTE	6/213 *v* 15/219 (p=0.07; 95% CI for the difference, 0.02% to 8.1%).	
			Major bleeding	1/213 patients (0.5%) *v* 11/219 (5%), reduction in risk of 91% (p=0.006).	
			Death	10/213 (4.7%) *v* 21/219 (9.6%) a risk reduction of 51% (p=0.049).	
Koopman MM, *et al*, 1996, Multi national[2]	400 patients with symptomatic proximal deep vein thrombosis UH in hospital (198) LMWH at home (202)	PRCT	Recurrent VTE (within 6 months)	17/198(8.6%) *v* 14/202 (6.9%).	Unblinded
			Major bleeding (within 3 months)	4/198 *v* 1/202.	
			Quality of life (at 1, 12 and 24 weeks)	Physical activity and social functioning better in LMWH group.	
			Average length of stay	In the LMWH group was 2.7 days *v* 8.1 in the UH group.	
Levine M, *et al*, 1996, Canada[3]	500 patients with acute proximal deep vein thrombosis UH in hospital (253) *v* LMWH primarily at home (247)	PRCT	Recurrent VTE	17/253 (6.7%) *v* 13/247 (5.3%).	Two thirds of potential patients excluded
			Major bleeding	3/253 (2%) *v* 5/247 (2%).	
			Costs	6.5 days in hospital *v* 1.1 days. 120 (49%) patients in LWMH were not admitted at all.	
Belcaro G, *et al*, 1999, Italy[4]	294/589 patients with acute proximal UH in hospital (98) *v* treatment with LMWH primarily at home or in the hospital (97) *v* treatment with SCHep given directly at home (99)	PRCT	Recurrence/extension of DVT	6.2% *v* 6.1% *v* 7.1%.	264 (44%) of potential patients excluded
			Bleeding	Bleeds were all minor and mostly during hospital stay	
			Length of stay	5.4 ± 1.2 *v* 1.2 ± 1.4 days (there was no hospital stay in the SCHep group)	
			Treatment costs	Average treatment costs in 3 months in the UH group were considered to be 100%. In comparison costs in the LMWH group was 28% of the UH and 8% in the SCHep group	

1 Hull R, Raskob G, Pineo G, *et al*. Subcutaneous low weight molecular weight heparin compared with continuous intravenous heparin in the treatment of proximal vein thrombosis. *N Engl J Med* 1992;**326**:975–82.
2 Koopman M, Prandoni P, Piovella F, *et al*. Treatment of venous thrombosis with intravenous unfractionated heparin administered in the hospital as compared with subcutaneous low molecular weight heparin administered at home. *N Engl J Med* 1996;**334**:682–7.
3 Levine M, Gent M, Hirsh J, *et al*. A comparison of low molecular weight heparin administered primarily at home with unfractionated heparin administered in the hospital for proximal vein thrombosis. *N Engl J Med* 1996;**334**:677–81.
4 Belcaro G, Nicolaides A, Cesarone M, *et al*. Comparison of low molecular weight heparin, administered primarily at home, with unfractionated heparin, administered in hospital and subcutaneous heparin administered at home for deep vein thrombosis. *Angiology* 1999;**50**:781–7.

Outpatient treatment for patients with uncomplicated above knee deep vein thrombosis

Report by Beverley Lane, *Research Nurse*
Search checked by Magnus Harrison *Clinical Research Fellow*

Clinical scenario
A 25 year old man presents at the emergency department with a two day history of a swollen and painful right leg. A DVT is suspected and an ultrasound confirms the presence of an extensive clot in the femoral vein. Otherwise he is fit and well. There are no beds in the hospital and you wonder whether the evidence exists to confirm that this patient can be treated safely as an outpatient using low molecular weight heparin.

Three part question
In [patients with an above knee uncomplicated DVT] is [outpatient management with low molecular weight heparin or traditional inpatient management] [feasible and safer]?

Search strategy
Medline 1966–07/00 using the OVID interface. {(Exp venous thrombosis OR deep vein thrombosis.mp OR dvt.mp) OR [(exp thrombosis OR exp venous thrombosis OR thrombosis.mp) AND (exp veins OR Vein$.mp OR vein$.mp)] AND (exp hospitilization OR hospitalisation.mp) OR (inpatient.mp) OR (outpatient.mp OR exp ambulatory care OR ambulatory care.mp) AND (exp heparin OR exp heparin, low molecular weight OR heparin.mp OR exp anticoagulants OR anticoagulants.mp NOT prophylaxis.mp OR exp primary prevention OR prevention.mp)] AND (exp therapeutics OR treatment.mp). LIMIT to human AND english language.

Search outcome
Altogether 493 papers identified of which 485 were irrelevant or of insufficient quality for inclusion. The remaining eight papers are shown in the table 3.

Comments
There are no randomised control trials to answer the question posed. However, all the cohort studies come to the same conclusion.

Clinical bottom line
Selected patients with uncomplicated proximal DVT can be treated safely as outpatients.

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 3

Author, date and country	*Patient group*	*Study level*	*Outcomes*	*Key results*	*Study weakness*
Lindmarker P and Holmstrom M, 1996, Sweden[1]	434 patients with symptomatic DVT, 239 proximal, 195 distal Patients were followed up for 3 months	Cohort	Recurrent DVT, incidence of pulmonary embolus, bleeding events, death	Frequency of major events during the administration of LMWH was 0.92% with an exact 95% CI of 0.25, 2.35% During the 3 month follow up period there were 3 reoccurrences and 1 PE There were no deaths during initial treatment with LMWH	High incidence of distal DVT (45%) may have affected the complication rate
Mattiasson I, *et al*, 1997, Sweden[2]	523 consecutive patients from 6 hospitals Patients followed up for 3 months	Cohort	Any bleeding event, pulmonary embolus (PE), progression of thrombus Eligibility	No serious bleeding event was reported. No serious thromboembolic complication was noted. 197/523 (38%) were deemed suitable (according to criteria) for total outpatient care 43 (8%) were initially hospitalised but then discharged after a median of 2 days	Excluded patients with thrombus involving the v iliaca and v cava This may reflect the zero incidence of PE
Grau E, *et al*, 1998, Spain[3]	71 consecutive patients presenting to the ED with a DVT (56 proximal, 15 calf) Patients were assessed monthly for 6 months	Cohort	Recurrent venous thromboembolic event (VTE) Ambulatory care	No patients had VTE recurrence during the 6 months of follow up. Ambulatory care was feasible in 39 (55%) of patients. 24 of these were not hospitalised at all and the remaining 15 were discharged within 2 days	Small number of patients
Groce B, 1998, USA[4]	125/142 patients with acute proximal DVT	Cohort	Length of stay Recurrent DVT Bleeding	From 5.4 to 0.97 days. 84 patients were in hospital ≤24 hours. The remaining 41 stayed between 1.1 and 3 days 1/125 In 2/125	Preliminary results
Harrison L, *et al*, 1998, Canada[5]	89/113 consecutive patients 69 had proximal DVT, 11 calf vein DVT, 7 had upper extremity DVT, 2 had PE Patients were followed up at 3 months after initial diagnosis	Cohort	Bleeding episode Recurrent VTE Patient satisfaction	There was 1 bleeding episode requiring admission 5 cases of recurrent VTE were reported (all had malignant disease) 1 death was reported 75/82 (91%) were pleased at home treatment	Some patients were followed up at 3 months over the telephone, which may affect validity of findings Possibility that satisfaction questionnaire not validated
Ting S, *et al*, 1998, Australia[6]	100 consecutive patients with acute lower limb DVT (53 proximal, distal 47) Patients were followed up for 6 months	Cohort	Bleeding Recurrent VTE PE	6 minor bleeding complications. In 2 of these Dalteparin was stopped 4 patients had reoccurrence between 5–12 months No episodes of symptomatic PE reported	
Wells P, *et al*, 1998, USA[7]	194/233 patients presenting with DVT were recruited into 2 care models Patients were followed up for 6 months	Cohort	Recurrent VTE Bleeding events	The overall recurrent event rate was 3.6% (95% CI 1.5%, 7.4%) The overall rate of major haemorrahge was 2.0% (95% CI 0.6%, 5.2%) More than 184/194 patients were treated mainly at home	As patients were cared for in a highly supervised research setting, evidence of their satisfaction/anxiety with the service could have been assessed
Yusen D, *et al*, 1999, USA[8]	195 hospitalised patients diagnosed as having a proximal DVT were assessed for outpatient treatment.	Cohort	Recurrent VTE, major bleeding, death Eligibility	No complications were recorded in any of the 36 eligible or possibly eligible patients Of the 159 patients classified as ineligible, 13 (8%; 95% CI 4%, 12%) died or developed serious complications	Criteria applied retrospectively Lack of documentation may have limited the ability to determine accurate complication rates

1 Lindmarker P, Holmstrom M. Use of low molecular weight heparin (Dalteparin), once daily for the treatment of deep vein thrombosis. A feasibility and health economic study in an outpatient setting. *J Intern Med* 1996;**240**:395–401.
2 Mattiasson I, Berntorp S, Bornhov S, *et al*. Out patient treatment of acute deep vein thrombosis. *Int Angiol* 1998;**17**:146–50.
3 Grau E, Real E, Pastor E, *et al*. Home treatment of deep vein thrombosis: a two years experience of a single institution. *Haematologica* 1998;**83**:438–41.
4 Groce J. Patient outcomes and cost analysis associated with an outpatient deep vein thrombosis treatment program. *Pharmacotherapy* 1998;**18**:175–80S.
5 Harrison L, McGinnis J, Crowther N, *et al*. *Arch Intern Med* 1998;**158**:2001–3.
6 Ting S, Ziegenbein R, Gan TE, *et al*. Dalteparin for deep vein thrombosis: a hospital in the home programme. *Med J Aust* 1998;**168**:272–6.
7 Wells P, Kovacs M, Boramis J, *et al*. Expanding eligibility for outpatient treatment of deep vein thrombosis and pulmonary embolism with low molecular weight heparin. A comparison of patient self-injecting with homecare injection. *Arch Intern Med* 1998;**158**:1809–12.
8 Yusen R, Haraden B, Gage B, *et al*. Criteria for outpatient management of proximal lower extremity deep vein thrombosis. *Chest* 1999;**115**:972–9.

SimpliRed D-dimer assay in suspected pulmonary embolus

Report by Magnus Harrison, *Research Fellow*
Search checked by Steve Jones, *Research Fellow*

Clinical scenario

A 40 year old man presents with acute suspected pulmonary embolus (PE). You wonder whether a negative SimpliRed D-dimer assay is sufficient to rule out the diagnosis of PE.

Three part question

In [a patient suspected of having an acute pulmonary embolus] is [a negative SimpliRed d-dimer assay] able to [rule out PE]?

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 4

Author, date and country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Ginsberg JS, *et al*, 1998, Canada[1]	Over 18s clinically suspected PE, referred to TE consultant	Prospective cohort	Sensitivity and specificity LRs	Whole group SimpliRED: sensitivity 84.8% specificity 68.4% LR+ 2.7 LR− 0.22 In Low PTP Sens 79% Spec 75% LR− 0.27	Follow up not same in all groups. For subgroup analysis only LR−ve given, no sensitivity or specificity No further identification of patient's presenting problem No sample size calculation No CIs given
De Groot M, *et al*, 1999, Netherlands[2]	In patients and outpatients suspected of PE	Prospective management study	False –ve D-dimer results	10% of normal SimpliRED results had PE that is, 90% sensitivity	Incorporation bias RS not universally applied No sample size calculation No CIs given
Farrell S, *et al*, 2000, USA[3]	Consecutive patients referred from ED for ?DVT and PE	Prospective clinical trial	Sensitivity PVs LRs	PE +ve 32.8% Sens 68% 95% CI 54, 83% Spec NPV 83% 95% CI 75, 91% LR−ve 0.42 95% CI 0.26, −0.66	RS not applied to all patients Wide CIs
Ginsberg JS, *et al*, 1995, Canada and Netherlands[4]	Patients referred to TE consultant, suspected of acute PE	Prospective cohort	Sensitivity and specificity PVs	PE +ve 19% Sens 94% 95% CI 70, 99% Spec 66% 95% CI 53, 77% NPV 98% PPV 38%	RS not applied to all patients Large CIs, therefore need verification in a more powerful study

Search strategy

Medline 1966–07/00 using the OVID interface. [{(Exp pulmonary embolism or pulmonary embolism.mp) OR {(pulmonary.mp.) AND (exp embolism OR embolism$.mp.)} OR (exp thromboembolism or thromboembolic.mp.)] AND (Simplired$ OR exp fibrin fibrinogen degredation products or d-dimer$.mp)].

Search outcome

Altogether 172 papers were found of which 162 were irrelevant and six of insufficient quality for inclusion. The remaining four papers are shown in table 4.

Comments

The "gold standard" investigation for the diagnosis of PE is pulmonary angiography. However, the universal application of this investigation in all patients, in any clinical trial for the investigation of PE, is unethical; the morbidity and mortality associated with this investigation are unacceptably high. Therefore most research is conducted using decision making analysis tools; this would be acceptable if all study patients are subject to the same diagnostic tests. If this does not happen, the validity of the results can be questioned. In the above trials, where the confidence intervals are given, the width of the interval is large; this could be remedied with a larger more powerful trial. As they stand, the confidence intervals are too wide.

Clinical bottom line

SimpliRed does not have the required sensitivity to be used to rule out PE in an ED setting.

1 Ginsberg JS, Wells RS, Brill-Edwards P, *et al*. Sensitivity and specificity of a rapid whole-blood assay for d-dimer in the diagnosis of pulmonary embolism. *Ann Intern Med* 1998;**129**:1006–11.
2 De Groot M, van Marwijk Kooy M, *et al*. The use of a rapid d-dimer blood test in the diagnostic work-up for pulmonary embolism: a management study. *Thromb Haemost* 1999;**82**: 1588–92.
3 Farrell S, Hayes T, Shaw M. A negative SimpliRED d-dimer assay result does not exclude the diagnosis of deep vein thrombosis or pulmonary embolus in emergency department patients. *Ann Emerg Med* 2000;**35**:121–5.
4 Ginsberg JS, Wells RS, Brill-Edwards P, *et al*. Application of a novel and rapid whole blood assay for d-dimer in patients with clinically suspected pulmonary embolism. *Thromb Haemost* 1995; **73**:35–8.

Elastic compression stockings and the risk of post-thrombotic syndrome in patients with symptomatic proximal vein thrombosis

Report by Beverley Lane, *Research Nurse*
Search checked by Steve Jones, *Research Fellow*

Clinical scenario

A 35 year old woman attends the emergency department with a swollen and painful left leg. A DVT is suspected and confirmed on ultrasound. You are aware of the possible risks of developing post-thrombotic syndrome and

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 5

Author, date and country	*Patient group*	*Study level*	*Outcomes*	*Key results*	*Study weaknesses*
Brandjes D, *et al*, 1997, Holland[1]	194 consecutive patients with a first episode of proximal DVT (proved on venogram).	PRCT	Incidence of PTS	Mild to moderate PTS occurred in 19 patients in the stocking group and in 46 patients in the control group ($p \leq 0.001$)	Due to the non blinded design, potential bias in the assessment of post-thrombotic syndrome
	Custom fitted graduated compression stockings (96), *v* no stockings (98). Assessment every 3 months for 2 years, and thereafter every 6 months for at least 5 years.		PTS was assessed using clinical characteristics and leg measurements	11 patients in the stocking group developed severe PTS compared with 23 in the control group ($p \leq 0.001$)	Lack of an accepted definition of PTS

wonder whether this young woman would benefit from the use of compression stockings.

Three part question
In [patients with confirmed deep vein thrombosis] does [the use of compression stockings] reduce [the risk of post-thrombotic syndrome]?

Search strategy
Medline 1966–07/00 using the OVID interface. {(Exp.thrombosis OR venous thrombosis OR thrombosis.mp) AND (exp.stockings.mp) OR TED stockings.mp OR support stockings.mp OR exp. compression stockings.mp OR graduated compression stockings.mp). LIMIT to english language AND human.

Search outcome
Altogether 19 papers were found of which 18 were irrelevant or of insufficient quality for inclusion. The remaining paper is shown in table 5.

Comments
The incidence of PTS following confirmed DVT is unknown but it has been reported to be between 20% and 100%. This wide range probably reflects the small size of these retrospective studies with different periods of follow up and selection criteria. Interpretation of the findings from these studies is also hampered by the lack of objective diagnostic criteria for PTS.

Clinical bottom line
Elastic compression stockings should be used within two weeks of onset of acute thrombotic event and worn for up to two years.

1 Brandjes D, Buller H, Heijboer ??,*et al*. Randomised trial of effect of compression stockings in patients with symptomatic proximal vein thrombosis. *Lancet* 1997;**349**:759–62.

Prior injection of local anaesthetic and the pain and success of intravenous cannulation

Report by Ross Murphy, *Specialist Registrar*
Search checked by Simon Carley, *Specialist Registrar*

Clinical scenario
A 45 year old woman attends the emergency department with cellulitis. You decide to admit her for intravenous antibiotics. She becomes agitated, distressed and tearful when you explain this to her. On questioning she reveals that she is afraid of the pain of intravenous cannulation. You wonder whether a prior injection of local anaesthetic would lessen the pain of cannulation without affecting your chances of success.

Three part question
In [a patient requiring intravenous cannulation] will [a prior injection of local anaesthetic] reduce [the pain of cannulation without effecting the chance of successful cannulation]?

Search strategy
Medline 1966–07/00 using the OVID interface. [Venflon.mp OR cannula.mp or exp catheterization, peripheral OR exp infusions, intravenous OR exp injections, intravenous] AND [local anaesthetics.mp OR exp anaesthetics, local OR exp bupivicaine OR exp lidocaine OR exp procaine OR exp tetracaine] AND [pain.mp OR exp pain]. LIMIT to human and english language AND abstracts.

Search outcome
Altogether 251 papers were found of which 241 were irrelevant or of insufficient quality for inclusion. The remaining 10 papers are shown in table 6.

Comments
These studies do indicate that a prior injection of local anaesthetic lessens the pain of intravenous cannulation without affecting the chances of successful cannulation. However, none of the trials were fully blinded and most were not properly single blinded. One used a placebo control and only one reported side effects. While the results were statistically significant it is not known if they were clinically significant and few of the trials commented on the increased length of time it takes to administer anaesthetic or the cost to the health service. Although different anaesthetics were used in different studies most concen-

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

Table 6

Author, date and country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Harrison N, *et al*, 1991, UK[1]	60 patients for surgery Cannulation with 18G or 20G or 22G venflon on one arm *v* injection with 1% sub-cut lignocaine with a 25G needle on other arm.	Clinical trial Randomised Blinded	Pain using visual analogue scales	Cannulation significantly more painful than lignocaine injection in all groups	Some patients were pre-medicated
Langham BT and Harrison DA, 1992, UK[2]	60 patients for surgery Double cannulation with 18G, 20G or 22G venflons preceded by an injection of 1% sub-cut lignocaine with 25G needle on one arm *v* nothing on the other	Clinical trial Randomised Blinded	Pain using visual analogue scales	Cannulation without lignocaine significantly more painful than cannulation with lignocaine	Some patients were pre-medicated
Nuttall GA, *et al*, 1993, USA[3]	280 patients for surgery Cannulation with 18G venflon preceded by nothing *v* injection with 25G needle of 0.9% benzyl alcohol or 3% 2-chloroprocaine or 1% lignocaine or 1% lignocaine with preservative or 1% alkalinised lignocaine with preservative or normal saline	Clinical trial Randomised Double blinded Controlled	Pain using visual analogue scales	Cannulation without anaesthetic significantly more painful than cannulation with anaesthetic Alkalinised lignocaine had the lowest mean pain score for cannulation	
Selby IR and Bowles BJ, 1995, UK[4]	160 patients for surgery Cannulation with 20G venflon preceded by nothing *v* cannulation preceded by EMLA or ethyl chloride spray or 1% sub-cut lignocaine injected with 25G needle.	Clinical trial Randomised	Pain on anaesthetic application, cannulation and a minute afterwards using visual analogue scales Number of failed cannulations	Cannulation without lignocaine significantly more painful than lignocaine injection No significant difference in number of failed cannulations	Not blinded. Did not compare pain of whole procedure
Van den Berg AA, *et al*, 1995, USA[5]	278 patients for surgery Cannulation with 21G butterfly *v* 23G butterfly *v* 20G venflon *v* injection with 1% sub-cut lignocaine with 25G needle prior to cannulation with a venflon of any size	Clinical trial Randomised Blinded	Pain Subjectively using observation and objectively using visual analogue scales	Cannulation with 20G venflon and 21G butterfly significantly more painful than cannulation with 23G butterfly and anaesthetic injection before cannulation	Single blinded
Klein EJ, *et al*, 1994, USA[6]	59 children requiring cannulation in emergency department Cannulation with 18–24G venflons preceded by nothing *v* cannulation preceded by injection with 27G needle of sub-cut buffered lignocaine	Clinical trial Randomised	Pain of entire procedure using visual analogue scales Number of attempts preceding successful cannulation	Cannulation without lignocaine significantly more painful than cannulation with lignocaine regardless of venflon size No significant difference in number of attempts	Not blinded. Small sample size with wide confidence intervals
Sacchetti AD, *et al*, 1996, USA[7]	110 children under 2 years requiring cannulation in emergency department Cannulation with 24G venflon preceded by nothing *v* cannulation preceded by injection with 27–29G needle of sub-cut lignocaine	Clinical trial	Number of attempts preceding successful cannulation	No significant difference between groups	2 groups entered into study over 2 different periods. Not blinded. Not randomised
Burgher SW, *et al*, 1998, UK[8]	103 patients requiring cannulation in emergency department Cannulation with 18G venflon preceded by nothing *v* cannulation preceded by injection with 27G needle of sub-cut buffered lignocaine or sub-cut 0.9% benzyl alcohol and normal saline	Clinical trial Randomised Blinded	Pain of anaesthetic injection and cannulation using visual analogue scales Number of attempts before successful cannulation and number of successful cannulations on the first attempt	Cannulation without lignocaine significantly more painful than lignocaine injection and significantly more painful than cannulation with lignocaine No significant difference in number of attempts or success rate	Patients entered into study when investigators available and department not too busy. Did not compare pain of whole procedure
Fein JA, *et al*, 1998, USA[9]	99 children requiring cannulation in emergency department Cannulation with 18–24G venflons preceded by nothing *v* cannulation preceded by injection with 27G needle of sub-cut lignocaine or benzyl alcohol and normal saline	Clinical trial Randomised	Pain using visual analogue scales	Cannulation without lignocaine significantly more painful than cannulation with lignocaine regardless of venflon size	Patients entered into study when investigators available
Holdgate A, *et al*, 1999, Australia[10]	166 patients requiring cannulation in emergency department Cannulation preceded by nothing *v* cannulation preceded by injection with 25G needle of sub-cut 1% lignocaine	Clinical trial Randomised	Successful cannulation at first attempt	No significant difference between groups	Not blinded. Venflon size not considered

trated on 1% lignocaine. Previous studies have shown that the pain of injection of local anaesthetic is less when it is warmed and buffered with bicarbonate and in order to achieve best results this is how lignocaine should be administered prior to attempted cannulation.

Clinical bottom line

A prior injection of local anaesthetic does reduce the pain of intravenous cannulation without affecting the success.

1 Harrison N, Langham BT, Bogod DG. Appropriate use of local anaesthetic for venous cannulation. *Anaesthesia* 1992;**47**:210–12.

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.

2 Langham BT, Harrison DA. Local anaesthetic: Does it really reduce the pain of insertion of all sizes of venous cannula? *Anaesthesia* 1992;**47**:890–91.
3 Nuttall GA, Barnett MR, Smith RL, *et al*. Establishing intravenous access: A study of local anaesthetic efficacy. *Anaesth Analg* 1993;**77**:950–3.
4 Selby IR, Bowles BJ. Analgesia for venous cannulation: A comparison of EMLA, lignocaine, ethyl chloride and nothing. *J R Soc Med* 1995;**88**:264–7.
5 Van den Berg AA, Prabhu Rama NV. Rationalising venepuncture pain: Comparison of lignocaine injection, butterfly and venflon. *Anaesth Intens Care* 1995;**23**:165–7.
6 Klein EJ, Shugerman RP, Leigh-Taylor K, *et al*. Buffered lidocaine: Analgesia for intravenous line placement in children. *Pediatrics* 1995;**95**;709–12.
7 Sacchetti AD, Carraccio C. Subcutaneous lidocaine does not affect the success rate of intravenous access in children less than 24 months of age. *Acad Emerg Med* 1996;**3**:1016–19.
8 Burgher SW, McGuirk TD. Subcutaneous buffered lidocaine for intravenous cannulation: Is there a role in emergency medicine? *Acad Emerg Med* 1998;**5**:1057–63.
9 Fein JA, Boardman CR, Stevenson S. Saline with benzyl alcohol as intradermal anaesthesia for intravenous line placement in children. *Pediatr Emerg Care* 1998;**14**:119–22.
10 Holdgate A, Wong G. Does local anaesthetic affect the success rate of intravenous cannulation? *Anaesth Intens Care* 1999;**27**:257–9.

J Accid Emerg Med: first published as 10.1136/emj.17.6.400 on 1 November 2000. Downloaded from http://emj.bmj.com/ on September 21, 2019 at MIT Libraries. Protected by copyright.