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] Four general topics are covered in this issue of the journal together with two prehospital topics.

- Gum elastic bougies in difficult intubation
- BURP and laryngoscopy
- Local anaesthetic and arterial puncture
- Propofol for sedation in the emergency department

Prehospital BETs

- Spinal boards or vacuum mattresses for immobilisation
- Cervical collars and intracranial pressure

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.

Gum elastic bougies in difficult intubation

Report by Simon Carley, *Specialist Registrar*
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Clinical scenario

A 55 year old woman is brought to the emergency department after an overdose of alcohol and tricyclic antidepressants. She has a tachycardia (110) and a systolic blood pressure of 105 mm Hg. The GCS is 5 (extends to pain). You decide to do an RSI using etomidate and suxamethonium. You are only able to visualise the epiglottis at laryngoscopy (Cormack grade 3 view), and struggle to intubate the patient on the third attempt (having intubated the oesophagus twice). You wonder if it would have been easier if you had used a gum elastic bougie.

Three part question

In [patients in with a poor laryngoscopic view] is [use of a gum elastic bougie better than simply using the ET tube] at [successfully and quickly achieving tracheal intubation]?

Search strategy

Medline 1966–07/2001 using the OVID interface. [{exp laryngoscopy OR laryngoscopy.mp OR exp intubation, intratracheal OR intubation.mp OR intubate$.mp} AND {bougie$ OR gum elastic.mp}] LIMIT to human AND english.

Table 1

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Nolan JP, 1993, UK	157 patients undergoing elective surgery	PRCT	Number of grade 3 views in neutral position	34/157 (22%)	Small number of truly difficult laryngoscopies in whom differences are likely to be the greatest
			Median time for intubation	20 secs for direct intubation *v* 25 seconds for use of the bougie	
	Patients were intubated in the neutral c-spine position		Success rate for intubation	5/78 (6.4%) direct intubation patients could not be intubated (they were subsequently intubated using the bougie). 0/79 patients could not be intubated using the bougie	No grade 4 views
	Patients were either intubated direct (just with the ETT) or using a bougie.		Number of patients requiring prolonged time for intubation (>45 seconds)	11 in direct visualised group *v* none in the bougie group.	

Search outcome
Altogether 78 papers were found of which one directly answered the three part question. This paper is shown in table 1.

Comments
Although the mean time for intubation is longer with the bougie the difference is clinically unimportant. Of greater interest is the number of patients who could not be intubated directly, but who were subsequently intubated using the bougie. Similarly, there were no prolonged intubation times in the bougie group. Use of a gum elastic bougie appears to ease intubation in a neutral c-spine position.

Clinical bottom line
A gum elastic bougie should be available as an aid to intubation during difficult laryngoscopy.

1 Nolan JP, Wilson ME. Orotracheal intubation in patients with potential cervical spine injuries. An indication for the gum-elastic bougie *Anaesthesia* 1993;**48**:630–3.

BURP and laryngoscopy

Report by Simon Carley, *Specialist Registrar*
Checked by Rupert Jackson, *Specialist Registrar*

Clinical scenario
A 35 year old man with a severe head injury is brought to the emergency department. He has fallen from a ladder and is leaking CSF from the left ear suggesting a base of skull fracture. He has a GCS of 3 and dilated pupils. There are no other apparent injuries. You decide to intubate him using an RSI technique. Laryngoscopic view is poor despite the use of a McCoy laryngoscope and cricoid pressure. You eventually intubate using a gum elastic bougie. Your assistant performing cricoid pressure asks during the procedure if you want a BURP. Other bodily functions come to mind! Later your colleague explains that BURP (backwards, upwards, to the right, with pressure) on the thyroid cartilage improves the view. You wonder if in fact it is any better than simple cricoid.

Three part question
In [patients in with a poor laryngoscopic view] is [the BURP technique better than simple cricoid pressure] at [improving laryngoscopic view]?

Search strategy
Medline 1966–07/2001 using the OVID interface. [{exp laryngoscopy OR laryngoscopy.mp OR exp intubation, intratracheal OR intubation.mp OR intubate$.mp} AND [{(back.mp OR backward$.mp OR posterior.mp) AND pressure.mp} OR BURP.mp] LIMIT to human AND english.

Search outcome
Altogether 72 papers were found of which three were relevant to the three part question. These three papers are shown in table 2.

Comments
Optimising the view at laryngoscopy is an important step in successfully intubating patients in the emergency department. Although these studies only contain small numbers of true grade 3 patients (and no grade 4) there was a consistent improvement in laryngoscopic view. The BURP technique seems to be an additional step beyond simple backward pressure (which is likely to have a similar effect as cricoid pressure). It should therefore be taught to people assisting in RSI in the emergency department.

Clinical bottom line
The BURP technique can improve the laryngoscopic view and should be taught to those assisting in anaesthetic procedures.

1 Benumof JL, Cooper SD. Quantitative improvement in laryngoscopic view by optimal external laryngoscopic manipulation. *J Clin Anesth* 1996;**8**:136–40.
2 Takahata O, Kubota M, Mamiya K, *et al*. The efficacy of the "BURP" maneuver during a difficult laryngoscopy. *Anesth Analg* 1997;**84**:419–21.
3 Vanner RG, Clarke P, Moore WJ, *et al*. The effect of cricoid pressure and neck support on the view at laryngoscopy. *Anaesthesia* 1997;**52**:896–900.

Table 2

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Benumof JL, 1996, USA	181 elective patients undergoing GA.Back plus cephalad pressure was compared with standard view	Observational study	Improvement of laryngoscopic view	All views improved	
			Number of improved views in grade 3 group	All views improved	
Takahata O, 1997, Japan	630 patients undergoing routine surgery.BURP was compared with back pressure on the larynx	Observational study	Number of improved views in grade 3 group	357 grade 1 views, 261 grade 2 views,12 grade 3 views, 0 grade 4 views. 9 patients with an initial grade 3 Cormack view improved to grade 2 after simple back pressure.	Comparison was with back pressure on thyroid cartiladge rather than on cricoid.Very small number of initial grade 3, and no grade 4 views.
			Number of improved views in grade 3 group	All patients with an initial grade 3 Cormack score improved to grade 2 after BURP.	
			Number of grade 2 views that improved (to grade 1 or an improved grade 2)	176/261 after back pressure alone. 42/85 further improved with BURP	
Vanner RG, 1997, UK	55 elective female patients standard view *v* simple cricoid *v* cricoid plus upward pressure	Observational study	Number of improved views with upward pressure *v* simple cricoid alone	Better with upward pressure	Only female patients

Local anaesthetic and arterial puncture

Report by Damian Bates, *Specialist Registrar*
Checked by Peter Cutting, *Specialist Registrar*

Clinical scenario
A 67 year old man attends with increasing shortness of breath. He is known to have obstructive airways disease. You want to perform arterial puncture for blood gas measurement. He tells you that last time it was very painful. You wonder if an injection of local anaesthetic would help?

Three part question
In [a patient requiring blood gases or arterial puncture] does [an injection of local anaesthetic] [reduce pain without affecting success]?

Search strategy
Medline 1966–07/2001 using the Ovid interface. [{exp blood gas analysis OR abg.mp OR arterial blood gas$.mp OR blood gas$.mp} OR ({exp arteries OR artery.mp OR arterial.mp AND {exp punctures OR puncture$.mp OR exp catheterisation OR cannulation.mp OR cannula.mp}) AND {exp anesthesia, local OR anesthetics, local OR local anesthesi$.mp OR local anaesthesi$.mp} AND {exp pain OR pain$.mp}] LIMIT to human AND english.

Search outcome
Altogether 88 papers were identified of which three were relevant. These three papers are shown in table 3.

Comments
Lightowler and Elliott surveyed junior doctors prior to their study and found that 84% never used local anaesthetic before arterial puncture citing that it made the procedure both more difficult and more painful. Dar *et al* cite two papers that showed delay in presentation to be an important contributor to deaths from asthma and suggest that a previous painful experience could lead to such a delay.

Clinical bottom line
Local anaesthetic infiltration prior to arterial puncture significantly reduces the pain of the procedure without affecting success rates.

1 Dar K, Williams T, Aitken R, *et al*. Arterial versus capillary sampling for analysing blood gas pressures. *BMJ* 1995;**310**:24–5.
2 Giner J, Casan P, Belda J, *et al*. Pain during arterial puncture. *Chest* 1996;**110**:1443–5.
3 Lightowler JV, Elliott MW. Local anaesthetic infiltration prior to arterial puncture for blood gas analysis: a survey of current practice and a randomised double blind placebo controlled trial. *J R Coll Physicians Lond* 1997;**31**:645–6.

Table 3

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Dar K *et al*, 1995, England	55 acute medical admissions requiring blood gas measurement. capillary samples from all patients, plus arterial sample after infiltration of 1% lignocaine or no infiltration using 22G needle	PCT	pain of arterial puncture using a scale 0 to 10. preference of capillary or arterial sampling comparability of results from arterial and capillary samples	lower mean pain score with LA 2.0 *v* 7.0 without LA capillary sampling less painful mean differences for pO_2 and pCO_2 were not significant. mean differences for pH and standard bicarbonate reported to be significant but clinically unimportant	did not assess significance of difference between LA or not. Pain scores for capillary sampling are different for the two groups
Giner J *et al*, 1996, Spain	270 patients attending pulmonary function lab for abg. arterial puncture with 22G needle after infiltration with 1% mepivacaine, placebo or nothing	PRCT	Pain using 10 cm visual analogue scale time to prepare and perform success at first pass	less pain with LA (1.5 cm *v* 3.06 cm with placebo, p=0.00001) (1.5 *v* 2.8 cm with nothing, p=0.0002) less time without LA (134 seconds *v* 171 seconds with infiltration, p<0.05) first pass success 93% with LA, 91% with placebo and 90 % without infiltration, significance not tested.	Not emergency patients
Lightowler JV and Elliott MW, 1997, England	101 patients requiring abg. arterial puncture with 29G needle after infiltration with 2% lignocaine, placebo or nothing.	PRCT	Pain, using a 4 point scale difficulty of procedure as number of times skin broken, number of passes made and doctor rating.	Arterial puncture less painful with LA (1.5 *v* 2.2 with placebo p=0.0008, 1.5 *v* 2.1 with nothing p=0.0005) no difference in difficulty, doctor rating 1.2 with LA *v* 1.1 placebo *v* 1.1 nothing	Separates pain of infiltration from arterial puncture in scoring

Use of propofol for sedation in the emergency department

Report by Rupert Jackson, *Specialist Registrar*
Checked by Simon Carley, *Specialist Registrar*

Clinical scenario
A 35 year old man presents with a dislocated shoulder. You are about to undertake the reduction under sedation in the emergency department and wonder whether the use of a propofol infusion rather than boluses of midazolam would give effective sedation with shorter recovery time without compromising safety.

Three part question
In [patients requiring conscious sedation for short painful procedures] does [propofol compared with midazolam] give [shorter recovery times whilst being safe and effective]?

Search strategy
Medline 1966- July 2001 using the Ovid interface. {exp propofol/ OR "propofol".mp} and {exp midazolam/ OR "midazolam".mp OR exp diazepam/ OR "diazepam".mp. OR exp lorazepam/ OR "lorazepam".mp. OR exp benzodiazepines/ OR "benzodiazepine$".mp.}

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Gupta A *et al*, 1990, Sweden	30 patients undergoing cardioversion Randomised to midazolam or propofol or thiopentone	PRCT	Physiological observations	Decreased BP in propofol group, equal incidences of desaturation. Apnoea requiring assisted ventilation in 3 of propofol group.	Not emergency setting Unblinded
			Sedation and recovery times	Shorter time to sedation and to recovery with propofol *v* midazolam (p<0.05).	Sedation titrated to loss of eyelash reflex (that is, not conscious sedation)
Pratila MG *et al*, 1993, USA	90 patients undergoing central venous line insertion Randomised midazolam or propofol boluses (PB) or infusion (PI)	PRCT	Physiological observations	No significant cardiovascular adverse events. Sao_2 drop 2.2% with propofol (PB) *v* 0.3% midazolam (p<0.04)	Not emergency setting Unblinded
			Complications	Apnoea in 3 of PB group, none required assisted ventilation	
			Recovery time	Recovery time shorter with propofol, 8 min (PI) and 14 min (PB) *v* 25 min with midazolam (p<0.05)	
Parworth LP *et al*, 1998, USA	57 patients undergoing 3rd molar tooth extraction. Randomised to midazolam or propofol	PRCT	Physiological observations	2 in midazolam group *v* 1 in propofol group were apnoeic for >20 secs, none required assisted ventilation. No significant cardiovascular adverse events.	All patients given fentanyl. Not emergency setting. Unblinded. Recovery time not assessed.
			Sedation efficiency	Propofol group less cooperative (p=0.02).	
Havel CJ Jr *et al*, 1999, USA	89 children aged 2–18 with isolated limb injury requiring reduction in ED Randomised to midazolam or propofol	PRCT	Recovery time	Recovery in 14.9 min with propofol *v* 76.4 min with midazolam (p<0.001)	All patients given morphine. Small numbers to detect significant complications. Incomplete follow up after discharge
			Complications	No differences in rates of hypoxia, hypotension. No clinically significant complications.	
			Sedation scores	Sedation scores equivalent between groups.	

AND {exp conscious sedation/ OR "sedation".mp OR exp manipulation, orthopedic/ OR "manipulation".mp OR "reduction".mp. OR exp dislocations/ OR "dislocation".mp. OR exp fractures, closed/ OR exp fractures/ OR "fractures".mp. OR exp abscess/ OR "abscess".mp.OR "incision".mp. OR exp electric countershock/ OR "cardioversion".mp.} AND maximally sensitive RCT filter limit to human AND english.

Search outcome

Altogether 220 papers were identified of which one compared the use of propofol with midazolam in the emergency department. A further three papers compared the two agents in other settings for conscious sedation for short procedures. While not directly applicable to the emergency department these have been included as they are applicable to the three part question. These four papers are shown in table 4.

Comments

The routine use of propofol for sedation by non-anaesthetists is not currently accepted practice. Sedation by any means has inherent risks and there must be adequate resuscitation equipment and skilled staff available. Adverse events will occur more quickly with propofol than with midazolam, but they will also resolve more quickly. The papers confirm the efficacy and safety of propofol for conscious sedation and the shorter onset and recovery times are a major advantage.

Clinical bottom line

From the available evidence it seems that sedation with propofol in the emergency department is safe, effective, and dramatically reduces recovery times. The use of this agent should be considered.

1 Gupta A, Lennmarken C, Vegfors M, *et al*. Anaesthesia for cardioversion. A comparison between propofol, thiopentone and midazolam. *Anaesthesia* 1990;**45**:872–5.
2 Pratila MG, Fischer ME, Alagesan R, *et al*. Propofol versus midazolam for monitored sedation: a comparison of intraoperative and recovery parameters. *J Clin Anesth* 1993;**5**:268–74.
3 Parworth LP, Frost DE, Zuniga JR, *et al*. Propofol and fentanyl compared with midazolam and fentanyl during third molar surgery. *J Oral Maxillofac Surg* 1998;**56**:447–53.
4 Havel CJ Jr, Strait RT, Hennes H. A clinical trial of propofol vs midazolam for procedural sedation in a pediatric emergency. *Acad Emerg Med* 1999;**6**:989–97.

Spinal boards or vacuum mattresses for immobilisation

Report by Muhammad Ahmad, *Specialist Registrar*
Checked by John Butler, *Specialist Registrar*

Clinical scenario

A 60 year old man was involved in a road traffic accident at high speed. He was complaining of low back pain at the scene and he was immobilised on a long spinal board. When the patient arrived at the emergency department, he was very uncomfortable on the board and he requested removal. You wonder whether a vacuum mattress is more comfortable and provides better degree of immobilisation.

Three part question

In [patients requiring spinal immobilisation] is [a vacuum mattress than a long spinal board] at providing [comfort and immobilisation]?

Search strategy

Medline 1966–07/2001 using the OVID interface. ({exp vacuum OR vacuum$.mp OR vacuum splint$.mp OR vacuum matress$.mp} AND {back board$.mp OR backboard$.mp OR spin$ board$.mp} LIMIT to human AND english.

Table 5

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Lovell ME and Evans JH, 1994, UK	30 healthy volunteers 7 different support surfaces	Observational	Interface pressure	Vacuum stretcher interface pressure was 36.7 mm Hg while the pressure with spinal board was 115.5 mm Hg	Small numbers
Main PW and Lovell ME, 1996, UK	4 healthy volunteers 7 different support surfaces	Observational	Interface pressure	Vacuum splint most comfortable p=<0.001	Only 4 subjects used in study
Johnson DR *et al*, 1996, USA	30 paramedic students	PRCT	Degree of immobilisation	No significant difference in immobilisation	Small numbers
	Collar + vacuum splint *v* collar + backboard *v* vacuum splint only *v* backboard only		Comfort	Vacuum splint more comfortable p=<0.001	No trauma patient
			Speed of application	Fast application with vacuum splint p=<0.001	
Hamilton RS and Pons PT, 1996, USA	26 healthy volunteers	PRCT	Degree of immobilisation	Significant increase in immobilisation	Small numbers No trauma patient included
	Cervical collar + backboard *v* backboard *v* cervical collar + vacuum splint *v* vacuum splint		Efficacy and comfort	Efficacy and comfort with vacuum splint p<0.05	
Chan D *et al*, 1996, USA	37 healthy volunteers Neck collar + backboard *v* neck collar + vacuum mattress	PRCT	Pain	Significant more pain in spinal board group. P<0.001	Small numbers Study on healthy volunteers, no trauma patient

Search outcome

Altogether seven papers were found of which five were relevant to the three part question. These five papers are shown in table 5.

Comments

A Cochrane review concluded that there were no relevant RCTs.[6] However, studies done on volunteers have shown that the vacuum splint is more comfortable than long spinal boards with no loss of stability. A large randomised trial in trauma patients is required.

Clinical bottom line

The vacuum mattress provide comparable spinal immobilisation to the long spinal board with increased comfort.

1 Lovell ME, Evans JH. A comparison of the spinal board and the vacuum stretcher, spinal stability and interface pressure. *Injury* 1994;**25**:179–80.
2 Main PW, Lovell ME. A review of seven support surfaces with emphasis on their protection of the spinally injured. *J Accid Emerg Med* 1996;**13**:34–7.
3 Johnson DR, Hauswald M Stockhoff C. Comparison of a vacuum splint device to a rigid backboard for spinal immobilization. *Am J Emerg Med* 1996;**14**:369–72.
4 Hamilton RS, Pons PT. The efficacy and comfort of full-body vacuum splint for cervical-spine immobilization. *J Emerg Med* 1996;**14**:553–9.
5 Chan D, Goldberg RM, Mason J, *et al*. Backboard vs mattress splint immobilization: a comparison of symptoms generated. *J Emerg Med* 1996;**14**:293–8.
6 Kwan I, Bunn F, Roberts I. Spinal immobilisation for trauma patients (Cochrane Review). In: *The Cochrane Library,* Issue 2, 2001. Oxford: Update Software.

Cervical collars and intracranial pressure

Report by Muhammad Ahmad, *Specialist Registrar*

Checked by John Butler, *Specialist Registrar*

Clinical scenario

A 26 year old man was brought to the emergency department by the paramedics after a road traffic accident. He was immobilised on a long spinal board and a correctly fitted collar was applied to his neck. The patient was unconscious. You wonder whether the cervical collar raises intracranial pressure in head injury patients

Three part question

In [patients with a head injury requiring cervical spine immobilisation] does [a correctly fitted cervical collar] increase [intracranial pressure]?

Search strategy

Medline 1966–07/2001 using the OVID interface. [({exp neck OR exp neck injuries OR exp cervical vertebrae OR cervical.mp} AND {exp braces OR brace$.mp OR collar$.mp}) OR cervical collar$.mp) AND {exp intracranial pressure OR intracranial pressure$.mp OR ICP.mp}]

Table 6

Author, date and country	*Patient group*	*Study type (level of evidence)*	*Outcomes*	*Key results*	*Study weaknesses*
Craig GR and Nielsen MS, 1991, UK	2 patients with severe head injury	Observational	ICU with and without cervical collar	Significant rise in ICP in both cases	Only two patients used in study
Raphael JH and Chotai R, 1994, UK	9 patients scheduled for elective spinal anaesthesia	Randomised cross over study	CSF pressure	Significant rise in CSF pressure with cervical collar p=0.01	Small numbers Measurements made in lateral decubitus position
Davies G *et al*, 1996, UK	19 patients with severe head injury	Observational	Rise in intracranial pressure	Significant rise in ICP with cervical collar. Mean −4.5 mm Hg p=0.001	Small numbers Excluded patient with ICP >30 mm Hg
Kolb JC *et al*, 1999, USA	20 adult patients undergoing lumbar puncture	Observational	CSF pressure in lumbar subarachnoid space	Significant rise in CSF pressure with cervical collar. Mean −24.7 mm Hg p=0.001	Patients tested in lateral decubitus position Small numbers

Search outcome

Altogether seven papers were found of which four were relevant to the three part question. These four papers are shown in table 6.

Comments

These studies have shown that a semi-rigid cervical collar, causes a variable rise in intracranial pressure in most patients.

Clinical bottom line

Correctly fitted cervical collars increase intracranial pressure.

1 Craig GR, Nielsen MS. Rigid cervical collars and intracranial pressure. *Int Care Med* 1991;**17**:504–5.
2 Raphael JH, Chotai R. Effects of the cervical collar on cerebrospinal fluid pressure. *Anaesthesia* 1994;**49**:437–9.
3 Davies G, Deakin C, Wilson A. The effect of a rigid collar on intracranial pressure. *Injury* 1996;**27**:647–9.
4 Kolb JC, Summers RL, Galli RL. Cervical collar induced changes in intracranial pressure. *Am J Emerg Med* 1999;**17**:135–7.