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. Each BET has been constructed in the four stages that have been described elsewhere. The BETs shown here together with those published previously and those currently under construction can be seen at http://www.bestbets.org.

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

Gum elastic bougies in difficult intubation

Report by Simon Carley, Specialist Registrar
Checked by John Butler, Specialist Registrar

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 intubate$.mp OR bougie$ OR gum elastic.mp] LIMIT to human AND english.

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nolan JP, 1993, UK</td>
<td>157 patients undergoing elective surgery</td>
<td>PRCT</td>
<td>Number of grade 3 views in neutral position</td>
<td>34/157 (22%)</td>
<td>Small number of truly difficult laryngoscopies in whom differences are likely to be the greatest</td>
</tr>
<tr>
<td></td>
<td>Patients were intubated in the neutral c-spine position</td>
<td></td>
<td>Median time for intubation</td>
<td>20 secs for direct intubation v 25 seconds for use of the bougie</td>
<td>No grade 4 views</td>
</tr>
<tr>
<td></td>
<td>Patients were either intubated direct (just with the ETT) or using a bougie.</td>
<td></td>
<td>Success rate for intubation</td>
<td>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. 11 in direct visualised group v none in the bougie group.</td>
<td></td>
</tr>
</tbody>
</table>
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.

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.

Table 2

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benumof JL, 1996, USA</td>
<td>181 elective patients undergoing GA. Back plus cephalad pressure was compared with standard view</td>
<td>Observational study</td>
<td>Improvement of laryngoscopic view</td>
<td>All views improved</td>
<td>All views improved</td>
</tr>
<tr>
<td></td>
<td>630 patients undergoing routine surgery. BURP was compared with back pressure on the larynx</td>
<td>Observational study</td>
<td>Number of improved views in grade 3 group</td>
<td>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. All patients with an initial grade 3 Cormack score improved to grade 2 after BURP. 176/261 after back pressure alone. 42/85 further improved with BURP.</td>
<td>Comparison was with back pressure on thyroid cartilage rather than on cricoid. Very small number of initial grade 3, and no grade 4 views.</td>
</tr>
<tr>
<td>Takahata O, Japan 1997</td>
<td>55 elective female patients with simple cricoid + cricoid plus upward pressure</td>
<td>Observational study</td>
<td>Number of improved views with upward pressure + simple cricoid alone</td>
<td>Better with upward pressure</td>
<td>Only female patients</td>
</tr>
</tbody>
</table>

**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$.mp OR exp catheterisation OR cannulation.mp OR cannula.mp}) AND {exp anesthetics, local OR local anesthetics, local OR local anaesthetics$ OR local anaesthesia$ OR local anesthetics$ OR local anaesthetics$.mp} AND {exp pain OR pain$.mp} LIMIT to human AND english.

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**Table 3**

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dar K et al, 1995, England</td>
<td>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</td>
<td>PCT</td>
<td>pain of arterial puncture using a scale 0 to 10. preference of capillary or arterial sampling comparability of results from arterial and capillary samples</td>
<td>lower mean pain score with LA 2.0 v. 7.0 without LA capillary sampling less painful</td>
<td>did not assess significance of difference between LA or not. Pain scores for capillary sampling are different for the two groups</td>
</tr>
<tr>
<td>Giner J et al, 1996, Spain</td>
<td>270 patients attending pulmonary function lab for abg. arterial puncture with 22G needle after infiltration with 1% mepivacaine, placebo or nothing</td>
<td>PRCT</td>
<td>Pain using 10 cm visual analogue scale time to prepare and perform success at first pass</td>
<td>less time without LA (134 seconds v. 171 seconds with infiltration, p &lt;0.05) first pass success 93% with LA, 91% with placebo and 90% without infiltration, significance not tested.</td>
<td>Not emergency patients</td>
</tr>
<tr>
<td>Lightowler JV and Elliott MW, 1997, England</td>
<td>101 patients requiring abg. arterial puncture with 29G needle after infiltration with 2% lignocaine, placebo or nothing.</td>
<td>PRCT</td>
<td>Pain, using a 4 point scale difficulty of procedure as number of times skin broken, number of passes made and doctor rating.</td>
<td>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</td>
<td>Separates pain of infiltration from arterial puncture in scoring</td>
</tr>
</tbody>
</table>

**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.

**Search strategy**


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**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.


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**Search outcome**

Altogether 88 papers were identified of which three were relevant. These three papers are shown in table 3.
### Table 4

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gupta A et al, 1990, Sweden</td>
<td>30 patients undergoing cardioversion</td>
<td>PRCT</td>
<td>Physiological observations</td>
<td>Decreased BP in propofol group, equal incidences of desaturation. Apnoea requiring assisted ventilation in 3 of propofol group.</td>
<td>Not emergency setting Unblinded</td>
</tr>
<tr>
<td></td>
<td>Randomised to midazolam or propofol or thiopentone</td>
<td></td>
<td>Sedation and recovery times</td>
<td>Shorter time to sedation and to recovery with propofol vs midazolam (p&lt;0.05).</td>
<td>Sedation titrated to loss of eyelash reflex (that is, not conscious sedation)</td>
</tr>
<tr>
<td>Pratila MG et al, 1993, USA</td>
<td>90 patients undergoing central venous line insertion</td>
<td>PRCT</td>
<td>Physiological observations</td>
<td>No significant cardiovascular adverse events. Sao2 drop 2.2% with propofol (PB) ≤ 0.3% midazolam (p=0.04)</td>
<td>Not emergency setting Unblinded</td>
</tr>
<tr>
<td></td>
<td>Randomised midazolam or propofol boluses (PB) or infusion (PI)</td>
<td>Complications</td>
<td>Apnoea in 3 of PB group, none required assisted ventilation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recovery time</td>
<td>Recovery time shorter with propofol, 8 min (PB) and 14 min (PB) ≤ 25 min with midazolam (p&lt;0.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parworth LP et al, 1998, USA</td>
<td>57 patients undergoing 3rd molar tooth extraction.</td>
<td>PRCT</td>
<td>Physiological observations</td>
<td>2 in midazolam group v 1 in propofol group were apnoeic for &gt;20 secs, none required assisted ventilation. No significant cardiovascular adverse events.</td>
<td>All patients given fentanyl. Not emergency setting Unblinded. Recovery time not assessed.</td>
</tr>
<tr>
<td></td>
<td>Randomised to midazolam or propofol</td>
<td>Sedation efficiency</td>
<td>Propofol group less cooperative (p=0.02).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Havel CJ Jr et al, 1999, USA</td>
<td>89 children aged 2–18 with isolated limb injury requiring reduction in ED</td>
<td>PRCT</td>
<td>Recovery time</td>
<td>Recovery in 14.9 min with propofol v 76.4 min with midazolam (p&lt;0.001)</td>
<td>All patients given morphine. Small numbers to detect complications. Incomplete follow up after discharge</td>
</tr>
<tr>
<td></td>
<td>Randomised to midazolam or propofol</td>
<td>Complications</td>
<td>No differences in rates of hypoxia, hypotension. No clinically significant complications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedation scores</td>
<td>Sedation scores equivalent between groups.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


**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.

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**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.

**Search strategy**

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

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### Table 5

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lovell ME and Evans JH, 1994, UK</td>
<td>30 healthy volunteers</td>
<td>Observational</td>
<td>Interface pressure</td>
<td>Vacuum stretcher interface pressure was 36.7 mm Hg while the pressure with spinal board was 115.5 mm Hg</td>
<td>Small numbers</td>
</tr>
<tr>
<td>Main PW and Lovell, 1996, UK</td>
<td>4 healthy volunteers</td>
<td>Observational</td>
<td>Interface pressure</td>
<td>Vacuum splint most comfortable $p=0.001$</td>
<td>Only 4 subjects used in study, Small numbers</td>
</tr>
<tr>
<td>Johnson DR et al, 1996, USA</td>
<td>30 paramedic students</td>
<td>PRCT</td>
<td>Degree of immobilisation</td>
<td>No significant difference in immobilisation</td>
<td>No trauma patient</td>
</tr>
<tr>
<td>Hamilton RS and Pons PT, 1996, USA</td>
<td>26 healthy volunteers</td>
<td>PRCT</td>
<td>Degree of immobilisation</td>
<td>Significant increase in immobilisation</td>
<td>Small numbers</td>
</tr>
<tr>
<td>Chan D et al, 1996, USA</td>
<td>37 healthy volunteers</td>
<td>PRCT</td>
<td>Pain</td>
<td>Significant more pain in spinal board group. $p&lt;0.001$</td>
<td>Small numbers, Study on healthy volunteers, no trauma patient</td>
</tr>
</tbody>
</table>

### 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. 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.

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### 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

### 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)]

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### Table 6

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craig GR and Nielsen MS, 1991, UK</td>
<td>2 patients with severe head injury</td>
<td>Observational</td>
<td>ICU with and without cervical collar</td>
<td>Significant rise in ICP in both cases</td>
<td>Only two patients used in study, Small numbers</td>
</tr>
<tr>
<td>Raphael JH and Chotai R, 1994, UK</td>
<td>9 patients scheduled for elective spinal anaesthesia</td>
<td>Randomised cross over study</td>
<td>CSF pressure</td>
<td>Significant rise in CSF pressure with cervical collar $p=0.01$</td>
<td>Small numbers, Measurements made in lateral decubitus position, Small numbers</td>
</tr>
<tr>
<td>Davies G et al, 1996, USA</td>
<td>19 patients with severe head injury</td>
<td>Observational</td>
<td>Rise in intracranial pressure</td>
<td>Significant rise in ICP with cervical collar. Mean $-4.5$ mm Hg $p=0.001$</td>
<td>Excluded patient with ICP $&gt;50$ mm Hg, Patients tested in lateral decubitus position, Small numbers</td>
</tr>
<tr>
<td>Kolb JC et al, 1999, USA</td>
<td>20 adult patients undergoing lumbar puncture</td>
<td>Observational</td>
<td>CSF pressure in lumbar subarachnoid space</td>
<td>Significant rise in CSF pressure with cervical collar. Mean $-24.7$ mm Hg $p=0.001$</td>
<td>Small numbers</td>
</tr>
</tbody>
</table>
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.

Spinal boards or vacuum mattresses for immobilisation

Muhammad Ahmad and John Butler

doi: 10.1136/emj.18.5.379

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