Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary

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 four topics covered in this issue of the journal are:

- Radiological diagnosis of mandibular fracture
- Management of undisplaced Bennett’s fracture
- Diagnostic imaging of the hip in the limping child
- Immediate anticoagulant management of unstable angina

Radiological diagnosis of mandibular fracture
Report by Piraya Begum, Medical Student
Search checked by Steve Jones, Research Fellow

Clinical scenario
A 24 year old man presents to the emergency department on Saturday night with injuries to his lower jaw. He has been involved in a fight. On examination there is extensive bruising to the left side of the face and chin. The patient is unable to open his mouth or talk due to pain and trismus. You suspect a mandibular fracture and decide to x ray the mandible. You wonder whether a standard mandibular series or a panoramic view is the best technique for accurately detecting any fracture.

Table 1

<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>Johnston and Doris, 1980, USA'</td>
<td>17 patients with 24 mandibular fractures</td>
<td>Survey</td>
<td>x Ray diagnosis</td>
<td>8 (47%) fractures seen more easily on OPG OPG more easily interpreted</td>
<td>Patients with fractures only</td>
</tr>
<tr>
<td>Standard series vs OPG</td>
<td></td>
<td></td>
<td>Ease of interpretation</td>
<td>33% fractures seen more easily on OPG</td>
<td>Gold standard not stated</td>
</tr>
<tr>
<td>Moilanen, 1982, Finland'</td>
<td>272 mandibular fractures</td>
<td>Retrospective diagnostic</td>
<td>x Ray diagnosis</td>
<td>Error rate 7% for OPG, 40% for standard series</td>
<td>Patients with fractures only</td>
</tr>
<tr>
<td>Standard series vs OPG</td>
<td></td>
<td></td>
<td>Accuracy of interpretation</td>
<td></td>
<td>Gold standard not stated</td>
</tr>
<tr>
<td>Chayra et al, 1986, USA'</td>
<td>50 patients with 88 mandibular fractures</td>
<td>Retrospective diagnostic</td>
<td>x Ray diagnosis</td>
<td>27% fractures seen more easily on OPG</td>
<td>Gold standard not stated</td>
</tr>
<tr>
<td>Standard series vs OPG</td>
<td></td>
<td></td>
<td>Accuracy of interpretation</td>
<td>Error rate 8% for OPG, 34% for standard series</td>
<td>Patients with fractures only</td>
</tr>
<tr>
<td>Markowitz et al, 1999, USA'</td>
<td>21 patients with 33 fractures</td>
<td>Prospective diagnostic</td>
<td>x Ray diagnosis</td>
<td>Sensitivities 91% (standard series) vs 88% (OPG)</td>
<td>Gold standard not stated</td>
</tr>
<tr>
<td>Standard series vs OPG vs CT scan</td>
<td></td>
<td></td>
<td>Accuracy of interpretation</td>
<td>Accuracy 93% (standard series) vs 90% (OPG)</td>
<td>Patients with fractures only</td>
</tr>
</tbody>
</table>

OPG = orthopantomography.

Management of undisplaced Bennett’s fracture

Report by Bruce Martin, Clinical Fellow

Search checked by Martin Smith, Specialist Registrar

Clinical scenario

A 32 year old man presents to the emergency department following a fight. He complains of pain around the base of the right thumb metacarpal. Radiography reveals an undisplaced Bennett’s fracture. You wonder whether he should be treated conservatively or surgically.

Three part question

In [an adult patient with an undisplaced Bennett’s fracture] is [conservative management better than surgical management] at [minimising time to recovery and final disability]?

Search strategy

Medline 1966 to 10/99 using the OVID interface. [{exp fractures OR exp fractures, closed OR fracture$.mp} AND {{exp thumb OR OR orthopantomogram.mp OR OPG.mp} LIMIT to human AND english}.]

Search outcome

Sixty four papers were found of which 60 were irrelevant or of insufficient quality for inclusion. The four remaining papers are shown in table 1.

Comment

None of the studies offer good evidence to answer the question. All are small, poorly designed and study only patients with fractures. All, except the last, suggest that there is some diagnostic advantage in using orthopantomography (OPG), but reinforce the view that OPG alone is not sufficiently sensitive to be used as a SnOut. Further well designed diagnostic studies in the correct spectrum of patients are needed.

Clinical bottom line

Adult patients with suspected mandibular fractures should have OPG as a screening radiograph. If no fracture is seen but clinical suspicion remains high then further views should be obtained.


Table 2

<table>
<thead>
<tr>
<th>Author, date, and country</th>
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<th>Study type (level of evidence)</th>
<th>Outcomes</th>
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<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>van Niekerk and Ouwens, 1989, Netherlands</td>
<td>12 of 23 patients with fractures at the base of the thumb metacarpal treated surgically</td>
<td>Retrospective survey</td>
<td>Limitation of activities of daily living</td>
<td>No limitations</td>
<td>Small numbers Uncontrolled</td>
</tr>
<tr>
<td>Kjaer-Petersen et al, 1990, Denmark</td>
<td>41 patients with Bennett’s fracture treated variously (9 closed reduction, 6 percutaneous K wires, 26 open reduction) Followed up at a median of 7.3 years</td>
<td>Retrospective survey</td>
<td>Residual symptoms</td>
<td>No symptoms in 15 of 18 with good reductions compared with 6 of 13 with residual displacement</td>
<td></td>
</tr>
<tr>
<td>Livesey, 1990, UK</td>
<td>17 patients with Bennett’s fracture treated conservatively Followed up at a mean of 26 years</td>
<td>Retrospective survey</td>
<td>Residual symptoms</td>
<td>7 of 17</td>
<td>Small numbers Uncontrolled</td>
</tr>
<tr>
<td>Thurston and Dempsey, 1993, New Zealand</td>
<td>21 of 76 patients with Bennett’s fracture Followed up at a mean of 7 years 7 months</td>
<td>Retrospective survey</td>
<td>Range of movement and grip strength</td>
<td>Reduced in all patients</td>
<td>Small numbers Uncontrolled</td>
</tr>
<tr>
<td>Timmenza et al, 1994, Netherlands</td>
<td>18 patients with Bennett’s fracture. Closed reduction with K wire fixation (7) v open reduction and bone graft (11) Followed up at a mean of 10.7 years</td>
<td>Retrospective survey</td>
<td>Thumb mobility</td>
<td>Full in all cases</td>
<td>Small numbers</td>
</tr>
<tr>
<td>Oosterbos and de Boer, 1995, Netherlands</td>
<td>20 of 22 patients with Bennett’s fracture treated by closed reduction and plaster immobilisation</td>
<td>Retrospective survey</td>
<td>Subjective outcome Development of arthrosis</td>
<td>Satisfactory in 18 of 20 7 of 20. In 6 of these original reduction had been nonanatomic</td>
<td>Small numbers Uncontrolled</td>
</tr>
</tbody>
</table>

Three part question

In [an adult patients with an undisplaced Bennett’s fracture]. Is [conservative management better than surgical management] at [minimising time to recovery and final disability]?

Search strategy

Medline 1966 to 10/99 using the OVID interface. [{exp fractures OR exp fractures, closed OR fracture$.mp} AND {{exp thumb OR OR orthopantomogram.mp OR OPG.mp} LIMIT to human AND english}.]

Search outcome

Sixty four papers were found of which 60 were irrelevant or of insufficient quality for inclusion. The four remaining papers are shown in table 1.

Comment

None of the studies offer good evidence to answer the question. All are small, poorly designed and study only patients with fractures. All, except the last, suggest that there is some diagnostic advantage in using orthopantomography (OPG), but reinforce the view that OPG alone is not sufficiently sensitive to be used as a SnOut. Further well designed diagnostic studies in the correct spectrum of patients are needed.

Clinical bottom line

Adult patients with suspected mandibular fractures should have OPG as a screening radiograph. If no fracture is seen but clinical suspicion remains high then further views should be obtained.

Diagnostic imaging of the hip in the limping child

Report by Nicola Wright, Medical Student
Search checked by Vince Choudhery, Specialist Registrar

Clinical scenario
A 3 year old child presents to the emergency department with recent onset of left sided limp and no history of trauma. He is apyrexial, systematically well with a normal white cell count and erythrocyte sedimentation rate. You diagnose irritable hip and wonder whether xray or ultrasonography is better at detecting a joint effusion.

Three part question
In [a child with an irritable hip] is [xray better than ultrasonography] at [detecting a hip effusion]?

Search strategy
Medline 1966 to 10/99 using the OVID interface. [(exp hip joint OR exp hip OR hip$.mp) AND (exp pain OR pain$.mp OR irri-tations OR synovitis OR synovitis.mp)] AND [(exp pediatric OR paediatric.mp OR child$) AND (exp ultrasonography OR ultrasound$.mp)] LIMIT to human AND english.

Search outcome
Fifty two papers were found of which 46 were irrelevent or of insufficient quality for inclusion. The six remaining papers are shown in table 3.

Comment
In all the studies found, ultrasonography was its own gold standard for the detection of hip effusions. Therefore no comment about the sensitivity or specificity of ultrasonography itself can be made. Radiography is, however, clearly less sensitive than ultrasonography at detecting hip effusions. The role of xray in detecting Perthes’ disease should not be forgotten.

Clinical bottom line
Ultrasound is more sensitive than plain xray at detecting hip effusions in children. It should be the first imaging investigation of the irritable hip.

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>
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<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam et al, 1986, UK</td>
<td>87 children with irritable hip</td>
<td>Diagnostic</td>
<td>Detection of effusions</td>
<td>28 of 47 children with an effusion on ultrasound had xray abnormalities</td>
<td>No universal gold standard</td>
</tr>
<tr>
<td>Rosenborg and Mortensson, 1986, Sweden</td>
<td>58 examinations of 47 children, 40 of whom had acute unilateral transient synovitis of the hip</td>
<td>Diagnostic</td>
<td>Detection of effusions</td>
<td>43% of 23 children with an effusion on ultrasound had iliopsoas fatty layer sign on plain xray, while 52% had and abnormal capsular fat pad sign</td>
<td>No universal gold standard</td>
</tr>
<tr>
<td>Zieger et al, 1987, Germany</td>
<td>123 consecutive patients with suspected joint effusions</td>
<td>Diagnostic</td>
<td>Detection of effusions</td>
<td>US$100% sensitive for xray 27.8% sensitive</td>
<td>No universal gold standard</td>
</tr>
<tr>
<td>Miralles et al, 1989, Spain</td>
<td>500 children with a painful hip or a limp</td>
<td>Diagnostic</td>
<td>Detection of effusions</td>
<td>58 of 235 patients with effusions on ultrasound had abnormal xrays. 4 patients with normal ultrasounds had abnormal xrays.</td>
<td>No universal gold standard</td>
</tr>
<tr>
<td>Bickerstaff et al, 1990, UK</td>
<td>111 children with acute hip pain</td>
<td>Diagnostic</td>
<td>Change in clinical care</td>
<td>US$ detection of effusion changed clinical care in only 6 cases</td>
<td>No universal gold standard</td>
</tr>
<tr>
<td>Terjesen and Osthus, 1991, Norway</td>
<td>59 children with acute synovitis of the hip</td>
<td>Diagnostic</td>
<td>Detection of effusions</td>
<td>Effusions detected in all patients by US$, but in none by xray</td>
<td>No universal gold standard</td>
</tr>
</tbody>
</table>

USS = ultrasonography.
Immediate anticoagulant management of unstable angina

Report by Katrina Richell-Herren, Research Fellow

Search checked by Kevin Mackway-Jones, Consultant

Clinical scenario
A 45 year old man attends the emergency department with 30 minutes of chest pain. An ECG shows ST segment depression in the inferior leads. You wonder whether he should be treated with low molecular weight heparin (LMWH) or a glycoprotein IIb/IIIa complex inhibitor.

Three part question
In [a patients with acute myocardial ischaemia] is [a low molecular weight heparin better than a platelet glycoprotein IIb/IIIa complex inhibitor] at [reducing morbidity and mortality]?

Search strategy
Medline 1966 to 10/99 using the OVID interface. [exp angina, unstable OR unstable angina.mp OR exp myocardial ischemia OR myocardial ischaemia.mp OR myocardial ischaemiaa.mp] AND [exp heparin OR exp heparin, low-molecular-weight OR heparin$.mp OR LMWH$.mp] AND [exp platelet aggregation inhibitors OR exp platelet glycoprotein gpiib-iiia complex OR tirofiban$.mp)] AND maximally sensitive RCT filter LIMIT to human AND english.

Search outcome
Altogether 324 papers were found of which 318 were irrelevant or of insufficient quality for inclusion. The six remaining papers, which refer to five studies, are shown in table 4.

**Comment**
There is no trial that directly compares LMWHs with platelet glycoprotein IIb/IIIa complex inhibitors. Both treatments appear to be better than no treatment. The evidence that enoxaparin is better than unfractionated heparin is compelling (for unstable angina odds ratios 0.81, 95% confidence interval 0.68 to 0.96), while that for tirofiban is less so. Even more work is required in this area.

**Clinical bottom line**
All patients with unstable angina should receive LMWHs in preference to unfractionated heparin. The case for the use of platelet glycoprotein IIb/IIIa complex inhibitors in preference to LMWHs has not been established.

The BMA library supplied the papers.


**Table 4**

<table>
<thead>
<tr>
<th>Author, date, and country</th>
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<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gurfinkel et al, 1996, Argentina1</td>
<td>219 patients with unstable angina (Aspirin alone v aspirin and heparin v aspirin and LMWH)</td>
<td>Double blind PRCT</td>
<td>Major end points (recurrent angina, myocardial infarction, urgent revascularisation, major bleeding, death)</td>
<td>Recurrent angina, myocardial infarction, and urgent revascularisation were significantly less frequent in the LMWH group. Major bleeding only occurred in the unfractionated heparin group.</td>
<td></td>
</tr>
<tr>
<td>Cohen et al, 1997 and 1998, USA1</td>
<td>3171 patients with angina at rest or non-Q wave myocardial infarction (Enoxaparin v unfractionated heparin)</td>
<td>Double blind PRCT</td>
<td>Composite end point (recurrent angina, myocardial infarction, death)</td>
<td>No difference at 48 h. Significantly better (16.6% v 19.8%) in enoxaparin group at 14 days. Difference continues at 30 days</td>
<td></td>
</tr>
<tr>
<td>PRISM Study Investigators, 1998, Multinational1</td>
<td>3232 with unstable angina, myocardial ischaemia, raised CK-MB or history of significant IHD (All on aspirin; Unfractionated heparin or tirofiban)</td>
<td>Double blind PRCT</td>
<td>Composite end point (refractory ischaemia, myocardial infarction, death)</td>
<td>Significantly better (2.3% v 3.6%) in tirofiban group at 48h. No difference at 14 and 30 days, although mortality was lower in tirofiban group at this time. No difference in mortality at 6 months</td>
<td></td>
</tr>
<tr>
<td>PRISM-PLUS Study Investigators, 1998, Multinational1</td>
<td>1915 patients with unstable angina, myocardial ischaemia or raised CK-MB (All on aspirin; Unfractionated heparin or tirofiban or unfractionated heparin and tirofiban)</td>
<td>Double blind PRCT</td>
<td>Composite end point (refractory ischaemia, myocardial infarction, death)</td>
<td>Significantly worse mortality in tirofiban alone group at 7 days (4.6% v 1.1% for heparin alone)</td>
<td>Tirofiban alone group stopped prematurely</td>
</tr>
<tr>
<td>The PARAGON Investigators, 1998, Multinational1</td>
<td>2282 patients with non-ST elevation acute coronary syndromes. All on aspirin (High or low dose tirofiban with or without unfractionated heparin v heparin alone)</td>
<td>Double blind PRCT</td>
<td>Composite end point (non-lethal myocardial infarction or death)</td>
<td>No differences at 30 days. Significantly lower composite end point occurrence at 6 months for low dose lamifiban and heparin</td>
<td></td>
</tr>
</tbody>
</table>

CK-MB = creatine kinase MB fraction; IHD = ischaemic heart disease; LMWH = low molecular weight heparin; PRCT = prospective randomised controlled trial.