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 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

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.

## Radiological diagnosis of mandibular fracture

Report by Piraya Begum, *Medical Student*
Search checked by Steve Jones, *Research Fellow*

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

Correspondence to:
Kevin Mackway-Jones, Consultant
(e-mail: kmackway@fs1.mci.man.ac.uk)

*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.

*Three part question*

In [adult patients with mandibular trauma] are [panoramic radiographs better than the standard mandibular series] at [accurately diagnosing fractures]?

*Search strategy*

Medline 1966 to 10/99 using the OVID interface. [({exp fractures OR fracture$.mp} AND {exp mandible OR mandible$.mp or mandibular.mp}) OR exp mandibular fractures] AND {exp radiography OR x-ray$.mp OR roentgen$.mp} AND {exp radiography, panoramic

*Table 1*

| *Author, date, and country* | *Patient group* | *Study type (level of evidence)* | *Outcomes* | *Key results* | *Study weaknesses* |
|---|---|---|---|---|---|
| Johnston and Doris, 1980, USA[1] | 17 patients with 24 mandibular fractures | Survey | *x* Ray diagnosis | 8 (47%) fractures seen more easily on OPG | Patients with fractures only |
| | Standard series *v* OPG | | Ease of interpretation | OPG more easily interpreted | |
| Moilanen, 1982, Finland[2] | 272 mandibular fractures | Retrospective diagnostic | *x* Ray diagnosis | 33% fractures seen more easily on OPG | Gold standard not stated |
| | Standard series *v* OPG | | Accuracy of interpretation | Error rate 7% for OPG, 40% for standard series | Patients with fractures only |
| Chayra *et al*, 1986, USA[3] | 50 patients with 88 mandibular fractures | Retrospective diagnostic | *x* Ray diagnosis | 27% fractures seen more easily on OPG | Gold standard not stated |
| | Standard series *v* OPG | | Accuracy of interpretation | Error rate 8% for OPG, 34% for standard series | Patients with fractures only |
| Markowitz *et al*, 1999, USA[4] | 21 patients with 33 fractures | Prospective diagnostic | *x* Ray diagnosis | Sensitivities 91% (standard series) *v* 88% (OPG) | Gold standard not stated |
| | Standard series *v* OPG *v* CT scan | | Accuracy of interpretation | Accuracy 93% (standard series) *v* 90% (OPG) | Patients with fractures only |

OPG = orthopantomography.

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.


1 Johnston CC, Doris PE. Clinical trial of pantomography for the evaluation of mandibular trauma. *Ann Emerg Med* 1980;**9**:415–8.
2 Moilanen A. Primary radiographic diagnosis of fractures in the mandible. *Int J Oral Surg* 1982;**11**:299–303.
3 Chayra GA, Meador LR, Laskin DM. Comparison of panoramic and standard radiographs for the diagnosis of mandibular fractures. *J Oral Maxillofac Surg* 1986;44: 677–9.
4 Markowitz BL, Sinow JD, Kawamoto HK, *et al*. Prospective comparison of axial computed tomography and standard and panoramic radiographs in the diagnosis of mandibular fractures. *Ann Plast Surg* 1999;**42**:163–9.


## 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 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$.mp} AND [({exp thumb OR thumb.mp OR first.mp} AND {exp metacarpus OR metacarp$.mp}) OR Bennett$] AND {exp emergency treatment OR exp treatment outcome OR treatment$.mp OR treat$.mp}] LIMIT to human AND english.

*Search outcome*
Ninety eight papers were found of which 92 were irrelevant or of insufficient quality for inclusion. The remaining six papers are shown in table 2.

*Comment*
The evidence in this area is extremely poor. All studies are small and retrospective. A well designed prospective randomised controlled trial is needed.

*Clinical bottom line*
Good initial reduction probably reduces the incidence of later arthrosis of the base of the thumb metacarpal. There is no evidence to help decide whether a conservative or a surgical approach is preferable.

*Table 2*

| *Author, date, and country* | *Patient group* | *Study type (level of evidence)* | *Outcomes* | *Key results* | *Study weaknesses* |
|---|---|---|---|---|---|
| van Niekerk and Ouwens, 1989, Netherlands[1] | 12 of 23 patients with fractures at the base of the thumb metacarpal treated surgically | Retrospective survey | Limitation of activities of daily living | No limitations | Small numbers<br>Uncontrolled |
| Kjaer-Petersen *et al*, 1990, Denmark[2] | 41 patients with Bennett's fracture treated variously (9 closed reduction, 6 percutaneous K wires, 26 open reduction)<br>Followed up at a median of 7.3 years | Retrospective survey | Residual symptoms | No symptoms in 15 of 18 with good reductions compared with 6 of 13 with residual displacement | |
| Livesey, 1990, UK[3] | 17 patients with Bennett's fracture treated conservatively<br>Followed up at a mean of 26 years | Retrospective survey | Residual symptoms<br>Range of movement and grip strength | 7 of 17<br>Reduced in all patients | Small numbers<br>Uncontrolled |
| Thurston and Dempsey, 1993, New Zealand[4] | 21 of 76 patients with Bennett's fracture<br>Followed up at a mean of 7 years 7 months | Retropective survey | Residual symptoms | Less if residual fracture displacement less than 1mm<br>Method of reduction immaterial | Small numbers |
| Timmenga *et al*, 1994, Netherlands[5] | 18 patients with Bennett's fracture. Closed reduction with K wire fixation (7) *v* open reduction and bone graft (11)<br>Followed up at a mean of 10.7 years | Retropective survey | Thumb mobility<br>Grip strength<br>Osteoarthritis | Full in all cases<br>Reduced in all cases<br>Degree correlated with the residual displacement | Small numbers |
| Oosterbos and de Boer, 1995, Netherlands[6] | 20 of 22 patients with Bennett's fracture treated by closed reduction and plaster immobilisation | Retrospective survey | Subjective outcome<br>Development of arthrosis | Satisfactory in 18 of 20<br>7 of 20. In 6 of these original reduction had been nonanatomic | Small numbers<br>Uncontrolled |

1 van Niekerk JL, Ouwens R. Fractures of the base of the first metacarpal bone: results of surgical treatment. *Injury* 1989;**20**:359–62.
2 Kjaer-Petersen K, Langhoff O, Andersen K. Bennett's fracture. *J Hand Surg [Br]* 1990;**15**:58–61.
3 Livesey PJ. The conservative management of Bennett's fracture-dislocation: a 26-year follow-up. *J Hand Surg [Br]* 1990;**15**:291–4.
4 Thurston AJ, Dempsey SM. Bennett's fracture: a medium to long-term review. *Aust N Z J Surg* 1993;**63**:120–3.
5 Timmenga EJ, Blockhuis TJ, Maas M, *et al.* long-term evaluation of Bennett's fracture. A comparison between open and closed reduction. *J Hand Surg [Br]* 1994;**19**:373–7.
6 Oosterbos CJ, de Boer HH. Nonoperative treatment of Bennett's fracture: a 13 year follow-up. *J Orthop Trauma* 1995;**9**:23–7.

## 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, systemically well with a normal white cell count and erythrocyte sedimentation rate. You diagnose irritable hip and wonder whether *x* ray or ultrasonography is better at detecting a joint effusion.

*Three part question*
In [a child with an irritable hip] is [*x* ray 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 irritable$.mp OR limp$.mp OR exp synovitis OR synovitis.mp}) AND {exp pediatric OR pediatric$.mp OR paediatric.mp OR child$] AND {exp ultrasonography OR ultrasound$.mp} LIMIT to human AND english.

*Search outcome*
Fifty two papers were found of which 46 were irrelevant 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 *x* ray in detecting Perthes' disease should not be forgotten.

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

1 Adam R, Hendry GM, Wild SR, *et al.* Arthrosonography of the irritable hip in childhood: a review of 1 year's experience. *Br J Radiol* 1986;**59**:205–8.
2 Rosenborg M, Mortensson W. The validity of radiographic assessment of childhood transient synovitis of the hip. *Acta Radiologica: Diagnosis* 1986;**27**:85–9.
3 Zieger MM, Dorr U, Schulz RD. Ultrasonography of hip joint effusions. *Skeletal Radiol* 1987;**16**:607–11.
4 Miralles M, Gonzalez G, Pulpeiro JR, *et al.* Sonography of the painful hip in children: 500 consecutive cases. *Am J Roentgenol* 1989;**152**:579–82.
5 Bickerstaff DR, Neal LM, Booth AJ, *et al.* Ultrasound examination of the irritable hip. *J Bone Joint Surg Br* 1990; **72**:549–53.
6 Terjesen T, Osthus P. Ultrasound in the diagnosis and follow-up of transient synovitis of the hip. *J Pediatr Orthop* 1991;**11**:608–13.

*Table 3*

| *Author, date, and country* | *Patient group* | *Study type (level of evidence)* | *Outcomes* | *Key results* | *Study weaknesses* |
|---|---|---|---|---|---|
| Adam *et al*, 1986, UK[1] | 87 children with irritable hip | Diagnostic | Detection of effusions | 28 of 47 children with an effusion on ultrasound had *x* ray abnormalities | No universal gold standard |
| Rosenborg and Mortensson, 1986, Sweden[2] | 58 examinations of 47 children, 40 of whom had acute unilateral transient synovitis of the hip | Diagnostic | Detection of effusions | 43% of 23 children with an effusion on ultrasound had iliopsoas fatty layer sign on plain *x* ray, while 52% had and abnormal capsular fat pad sign | No universal gold standard |
| Zieger *et al*, 1987, Germany[3] | 123 consecutive patients with suspected joint effusions | Diagnostic | Detection of effusions | USS 100% sensitive<br>*x* Ray 27.8% sensitive | No universal gold standard |
| Miralles *et al*, 1989, Spain[4] | 500 children with a painful hip or a limp | Diagnostic | Detection of effusions | 58 of 235 patients with effusions on ultrasound had abnormal *x* rays. 4 patients with normal ultrasounds had abnormal *x* rays | No universal gold standard |
| | | | Change in clinical care | USS detection of effusion changed clinical care in only 6 cases | |
| Bickerstaff *et al*, 1990, UK[5] | 111 children with acute hip pain | Diagnostic | Detection of effusions | Effusion detected in 71% by USS but only in 15% by *x* ray | No universal gold standard |
| | | | Change in clinical care | *x* Ray changed clinical care in only 2 cases (children with Perthes' disease) | |
| Terjesen and Osthus, 1991, Norway[6] | 59 children with acute synovitis of the hip | Diagnostic | Detection of effusions | Effusions detected in all patients by USS, but in none by *x* ray | No universal gold standard |

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 IIa/IIIb 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 ischemia$.mp OR myocardial ischaemia.mp} AND ({exp heparin OR exp heparin, low-molecular-weight OR heparin$.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.

1 Gurfinkel EP, Manos EJ, Mejail RI, *et al.* Low molecular weight heparin versus regular heparin or aspirin in the treatment of unstable angina and silent ischemia. *J Am Coll Cardiol* 1995;**26**:313–8.
2 Cohen M, Demars C, Gurfinkel EP, *et al.* A comparison of low-molecular-weight heparin with unfractionated heparin for unstable coronary artery disease. Efficacy and safety of subcutaneous enoxaparin in non-Q-wave coronary events study group. *N Engl J Med* 1997;**337**:447–52.
3 Cohen M, Demars C, Gurfinkel EP, *et al.* Low-molecular-weight heparins in non-ST-segment elevation ischemia: the ESSENCE trial. Efficacy and safety of subcutaneous enoxaparin versus intravenous unfractionated heparin, in non-Q-wave coronary events. *Am J Cardiol* 1998;**82**:19L–24L.
4 PRISM Study Investigators. A comparison of aspirin plus tirofiban with aspirin plus heparin for unstable angina. *N Engl J Med* 1998;**338**:1498–505.
5 PRISM-PLUS Study Investigators. Inhibition of platelet glycoprotein IIb/IIIa receptor with tirofiban in unstable angina and non-Q-wave myocardial infarction. *N Engl J Med* 1998;**338**:1488–97.
6 The PARAGON Investigators. International, randomized, controlled trial of lamifiban (a platelet glycoprotein IIb/IIIa inhibitor), heparin, or both in unstable angina. *Circulation* 1998;**97**:2386–95.

*Table 4*

| *Author, date, and country* | *Patient group* | *Study type (level of evidence)* | *Outcomes* | *Key results* | *Study weaknesses* |
|---|---|---|---|---|---|
| Gurfinkel *et al*, 1996, Argentina[1] | 219 patients with unstable angina<br>Aspirin alone *v* aspirin and heparin *v* aspirin and LMWH | Double blind PRCT | Major end points (recurrent angina, myocardial infarction, urgent revascularisation, major bleeding, death)<br>Minor end points (silent myocardial ischaemia, minor bleeding) | Recurrent angina, myocardial infarction, and urgent revascularisation were significantly less frequent in the LMWH group. Major bleeding only occurred in the unfractionated heparin group<br>Silent myocardial ischaemia was significantly less frequent in the LMWH group. Minor bleeding was significantly more frequent in the unfractionated heparin group | |
| Cohen*et al*, 1997 and 1998, USA[2 3] | 3171 patients with angina at rest or non-Q wave myocardial infarction<br>Enoxaparin *v* unfractionated heparin | Double blind PRCT | Composite end point (recurrent angina, myocardial infarction, death) | No difference at 48 h. Significantly better (16.6% *v* 19.8%) in enoxaparin group at 14 days. Difference continues at 30 days | |
| PRISM Study Investigators, 1998, Multinational[4] | 3232 with unstable angina, myocardial ischaemia, raised CK-MB or history of significant IHD. All on aspirin<br>Unfractionated heparin or tirofiban | Double blind PRCT | Composite end point (refractory ischaemia, myocardial infarction, death) | 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 | |
| PRISM-PLUS Study Investigators, 1998, Multinational[5] | 1915 patients with unstable angina, myocardial ischaemia or raised CK-MB<br>All on aspirin<br>Unfractionated heparin or tirofiban or unfractionated heparin and tirofiban | Double blind PRCT | Composite end point (refractory ischaemia, myocardial infarction, death) | Significantly worse mortality in tirofiban alone group at 7 days (4.6% *v* 1.1% for heparin alone)<br>Significantly lower composite end point occurrence in tirofiban plus heparin group at 7 (12.9% *v* 17.9%) and 30 days | Tirofiban alone group stopped prematurely |
| The PARAGON Investigators, 1998, Multinational[6] | 2282 patients with non-ST elevation acute coronary syndromes. All on aspirin<br>High or low dose tirofiban with or without unfractionated heparin *v* heparin alone | Double blind PRCT | Composite end point (non-lethal myocardial infarction or death) | No differences at 30 days. Significantly lower composite end point occurrence at 6 months for low dose lamifiban and heparin | |

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