Vertebral compression fractures – new clinical signs to aid diagnosis

JAMES LANGDON¹, ADAM WAY¹, SAMUEL HEATON¹, JASON BERNARD², SEAN MOLLOY¹

¹Spinal Deformity Unit, The Royal National Orthopaedic Hospital, Stanmore, UK

²Department of Orthopaedics, St George's Hospital, London, UK

ABSTRACT

INTRODUCTION Acute osteoporotic vertebral compression fractures are common and usually managed conservatively. However, a significant number will remain symptomatic, causing significant pain with considerable associated morbidity and mortality. These fractures can be effectively treated with cement augmentation. However, it is impossible to distinguish between an acute and a chronic healed fracture on plain radiographs. The definitive investigation is a magnetic resonance scan. The aim of this paper is to describe and evaluate two new clinical signs to help in the diagnosis of symptomatic fractures. A prospective study of 83 patients with suspected acute osteoporotic vertebral compression fractures was carried out. All patients had a full clinical assessment, which included closed-fist percussion of their spine and asking the patient to lie supine on the examination couch. All patients had a MRI scan.

RESULTS The closed-fist percussion sign had a sensitivity of 87.5% and a specificity of 90%. The supine sign had a sensitivity of 81.25% and a specificity of 93.33%.

CONCLUSIONS These tests will enable the practitioner to predict more accurately which patients have an acute fracture, guiding referral for further imaging.

KEYWORDS

Symptomatic osteoporotic vertebral compression fractures – Diagnosis

CORRESPONDENCE TO

James Langdon, Specialist Registrar in Trauma and Orthopaedics, The Spinal Deformity Unit, The Royal National Orthopaedic Hospital, Brockley Hill, Stanmore HA7 4LP, UK

E: jameslangdon@doctors.org.uk or jmplangdon@gmail.com

Osteoporotic vertebral compression fractures are the most common type of fragility fracture. Overall, 25% of women over the age of 65 years and 40% of women over the age of 80 years have a vertebral compression fracture.¹ These fractures are frequently misdiagnosed as there is often no history of preceding trauma.²

Pain severity following an acute osteoporotic vertebral compression fracture is variable. Whilst a cohort of patients are able to continue with their normal activities of daily living, a considerable number are severely incapacitated.³ Osteoporotic vertebral compression fractures not only cause back pain and loss of function, but can also result in a progressive spinal deformity, decreased lung capacity, and gastrointestinal dysfunction.^{4–6} Following a vertebral compression fracture, there is an increased risk of adjacent level fracture, and studies have shown a 23% increase in 1-year mortality.^{7,8}

Traditionally, we have been unable to offer any effective treatment to these patients, with many left languishing on 'care of the elderly' wards for considerable periods of time.⁹ Percutaneous vertebroplasty and balloon kyphoplasty offer

effective treatment for patients with debilitating pain due to an osteoporotic vertebral compression fracture.^{10–15} However, it is difficult to diagnose patients with a symptomatic fracture (an acute fracture or one that is more chronic but has failed to heal). It is impossible to distinguish between an acute and a healed fracture on plain radiographs (Fig. 1). Cement augmentation is only effective treatment for symptomatic fractures. The definitive investigation to determine the presence of a symptomatic fracture is a magnetic resonance (MR) scan. Symptomatic fractures have oedema on the short tau inversion recovery (STIR; Fig. 2).¹⁴ They may also have a visible fracture line on the T1-weighted image (Fig. 3).¹⁴ However, access to MR scanning is limited and, therefore, we need to improve our clinical suspicion, so that we are only scanning those most likely to have a symptomatic fracture amenable to treatment.

In his management of these patients, the senior author (SM) made two observations. First, closed-fist percussion at the level of an acute vertebral compression fracture results in a severe, sharp, fracture pain. Second, a large number of these patients reported that they were unable to lie supine

Figure 1 A plain lateral radiograph of an osteoporotic vertebral compression fracture.

Figure 2 A sagittal T1-weighted MR scan showing an osteoporotic vertebral compression fracture line.

for their MR scan due to extreme pain. Many of these patients also reported sleeping in a chair at night.

The aim of this study was to evaluate these two clinical signs to determine how effective they are at predicting a symptomatic osteoporotic vertebral compression fracture.

Patients and Methods

The clinical signs

1. The examiner stands behind the patient. The patient stands facing a mirror so that the examiner can gauge their reaction. The entire length of the spine is examined using firm, closed-fist percussion. The clinical sign is positive when the patient complains of a sharp, sudden, fracture pain.
2. The patient is asked to lie supine on the examination couch with only one pillow. The clinical sign is positive when a patient is unable to lie supine due to severe pain in their spine.

Patients

Eighty-three consecutive patients with a suspected symptomatic osteoporotic vertebral compression fracture were

Figure 3 A sagittal STIR sequence showing oedema within the fractured vertebral body.

prospectively evaluated in this study. There were 8 men and 75 women with a mean age of 78.4 years (range, 72–95 years). All patients reported acute onset back pain of varying duration and were suspected as having a vertebral compression fracture. Five patients were excluded from this study: two because they had a pacemaker *in situ* and were unable to have a MR scan; two further patients were excluded as they were unable to tolerate a MR scan due to claustrophobia; and one patient was excluded with a spinal metastasis.

The patients were all assessed by the senior author (SM). For each patient the clinical assessment included closed-fist percussion, and then asking the patient to lie supine on the examination couch. All patients had a MR scan of their thoracic and lumbar spine. Only sagittal T1-weighted and STIR sequences were performed. The presence of a fracture was delineated by the identification of oedema on the STIR sequences with or without a fracture line on the T1-weighted sequences.

Results

Of the 78 patients who were included in this study, 48 were found to have an acute or chronic, but non-healed, vertebral compression fracture on their MR scan. In addition, three patients were found to have sacral pressure sores due to sleeping in a chair at night.

Forty-five patients were positive for closed-fist percussion. Forty-two of these patients had an acute fracture on their MR scan. However, there were six patients who were negative for closed-fist percussion, but who had an acute fracture on the scan. The sensitivity of this sign was 87.5%, and the specificity was 90% (Table 1).

Forty-one patients were unable to lie flat and 39 of these had an acute fracture on their MR scan. However, there were nine patients who were comfortably able to lie supine, but who had an acute fracture on their scan. The sensitivity of this sign was 81.25%, and the specificity was 95.33% (Table 2).

The number of fractures at each spinal level, and the number correctly identified by the two clinical signs are shown in Table 3.

Discussion

Osteoporotic vertebral compression fractures are an increasingly common problem. Traditionally, we have been unable to treat these patients, resulting in a high associated morbidity and mortality. Cement augmentation techniques can now offer effective treatment to these patients. However, we need to be able to diagnose a symptomatic fracture reliably. Magnetic resonance imaging is currently the only available definitive diagnostic tool, but is a limited

Table 1 Results for the closed-fist percussion sign

	Acute fracture on MRI		Total
	Positive	Negative	
Positive	42	3	45
Negative	6	27	33
Total	48	30	78

Table 2 Results for the supine sign

	Acute fracture on MRI		Total
	Positive	Negative	
Positive	39	2	41
Negative	9	28	37
Total	48	30	78

Table 3 The number of fractures identified at each spinal level

Spinal level	Acute fracture on MR scan	Positive closed-fist percussion sign	Positive supine sign
T10	3	3	3
T11	3	3	3
T12	6	6	5
L1	9	8	9
L2	5	5	5
L3	7	7	6
L4	7	5	4
L5	8	5	4
Total	48	42	39

resource. These two clinical signs help in the identification of patients with a symptomatic fracture and are, therefore, useful predictors of which patients require a MR scan.

Both tests were found to be less reliable at detecting symptomatic fractures in the lower lumbar spine (Table 3). With closed-fist percussion, the authors felt that this was most likely due to the greater thickness of soft tissues covering the spine at this level. On lying supine, the authors postulate that patients experience pain due to the spine extending causing the fracture cleft to open up. However, due to the lordosis of the lumbar spine, this phenomenon does not occur as much with fractures of the lower lumbar spine; therefore, these patients are able to lie supine more

comfortably. These two clinical signs have been kept as separate entities for the purpose of this paper, as the combined sign is both less sensitive and less specific.

A patient unable to tolerate lying flat maybe considered to be a clinical symptom rather than a clinical sign. The authors, however, would argue that many patients do not lie supine at home and may sleep on their side, propped up on pillows, or sitting up in a chair and, therefore, do not report this symptom. We believe that asking the patient to lie supine on the examination couch with only one pillow is a much more reliable indicator of a symptomatic fracture than the history alone. Many of the patients were unable to lie flat for their MR scan, and were scanned either on their side or propped up on pillows.

Conclusions

These two clinical signs are useful adjuncts in the diagnostic evaluation of symptomatic osteoporotic vertebral compression fractures, as either a positive closed-fist percussion sign or a positive supine sign is a reliable indicator of the presence of a symptomatic vertebral compression fracture. By incorporating these signs into routine clinical assessment, we are better able to predict which patients have a fracture that is amenable to cement augmentation treatment, enabling the surgeon to rationalise those patients referred for a MR scan.

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