Use of Percussion as a Screening Tool in the Diagnosis of Occult Hip Fractures

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ABSTRACT

Traumatic hip pain is a common clinical problem in the emergency department. There is significant morbidity in discharging a patient with an undiagnosed undisplaced hip fracture. The auscultatory percussion technique is a useful method to risk stratify patients who present with traumatic hip pain and with normal radiographs. We sought to study the sensitivity and specificity of the auscultatory percussion technique in a prospective study.

Keywords: Hip fracture, auscultatory percussion, normal radiography, sensitivity, specificity

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INTRODUCTION

Vast amount of resources are used in the diagnosis of radiologically occult hip fractures. Also previous studies done have shown that the incidence of delayed diagnosis of hip fractures ranges from 2% to 9%[1-3]. Post traumatic hip pain is a common clinical problem encountered in the accident and emergency (A&E) department, and failure to make a early diagnosis in these occult fractures can result in significant patient morbidity, let alone its medico-legal implications in an increasing litigious climate.

Bowditch[4] first described in 1846, this useful technique in which auscultatory percussion is used to diagnose hip fractures. Except for one case report[5], this has not been cited in emergency medicine texts or literature. We sought to determine the reliability of this useful test in a single blinded, prospective study.

METHODS

We studied a convenience sample of 290 patients with suspected radiologically occult hip fractures from December 1997 to December 1999. Doctors from the A&E Department were taught the auscultatory percussion technique to identify hip fractures. The test was performed by percussing the patella and simultaneously auscultating with the bell of the stethoscope over the pubic symphysis. The percussion note was then compared over the contralateral side in a similar fashion. A positive test was one that resulted in diminished percussion note on the side of pain felt and a negative test was defined as one in which no difference in percussion note was obtained.

All patients enrolled suffered post-traumatic hip pain and were unable to ambulate subsequent to the injury. Initial two view (antero-posterior and lateral) x-rays were normal and there was no abnormal posturing of the affected limb. A different doctor performed the test and was blinded as to the side of pain experienced by the patient, the latter's x-rays and view of the lower limbs by covering with a blanket. All patients were fully ambulant prior to the injury and there was no pre-determined age limit. Exclusion criteria included those who were pre-morbidly non-ambulant, those in whom overt fractures of the pelvis, femur and patella were demonstrated on initial radiography, severe osteoarthritic changes of the knee and hip and a previous history of patellectomy.

Results were collected and were tabulated as either a positive or negative test by the principal investigator. A positive test was defined as one in which a diminution of percussion note was present on the afflicted side and a negative test was defined as that in which there was no difference in the percussion note on auscultation when comparing both sides.

These patients were all admitted for a period of bed rest and further evaluation to the orthopaedic department. During their stay in hospital, they were investigated further by repeat radiography, bone scintigraphy, magnetic resonance imaging (MRI) or computerised tomography (CT) and the final results of these were also collected for analysis of the data.

RESULTS

Two-hundred-and-ninety patients enrolled as a convenience sample for this single blinded prospective study and some were admitted to the orthopaedic department for further investigation of a suspected occult femoral neck fracture.

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Fig. 1 Summary of results.

	Fracture present (%)	Fracture absent (%)
Positive test	245 (84.5)	5 (1.7)
Negative test	10 (3.4)	30 (10.3)

Pre-test odds = 4
Post-test odds = 26.9
Post-test probability = 0.96

This comprised of 54 males (18.6%) and 236 (81.4%) females. The mean age was 72 years with a standard deviation of ± 6.8 years.

Of these, 84.5% (n=245) had a positive percussion test and 3.4% (n=10) had a negative test in which a subsequent fracture was demonstrated by further investigation. In contrast, 10.3% (n=30) had a negative percussion test while 1.7% (n=5) had a positive test when further investigation failed to reveal any fracture of the femoral neck. The results of these are summarised in Fig. 1.

Upon further analysis, this translated into a sensitivity of 0.96 (95% CI 0.87-0.99), specificity of 0.86 (95% CI 0.49-0.98) with a positive predictive value of 0.98 and a negative predictive value of 0.75. The likelihood ratio for a positive test was 6.73 and that for a negative test was 0.75.

Beta error calculated for the sensitivity was 0.04 while that for the specificity was 0.14.

DISCUSSION

Acute orthopaedic problems make up a large part of emergency department practice. Misdiagnosis of these injuries often results from failure to consider certain clinical entities as a cause of the patient's complaints, and may result in unnecessary complications for the patient. Indeed, a missed orthopaedic injury is a leading cause of litigation claims in emergency medicine.

Traumatic hip injury is a common presentation to the A&E Department. When radiographs show a hip fracture, management is straightforward. However a small number of patients with traumatic hip pain and a fracture will have normal initial plain radiographs. Any emergency physician will realise that normal plain radiographs do not conclusively rule out an undisplaced hip fracture. These patients if discharged will return with a displaced fracture or persistent pain.

Establishing the diagnosis of a non-displaced hip fracture in the elderly can be a prolonged and costly procedure, involving hospital admission, several days of bed rest and a bone scan or MRI. These are all not without an increased risk of the complication of developing deep venous thrombosis, nosicomial infections and prolonged immobilisation in those that do not have a fracture.

Fig. 2a Auscultation over the symphysis pubis.

Fig. 2b Percussion over the patella.

On the other hand, a missed diagnosis, in the minority of cases, will be missed at the time of the initial visit. The missed diagnosis results from subtle physical findings and from an initial negative radiographic intepretation. Serious morbidity may ensue if the ambulatory patient converts a non-recognised-undisplaced fracture to a displaced one.

There are numerous clinical pathways to conclusively rule in or rule out the diagnosis of an undisplaced hip fracture in patients with normal radiographs. And these usually use more sophisticated imaging techniques like bone scans, tomography, CT and MRI. An alternative clinical decision is to discharge the patient to a regimen of strict bed rest and repeat the radiographs after one week.

Each of these approaches depends on the physician forming a clinical suspicion of an undisplaced hip fracture. The paradox is that patients with an undisplaced hip fracture yet normal plain radiographs are precisely the patients most likely to have a subtle clinical presentation. These patients may have suffered a relatively trivial trauma, will have no deformity, and will, in general have a good range of motion. Generally they are usually able to ambulate albeit have an antalgic gait. These clinical findings are similar to those with simple soft tissue injuries to the hip. In

contrast, the auscultatory percussion sign should not produce a muffled sound if the patient suffered only a soft tissue injury and its presence should increase the clinician's suspicion on the possibility of an undisplaced fracture and take the appropriate further action.

Despite the early recognition of the principle of auscultatory percussion in the diagnosis of fractures, current textbooks of either emergency medicine or orthopaedics do not mention this technique. Also several articles published in emergency medicine cite the problem of diagnosis of undisplaced hip fractures but none mention this clinical examination technique.

In the emergency department, we seldom have the luxury of using bone scan or MRI to exclude the presence of these fractures, and the usual disposal of a patient with a history and physical examination leading to a high index of suspicion would be managing the patient as above.

In our two year series, we obtained a sample size that had sufficient power for analysis of the sensitivity, specificity as well as the likelihood ratios. It showed a good positive predictive value (0.98) with a sensitivity of 0.96. This would translate that this simple test of auscultatory percussion could effectively rule out the diagnosis of an occult hip fracture should it be negative.

A positive test however had a specificity of 0.76, and this could be attributed to other confounding factors like an old fracture, implants, osteoarthritis of both the knee and hip.

This is a seemingly straightforward study of using clinical bedside methods of picking up or excluding hip fractures; but having a small but still significant false negative (3.4%) and false postive (1.7%) in the group of ambulant patients, proves that the method of percussion is at best an added clinical technique. This is the contentious group of patients whom we still do not have the whole answer, in spite of modern imaging techniques.

The problem with doing a single blind study is that it is difficult to ensure that the evaluator is "completely blinded" – having to move the hip in a patient which has a fracture is likely to produce pain, thus "biasing" the outcome and evaluation.

CONCLUSION

In establishing the diagnosis of an undisplaced hip fracture, a clinician utilises all available tools and considers all pertinent findings. The astute clinician realises that neither physical examination nor plain radiographs are 100% sensitive in ruling out undisplaced hip fractures. Any tool that can increase the sensitivity and specificity should be considered a valuable addition to formulating a diagnosis. A positive auscultatory percussion test is a useful manoeuvre that can be used to raise one's suspicion for fracture, especially in the unconscious, demented or uncooperative patient. It is an expedient and painless screening tool that can be a useful part of the initial evaluation of patients with hip pain.

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