Technical note

Radiographic diagnosis of the occult hip fracture

Experience in 16 patients

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ABSTRACT – We have benefited from using a simple, time-saving radiographic procedure for more than 5 years which may establish a correct diagnosis in most patients with clinically suspected, but initially occult, hip fractures.

The primarily occult femoral neck fracture is a diagnostic problem for the radiologist as well as the orthopedic surgeon. Several methods have been tried to overcome this.

1. Skeletal scintigraphy may be of help (Schmidt and Deininger 1985, Pool and Crabbe 1996, Schultze 1998), especially in hips with little, if any, osteoarthrosis. However, a negative radioisotope scan in patients with a fractured neck of the femur has been reported (Mulcahy and O'Malley 1995). Furthermore, false impression of a fracture because of increased uptake in cases of injured joint capsule can also occur (Schmidt and Deininger 1985).

2. Skeletal tomography is certainly of value, especially in patients where severe osteoarthrotic changes make interpretation difficult. In very rare instances skeletal tomography may be falsely negative, when the fracture line parallels the tomographic plane. This can occur in pertrochanteric fractures when there is marked outward rotation of the hip during tomography.

3. CT is reportedly of value (Hughes et al. 1991, Poole and Crabbe 1996). However, the CT chiefly seems to clarify details as to course and extension of fracture lines and degree of dislocation in proven fractures, especially of the pelvic bones.

4. MRI is useful (Rizzo et al. 1993, Stiris and Lilleas 1997, Pandey et al. 1998) but such MRI facilities are sometimes scarce or unavailable.

We have used the following procedure in patients with suspected fracture of the femoral neck for more than 5 years.

Method

The patient is placed on an ordinary fluoroscopy table supplied with an over-head tube (in our Radiological Department, General Electric equipment is used). A 24 × 30 cm film cassette is horizontally oriented, divided into 6 parts. This gives 6 exposures, each measuring approximately 9 × 11 cm. During fluoroscopy the radiologist centers the beam over the affected collum-pertrochanteric area. Care is taken to have the lesser trochanter within the field so that the degree of rotation can be judged on each exposure. A fine or ultra-fine focus is chosen to provide good picture detail. A moderate kilovoltage level is also used to ensure high picture contrast. In our hands, a kV range between 60–68 has proved satisfactory. Using automatic exposure, a center chamber is chosen.

We recommend that the radiologist stays at the radiographic table and, if necessary, takes the films. The aim is to obtain 6 exposures of high

Data from 16 patients

Patient number	Age	Sex f/m	Suspected type of fracture	Result of primary radiographs	Result of suppl. examination	Fate op./nonop.	Follow-up time (months)
1	91	f	pertrochanteric	equivoc	+	op.	18
2	94	f	cervical	–	+	op.	died
3	84	f	cervical (old?)	equivoc	–	nonop.	18
4	45	f	cervical	equivoc	–	nonop.	1.5
5	77	f	cervical	equivoc	+	op.	5
6	76	f	cervical/pertroch	–	–	nonop.	1.5
7	72	f	cervical	equivoc	–	nonop.	1
8	13	f	cervical	–	–	nonop.	3
9	87	f	cervical	equivoc	+	op.	2
10	80	m	cervical	equivoc	–	nonop.	2
11	83	f	cervical	–	–	nonop.	6
12	88	m	cervical	equivoc	–	nonop.	2 days
13	52	m	cervical	equivoc	+	nonop.	2
14	80	f	cervical	equivoc	+	op.	1
15	87	m	pertrochanteric	equivoc	+	op.	1.5
16	75	m	cervical	–	+	op.	1.5

Patient no. 2 died some time after discharge from the hospital, cause of death unknown. Patient no. 12 died of a heart attack 2 days after the radiographic examination. Patient no. 13 was not operated on because of serious contraindications (badly regulated diabetes and alcoholism).

quality, all frontal views, but with various rotations. While these patients usually lie with the hip outwardly rotated the first exposure is taken in this position. The radiologist firmly but gently grips the patient's ankle/wrist with one hand and then, between each of the following exposures, gently rotates the leg inwards, a few degrees at a time, while reassuring the patient. Our experience is that if this is done very slowly, little if any pain is caused, and much less so than that experienced by the patient when he/she is lifted from the bed to the examination table and vice versa. If pain is a problem, the same rotational effect is achieved when a pillow is put under the affected side of the pelvis or, if possible, by angling the beam in the above/lateral-below/medial direction.

Patients (Table)

We have used this method in 16 patients and found it to be of decisive help in establishing a correct diagnosis, while survey pictures have been negative or inconclusive. In 8 cases, the result has been positive since a fracture was found and in 8 cases, a fracture was ruled out. In 2 patients, tomography was also performed. Follow-up examinations have proved the diagnosis to be correct in all cases.

Discussion and conclusion

This simple procedure is not mentioned in several text books for radiographers. In our experience, it is both time- and resource-saving since it takes less than 5 minutes. The result in most instances is convincing and other methods are thus made superfluous.

We have not yet used MRI to solve this problem, but we have no reason to doubt its value. But as long as MRI is not available in all hospitals dealing with and treating hip fractures—less than half of the hospitals in Norway—one must resort to other methods.

Hughes S S, Voit G, Kates S L. The role of computerized tomography in the diagnosis of an occult femoral neck fracture associated with an ipsilateral femoral shaft fracture: case report. J Trauma 1991; 31 (2): 296-8.

Mulcahy D, O'Malley M. Negative radioisotope bone scan in a patient with a fractured neck of femur. Ir J Med Sci 1995; 164 (1): 42-4.

Pandey R, McNally E, Ali A, Bulstrode C. The role of MRI in the diagnosis of occult hip fractures. Injury 1998; 29 (1): 61-3.

Pool F J, Crabbe J P. Occult femoral neck fractures in the elderly: optimisation of investigation. N Z Med J 1996; 109 (1024): 235-7.

A 91-year-old woman who sustained trauma to her right hip. Primary radiographs in standard projections (A) were considered normal by 2 senior radiologists independently. Because of a clinically suspected fracture, special radiographs using the above-described technique were taken some hours later (B), and a pertrochanteric fracture without dislocation is evident. In retrospect, the explanation for the divergence may partly be that, contrary to what is most often the case, the initial frontal view was taken with the hip inwardly rotated. Please compare the form of the lesser trochanter on the primary frontal view and that on the special projections.

Rizzo P F, Gould E S, Lyden J P, Asnis S E. Diagnosis of occult fractures about the hip. Magnetic resonance imaging compared with bone-scanning. J Bone Joint Surg (Am) 1993; 75 (3): 395-401.

Schmidt C, Deininger H K. Die maskierte Fraktur im Röntgenbild und ihr Nachweis durch die Skelettszintigraphie. Radiologe 1985; 25 (3): 104-7.

Schultze J. Okkulte Schenkelhalsfraktur im proximalen Femur. Nuklearmedizin1998; 37 (2): 80-2.

Stiris M G, Lilleas F G. MR findings in cases of suspected impacted fracture of the femoral neck. Acta Radiol 1997; 38 (5): 863-6.