

CAT FOR DIAGNOSIS

Clinical Question:

How much accuracy of CT scan compare with MRI to detect occult hip fracture?

P: Elderly patient with hip pain after falling accident

I: CT scan

C: MRI

O: Performance to detect occult fracture of hip

Source Citation: [http://www.injuryjournal.com/article/S0020-1383\(15\)00264-8/abstract](http://www.injuryjournal.com/article/S0020-1383(15)00264-8/abstract)

M. Haubro et al. Sensitivity and specificity of CT- and MRI-scanning in evaluation of occult fracture of proximal femur. Injury, Int. J. Care Injured 2015; 46:1557-1561.

Impact factor (2015-2016): 1.91

A. Study Characteristics: Prospective cohort study

1. Patients included – from Emergency room at Odense University hospital, Denmark in the period from 23rd of October 2008 to 6th of January 2012

- 1588 fractures of the proximal femur discharge from the Department of orthopaedic surgery (Femoral neck 770, Intertrochanteric 582, Subtrochanteric 136).
- 74 of the patients referred (74 hips) had initially an X-ray without fracture (Occult hip fracture)

Inclusion criteria

- Suspected fracture of proximal femur

Exclusion criteria

- Incomplete medical reports: 4 cases.
- Not able to cooperate to the full MRI protocol: 1 case
- Registered twice with the same hip why the first visit: 1 case

67 cases completed the analysis, 40 females and 27 males

Mean age of 80.5 years

Mean time from first X-ray to CT & MRI were 2.0 and 2.1 days.

2. Diagnostic Test Evaluated – CT scan

GE 4 slice VCT scanner, GE 1 slice CT scanner, GE XTlight Speed VCT 64 slice.

Scan protocol: Helical, full. 0.625 mm with a pitch of 0.984, image interval 0.625 mm. 120 kV, 700 mA. The scans were constructed from bone recon filters.

3. Gold Standard – MRI (Interpret by senior consulting radiologist)

Phillips 3T Acieva, Phillips 1T Panorama (open), and Phillips 1.5T Acieva.

The CT and MRI scans were analyzed on a GE workstation with the following software: 07MW.18.4_SPS-1-12.V40_H_H64_G_GTL.

B. Validity Criteria:

1. Did clinicians face diagnostic uncertainty? : **Yes**

Participant in this study is patients coming with hip pain after low energy trauma and have no fracture on standard X-rays. This situation is clinical dilemma.

2. Was there a blind comparison with a gold standard? **Yes**

Both CT & MRI were evaluated in random order and blinded considering any identification number or findings of other investigators.

3. Was the gold standard performed regardless of the test result? **Yes**

All participants perform both CT- and MRI-scanning of the proximal femur.
No work up bias.

C. Results [adjust the number of rows as needed]:

Table 1: Diagnostic sensitivity, specificity, PPV and NPV of CT & MRI
"MRI interpret by senior consulting radiologist" is gold standard

Accuracy	Senior consulting radiologist		Resident in radiology		Resident in orthopaedic surgery	
	MRI	CT	MRI	CT	MRI	CT
Sensitivity	1.00	0.87(0.60;0.98)	0.87(0.60;0.98)	0.67(0.38;0.88)	0.80(0.52;0.96)	0.47(0.21;0.73)
Specificity	1.00	1.00(0.93;1.00)	0.88(0.77;0.96)	0.96(0.87;1.00)	0.90(0.79;0.97)	0.96(0.87;1.00)
PPV	1.00	1.00(0.75;1.00)	0.68(0.43;0.87)	0.83(0.52;0.98)	0.71(0.44;0.90)	0.78(0.40;0.97)
NPV	1.00	0.96(0.87;1.00)	0.96(0.86;1.00)	0.91(0.80;0.97)	0.94(0.84;0.99)	0.86(0.75;0.94)

Table 2: Diagnostic likelihood ratio and Diagnostic odd ratio of CT scan

	Senior consulting radiologist	Resident in radiology	Resident in orthopedic surgery
LR positive	∞	16.75	11.75
LR negative	0.13	0.34	0.55
Diagnostic odd ratio	∞	49.26	21.36

Interobserver agreement showed relative high kappa coefficients in all comparisons between residents and experienced radiologist, ranging from 0.46 in orthopaedic resident to 0.69 in radiologic resident.

D. Applicability:

1. Will the reproducibility of the test be applicable in my setting? **Yes**

The author state clearly about methodology, so I think, reproducibility of the test can apply in my setting.

2. Are the results applicable to patients in my practice? **Yes**

Patient in my practice is suspected for occult hip fracture too, the same as in this study population so I think, I can apply these results.

3. Will the results change my management? **Yes**

From table 2 in the 3rd column show LR positive 16.75 & LR negative 0.34 for CT interpret by resident in radiology means that if the test positive has large impaction (>10) but if the test negative has only small impaction.

From table 2 in the 4th column show LR positive 11.75 & LR negative 0.55 for CT interpret by resident in orthopedic surgery means that if the test positive has large impaction (>10) but if the test negative has only little impaction or no change.

From the result, I think if the test positive can help me to change my management but in the opposite way if the test negative, I still want to do further investigation to confirm diagnosis.

Author's Conclusion:

- MRI still seems to be the preferred modality to exam this patient category and requires trained radiologist to interpret the results.
- Interobserver analysis show moderate to substantial agreement.
- Population of which the patients were included from is not strictly presented leading to selection bias.
- Information about osteoporosis is not available.

Reviewer's Conclusion:

- Both MRI and CT scan are both high sensitivity and specificity diagnostic tools if interpret by senior radiologist.
- MRI is better than CT scan like as the author said.
- If the doctor have low experience to interpret, it's better to use MRI than CT.
- About high specificity when compare with sensitivity, CT scan is useful test to rule in if the test positive than to rule out if the test negative.

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