

Preoperative “Computed Tomography Capsular Sign” for the Detection of Occult Ipsilateral Femoral Neck Fractures Associated With Femoral Shaft Fractures

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Purpose: Ipsilateral femoral neck fractures (FNFs) associated with femoral shaft fractures often appear nondisplaced and are missed even on the preoperative CT. We aimed to evaluate the “CT capsular sign”, which refers to anterior capsular distension of the hip with intra-articular fluid, as an additional clue for detecting occult ipsilateral FNF. We hypothesized that the preoperative CT capsular sign would strongly predict the presence of ipsilateral FNF.

Methods: From January 2006 through December 2017, records of 166 consecutive patients who underwent surgical fixation for femoral shaft fracture after high-energy trauma were retrospectively reviewed. To evaluate the diagnostic performance of the CT capsular sign, we excluded patients who had no preoperative CT scan, concurrent acetabulum and/or femoral head fracture, and displaced FNFS. Finally, 79 patients were included in this study. The FNF group included 13 patients, whose fractures were not detected in the initial plain radiographs but confirmed on the preoperative CT or during and/or after operation. The remaining 66 patients were included in the femoral neck intact group. Side-to-side difference of >1 mm of capsular distension was considered a positive CT capsular sign.

Results: Among 13 ipsilateral FNFS, 6 and 12 cases showed a definite fracture line and positive CT capsular sign, respectively, on the preoperative CT scan. The association with the presence of ipsilateral FNF was significantly higher in CT capsular sign than in definite fracture line (92% vs 46%, $P = 0.031$). Among the 66 patients without FNF, 4 had a positive CT capsular sign. The CT capsular sign could predict ipsilateral FNF with sensitivity of 92% (12/13), specificity of 94% (62/66), positive predictive value of 75% (12/16), negative predictive value of 98% (62/63), and accuracy of 94% (74/79).

Conclusion: Surgeons should highly suspect for ipsilateral FNF when the CT capsular sign is present.

