The role of three-phase Technetium-99m bone imaging in predicting postoperative osteonecrosis in Femoral Neck Fractures Patients: a mean 2-year follow-up

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INTRODUCTION: Local blood perfusion is closely related to avascular necrosis of the femoral head. However, there is still no evidence of whether abnormal blood perfusion after femoral neck fracture treatment is related to the occurrence of osteonecrosis. This study aimed to explore the value of using a three-phase bone scan (TPBS) to monitor blood perfusion status in predicting postoperative necrosis of the femoral head (ONFH) in patients with internal fixation of femoral neck fractures.

METHODS: Thirty-five patients who received three-phase Technetium-99m bone scanning after internal fixation of femoral neck fracture between 2017 and 2021 were retrospectively reviewed. The patients were divided into the ONFH group (n=9) and the non-ONFH group (n=26). The osteonecrosis of the femoral head was labeled based on plain radiography and magnetic resonance imaging (MRI) at the last follow-up. The association between the abnormal three-phase bone imaging and postoperative ONFH was analyzed between groups.

RESULTS SECTION: Nine out of 35 patients developed ONFH at follow-up, with 12 patients showing femoral head perfusion defects on postoperative TPBS imaging. The sensitivity, specificity, positive predictive value, and negative predictive value of TPBS are 77.78%, 80.77, 58.33%, and 91.30%, respectively.

DISCUSSION: This study found that TPBS, which evaluates the perfusion status of the femoral head after internal fixation of a femoral neck fracture, showed high sensitivity and specificity in predicting the occurrence of postoperative femoral head necrosis.

SIGNIFICANCE/CLINICAL RELEVANCE: This work provides evidence for predicting femoral head necrosis by monitoring femoral head perfusion through TPBS and guides personalized and precise postoperative treatment for patients with femoral neck fractures.

Fig.1 Representative X-ray images of an ONFH patient. a, the x-ray before discharge; b, the x-ray two years after the surgery, showing evident signs of osteosclerosis, focal osteoporosis, and cystic change in the femoral head (ARCO stage II).

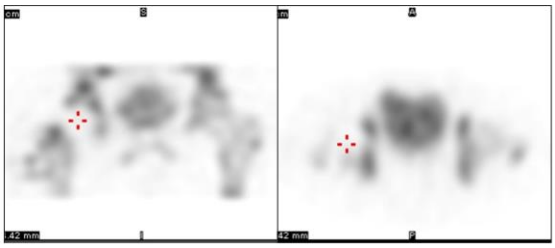

Fig.2 Coronal and axial images of postoperative pelvic blood perfusion three days after the surgery; Red mark, The affected side of the femoral head.

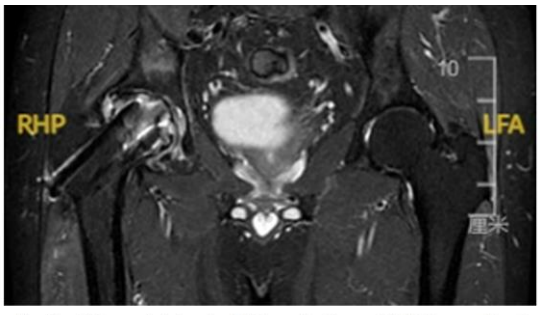

Fig.3 T2-weighted MRI of the ONFH patient matching the X-ray above.