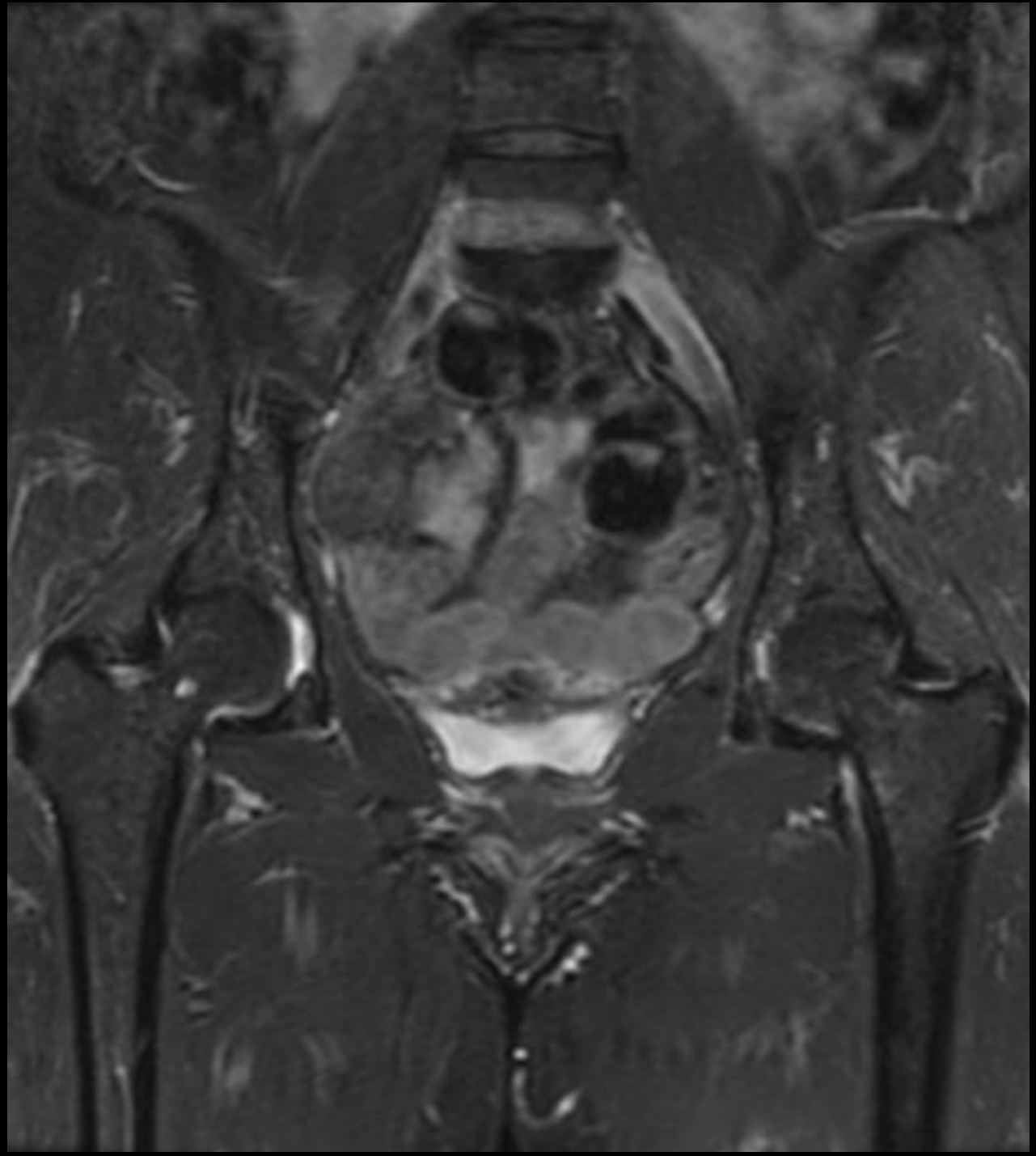
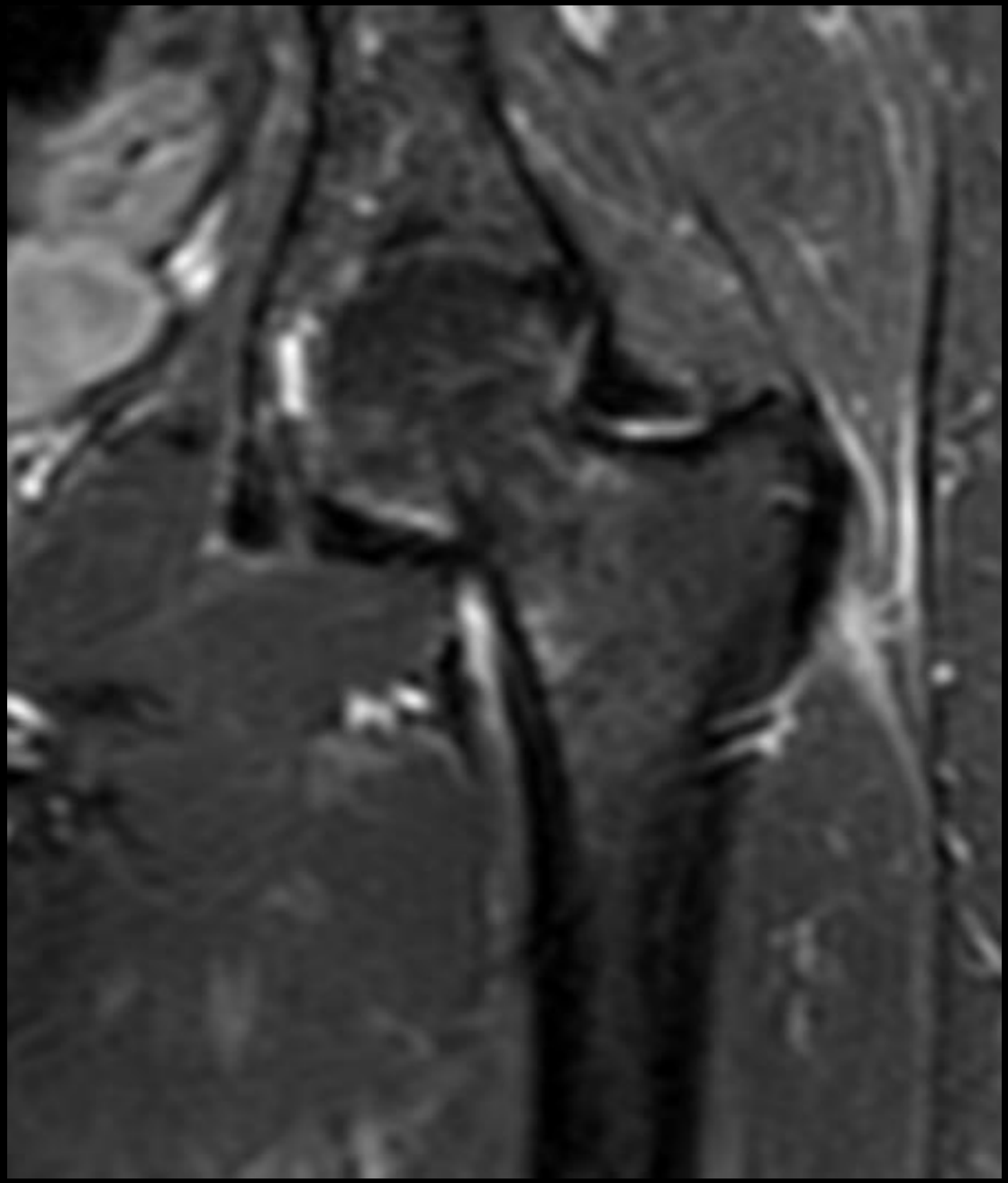
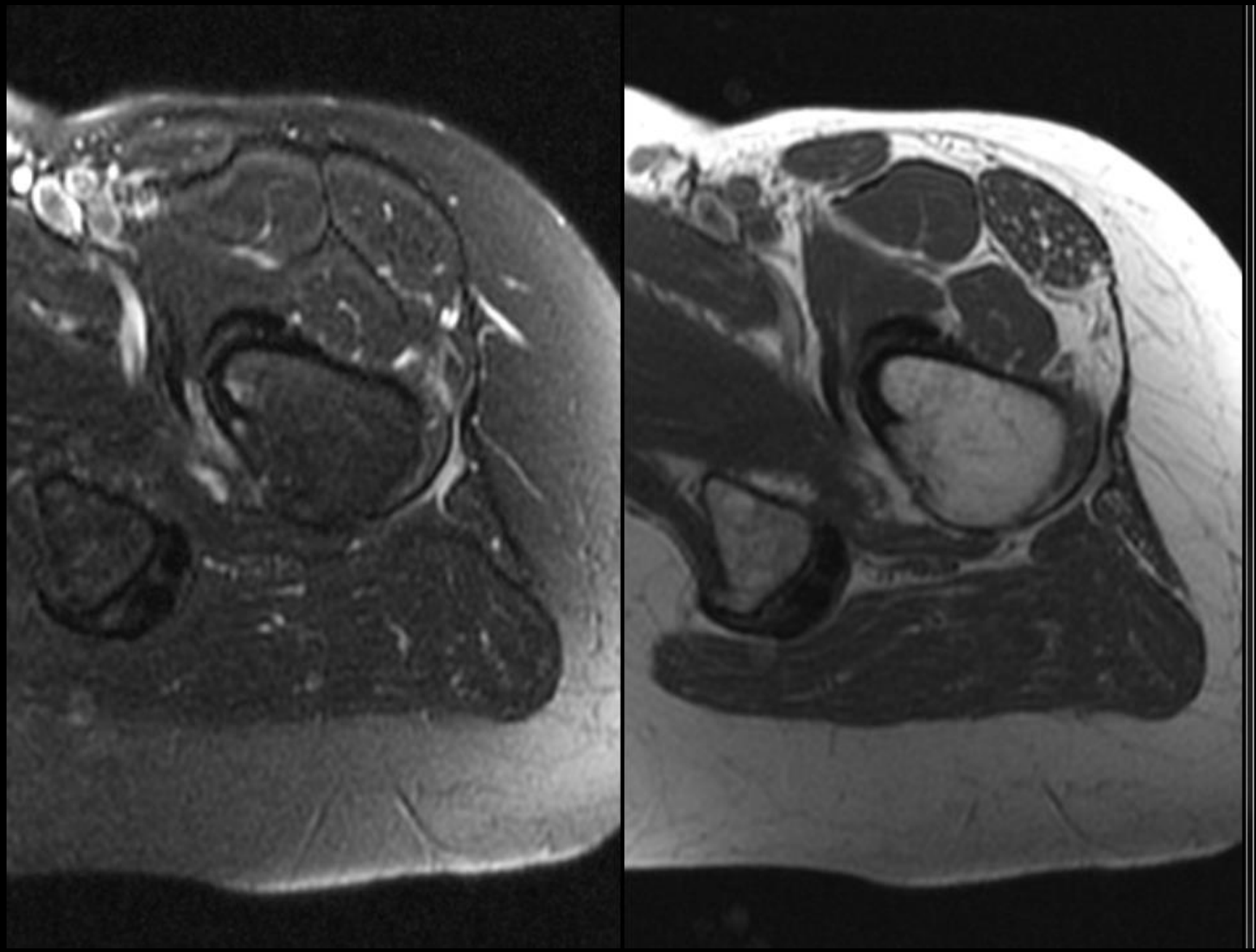
Avid female runner with L hip pain x a few weeks. No significant trauma or injury.







Stress fracture of the femoral neck Demographics

- 5-10% stress fractures (vast majority involve tibia > tarsal bones > metatarsals)
- Traditionally described in military recruits
- Increased incidence in civilian population—athletes subjected to increased physical demand

Stress fracture of the femoral neck Demographics

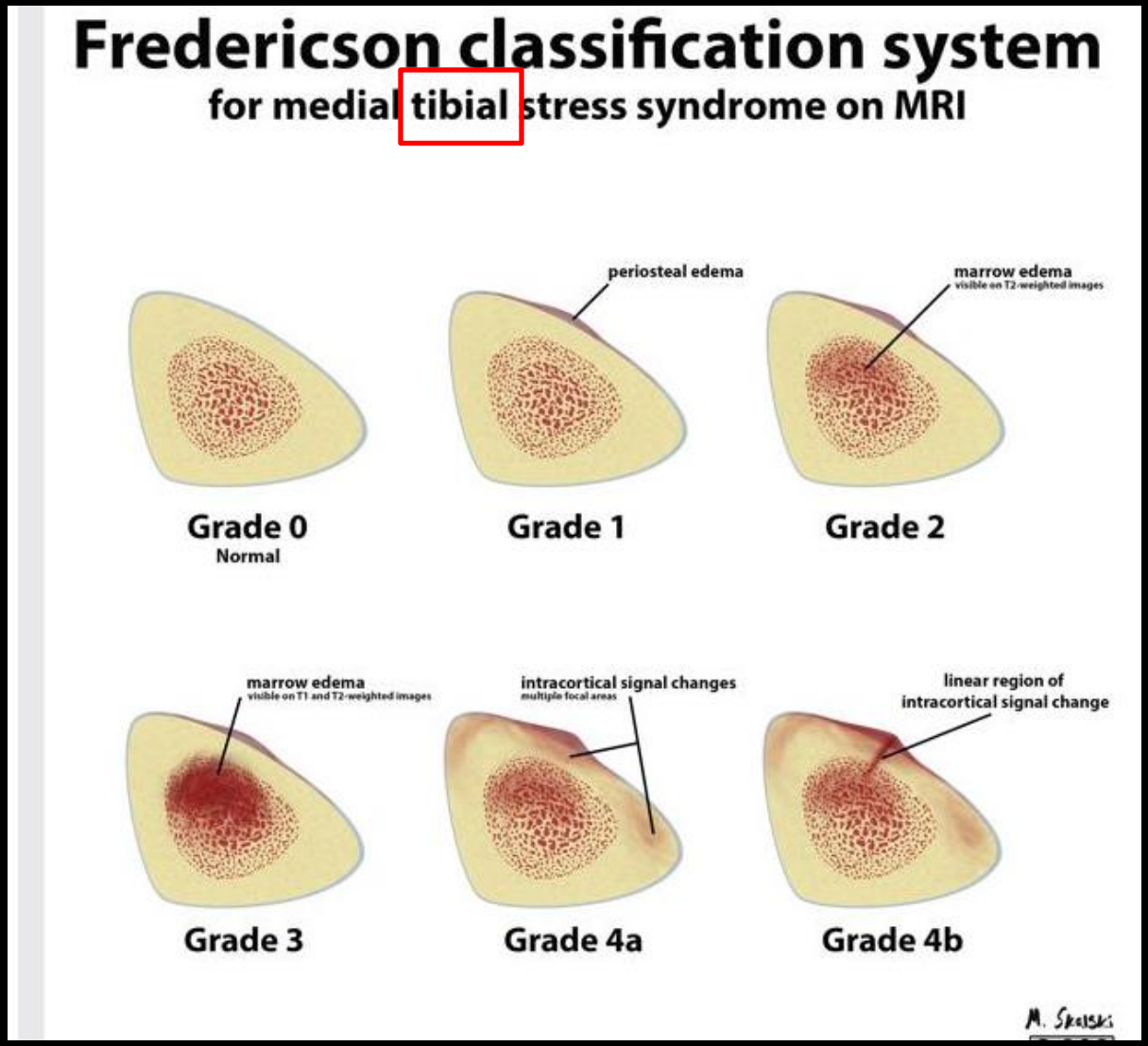
Matheson et al. Am J Sports Med, 1987.

- 320 fractures
- Distance running most common associated activity
- 7.2 % femur
- Femoral neck fracture, equal M:F ratio
- No correlation between weekly mileage and anatomic site of stress fracture

Hulkko A, Orava S. Int J Sports Med 1987.

- 368 fractures
- Distance running most common associated activity
- 6.8% femur
- Femoral neck fracture, 1M:2F ratio
- Most fractures occurred in athletes who had been involved in training on a regular basis, with high intensity (6x +/week)

Stress fracture of the femoral neck: Imaging



- Grade 1 injury with significantly shorter time to return to sports
- Grade 4b injuries with significantly longer time to return to sports
- Grades 2, 3, 4a: no significant difference

Grade of stress injury	Time to return to sports (days)
1	3-20
2	14-65
3	18-90
4a	40-50
4b	30-157

Validation of MRI Classification System for Tibial Stress Injuries

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James Choi[2]
Kazuhiko Shinki[3]
Alejandro Munoz Del Rio[1]
Arthur De Smet[1]

OBJECTIVE. The purpose of our study was to compare an MRI classification system for tibial stress injuries with semiquantitative MR features of injury severity and clinical outcome.

MATERIALS AND METHODS. Two musculoskeletal radiologists retrospectively reviewed in consensus the MR findings of 142 tibial stress injuries to quantify the degree of periosteal and bone marrow edema and grade the injuries using the Fredericson classification system (grade 1 = periosteal edema only, grade 2 = bone marrow edema visible on T2-weighted images, grade 3 = bone marrow edema visible on T1-weighted and T2-weighted images, grade 4a = multiple focal areas of intracortical signal abnormality, and grade 4b = linear areas of intracortical signal abnormality). Kruskal-Wallis tests were used to determine the relationship between the grade of stress injury and the degree of periosteal and bone marrow edema and the time to return to sports activity.

RESULTS. Grade 4b injuries had significantly ($p < 0.002$) more severe and grade 1 injuries less severe periosteal and bone marrow edema than grades 2, 3, and 4a injuries. Grade 4b injuries had significantly ($p < 0.002$) longer time and grade 1 injuries shorter time to return to sports activity than grades 2, 3, and 4a injuries. There was no significant difference ($p =$ 0.06–0.79) among grades 2, 3, and 4a injuries in the degree of periosteal and bone marrow edema and the time to return to sports activity.

CONCLUSION. Grades 2, 3, and 4a stress injuries had similar degrees of periosteal and bone marrow edema and similar time to return to sports activity, which suggests that these three grades can be combined into a single category in an abbreviated Fredericson classification system.

Keywords: grading system, MRI, stress fracture, stress injury, tibia

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Stress injuries represent a spectrum of osseous abnormalities that occur in response to chronic repetitive stress applied to healthy bone. Stress injuries are common in athletes and represent approximately 10% of all injuries seen in sports medicine clinics. The vast majority of stress injuries involve the tibia, followed in order of decreasing fre-

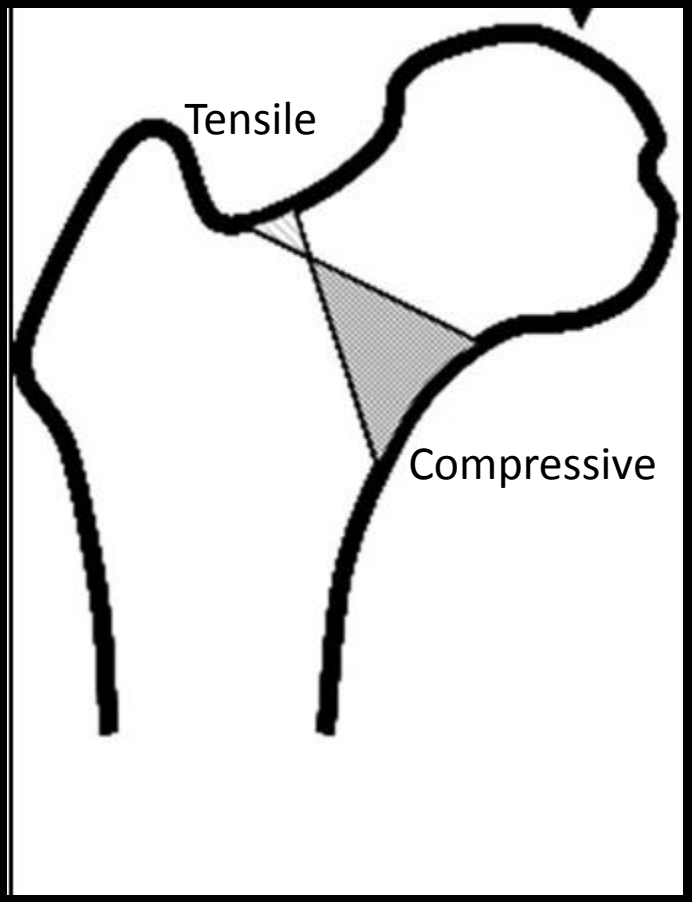
of the stress injury and thereby assist in the clinical management of the patient [5].

Fredericson and associates [5] developed an MRI classification system for tibial stress injuries on the basis of findings of periosteal edema, bone marrow edema, and intracortical signal abnormality. According to the classification system, a grade 1 injury is defined as periosteal edema only, a grade 2 in-

Stress fracture of the femoral neck: Management

TENSILE

- Superior aspect
- Operative management
  - Internal fixation



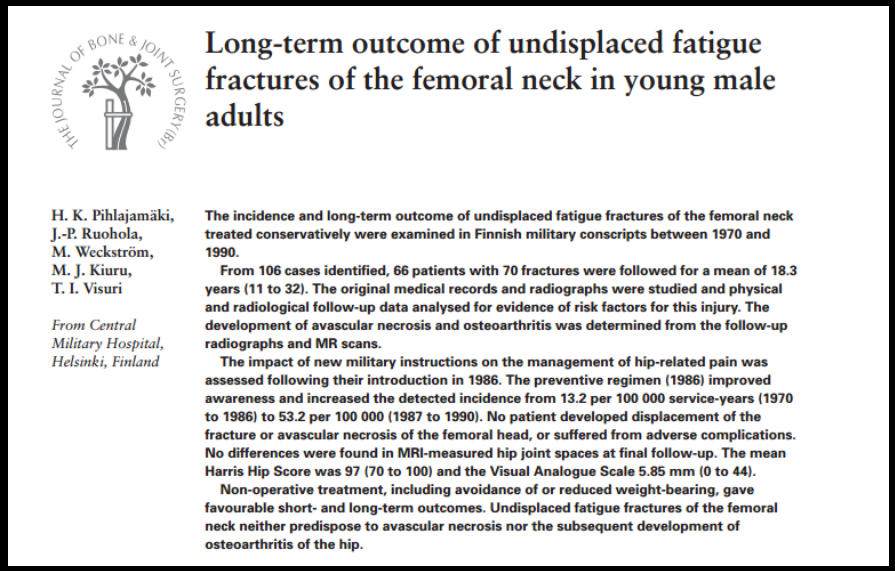
COMPRESSIVE

- Inferior asp
- Nonoperative management
  - Bedrest
  - Protected wt bearing

Stress fracture of the femoral neck: Management Controversy

- Nondisplaced tensile sided femoral neck stress fractures?

- Compressive sided femoral neck stress fractures that have a cortical break?



THE JOURNAL OF BONE & JOINT SURGERY (BR)

Long-term outcome of undisplaced fatigue fractures of the femoral neck in young male adults

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The incidence and long-term outcome of undisplaced fatigue fractures of the femoral neck treated conservatively were examined in Finnish military conscripts between 1970 and 1990.

From 106 cases identified, 66 patients with 70 fractures were followed for a mean of 18.3 years (11 to 32). The original medical records and radiographs were studied and physical and radiological follow-up data analysed for evidence of risk factors for this injury. The development of avascular necrosis and osteoarthritis was determined from the follow-up radiographs and MR scans.

The impact of new military instructions on the management of hip-related pain was assessed following their introduction in 1986. The preventive regimen (1986) improved awareness and increased the detected incidence from 13.2 per 100 000 service-years (1970 to 1986) to 53.2 per 100 000 (1987 to 1990). No patient developed displacement of the fracture or avascular necrosis of the femoral head, or suffered from adverse complications. No differences were found in MRI-measured hip joint spaces at final follow-up. The mean Harris Hip Score was 97 (70 to 100) and the Visual Analogue Scale 5.85 mm (0 to 44).

Non-operative treatment, including avoidance of or reduced weight-bearing, gave favourable short- and long-term outcomes. Undisplaced fatigue fractures of the femoral neck neither predispose to avascular necrosis nor the subsequent development of osteoarthritis of the hip.

Stress fracture of the femoral neck: Management Controversy

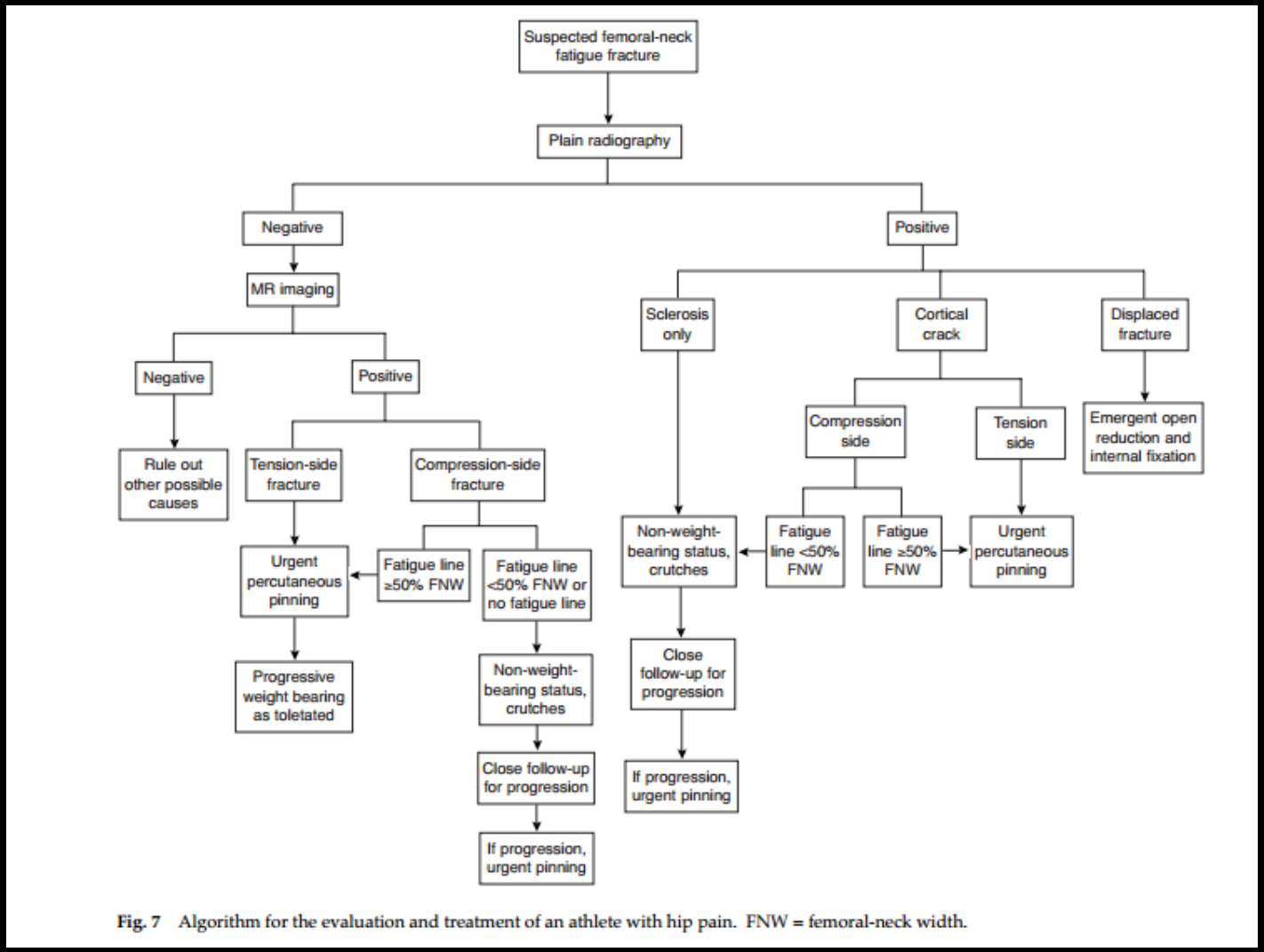

Fig. 7 Algorithm for the evaluation and treatment of an athlete with hip pain. FNW = femoral-neck width.

Shin AY, Gillingham BL. J Am Acad Orthop Surg 1997; 5:293-302.