


# Soccer Doc

## Stress fractures in football

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### Conflict of interest

President Dutch Sport Orthopaedic Association  
 President Dutch Arthroscopy Society  
 Chairman ACL guideline, member Achilles rupture & tendinopathy guideline  
 Vice-director Orthopedic training Erasmus MC  
 Ambassador Dance Medicine ESMA  
 Associate editor British Journal of Sports Medicine  
 Reviewer (AJSM, BMJ, KSSTA)  
 Consultant: Feyenoord, Excelsior, Scapino Ballet, CJD  
 Educational consultant: Technical University Delft, University of Applied  
 Sciences Rotterdam & Breederode, Smith & Nephew  
 Subsidy: Zon MW, Dutch Arthritis, NOV, Annafonds, ISAKOS



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## Sportorthopaedic knee surgeon

Trauma centre      Patient care Sport clinic      Children's hospital





Research  
 ZonMw      Reumafonds Dutch Arthritis Foundation      NEDERLANDSE ORTHOPAEDISCHE VERENIGING (NOV)



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## History of stress fractures

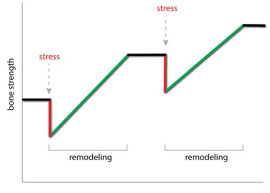

1850 March fracture (Metatarsal 2)  
 1930 Stress fracture in athletes

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## Pathophysiology of bone

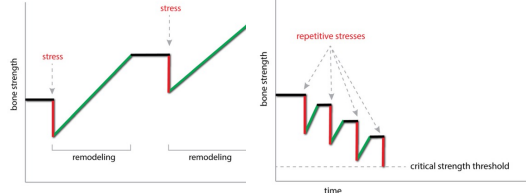

Repetitive loads cause an increase in bone remodeling activity

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## Pathophysiology of bone

Repetitive loads cause an increase in bone remodeling activity with a disproportionate increase in the rate of bone-resorbing osteoclastic activity

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## Incidence of stress fractures

1-5 % of all injuries in sport  
12 % in military recruits during basic training

Women 1.9 % at higher risk than men 0.8 %

Location dependent of load..... =sport.  
Throwers midshaft humerus  
Rowers rib fractures

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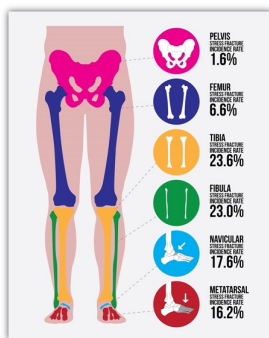
Location dependent of load..... =sport.  
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Football UEFA (plus) study:  
injury incidence of 0.04 injuries/1,000 hours.  
A team of 25 players can expect one stress fracture every third season.  
All fractures affected the lower extremities and 78% the fifth metatarsal, 12 % tibia, 6 % pelvic.  
Stress fractures to the fifth metatarsal bone, tibia or pelvis caused absences of three to five months.  
Twenty-nine percent of the stress fractures were re-injuries

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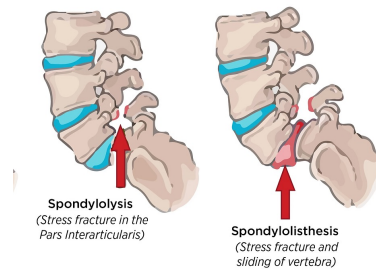
## Incidence/Location of stress fractures



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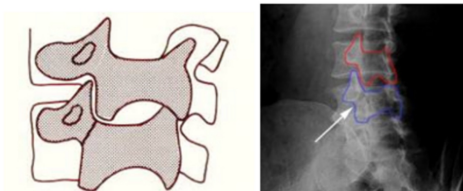
## Incidence/Location of stress fractures



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## Incidence/Location of stress fractures



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## Incidence/Location of stress fractures



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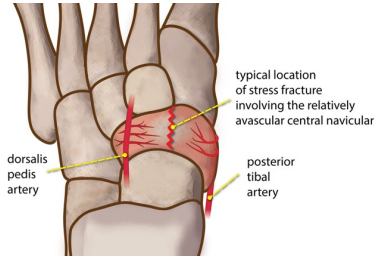
## Incidence/Location of stress fractures



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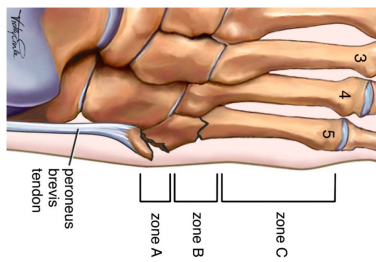
## Incidence/Location of stress fractures



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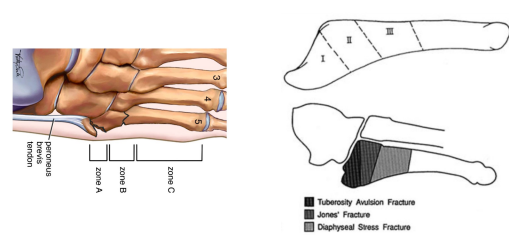
## Incidence/Location of stress fractures



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## Incidence/Location of stress fractures



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## Symptoms

Pain

Pressure pain 66%

Localized swelling 25 %

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## Diagnostics

Radiograph (2-4 weeks negative after onset symptoms (sensitivity 70%))

MRI

Tc scintigraphy (sensitivity 98%, specificity low)

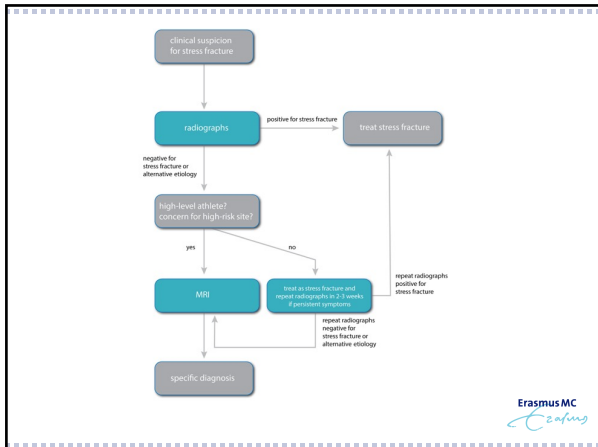
CT

PET CT

Additional exam.....: DEXA, osteoporosis work up?

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### MRI classification (Fredericson)

Grade	Illustration	Grade	Illustration
<b>Grade 0:</b> Normal MR		<b>Grade 3:</b> Moderate bone marrow edema seen on both T2-weighted images and T1-weighted images <i>return to sport in mean 39-44 days</i>	
<b>Grade 1:</b> Periosteal edema only <i>return to sport in mean 16 days</i>		<b>Grade 4a:</b> Cortical signal abnormality, not linear in morphology <i>return to sport in mean 39-44 days</i>	
<b>Grade 2:</b> Mild bone marrow edema seen on T2-weighted images only <i>return to sport in mean 39-44 days</i>		<b>Grade 4b:</b> Linear cortical signal abnormality <i>return to sport in mean 71 days</i>	

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### Classification

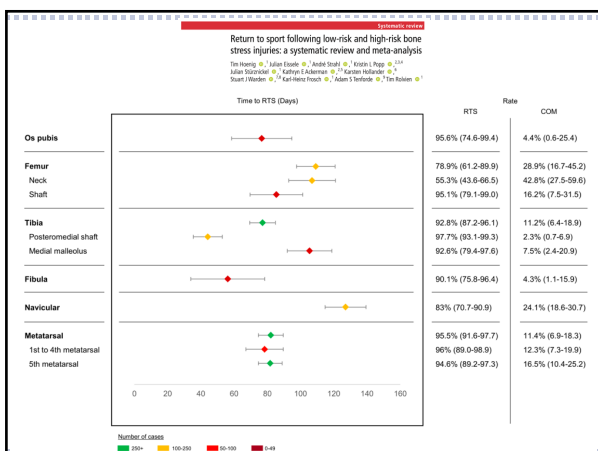
**Low risk**  
Location: clavicle, scapula, humerus, olecranon, ulna, radius, scaphoid, metacarpals, ribs, pars intertarsalis, sacrum, pubic rami, femoral shaft, tibial shaft, fibula, calcaneus, and metatarsal shaft.

**High risk**  
Location: femoral neck, anterior cortex tibia, medial malleolus, talus, tarsal navicular, patella, medial malleolus, fifth metatarsal, second metatarsal base, and hallux sesamoids

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low-risk stress fractures	high-risk stress fractures
posteromedial tibia (24-73%)	anterior tibial cortex
2nd/3rd metatarsals (17-35%)	medial malleolus
calcaneus (21-28%)	navicular
distal fibula	talus
cuboid	base of fifth metatarsal
cuneiforms	base of second metatarsal
	hallux sesamoids

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### Risk factors

**Intrinsic**

**Modifiable:**  
RED-S (relative energy deficiency in sport) an insufficient caloric intake and/or excessive energy expenditure  
increase BMI, Dietary intake (calcium, Vit D).

**Non modifiable:**  
Previous stress fracture, Younger age (23 versus 26 years), Gender female > men

**Extrinsic**

**Modifiable:**  
Load pre-season higher

**Non-modifiable:** .....

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## Treatment

Identify intrinsic and extrinsic risk factors

Modify risk factors

Titrate activity to a pain-free level for 4-8 weeks depending on the grade of injury

Braces/crutches

Complete rest

Immobilization

Additional/experimental (Bisphosphonates, Pneumatic bracing, PEMF, ESWT)

Surgery

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Surgery

**Return to play is permitted:**

- 1. The athlete is asymptomatic
- 2. No tenderness on examination
- 3. Able to perform all of the demands of his or her sport

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## Case 13-1--2023



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## Case 13-1--2023

Knee Surgery, Sports Traumatology, Arthroscopy (2021) 29:2495–2503  
<https://doi.org/10.1007/s00167-021-06490-2>


**ANKLE**

**High union rates following surgical treatment of proximal fifth metatarsal stress fractures**

Julian J. Hollander<sup>1,2,3</sup> · Quinten G. H. Rikken<sup>1,2,3</sup> · Jari Dahmen<sup>1,2,3</sup> · Sjoerd A. S. Stufkens<sup>1,2,3</sup> · Gino M. M. J. Kerkhoffs<sup>1,2,3</sup>

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## Case 26-01-2024



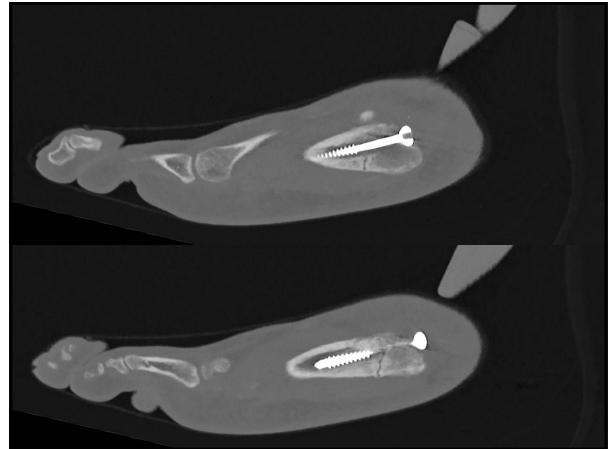
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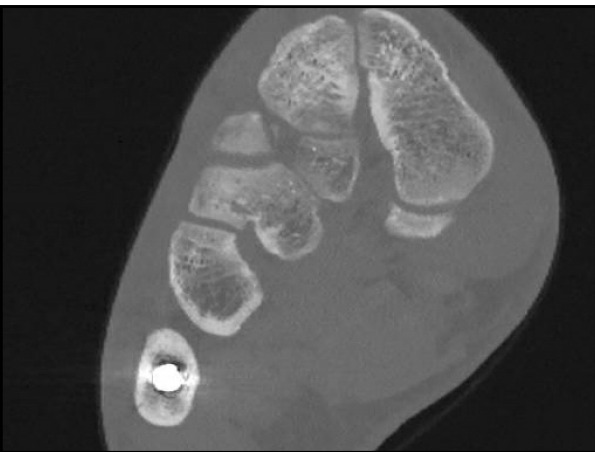
Case 12-02-2024



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Case 1 to be continued

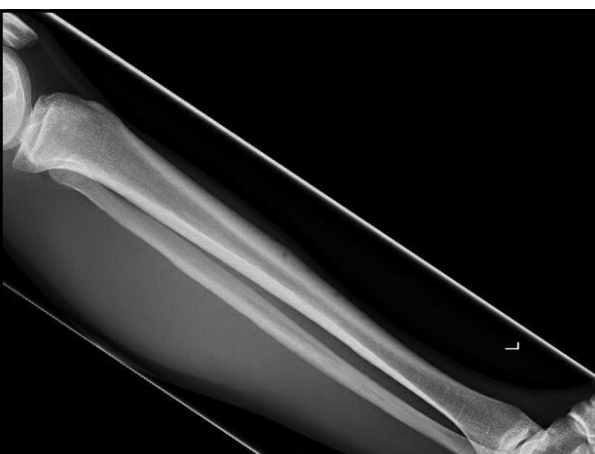
Original article

Fifth metatarsal fractures among male professional footballers: a potential career-ending disease

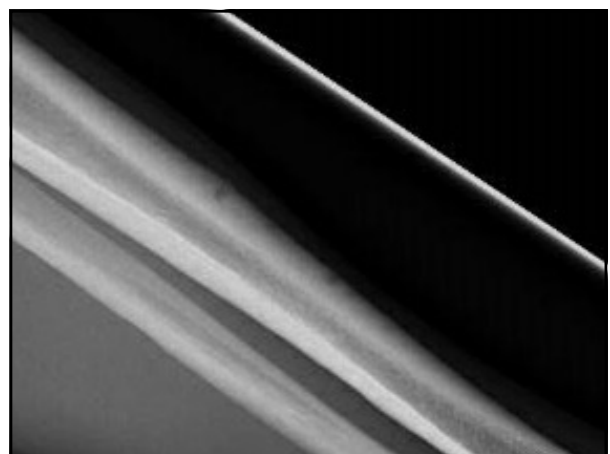
Jan Ekstrand,<sup>1</sup> C Niek van Dijk<sup>2</sup>

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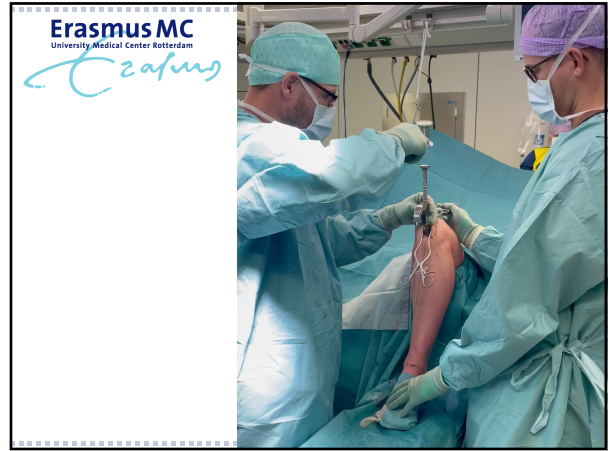


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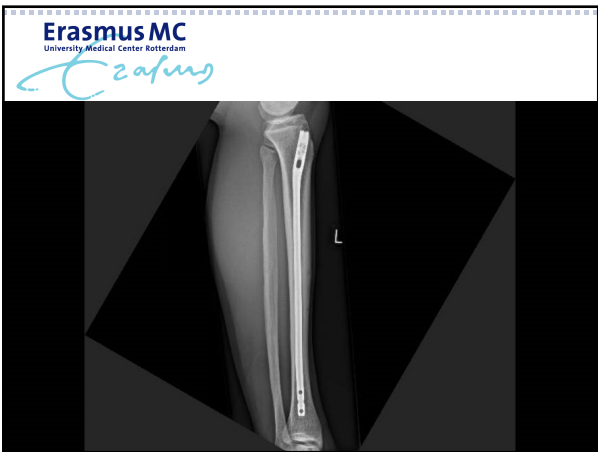




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**Take home message**


A stress fracture is a pathological fracture!

Be aware and conspicuous (repeat examination...)!

Every bone could have a stress fracture (Low versus high risk)!

Identify risk factors!

Treatment is specialised care!



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**Thank you**



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