Insufficiency fractures in rheumatic patients: Misdiagnosis and underlying characteristics

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Abstract

Objective

To report 9 patients with rheumatic diseases referred to our observation due to presumed exacerbation of their rheumatic disease, subsequently diagnosed as stress insufficiency fractures, and to characterize the clinical profile of patients prone to this complication.

Methods

The medical history of the patients was reviewed with special emphasis on their rheumatic disease, its course, duration and management, their menopausal state, location and characteristics of the fracture, its presentation and the initial presumed diagnosis, the delay in diagnosis, imaging diagnostic tests performed and outcome. Three representative case reports are presented.

Results

All 9 patients were women, 8 of them aged 50 years old or more, 8 with rheumatoid arthritis and 1 with polymyalgia rheumatica. They were all treated with corticosteroids and had reduction in their bone mass density when evaluated. Three of the patients presented with subcapital fracture of the femur, 4 had fractures of metatarsal bones and 2 had fractures of the distal tibia. In only one patient was a stress fracture initially suspected. Diagnosis was delayed by a mean of 31 days.

Conclusion

The diagnosis of stress fractures in patients with rheumatic diseases may often be delayed or missed, and thus improperly treated. Increased awareness of this entity is of importance for prompt diagnosis and correct management.

Key words

Insufficiency, stress fracture, rheumatoid arthritis, osteoporosis.

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Introduction

Non-traumatic bone fractures may result from physical stress by two main mechanisms: an extreme muscle strain (fatigue fracture) or a normal muscle strain effect on pre-existing bone weakness (insufficiency fracture). Stress fracture is a recognized complication of rheumatoid arthritis (RA) (1, 2). In a number of case reports, attention has been drawn to stress fractures occurring in the pelvis (3, 4), upper and lower tibia (5, 6), or the hindfoot (7).

Rheumatic patients present several predisposing factors to fractures such as: periarticular or diffuse osteoporosis secondary to inflammation and disuse (8), or to prolonged treatment with corticosteroids (9) or methotrexate (10); and deformities which cause the abnormal distribution of mechanical stress on bones (2). Though stress fractures in these patients are probably not rare, in many cases they may be underdiagnosed or misdiagnosed if the symptoms are attributed to an exacerbation of synovitis, avascular necrosis or other orthopedic and rheumatic conditions.

During the last year, following the recognition of an outstanding case (case 1) and our increased awareness of this entity, we diagnosed 8 additional rheumatic patients with stress fractures. This fact re-taught us the old lesson that awareness remains a prime prerequisite for diagnosis, and promoted us to characterize the clinical profile of these patients.

Patients and methods

Patients

The study included 9 patients with rheumatic disease followed at the rheumatology outpatient clinic, referred to our observation due to a presumed exacerbation of their rheumatic disease, subsequently diagnosed as stress fractures.

Clinical study

The patients and their charts were reviewed, with special emphasis placed on the history and course of their rheumatic disease, its duration and treatment, their menopausal state, hormone replacement or osteoporosis treatment, location and characteristics of the fracture, the presenting symptoms and signs, the initial presumed diagnosis, the delay in diagnosis, imaging diagnostic tests performed, and outcome. Dual energy X-ray absorptiometry (DXA) of the lumbar spine was performed in 7 patients.

Results

Eight out of the 9 patients were aged 50 years old or more (mean age 58 years, range 31 - 73 years). Eight of them had RA and one had polymyalgia rheumatica, with a mean disease duration of 16 years (range 1-29 years). All of the patients except one were treated with corticosteroids and presented significant reduction in their bone mass density when studied (Table I). Except for case 3, neither hormonal replacement therapy nor bisphosphonates were ever used in these patients. Three of the patients suffered

Table I. Epidemiological and clinical characteristics of 9 patients with rheumatic diseases who presented with stress fractures.

	Age/ gender	Disease duration/years	Treatment of the rheumatic disease	Yrs. in menopause/ T-score (DXA)
Case 1	73/ F	RA / 5	Prednisone 5 mg/d	25 yrs.; T = -3.1
Case 2	50/ F	RA / 25	Prednisone 10 mg/d, gold, azathioprine	0 yrs. T = -2.5
Case 3	53/ F	RA / 22	Prednisone 15 mg/d, MTX, Cy	4 yrs.; T = -2.7
Case 4	70/ F	RA / 29	Prednisone 10 mg/d, MTX	25 yrs.; T = -3.4
Case 5	71/ F	RA / 12	Prednisone 5 mg/d, MTX	21 yrs.; ND
Case 6	65/ F	PMR / 1	Prednisone 10 mg/d	15 yrs.; T = -2.5
Case 7	65/ F	RA / 5	MTX, NSAIDs	ND
Case 8	52/ F	RA / 25	Prednisone 10 mg/d, MTX, MNC	4 yrs., T = -2.9
Case 9	31/ F	JRA / 27	Prednisone 10 mg/d, MTX, MNC	T = -2.9

RA: rheumatoid arthritis; PMR: polymyalgia rheumatica; JRA: juvenile rheumatoid arthritis; MTX: methotrexate; MNC: minocycline; Cy: cyclosporine; NSAIDs: non-steroidal antiinflammatory drugs.

from a subcapital fracture of the femur (which was bilateral in one case), 4 had fractures of metatarsal bones and 2 had fractures of the distal tibia. In only one case (Case 3) was stress fracture suspected upon referral.

Synovitis, avascular necrosis or trochanteric bursitis was suspected in 8 patients and in 2 of the cases (Cases 2 and 4), the dosage of corticosteroids was initially increased due to a suspected exacerbation of their primary disease. Except for Case 3, diagnosis was delayed in all cases by a mean of 31 days (range 7-90). Six of the cases were finally diagnosed by X-rays, while in 3 cases isotopic bone scan disclosed the stress fractures (Table II).

Representative case reports

Case 1

The patient is a 70-year-old woman with seropositive RA of 5 years duration initially treated with methotrexate, sulphazalazine and minocycline. Over the last 3 years, her disease has been well controlled with the addition of prednisone at a dosage of 5 mg/d. Bone absorptiometry performed one year previously revealed a significant reduction in bone mass (T score -3.1). The patient refused hormone replacement therapy, could not tolerate alendronate and treatment with calcium, and 1,25 (OH) vitamin D (25 mcg/d) produced hypercalcemia. Her parathyroid hormone levels were normal.

In November 1998, she presented with a sudden and severe pain in her right hip. She denied any history of trauma. Her pain was exacerbated when standing and walking, and was partially relieved by rest. Physical examination disclosed exquisite tenderness on rotation of the right hip and limited range of movement. An X-ray of the hips was interpreted as normal (Fig. 1a). Ultrasound of the right hip disclosed effusion in the joint. The patient was prescribed NSAIDs and rest and a bone scan was ordered. A week later, there was no improvement in her complaint. The Tc diphosphonate isotopic scan was consistent with avascular necrosis of the femoral head or trauma (Fig. 1b). An X-ray of the hip repeated 2 weeks after the presentation disclosed a subcapital fracture of the right femur (Fig. 1c). The patient underwent total hip replacement with complete recovery.

Case 2

A 50-year-old woman presentedwith severe, deforming seropositive RA of 25 years duration. She has been treated with corticosteroids for the last 20 years at a mean prednisone dosage of 10 mg/d and was currently receiving gold, azathioprine and prednisone 10 mg/d. She had a history of renal stones and was treated with 500 mg calcium without vitamin D. The patient presented with sudden and severe pain in the left foot which exacerbated on walking and was partially relieved by rest. Physical examination disclosed deformed rheumatoid feet with severe subluxation of the metacarpophalangeal joints (MTPs), and swelling, redness and warmth over the left 4th MTP. X-ray of the feet revealed marked subluxation of the MTPs with erosive changes (Fig. 2a). The patient was prescribed rest and the dosage of prednisone was raised to 15 mg/d without improvement. An isotopic scan 10 days later suggested a stress fracture of the 4th metatarsal bone. X-rays of the foot performed at this time confirmed the diagnosis of stress fracture, revealing callus formation (Fig. 2a). A month later the patient presented with the same clinical picture in the 5th metatarsal bone, diagnosed as new stress fracture by a repeat radiograph.

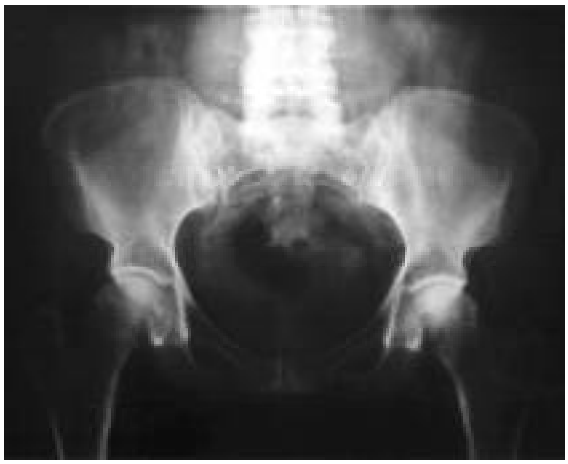
Case 3

The patient is a 53-year-old woman with seropositive RA of 22 years duration, and severe deformities of the hands, ankles and feet. She had been continuously treated with prednisone for the last 17 years, at a mean daily dosage of 10 mg and was currently receiving treatment with methotrexate and cyclosporine A. She had been treated with etidronate and calcium for the last year.

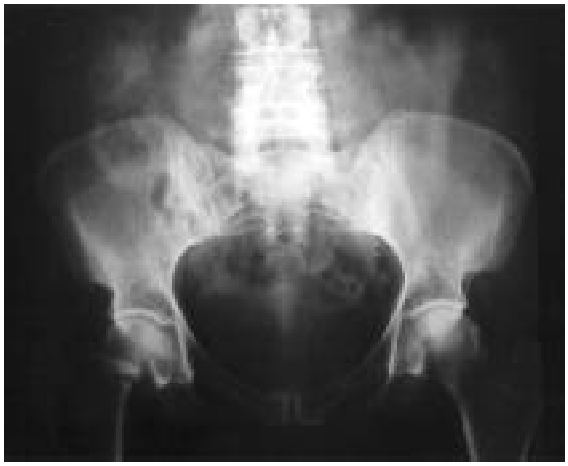
The patient presented with acute pain in the distal left fibula, without a history of trauma. On examination, she had clear synovitis of the left ankle with swelling, redness and tenderness, which was prominent on the left distal tibia. A possible diagnosis of synovitis versus insufficiency fracture was suspected. Technetium isotopic bone scans and X-rays confirmed a stress fracture of the left fibula.

Table II. Characteristics of stress fractures in 9 patients with rheumatic diseases

	Location of fracture	Presenting signs	Referral diagnosis	Delay in diagnosis (days)	Diagnostic imaging test
Case 1	Subcapital, right femur	Tenderness on rotation	Synovitis	15	Tc scan, X rays
Case 2	4th & 5th metatarsals	Swelling, redness, warmth	Synovitis	21	Tc scan, X rays
Case 3	Left distal fibula	Swelling, redness, warmth	Synovitis vs stress fracture	7	Tc scan, X rays
Case 4	2nd & 4th metatarsals	Swelling, redness, warmth	Synovitis	15	X rays
Case 5	Subcapital, left femur	Tenderness on rotation	Avascular necrosis	60	X rays
Case 6	Subcapital, right & left femur	Tenderness on trochanteric bursa	Trochanteric bursitis	30	X rays
Case 7	Left distal tibia	Tenderness	Synovitis	15	X rays
Case 8	3rd metatarsal	Swelling, redness, warmth	Synovitis vs stress fracture	90	X rays
Case 9	5th metatarsal	Swelling, tenderness	Synovitis	21	X rays



(a)



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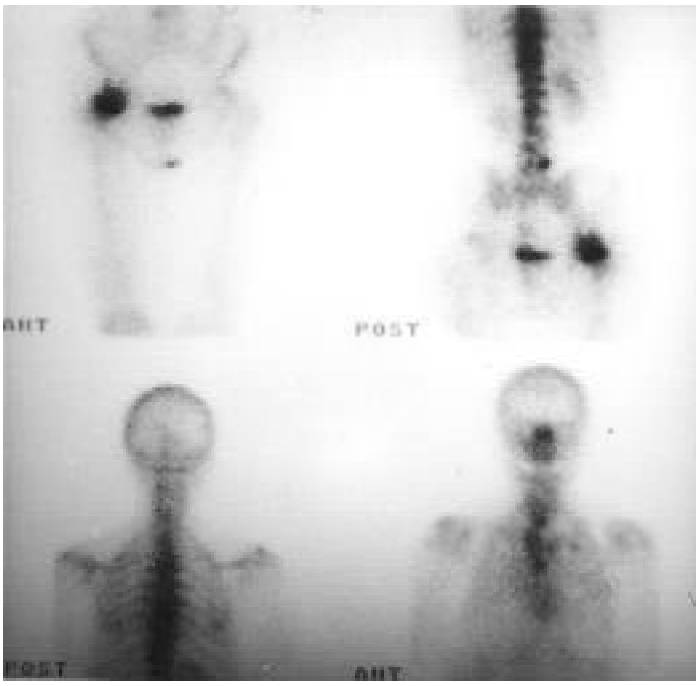
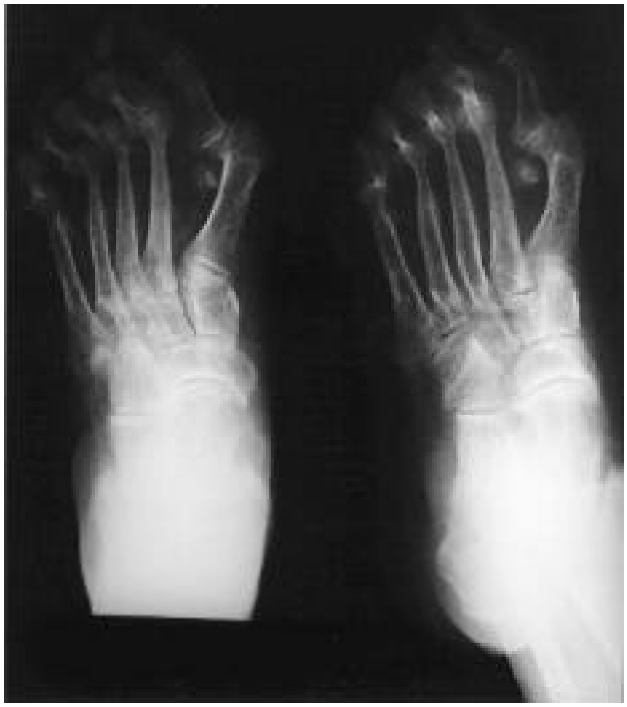


(b)

Fig. 1. Case 1. (**a**) Initial film - a thin sclerotic line can be seen at the medial sub-capital area on the right. The film was interpreted as normal. (**b**) Tc 99-bone scan performed a week later shows increased uptake at the Rt proximal femur, which could represent avascular necrosis or trauma. (**c**) X-ray of the same patient 10 days later; a wide oblique, sclerotic partial fracture line can be seen, confirming the diagnosis of stress fracture.



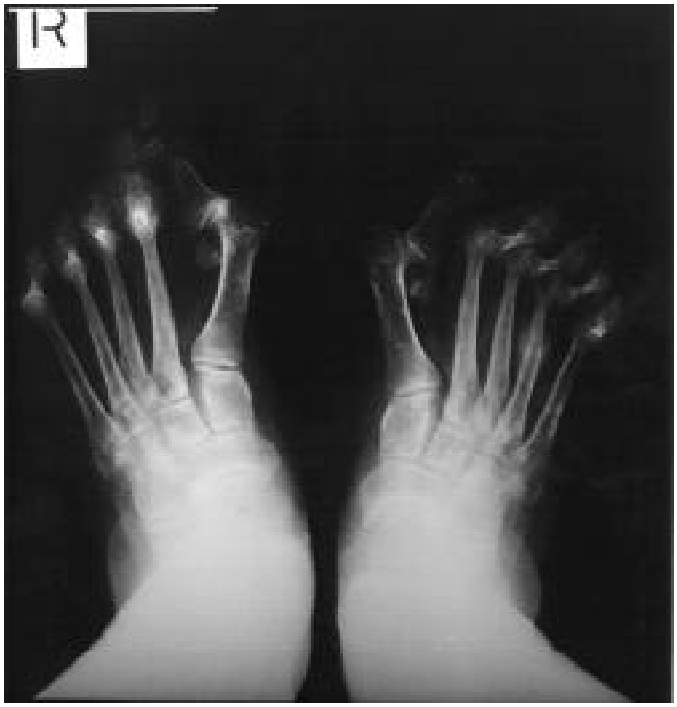


Fig. 2.Case 2. (**a**) Initial film of both feet showing severe changes compatible with rheumatoid arthritis; no fracture can be seen. (**b**) Ten days later, callus formation is apparent at the mid-portion of the left 4th metatarsus, representing a stress fracture.

Discussion

We have described 9 patients with pre-existing rheumatic diseases who presented with acute pain in the hip, feet or legs initially suggesting exacerbation of their rheumatic condition. None of them gave a history of increased physical activity or trauma preceding the onset of symptoms. All except one were misdiagnosed on referral as having synovitis or avascular necrosis, resulting in delay of the diagnosis and improper treatment in some of the cases. Female gender, postmenopausal age, osteoporosis and corticosteroid treatment were common denominators in 8 cases. The potential causes of stress fractures in these patients were severe osteoporosis and the presence of joint deformity, muscle weakness and spasm with resulting alteration in force distribution across joints.

There are two types of stress fractures:

1) the fatigue type in which abnormal muscle or mechanical strain on healthy bone with normal elastic resistance leads to a fracture. This type of fracture is commonly seen among young army recruits and in persons engaged in sport activities (11).

2) The insufficiency type in which normal strain on bones with diminished elastic resistance leads to fracture (12, 13). This is usually found in patients with bone diseases or rheumatoid arthritis. Several risk factors may contribute to the formation of insufficiency fracture such as osteoporosis due to the underlying disease, decreased mobility, corticosteroids or methotrexate, cartilage viability, joint instability, deformity and unbalanced distribution of forces as well as post-surgery regain of unaccustomed physical activity (2, 8-10, 14).

In 1941, Baer first reported a series of cases of fractures in chronic arthritis (15). Since then, several reports have confirmed this association. The most common sites of fracture are the femur neck (15, 16) and tibia (6, 17). Other sites frequently involved are the pelvis (4) and the fibula (6, 12, 18). Fractures of the metatarsals (2), ulna (19), radius (15) and hindfoot (7) have seldom been reported in rheumatic patients.

There are several factors which may mask the diagnosis of stress fractures in patients with rheumatic diseases:

1. In these patients, stress fractures related symptoms may mimic exacerbation or complication of the underlying disease. Wei described 2 patients with stress fracture of the fibular head, masquerading as monoarticular flares of ankle diseases (20), while Straaton *et al.* reported 3 patients with RA and insufficiency fractures of the distal tibia misdiagnosed as cellulitis (21). Joint deformities with anatomical changes make the precise clinical location and evaluation of the physical findings difficult - this is especially true for stress fractures, which involve the metatarsals in rheumatoid patients with severe subluxation of the MTP joints.

2. Radiographs in patients with RA are often pathological, showing basic erosive changes and subluxation, but they may not reveal insufficiency fractures in their first stages (22). In well-aligned fractures, callus formation may be the first and only radiological sign, and this could be delayed or depressed in rheumatoid patients and as a result of corticosteroid or immunosuppressive therapy. This problem can be overcome by Technecium-99 mm diphosphonate bone scintigram which shows increased uptake of the radiotracer at the fracture site as early as 48 hours after its occurrence (23), although it should be remembered that bone in the vicinity of the inflamed joints may also concentrate the radiotracer.

Insufficiency fractures may be preventable through a high level of awareness of the problem on the part of the physician and intensive treatment and prevention of osteoporosis. In patients with severe joint deformities of the lower limbs, the use of shoe orthoses or a cane which may reduce strains should be considered (24, 25).

In conclusion, although stress fractures are a possible and recognized complication in patients with rheumatic disease, especially postmenopausal women with osteoporosis, we feel from our own experience that they may be much more frequent than currently suspected. As reflected in the present study and from the review of the literature, the diagnosis of stress fractures in this constellation may often be delayed. Increased awareness of this entity is thus of importance for prompt diagnosis and correct treatment.

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