

Metatarsal Periosteal Reactions in Radiographs of the Diabetic Foot

DİABETİK AYAK FİLMLERİNDE METATARSAL PERİOST REAKSİYONLARI

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SUMMARY

A radiological study of the metatarsal bones was performed in 113 asymptomatic diabetic feet without evidence of infections, fracture, or ulceration. They were compared with 113 non diabetic controls. All radiographs were reviewed independently by two radiologists without knowledge of clinical findings. Periosteal reactions were found in 28 diabetic patients (13 men) affected and more often in combination than individually. The mean age and duration of the diabetes in the diabetic patients with periosteal reactions was found to be significantly higher than in patients without periosteal reactions.

KeyWords: Diabetes mellitus, Diabetic foot, Metatarsal periosteal reactions

Turk J Resc Med Sei 1991, 9:311-313

In classical conception, periosteal reaction, when evident in a radiograph of a diabetic foot is generally considered to indicate osteomyelitis. In

Geliş Tarihi: 28.11.1989

Kabul Tarihi: 23.1.1990

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Oyak Sitesi, 2/8. Sokak No: 4/14
Üçkuyular 35350 - İZMİR

Turk J Resc Med Sei 1991, 9

ÖZET

Ayaklarında enfeksiyon, kırık ve ülserasyon belirtisi olmayan 113 asemptomatik diyabetli hastada ve 113 kişiden oluşan diyabetli olmayan kontrol grubunda gerçekleştirilen bu çalışma ile diyabetes mellitus'lu hastalardaki metatarsal periosteal reaksiyonlar araştırılmıştır. Metatars grafileri, hasta ve kontrol grubuna ait bilgileri olmayan iki ayrı radyolog tarafından birbirinden bağımsız olarak değerlendirilmiştir. 28 diyabetli hastada (13'ü erkek) periost reaksiyonu saptanmıştır. Kontrol grubunda ise ancak 4 hastada periost reaksiyonu gözlenmiştir ($p < 0.001$). İkinci, üçüncü ve dördüncü metatarsal kemiklerin en sıklıkla tutulduğu gözlenmiştir. Hasta grubunda, periost reaksiyonu olanlarda ortalama yaş ve diyabetin süresi, periost reaksiyonu olmayanlara göre anlamlı düzeyde yüksek bulunmuştur. Bu sonuçlar diyabetli hastalarda metatarsal periost reaksiyonlarının yaygın olduğunu ve her zaman osteomyelit, ülserasyon, kırık vb. nedenlere bağlı olmadığını ortaya koymaktadır.

Anahtar Kelimeler: Diyabetes mellitus, Diyabet ayağı, Metatarsal periost reaksiyonu

T Klin Araştırma 1991. 9:311-313

1988, Willams et al. (7) found that the prevalence of metatarsal periosteal reaction (MPR) is 22 percent in diabetic patients who do not have any other clinical findings besides osteomyelitis.

We reviewed a relatively large representative group of diabetic patients without foot complaints and determined the prevalence of metatarsal periosteal reactions.

PATIENTS, METHODS, RESULTS

Radiographs of the feet were obtained of 113 diabetic patients (58 women and 55 men, 106 with type II diabetes and 7 with type I) attending our internal medicine outpatient department.

All the films were assessed for the presence of MPR by two different radiologists who didn't know the clinical conditions. Radiographs which were interpreted differently by the two radiologists were excluded.

A control group, consisting of individuals matched for age and sex and whose fasting blood glucose levels were normal in at least two separate occasions and whose foot examinations were entirely normal, was compiled from healthy volunteers.

In addition, diabetic patients who have MPR in their radiographs were also assessed with computerised tomography scanning for confirmation.

Statistical analysis was performed by X² and Mann Whitney U tests.

MPR was found in 28 diabetic patients (24.75) but only in three controls (3.5%) (p<0.001). Diabetic patients with MPR were compared with the other group of patients with out MPR from the point of view of mean age, duration of diabetes, type of diabetes, management, and male-female ratio. Duration of diabetes and mean age were higher in patients with MP than those without MPR (Table 1). The second, third, and the fourth metatarsals were affected most commonly and in combination with each other the MPR was on both sides of the shaft in 12 of the 28 of the 28 diabetic patients. There was no significant difference between right and left foot (Table 2).

Table 1. Characteristics of Diabetic Patients

Parameters	Metatarsal Periosteal reactions		
	Presents	Absent	P
Mean age	67 ± 4.4	58 ± 7.1	<0.01
Male female ratio	0.86	0.90	NS*
Duration of diabetes (years)	8 ± 5.1	9.1 ± 3.4	<0.
Type (I) diabetes (%)	0	6	NS
Type (II) diabetes (%)	100	94	NS
Management			
Insulin (%)	12	11	NS
Oral A** (%)	73	77	NS
Only diet (%)	15	12	NS

* Non Significant

** Oral antidiabetic agent

Table 2. The Dispersion of Metatarsal Periosteal Reactions in Radiographs of Patients' With Diabetic Feet and Control Group

Metatarsal	Right Foot					Left Foot					Total		
	1	2	3	4	5	1	2	3	4	5			
Bones													
Diabetic	0	5	10	7	1	23	1	4	8	13	1	27	
Control	0	0	2	3	2	0	7	0	2	3	3	0	8

DISCUSSION

MPR has been observed in diabetes (5) and frequently in association with trophic ulcers (4) and neuropathic joint diseases (6) Either et al. (2) reviewed foot radiographs in 162 diabetic patients with gangrene, with regards to the skeletal lesions and the arterial calcifications. They didn't mention MPR. Formation of new bone at the metatarsal periosteum, resulting from previous fracture has been reported in diabetes (3), but its nature seems quite different from the pattern of MPR described here.

The main purpose of this study was to determine the prevalence of MPR in diabetes; resulting from diabetes and not from other cause.

Our results are similar to Williams et al's (7) findings. The real cause of MPR in diabetic patients is unknown. Vibration perception threshold at the big toe was found to be significantly higher in patients without MPR than those with MPR, by these investigators. Edema, hemorrhagia, pus and malignant cell infiltration may separate periosteum from its shaft and the result is reactive periosteal new bone formation. Periosteal reaction occurs in three basic types as solid, laminated and spiculated. All of them may be seen in both malignant and benign conditions. Periosteal reaction 1 mm or thicker usually indicates a benign condition (1). The majority of our cases showed MPR thicker than 1 mm and there were of solid type (Figure 1).

In conclusion, our results suggest that MPR's are common among diabetic and do not, of themselves, indicate, osteomyelitis. In order to elucidate the real pathogenesis of MPR, more detailed investigations including vibration perception threshold measurements and even histopathological studies are necessary.

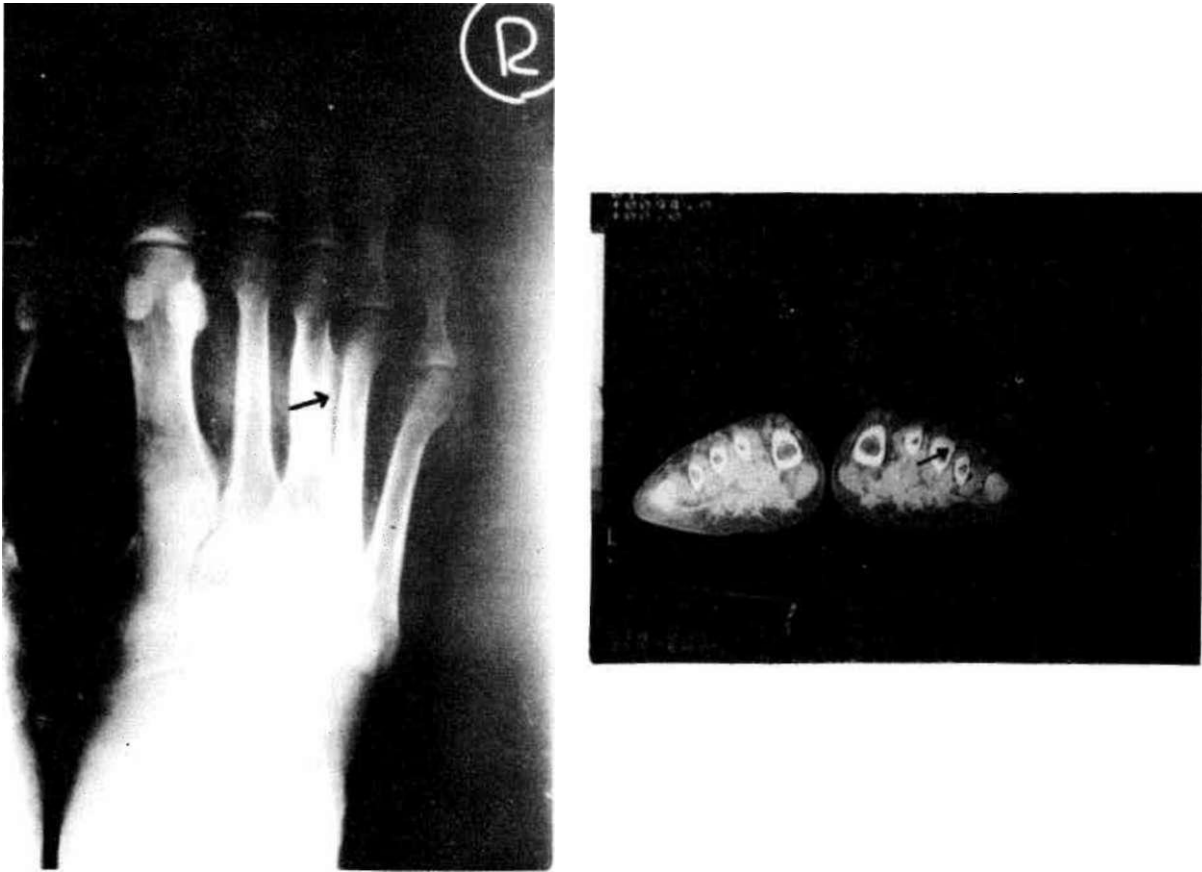


Figure 1. Radiograph and computerized tomography of right foot showing thick periosteal reactions along shaft of third metatarsal.

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