



Squamous cell carcinoma arising from chronic osteomyelitis

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Objectives: Our aim was to present the results from a retrospective study of 7 cases of squamous cell carcinoma arising from chronic osteomyelitis.

Methods: We treated seven cases of chronic osteomyelitis related squamous cell carcinoma between 1993 and 2005. The patients had an average age of 54.5 (range: 38-71) years, with a male predominance (6 men, 1 woman). We analyzed the time up to cancerization, the localization and histopathological type of the carcinoma, and the type and result of the treatment.

Results: The mean time between the occurrence of the skin lesions and the diagnosis of malignant degeneration was 24.5 (range: 9 to 40) years. The carcinoma resulted from tibia osteomyelitis in 4 cases, femur osteomyelitis in 2 cases and humerus osteomyelitis in one. The pathological examination showed five cases of a well differentiated squamous cell carcinoma with bone invasion, and two cases of invasive squamous cell carcinoma. The treatment consisted of amputation in all but one patient, who refused the amputation. The six amputee patients did not show local recurrence or metastatic dissemination over a period of five years.

Conclusion: Amputation appears to be an effective treatment method in squamous carcinoma secondary to chronic osteomyelitis.

Key words: Chronic osteomyelitis; malignant tumors; squamous cell carcinoma.

Carcinomatous degeneration in chronic osteomyelitis has been known since the 19th century.^[1-4] This malignant transformation is defined by a change in the clinical, radiological, bacteriological and histological symptomatology of the chronic osteomyelitis.^[5-7] It is a rare and late complication, developing 20 to 40 years after a chronic bone infection. This degeneration may involve the skin orifice or the fistula route. It is particularly seen after long bone infections and results most often in squamous cell carcinoma and rarely in a sarcoma or lymphoma.^[8-13] The physiopathological mechanism of this degeneration is unknown. Chronic irritation of the skin or soft tissue exposure to different growth factors may play an

important role.^[14] We report seven cases that allow us to discuss various aspects of this grave complication.

Patients and methods

We report seven cases of cancerous degeneration in chronic osteomyelitis which were treated in the Department of Traumatology and Orthopedic Surgery of Ibn Sina Hospital (Rabat, Morocco) between 1993 and 2005. The patients had an average age of 54.5 (range: 38-71) years, with a male predominance (6 men, 1 woman). All patients who were included in the study had malignant degeneration of a chronic skin lesion, associated with a chronic bone infection. The diagnostic criterion for chronic osteomyelitis was a bone infection with a fistula dis-



Fig. 1. Ulcerogranulated lesion. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]



Fig. 2. Ulcerogranulated lesion with fistula. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]

charge for over one year. Patients presented with clinical symptoms suggesting cancerization, including constant and disabling pain. A fistula adjacent to the osteomyelitis bone site produced a purulent discharge with an unpleasant odor in Patients 2, 3, 6 and 7. The fistula orifice presented an ulcerogranulated appearance with occasional loss of cutaneous substance in all cases (Figs. 1-4). Patients had no palpable lymph nodes on physical examination. Plain radiographs showed several areas of osteolysis (Figs. 5-8). The malignancy was confirmed with histopathological examination in all cases. We analyzed the time up to cancerization, the localization and histopathological type of the carcinoma, and the type and result of the treatment.

Results

The mean time between the occurrence of the skin lesions and the diagnosis of malignant degeneration was 24.5 (range: 9 to 40) years. Two cases had chron-

ic osteomyelitis. In five cases the osteomyelitis occurred after a fracture. Of these 5 cases, 2 had open fractures. The carcinoma resulted from tibia osteomyelitis in 4 cases, femur osteomyelitis in 2 cases and humerus osteomyelitis in one. Pathological examination showed five cases of a well differentiated squamous cell carcinoma with bone invasion, and two cases of invasive squamous cell carcinoma. None of the patients had metastasis (Table 1). The treatment consisted of amputation in all but one patient, who refused the amputation. We performed an amputation of the lower third of the thigh in 4 patients (Patients 1-4), and amputation of the upper third of the thigh in 2 (Patient 5 and 6). All amputees received an artificial limb with positive results; they experienced no residual pain and were ambulatory without crutches. The six amputee patients did not show local recurrence or metastatic dissemination over a period of five years (Table 2).



Fig. 3. Ulcerogranulated lesion. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]



Fig. 4. Ulcerogranulated lesion. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]

Discussion

Hawkins was the first to report a case of carcinomatous degeneration in chronic osteomyelitis in 1835.^[1] The two larger series of squamous cell carcinoma in chronic osteomyelitis are those of the Mayo-Clinic (23 cases) and the Institute Rizzoli (33 cases).^[5,6] The risk of this transformation is very difficult to assess, and is estimated between 0.2 and 1.7% of chronic osteitis.^[2] Only 24 to 45% of squamous cell carcinoma of the limb are related to osteomyelitis. In our series, we observed a male prevalence, with an average time of 24.5 years for malign transformation, and an average age of onset of 54.5 years, which are consistent with most literature data.

The most frequently affected site is the tibia, followed by the femur and carpal bones. The upper limb is rarely affected. Similarly, we observed four cases of tibial localization in a total of seven patients. The presentation was variable; we could observe an extension or an unusual persistence of skin ulceration, an onset of a burgeoning mass of the fistulous orifice, a rapidly growing and disabling pain, a discharge with an unpleasant odor, sometimes containing blood, or an increase in the size of the limb.^[16-20] When the neoplasm invades the bone, there is either osteolytic erosion or a pathological fracture. In our series, we observed osteolysis in five patients, which indicates the advanced stage of the disease. Diagnosis is confirmed by biopsy performed at all suspected wound sites.^[18,19] The malignant transformation most often results in squamous cell carcinoma and much more rarely in fibrosarcoma, osteosarcoma, reticulosarcoma, malignant fibrous histiocytoma or angiosarcoma.^[21-26] It begins at the skin or epithelial structure of the fistulous route and then invades the bone. We observed only squamous cell carcinoma in our series, the most frequent type in the literature. The occurrence of metastasis is limited to 15% of cases, always occurring within five years of diagnosis.^[6] The presence of satellite nodes is common but often indicates a simple inflammatory reaction. None of our patients had metastases or palpable lymph nodes at the initial assessment.

Many experts accept amputation as the best treatment option in carcinomatous degeneration in chronic bone infection.^[17-20] Wide resections can result in



Fig. 5. Plain radiographs showing areas of osteolysis.

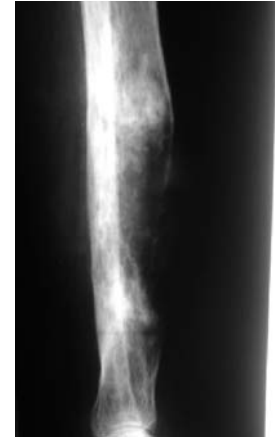


Fig. 6. Plain radiographs showing areas of osteolysis

local recurrence, which may again eventually necessitate amputation.^[15] All our patients were in the advanced stage, with bone invasion in five patients and active bone infection, associated with a large skin defect in all patients. We chose amputation, as the conservative treatment in advanced cases is very complex and often does not provide a complete recovery without recurrence. Amputation in these cases allows a faster and safer recovery. Prognosis is better for well differentiated squamous cell carcinoma than for other differentiated histological types. The existence of a lymph node or visceral metastasis brings down the rate of survival to 35-50%.^[17,19,20]



Fig. 7. Plain radiographs showing areas of osteolysis.



Fig. 8. Plain radiographs showing areas of osteolysis.

Table 1. Clinical and radiological features.

Patient	1	2	3	4	5	6	7
Sex	M	M	F	M	M	M	M
Age	53	52	49	71	60	58	38
Initial lesion	Post-traumatic chronic osteitis	Chronic osteomyelitis	Post-traumatic chronic osteitis	Post-traumatic chronic osteitis	Chronic osteomyelitis	Post-traumatic chronic osteitis	Post-traumatic chronic osteitis
Location	Tibia	Tibia	Tibia	Tibia	Femur	Femur	Humerus
Time of development (years)	25	40	14	22	36	26	9
Clinical symptoms	Pain + Ulcero-granulated appearance	Pain + Ulcero-granulated appearance + Foul-smelling discharge	Pain + Ulcero-granulated appearance + Foul-smelling discharge	Pain + Ulcero-granulated appearance	Pain + Ulcero-granulated appearance	Pain + Ulcero-granulated appearance + Foul-smelling discharge	Pain + Ulcero-granulated appearance + Foul-smelling discharge
Lymph nodes	No	No	No	No	No	No	No
Radiology	Osteolysis	Osteolysis	Osteolysis	Osteolysis	No	No	Osteolysis
Metastasis	No	No	No	No	No	No	No

In our series, the good prognosis was due to the pathological type of the tumors, the efficient and definitive treatment, and the absence of lymph nodes and metastasis.

Carcinomatous degeneration after chronic osteomyelitis is a rare and late complication. It should be considered even years after the development of chronic osteitis. The most suggestive signs are the persistence of a foul smelling fistula and the appearance of a painful tumor or a pathological frac-

ture. Biopsy is the most trusted method for diagnosis. Treatment depends on the stage of the disease: in the early stage, limb saving surgery can be performed, but in the advanced stages with bone invasion and large skin defects, amputation is necessary.

The aim of this series was to show the gravity of the disease and highlight the fact that it can occur many years after the onset of osteomyelitis. The most effective prevention of carcinomatous degeneration is the use of local fasciocutaneous flaps for

Table 2. Histopathology, treatment and recurrence details of the patients.

Patient	1	2	3	4	5	6	7
Histopathology	Well differentiated squamous cell carcinoma with bone invasion	Well differentiated squamous cell carcinoma with bone invasion	Well differentiated squamous cell carcinoma with bone invasion	Well differentiated squamous cell carcinoma with bone invasion	Invasive squamous cell carcinoma	Invasive squamous cell carcinoma	Well differentiated squamous cell carcinoma with bone invasion
Treatment	Amputation of the lower third of the thigh	Amputation of the lower third of the thigh	Amputation of the lower third of the thigh	Amputation of the lower third of the thigh	Amputation of the upper third of the thigh	Amputation of the upper third of the thigh	Refused amputation
Recurrence	No recurrence after 7 years	No recurrence after 5 years	No recurrence after 6 years	No recurrence after 3 years	No recurrence after 5 years	No recurrence after 38 months	Not reviewed

skin coverage to prevent chronic wounds which is a breeding ground for carcinomatous degeneration.

Conflicts of Interest: No conflicts declared.

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