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Epidemio-clinical and scanographic aspects of bone lesions in cancer patients

Miora Lovatiana Randrianalison[1], Feno Hasina Rabemanorintsoa[1], Lova Hasina NY ONY Narindra Rajaonarison[2], Gaëtan Duval Solofomalala[3], Ahmad Ahmad[2]

[1] Department of Medical Imaging, University Hospital Analakininina and Morafeno Toamasina, Madagascar

[2] Department of Medical Imaging, University Hospital Joseph Ravoahangy Andrianavalona, Madagascar

[3] Department of Orthopaedics and Traumatology, University Hospital Anosiala, Madagascar

Abstract

As a retrospective, descriptive and analytical study of 46 thoracic, abdominal and thoraco-abdomino-pelvic scans, this study focused on all bone lesions in cancer patients. The aim was to describe the epidemiological, clinical and radiological aspects of bone lesions in cancer patients in order to facilitate their diagnostic orientation. Metastatic bone lesions predominated, and the most common cancers were breast, prostate and lung cancer. These secondary bone lesions were mostly lytic, multiple and mainly affected the axial skeleton. Other bone lesions such as osteoarthritis, bone demineralisation and benign bone tumours were also noted. It should be remembered that other bone lesions may or may not occur in connection with the cancer and/or its treatment. This warrants the realization of imaging tests to detect and monitor different bone lesions, to better treat them.

Keywords: bone lesions, bone metastasis, cancer, CT-Scan, extension assessment

Introduction

Bone lesions are abnormalities in the morphology and density of bone structures. In cancer patients, it is usual to think of bone metastases first, but bone lesions in these patients may have several aetiologies. Bone metastases are common during the natural course of cancer. Their incidence in patients with metastatic cancer varies from 30 to 70% [1]. Bone is the third most common site of metastasis after the lungs and liver [2]. Due to the osteophilic nature of certain tumours, the most frequently observed metastases are those of breast cancer in women, and lung and prostate cancer in men. Haematological malignancies are also responsible for symptomatic bone infiltration [3]. Primary malignant bone tumours are rare and are dominated by osteosarcoma, chondrosarcoma and Ewing's sarcoma [1]. Bone loss may be secondary to anti-cancer therapies (chemotherapy, corticosteroids, anti-aromatases in breast cancer, anti-androgens in prostate cancer) [4]. Bone lesions may form part of a rheumatological paraneoplastic syndrome. A paraneoplastic syndrome is defined as signs or symptoms related to an occult or previously recognised tumour, without direct anatomical relationship to it, unexplained by metastases and disappearing in the most typical cases after effective treatment of the tumour. The tumour in question is more often malignant than benign. A demonstrative example of a rheumatological paraneoplastic syndrome is Pierre Marie's hypertrophying osteoarthropathy [5]. Imaging plays an important role in the diagnosis of bone lesions, as well as in their therapeutic management and monitoring. The aim of this study was to describe the epidemio-clinical and radiological aspects of bone lesions in cancer patients in order to facilitate their diagnostic orientation.

Materials and methods

This is a retrospective, descriptive and analytical study; spanning a period of 17 months from 1st January 2016 to 31 May 2017. We sorted and studied the scanographic reports of patients who came to the Polyclinique Saint François d'Assise Ankadifotsy, Antananarivo and collected the records of cancer patients who came for thoraco-abdomino-pelvic (TAP), thoracic or abdomino-pelvic CT and body scanner. Images were acquired using an ECLOS HITACHI 24-slice CT scanner. The images were acquired in helical mode, without and after contrast medium injection, with multiplanar reconstruction and double windowing.

All patients referred for a thoracic-abdominal-pelvic CT scan for extension or evaluation of a known cancer with a bone lesion were included, including 46 patients.

The parameters studied were :

- Patient's age
- Kind of patient
- Clinical information
- Nature of the primary cancer
- Nature of the bone lesion: condensing, lytic, mixed, lacunae, demineralisation, osteoarthritis.
- Location: dorsal spine, lumbar spine, ribs, sternum, iliac bone, symphysis pubis, sacrum, coccyx, upper end of femur.
- Number: single or multiple
- Associated signs :
- Periosteal reactions
- Invasion of soft tissue
- Suspected radiological diagnosis:
- Secondary malignant bone lesion
- Benign tumours bone lesion
- Pseudotumours
- Degenerative bone lesion
- Inflammatory or infectious bone lesion
- Other

The study was carried out with respect for patient confidentiality and the professional secrecy of all investigators who had access to the data.

The Pearson chi-square test was used to compare the proportions and the significance level was set at p<0.5.

Result

- **Descriptive Study**

Females predominated, with a sex ratio of 0.7.
The average age was 55.23, with extremes of 19 and 87. The age group most represented was between 59 and 69, with a percentage of 34.78%.
Of the 46 patients, 57% had come for an extension assessment and 30% for a therapeutic response assessment (initial or adjuvant chemotherapy). 9% of patients had bone pain, 2% had sensory-motor deficits and 2% had known bone metastases.
Three types of primary cancer predominated: breast (34.8%), digestive (21.7%) and lung (13%). Prostate cancer, brain cancer and haematological malignancies were found in equal proportions, each accounting for 8.7%. The remaining primary cancers were cervical cancer (4%), thyroid cancer (2.2%) and bladder cancer (2.2%).
The majority of patients had condensing lesions in 25% of cases and osteolytic lesions in 19.23% of cases. However, arthrosic lesions were noted in 27.45% and vertebral compression in 13.46% of cases. Other lesions such as demineralisation (7.49%), mixed lytic and condensing lesions (5.76%) and lacunae (1.92%) were rarely found.
The lesions were located primarily on the axial skeleton (dorsal spine 31.81%, lumbar spine in 31.81% of cases, sacrum 5.68%), followed by the iliac bone in 10% of cases, the ribs (7.95%) and the sternum (6.81%).
In 41 patients (89.13%), there were multiple bone lesions. Only digestive cancer and cervical cancer (10.87%) had single bone lesions.
Most patients had no signs associated with bone lesions. Only 4.34% of patients had soft tissue involvement and 2.17% had a periosteal reaction.
Secondary malignant bone lesions predominated in 56.52% of cases, followed by degenerative bone lesions (34.78%) and benign bone lesions (6.52%). There was a concomitant association of metastatic bone lesion and degenerative bone lesion in one patient.

- **Analytical Study**

We noted a predominance of secondary malignant bone lesions in patients between 39 and 59 years old, p=0.03.
Female breast cancer patients had the most bone lesions. For lung and digestive tract cancer, men had the most bone lesions, p=0.004.
The majority of requests for CT scans were for extension and post-treatment follow-up, and mainly concerned breast and digestive tract cancer, p= 0.0018.
The majority of primary cancers did not induce associated signs; only one case of breast cancer, one case of prostate cancer and one case of lung cancer were accompanied by associated signs p=0.005
Almost all lesions were multiple, p=0.04
Bone metastases were mainly observed in the dorsal and lumbar spine and were multiple at the outset, p=0.02.
We observed a predominance of secondary bone metastases in the dorsal and lumbar spine, iliac bone, ribs and sternum, p=0.00.

Discussion

Our study population was predominantly female, both for all bone lesions combined and for bone metastases alone. This is in line with some studies [6-8]. The predominance of women is explained by the incidence of breast aetiology. Breast cancer is responsible for 32.6% of metastases [9]. This can also be explained by the high level of breast cancer awareness in Madagascar in recent years, which has led women to undergo screening. However, other studies have found a male predominance [10-16], with lung and prostate cancers predominating.
The mean age was 55 years, similar to the data in the literature [10, 11, 15].
In our study, only 9% of patients had bone pain and 2% had a sensory-motor deficit. No pathological fractures were found. Achahbar [17] found that 33.3% of patients had bone pain and 14.81% had functional impotence. Shabani *et al* [12] found that 86.22% of patients had bone pain, 8.38% had neurological symptoms and 4.79% had a pathological fracture. According to the literature, pain is the most common symptom [18]. The number of our patients with bone pain may be erroneous due to incomplete clinical information.
In cancer patients, the American Society of Clinical Oncology (ASCO) recommended bone imaging only in symptomatic patients and the European Society of Medical Oncology (ESMO) in cases of pain, hypercalcaemia or elevated alkaline phosphatase [19].
We observed that 46.15% of bone metastases were found in the extension work-up, with p=0.0018. This may be explained by the fact that people only consult a doctor when the disease has worsened, but also by the fact that the extension work-up cannot be carried out quickly due to a lack of resources.
Five types of primary cancer predominated: breast (34.8%), digestive (21.7%), lung (13%), prostate and haematological malignancies (8.7%). Delbet had shown in his studies that the risk of breast cancer could be reduced by early treatment of precancerous lesions with Delbiase (magnesium salts) [20]. These pre-cancerous lesions were dominated by chronic mastitis, multi-cystic breast and breast discharge [19]. Other authors have reported different results [10, 11, 14], with lung cancer, prostate cancer and haematological malignancy predominating (table 1). The order of these cancers is different because of certain confounding variables such as the dominant sex of the target population and environmental factors (smoking, air pollution, etc.) [12].

Table 1: Comparison between the cancerous origin of metastases in our series and in the literature

	Achachbar [17]	Jbili [11]	Charre [6]	Kim [14]	Kodjo [10]	Our series (%)
Breast	26	16	44,9	3,6	9,7	34,80
Prostate	11	2,8	3,8	4,8	35,7	8,70
Lung	15	20,3	20,9	46,4	5,7	13
Digestive tract	4	4,3	1,3	16,7	2,4	21,70
Thyroid	11	1,4	0,9	8,3	0	2,20
Malignant haemopathy	0	37,6	2,6	0	3,2	8,70

Cerebral	0	0	0,4	0	0	4
Cervix	0	7,2	1,7	0	5,7	4
Bladder	4	1,4	2,6	0	0	2,17
Kidney	7	0	9,8	13,1	0	0

In our study, malignant bone lesions predominated. This is consistent with that of Toth *et al* who found 58.16% malignant bone lesions out of 349 lesions identified [15].

In terms of the nature of the lesions, arthrosic lesions were the most common, followed by condensing lesions and lytic lesions. The data in the literature are varied (table 2).

Table 2: Comparison of the nature of bone lesions with the literature

	Kodjo [10]	Hammon [21]	Charre [6]	Achahbar [17]	Jbili [11]	Our series (%)
Lytic disease	45,7	6,31	89	81	30,23	19,23
Condensing unit	22,2	19	21	4	6,97	25
Mixed	0	0	1	15	11,62	5,76
Fractured vertebrae	38,5	0	0	0	0	13,46
Pathological fracture	5,4	0	35	67	0	0
Other lesions	20,4	74,62	0	0	0	36,53

In terms of location, bone metastases were found in decreasing order at the dorso-lumbar, costal, sternal, pelvic and proximal end of the femur. This is consistent with the literature [21]. There is no specific mapping for each cancer, but some particularities are known. Breast, prostate and lung cancers have a particular affinity for the spine [22, 23]. Wang *et al* [24] have reported that the distribution of bone metastases differs according to the type of primary cancer. In their study, the distribution characteristics of bone metastases differed in lung and prostate cancers, mainly in the early stages of metastasis (p=0.00). We found no difference in the distribution of bone metastases for each cancer, p=0.2.

Bone metastases were mostly multiple and multifocal. This is in line with the observation of Jbili [11].

The majority of bone lesions found had no associated signs. Only one patient presented a periosteal reaction on a mixed bone metastasis of prostate cancer. Periosteal reaction is common in osteocondensing metastases and in prostate cancer [25]. Two patients presented with soft tissue invasion of a condensing bone lesion. Soft tissue involvement is included in the criteria for malignancy of a bone lesion [26].

For the suspected radiological diagnosis, we noted the predominance of bone metastases. Other authors have also reported the same results [10, 15, 27]. This may be explained by the predominance of osteophilic cancers such as breast, prostate and lung cancer in our study. Degenerative lesions were observed in second place; they were located mainly in the spine, concerned subjects aged between 59 and 69 years, and were predominant in digestive cancer. Stark *et al* [28] also found a prevalence of spinal degenerative disease in subjects in this age group with digestive cancer. Degenerative disease of the spine in cancer may be explained by a complex interaction of inciting factors linked to a person's genetic predisposition and to an inflammatory cascade in response to stress or trauma [28].

As our study was carried out in a private institution, it does not fully reflect the epidemiological profile of bone lesions in cancer patients in Madagascar. The CT scans we studied concerned only the thoraco-abdomino-pelvic region. The impossibility of exploring the entire skeleton does not allow us to confirm the preferential locations of bone lesions in cancer patients.

Conclusion

Our study shows that bone metastases are the most common bone lesions in cancer patients. The majority of the population was female, and breast cancer was the most common cause of bone metastases. Bone metastases were mostly discovered during the extension work-up. Bone pain in a cancer patient is the symptom that should lead us to look for these bone metastases.

CT scans are an effective means of detecting and characterising bone lesions during the work-up, but they are still expensive in our country and few people have health insurance. This would explain the high rate of bone metastases in the extension work-up in our study. The introduction of social security cover for serious illnesses such as cancer would enable early diagnosis and prevention of complications.

Figures

Fig 1: Osteocondensing lesion on the right iliac rim in a patient with bronchopulmonary cancer.

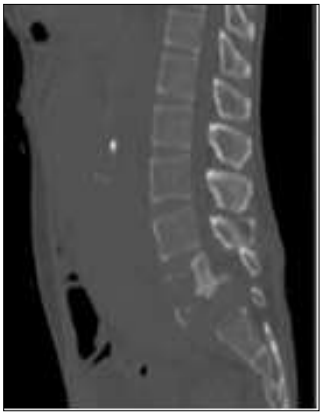

Fig 2: Lytic lesion at L5 and S1 in a patient with breast cancer.

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