Biopsy Path Contamination in Primary Bone Sarcomas*

Contaminação do trajeto de biópsia em sarcomas primários ósseos

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Rev Bras Ortop 2019;54:33–36.

Abstract

Objective To determine the incidence of contamination of the biopsy pathway in patients with primary bone sarcomas, as well as the clinical characteristics that influenced this outcome.

Materials and Methods The anatomopathological reports of the patients who were treated by the Orthopedic Oncology Sector of the Orthopedic and Traumatology Department of this institution were retrospectively evaluated.

Results Of the 148 patients included for evaluation in the present study, only 1 presented contamination by neoplastic cells in his biopsy pathway.

Conclusion The bone biopsy procedure in patients with primary bone sarcomas presents great safety regarding pathway contamination when performed in specialized centers that treat this type of pathology.

Keywords
- Ewing sarcoma
- osteosarcoma
- biopsy

Resumo

Objetivo Determinar a incidência da contaminação do trajeto de biópsia nos pacientes com sarcomas primários ósseos, bem como as características clínicas que influenciaram neste desfecho.

Método Foram avaliados retrospectivamente os laudos anatomopatológicos de pacientes tratados pelo Serviço de Oncologia Ortopédica do Departamento de Ortopedia e Traumatologia dessa instituição.

Resultado Dentre os 148 pacientes incluídos no presente estudo, apenas um apresentou contaminação por células neoplásicas em seu trajeto de biópsia.

Conclusão O procedimento de biópsia óssea em pacientes com sarcomas primários ósseos apresenta grande segurança no quesito contaminação quando feito em centros especializados no tratamento dessas patologias.

Palavras-chave
- sarcoma de Ewing
- osteossarcoma
- biópsia

* Work developed at the Departament of Ortopedics and Traumatology, Universidade Federal de São Paulo, São Paulo, SP, Brazil.

received
August 11, 2017
accepted
September 5, 2017
published online
January 6, 2018

DOI https://doi.org/10.1016/j.rbo.2017.09.006.
ISSN 0102-3616.

Introduction

Decades ago, some authors condemned surgical biopsies. They claimed that surgical biopsies could stimulate tumor growth, favor metastatic dissemination, form hematomas that contaminate the periphery of the lesion, cause infections at the surgical pathway, and prevent local radiotherapy.[1] Today, it is consensual that biopsy is an essential procedure to diagnose and stage neoplastic lesions; anatomopathological aspects determine the features of the disease and, therefore, the therapeutic approach to the neoplasm, whether it is benign or malignant. There are two basic types of biopsy: closed (percutaneous) biopsies, in which tissues are collected for diagnostic analysis through a small incision and the use of trephines or needles; and open biopsies, in which samples are collected through a careful surgical approach, either incisional (where only one lesion sample is obtained) or excisional (with total resection of the lesion).[2] The most common complications described in biopsies are infections, hemorrhage, and pathological fractures.[2,3] Tissues adjacent to the biopsy are assumed as potentially contaminated and, therefore, the pathway must be included in the final surgical incision.[4–8] Meanwhile, the biopsy must be planned by an experienced surgeon, who will perform the definitive surgical procedure,[2–4] in order to avoid accessing extracompartmental spaces, intermuscular planes (direct incision through muscles), neurovascular bundles, and joints. Without these precautions, the biopsy can have a negative impact on the survival of the patient and even prevent the preservation of the limb.[4] Despite the potential contamination of biopsy pathways, few papers debate this maxim and not much is known about its real incidence or other factors that can influence it.[7,9,10]

Material and Methods

This is a retrospective study based on the revision of anatomopathological reports from patients treated at the Orthopedic Oncology Sector of the Orthopedic and Traumatology Department of our institution. The present project was approved by the ethics committee under the number CAAE 70341717.0.0000.5505

The reports corresponded to the anatomopathological evaluation of the surgically resected part (local control of bone primary malignancy) and presented data regarding the biopsy pathway and the characteristics of the primary lesion. For this purpose, patients with reports informing gender, age, affected site, and characteristics of the local lesion (such as extension to soft parts and epiphyseal involvement), presence of metastasis at diagnosis, anatomopathological characteristics of the part after resection (tumor viability), anatomopathological characteristics of the resected metastasis (site and viability), and whether the biopsy pathway was involved or not were selected.

Results

We found anatomopathological reports of 148 patients that fulfilled the requirements for the present study; from these, 120 belonged to patients diagnosed with osteosarcoma (62 male, 58 female), and 28 to patients with Ewing sarcoma (18 male, 10 female), with a mean age of 15.6 and 14.1 years old, respectively (the mean age for bone malignancy was 15.3 years old).

From these patients, 137 were submitted to a percutaneous biopsy with a Jamshidi bone marrow biopsy needle between 8 and 9 G (which is the standard in our service). The remaining 11 patients were submitted to an open, incisional biopsy; no excisional open biopsy was performed.

Among the osteosarcoma patients, 12 had humeral lesions, 61 had femoral lesions (92% at the distal portion), 28 had tibial lesions, 6 had pelvic lesions, and 13 presented lesions in other less frequent bone regions. Among the Ewing sarcoma patients, four had humeral neoplasms, six had femoral lesions (five with diaphyseal involvement), three had tibial lesions, seven had fibular lesions, five had pelvic lesions, and three presented the disease in other bone regions.

Regarding the extension of the neoplasm (►**Table 1**), 109 patients with osteosarcoma presented with involvement of soft parts; from these, 74 had concurrent extension to the host bone epiphysis, and from the 11 patients with no extension to soft parts, 2 presented epiphyseal involvement and, in the remaining cases, the tumor was restricted to the metadiaphyseal region. Among the 28 patients with Ewing sarcoma, 15 had extension to soft parts and, from these, 3 presented concurrent epiphyseal involvement; of the 13 patients with no extension to soft parts, 5 presented epiphyseal involvement, and 8 cases were restricted to the metadiaphyseal region of the host bone.

Among the osteosarcoma patients, 69 presented an osteoblastic subtype (57.5%), 22 had a chondroblastic subtype (18.5%), 13 had mixed lesions, 7 had parosteal lesions, 5 had telangiectatic disease, and 4 presented other infrequent osteosarcoma subtypes.

Regarding the presence of metastasis at diagnosis, 21.6% of the osteosarcoma patients and 10.7% of the Ewing sarcoma patients already presented the systemic disease. The most common secondary site was the lung, corresponding to 58% of the metastases.

At the anatomopathological evaluation of the surgical part, according to the criteria by Huvos (►**Table 2**), 69.5% of the osteosarcoma patients and 48% the of Ewing sarcoma patients responded badly to chemotherapy.

Table 1 Enneking (1986)[11] staging of musculoskeletal neoplasms

Enneking classification	
Benign tumors	
B1	Latent benign
B2	Active benign
B3	Aggressive benign
Malignant tumors	
IA	Low-grade, intracompartmental, no metastases
IB	Low-grade, extracompartmental, no metastases
IIA	High-grade, intracompartmental, no metastases
IIB	High-grade, extracompartmental, no metastases
III	Any metastatic malignant neoplasm

Table 2 Huvos classification (1977),[12] tumor necrosis extension after chemotherapy

Huvos classification		
Grade I	No effect	Bad responder
Grade II	Partial response with > 50%	Bad responder
Grade III	> 90%	Good responder
Grade IV	100%, no viable tumor	Good responder

Regarding the biopsy pathway, only one patient had a neoplastic infiltration, which corresponded to the presence of malignant cells in the skin and in the subcutaneous region.

Discussion

Biopsy is an important procedure to diagnose bone lesions and, as such, it must be performed by a surgeon with expertise in the treatment of these neoplasms and/or in reference centers to minimize its known complications. A study showed that biopsies performed by other surgeons presented up to 18% of the diagnostic errors; 10% were improperly planned biopsies or yielded insufficient material; 9% had some skin, bone or soft parts complication; 10% influenced the course of the disease, and 3% resulted in unnecessary amputations.[4] Another study evaluating the difference between treatment centers and referring physicians/centers showed that the former presented 12% of the diagnostic errors, 3.5% of the improperly planned biopsies or of the biopsies that yielded insufficient material, and 3.5% of the alterations in the course of the disease; moreover, these results were statistically relevant.[3] In our service, the percutaneous biopsy with Jamshidi bone marrow biopsy needles is the gold standard; open biopsy procedures are indicated in lesions that do not allow a safe percutaneous approach, avoiding neurovascular bundles with no harm to the definite surgical access, or in those requiring a de novo procedure due to a diagnostic failure in the percutaneous approach; these findings are consistent with the current literature.[6] Regarding this issue, we presented 137 percutaneous approaches and 11 open approaches, but it was not possible to determine the reason for this approach.

Among the primary bone sarcomas, in the age group between childhood and early adulthood, the most common neoplasms were osteosarcomas, followed by Ewing sarcomas; the latter were mainly long bone lesions, especially in the knee region. The most frequent osteosarcoma subtype in the present study was the osteoblastic subtype, followed by the chondroblastic ones that, along with Ewing sarcoma, represented the largest niche of patients of the present study; these are high-grade neoplasms.[5]

Out of 148 malignant neoplasms, 84% presented lesion extension to soft parts (extracompartmental disease), and 92.5% were high-grade neoplasms in stages IIb or III according to the classification by Enneking[11] (►**Fig. 1**), showing aggressive neoplasms in advanced stages; 65.5% corresponded to bad responders to chemotherapy (grades I and

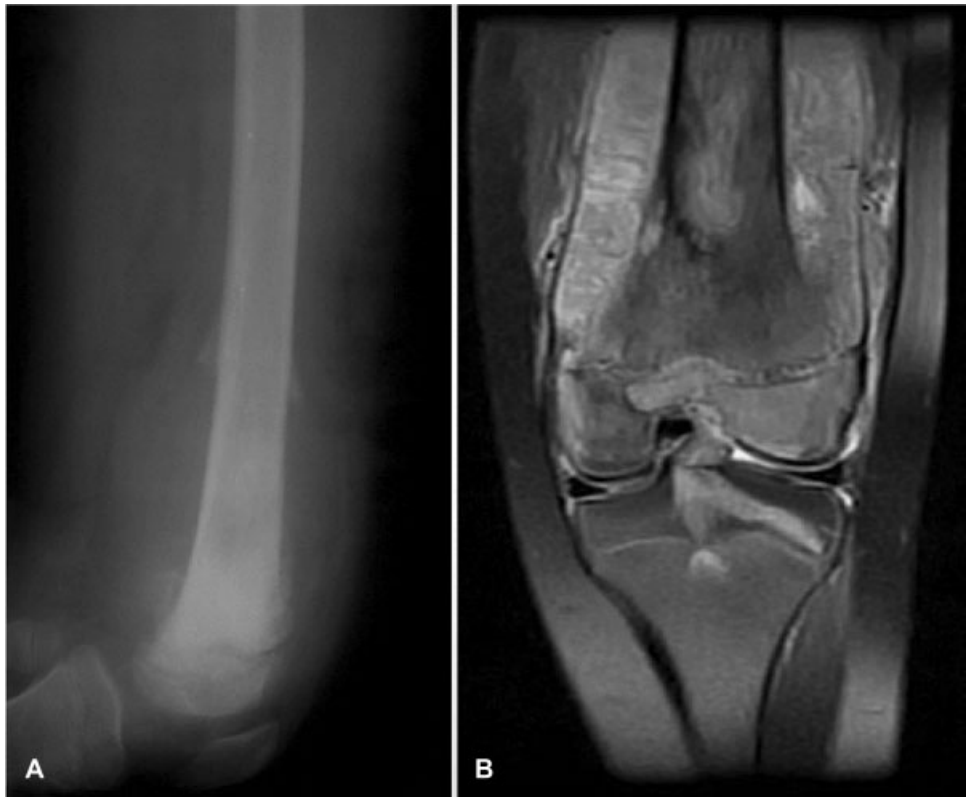

Fig. 1 Appearance of a patient diagnosed with osteosarcoma presenting in A) radiography showing an osteoblastic lesion, cortical rupture and soft parts extension; and B) disease spreading through the anterior cruciate ligament.

Table 3 Distribution of patients according to local disease extension and chemotherapy outcome

	Osteosarcoma	Ewing
Disease extension		
Intracompartmental	11	8
Extracompartmental	109	20
Huvos		
I	38	10
II	35	2
III	13	5
IV	19	8

II, according to the classification by Huvos), denoting a bad prognosis.[9,12] Meanwhile, Oliveira et al,[10] in their systematic review, report that none of the studies that analyzed the contamination of the biopsy paths evaluated the stage of the neoplasms (►**Table 3**). These authors also noted events known for their bad prognosis, such as pelvic neoplasms (12%), and extrapulmonary metastasis (skip, bone, central nervous system, soft parts, and cardiac metastases). One patient presented with involvement of soft parts with invasion of the subcutaneous tissue and the skin, but this contamination corresponded to the ulceration area due to the growth of the tumor, and not to the biopsy region.

Despite several bad prognosis data, we noted only one positive event regarding pathway contamination, and no factor determined or influenced the definition of this event. Mohana et al[13] and Barbosa Ribeiro et al[2] indicated up to 19.2% and 32% of contaminated pathways, respectively. Canon et al[14] demonstrated a lower local recurrence after pathway resection; however, Kaffenberger et al[15] and Saghieh et al[16] report that even the patients who were not submitted to biopsy pathway resection did not present with local recurrence.

Conclusion

Biopsy in primary bone sarcomas is a safe surgical procedure regarding contamination of the biopsy pathway if it is performed in a reference center by physicians with expertise in the treatment of these neoplasms.

However, our evaluation revealed some critical points:

1) We cannot reach the same conclusion when this procedure is not performed by an oncological orthopedist, since our sample space is restricted to our institution; 2) our number of evaluated patients is small, mainly due to the small incidence of these neoplasms and to the difficulty in finding complete medical records from older patients; 3) the number of open biopsies to statistically confront the percutaneous procedure is small; 4) the presence of a single positive event (contamination), preventing an analysis of the patient and/or of the features of the neoplasm that can influence its occurrence.

In summary, additional studies, with confluent methodologies and mostly multicentric (with a larger sample space and more realistic statistical evaluation), are required, since the main goal is to verify if pathway contamination is an unexceptional event and statistically relevant enough to be deemed a criterion to determine the surgical management of patients with primary bone sarcomas.

Conflicts of Interest
The authors have no conflicts of interest to declare

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