HISTOPATHOLOGICAL STUDY ON BIOPSY TRACK IN MALIGNANT MUSCULOSKELETAL TUMORS

MARCELO BARBOSA RIBEIRO, CLÁUDIA REGINA G.C.M. DE OLIVEIRA, RENÉE ZON FILIPPI, ANDRÉ MATHIAS BAPTISTA, MARCELO TADEU CAIERO, CARLOS FERNANDO SAITO, SÉRGIO ANTONIO BARBOSA DO NASCIMENTO, OLAVO PIRES DE CAMARGO

ABSTRACT

Objective: To investigate whether there is any risk of seeding by neoplasic cells along biopsy tracks and to study local histological abnormalities. Methods: This was a prospective study on biopsy tracks in patients who underwent operations due to malignant musculoskeletal tumors between April 2006 and April 2007. Results: Neoplasic cell implantation occurred in 32% of the tracks. The most common histological abnormalities in positive cases were classified as severe fibrosis, mild inflammatory component and severe neovascularization. Conclusion: We suggest that traditional oncological resection of the track should be carried out together with excision of the specimen.

Keywords: *Biopsy. Sarcoma. Bone neoplasm/disease. Soft tissue neoplasm/disease.*

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INTRODUCTION

Biopsy is an important step for staging, diagnosis and treatment of malignant musculoskeletal tumors. It must be performed in every case, since, with few exceptions, accurately determining lesion nature is impossible with other methods.[1]

Where to take material for biopsy on a patient is critical, in order to avoid proximity to neurovascular bundle, cross-sectional incisions, and/or proximity to limbs' extension and/or flexion mechanisms, since these will be later removed with the surgical piece. A preoperative planning must be made due to the importance of the procedure.[2]

A good biopsy technique is essential, because, if inaccurately made, a negative impact is noticed on patient's survival, sometimes preventing limb preservation. The decision on where and how to make a biopsy is crucial. It must be longitudinally done and at sites where wide resection is allowed together with tumor piece at the moment of a limb-preserving surgery.[3]

A biopsy inaccurately made may sometimes lead to limb amputation.[4,5]

There are two main biopsy types: closed (percutaneous) and open. Closed biopsy may be done with trephines or special needles, such as: Jamshidi, Ackermann e Tru-cut, among others. The open kind is performed through a small direct access port to tumor. It can be incisional, when a portion of tumor is removed, or excisional, when the whole tumor piece is removed.[6]

On soft parts sarcoma, local hemostasis should be carefully provided in order to avoid local and/ or systemic tumor dissemination.[7]

Some authors believe that musculoskeletal tumor biopsies should be performed by a surgeon experienced with orthopaedic oncology, since an inaccurate procedure may lead to amputation. It is also recommended that biopsies are made by the same surgeon who will make the resection, because he/ she is already familiar with its track.[8-12]

Major biopsy complications include: infection, hemorrhage, and fracture.[13]

OBJECTIVES

Assess the presence of neoplasic cells along biopsy tracks of patients with primary malignant musculoskeletal tumors.

Assess histological changes that might be associated to biopsy or to the presence of local neoplasia.

MATERIALS AND METHODS

A prospective descriptive study was conducted between April 2006 and April 2007, on biopsy track of patients with primary malignant musculoskeletal tumors.

All patients signed a free and informed consent term.

Twenty-five biopsy tracks of patients diagnosed with primary pelvic and apendicular skeletal sarcomas during the period mentioned above.

No patient had undergone radiotherapy prior to surgery.

Male gender showed prevalence, accounting for 80% of the cases.

Age ranged from 6 to 73 years old, with an average of 27.2 years, with the age group between 11 and 40 showing the highest prevalence of malignant neoplasia in this study.

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LIM 41 – Medical Investigation Laboratory for Musculoskeletal System, Department of Orthopaedics and Traumatology, HC/FMUSP

Study conducted at the Institute of Orthopaedics and Traumatology, FMUSP.
Correspondences to: *Rua Porto 1186, bloco Tulipas, Ap 103, Bairro Pio XII, Teresina - PI, Brazil, CEP 64019-900. E-mail:* **mbribeiro@hotmail.com/mbribeiro@usp.com**

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Bone tumors were studied in 72% of the cases (n = 18) while soft parts tumors in (n = 7) 28%. Osteoblastic osteosarcoma (48%) and synovial sarcoma were the most frequently diagnosed tumors (12%).

Most tumors were found on lower limbs (n = 16), with distal femoral segment being the most frequent site of these neoplasias.

Percutaneous biopsies with 4-mm trephines were made for bone and cartilaginous sarcomas, and with biopsy tweezers for soft parts tumors (e.g., Mathieu tweezers) with micro incisions.

For gross examination of the surgical specimen, the biopsy track including the epidermis, dermis, subcutaneous, as well as muscle fascia (if existent) was resected, the latter being the deepest plane. Then, longitudinal 2-mm sections were made at various levels, against biopsy scar. The material was sent to histological processing: fixation (10% formaldehyde), dehydration (96%-absolute alcohol), diaphanization (xylol) and paraffin baths. On the paraffin blocks, histological sections stained with hematoxylin and eosin were made, with histological analysis at various thickness levels on all slides. The following were assessed: presence of neoplastic cells, level of infiltration to skin layers for cases where neoplasia was present along the track, and histological changes, such as: fibrosis, neovascularization, and inflammatory component. They have been graded as mild, moderate or severe, according to histological changes grades. (Figure 1, Table 1)

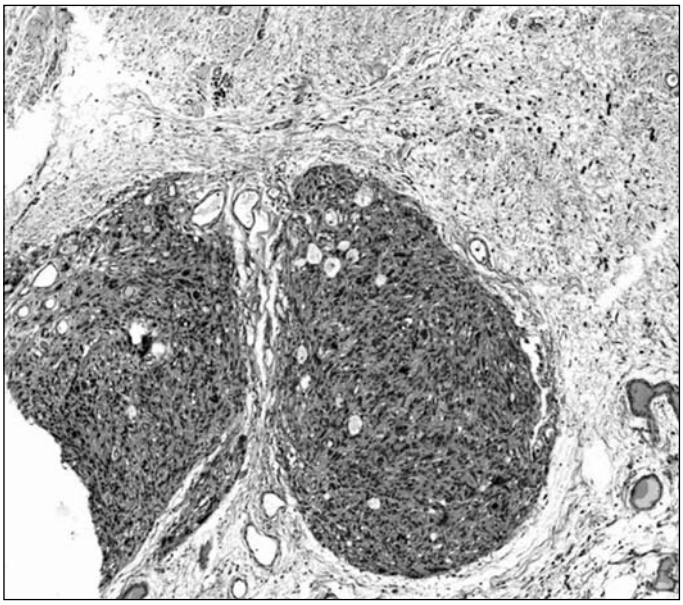

Figure 1 – *Microphotography Hematoxylin-Eosin (HE) 50X – Leiomyosarcoma. Track study showing the presence of neoplasic cells*

Table 1 – *Grades of histological changes*

Histological changes by 10 fields of 400X*	Grade		
	Mild	Moderate	Severe
Neovascularization (capillary)	< 10 vessels	10 - 25 vessels	> 25 vessels
Inflammatory Process	Focal infiltrate perivascular only	Focal infiltrate perivascular + intertistial	Diffuse infiltrate perivascular + intertistial
Fibrosis	Dermis only	Dermis + subcutaneous	Dermis + subcutaneous with collagenization

* HE stain.

RESULTS

In 32% (n = 8) of the cases, the track was seeded with neoplasic cells.

Histological changes most commonly seen on positive cases were classified as: severe fibrosis, mild inflammatory component, and severe neovascularization.

Concerning overall histological changes, neovascularization was severe for 56% of the cases, inflammatory component was mild for 68% of the assessed tracks, while fibrosis was severe for 68%. (Table 2)

On soft parts sarcoma, seeding was found in 57.1% of the cases, while in bone and cartilaginous neoplasia, seeding occurred in 22.2%.

The inflammatory component was mild in 87.5% of positive cases, while neovascularization was severe in 75% of those tracks. (Table 2)

Table 2 – *Histological grade and result of the track study.**

Histological change	Histological grade		
	Mild	Moderate	Severe
Inflammatory component	Positive = 7 (28%) Negative = 10 (40%)	Positive = 1 (4%) Negative = 5 (20%)	Positive = --- Negative =2 (8%)
Neovascularization	Positive = 2 (8%) Negative = 7 (28%)	Positive = --- Negative = 3 (12%)	Positive = 6 (24%) Negative = 7 (28%)
Fibrosis	Positive = --- Negative = ---	Positive = 7 (28%) Negative = 1 (4%)	Positive = 1 (4%) Negative = 16 (64%)

*Positive = presence of neoplasic cells. Negative = absence of neoplasic cells.

Fibrosis was severe in 83.3% of bone sarcomas, and in 28.6% of soft parts tumors.

Fibrosis was severe in 94.1% of negative tracks and in 5.9% of positive cases.

In most of the positive cases (62.5%), infiltration occurred at subcutaneous and dermis levels.

DISCUSSION

Concerning sex, gender, age group and site of tumors on the body, the results of this study are consistent with literature.[4,5]

When biopsy tracks are targeted for study, one of the main questions of many researchers is "is it possible to find, at subcutaneous level, the place along which a biopsy track instrument crossed?" For answering this question, we use local histological changes, since it is aggressive to the tissue, and so, feasible to make. Without these changes, it would be harder to find the exact place to study.

The level of tumor infiltration was necessary to confirm is positive cases were implants as a result of biopsy or if they could be tumors that infiltrated through the path formed on muscle fascia resulting into false positive. As in positive cases the tumor implant was not contiguous to tumor or was found on dermis and/ or subcutaneous level, this allowed us to conclude that these were cells left by biopsy, and not as a result of tumor invading the path formed on muscle fascia.

We found that of the eight cases regarded as positive, implant occurred mainly on the dermis and subcutaneous level, without continuation and/ or proximity to fascia, which could result in false positive cases.

There were a larger number of positive cases among soft part sarcomas. It might be suggested that the stronger cellularity and the lower amount of matrix - characteristic of those tumors - would be related to cell dissemination, while the opposite is seen in bone tumors, where a larger amount of matrix would allow for cell dilution and less contamination.

Mild inflammatory component and severe neovascularization were more frequently found on positive tracks, suggesting that immune (inflammatory) response and angiogenesis may play an important role on neoplasic dissemination.

When performing biopsies of bone tissues, a stronger local aggression results from sample collection, which may be associated to a stronger tissue response of fibrosis found in these cases.

Schwartz and Spengler[6] reported tumor implant on biopsy tracks of three patients, and finish their article stating that track must always be removed, even if the biopsy is percutaneously made. They also criticize the poor literature addressing the topic. There are few articles on biopsy tracks, and wide resection together with the surgical piece must be done.

Pollock and Stalley[7] warn about the risks of not removing biopsy tracks on patients submitted to biopsy with thin needles, where biopsy scar cannot be found at surgery. We agree with the authors according to the results of the present study, although it has not been made with thin needles.

Ginald[8] reported a case where tumor cells were seeded on biopsy track of a 74 year-old male patient with non-Hodgkin lymphoma at the iliac crest.

Stoker et al.[9] assessed the effectiveness of biopsies made with 2-mm Jamshidi needle in 208 procedures performed within a 2-year period. They described the benefits of this kind of biopsy and its complications, such as infection and fractures; They indicate track removal at final surgery.

Davies and Livesley[10] reported the case of an 18 year-old adolescent operated for osteosarcoma of the distal femur, who, after neo-adjuvant chemotherapy, resection with replacement by endoprosthesis, showed recurrence on biopsy track 18 months after surgery, evidencing the risk of tumor recurrence should the track remains on the patient.

From July 1994 to February 2000, Chojniak et al[11] retrospectively studied 1,300 biopsies carried out at Hospital do Câncer A. C. Camargo in São Paulo - SP. They found tumor implant on the biopsy track of a renal cell carcinoma patient with local progression, showing that even when biopsies are made based on tomography studies and using special needles, the risk of tumor implant still exists.

De Santos et al[12] describe the principles of percutaneous biopsy with needles, mentioning several surgical instrument models, access ports to the key complications on this kind of biopsy. Some clinical cases are reported. Concerning the potential to track contamination, they state that this is not clinically significant.

In an editorial article, Enneking[13] introduced the main concepts on musculoskeletal tumor biopsies and adding further details. He mentions the risk of inadvertent contamination of the biopsy track and surrounding tissues, but there is no detailed study on biopsy tracks.

Gonçalves et al.[14] studied 17 biopsy tracks of osteosarcoma patients and correlate them with the degree of tumor necrosis after neoadjuvant chemotherapy. In all cases, no tumor cell implant was found regardless of the degree of necrosis. In our series, the results are inconsistent with that study's, despite our further diversified sample.

The histological study of biopsy tracks is feasible, provided histological criteria are determined, and may be reproduced in future studies.

CONCLUSIONS

The histopathological study of biopsy tracks showed a high percentage (32%) of contamination by neoplasic cells, suggesting that track should be resected together with the surgical piece.

The findings on histological changes are important to locate, at subcutaneous level, where the biopsy instrument has passed, and the level of tumor infiltration enabled us to state that positive cases were no false-positive results.

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