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Research Article

Do we always need to resect the Percutaneous Biopsy Tract to perform a Limb Salvage Surgery for Sarcomas?

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Abstract

Background and objectives: Resection of the biopsy track is a standardized procedure in musculoskeletal oncology, but there is no specific literature regarding the incidence of local recurrence and prognosis after resection or not of the biopsy tract when performing percutaneous biopsy. The aim of our study is to detect which factors determine the development of local recurrences, especially those related to the biopsy tract resection.

Methods: We conducted an observational study with a retrospective analysis from prospectively collected data. The study included 121 patients (123 sarcomas from which 49 were bone sarcomas and 74 were soft tissue sarcomas) diagnosed after percutaneous biopsy and treated in our center from 2006 to 2012. We analyzed different factors that could influence on relapses such as biopsy track resection, histology and grade, margins and adjuvant treatments. We performed a multivariate analysis to detect the independent factors that affect the local recurrence rate. The minimum follow-up was two years.

Results: In our series, local relapses are affected exclusively by margin status (p=0.003) and histological diagnosis (p=0.012). These factors are independent from other variables such as adjuvant therapy or resection or not of the biopsy tract (p=0.999).

Conclusions: Obtaining adequate margins is the most single important factor for local recurrence or local recurrence free survival. We could not demonstrate statistically significant differences in patients in whom the resection of the biopsy tract was not performed.

VINTRODUCTION

It is commonly accepted that biopsy is a key step in the diagnosis of sarcomas since an incorrectly performed biopsy may affect prognosis [1,2]. The guidelines define general rules to perform the biopsy and resection of the biopsy track when performing definitive surgery [3,4,5]. Nevertheless, those professionals who are not used to deal with the sarcomas may perform biopsies incorrectly and consequently compromise the biopsy track resection in the definitive oncological surgical treatment. Therefore, nowadays, it is strongly recommended to refer the patients to a specialized multidisciplinary center before the histological diagnosis is made. Percutaneous core-needle biopsy of bone and soft tissue tumors has proven to be as effective as open incisional biopsy and it has fewer complications and lower costs [6,7]. The local recurrences may be located in the percutaneous biopsy path; however, the series reported in literature are scarce [8,9]. In our clinical practice, we found some situations where the percutaneous biopsy track was not resected. In those two special situations the percutaneous biopsy track was not resected in definitive limb sparing surgery. We studied the oncologic local prognosis of the patients treated in our center, specifically in relation with the resection or not of the

percutaneous biopsy track. Furthermore, we analyzed different factors that might influence on local relapses such as histological grade, histological type, number of biopsies, margin status, location, neo- or adjuvant therapy and hospital were biopsies were taken.

MATERIALS AND METHODS

We describe an observational study, where we conduct a retrospective analysis from prospectively collected data from 2006 to 2012. One hundred and twenty five sarcomas were diagnosed exclusively by a percutaneous core needle biopsy and subsequently treated during this period in our center. Two patients were lost to follow up. Minimum follow up time was two years (range 24-94 months).

We included 73 sarcomas in male and 50 in female patients. The median age of the patients was 49 years (range 12-86 years). 49 patients were bone sarcomas and 74 were soft tissue sarcomas. Baseline characteristics of the series are shown in (Table 1). The stage was made according to the Enneking and AJCC 2010 classification for bone sarcomas and soft tissue sarcomas respectively [10]. Other centers performed 22 out of the 125 biopsies, the rest of them were at our center; we could not find a statistically significant difference in the time from biopsy to surgery between these two groups (mean 3,58 months +/- 6,177 SD). The orthopedic oncology team resected 104 of the biopsy tracks together with the main tumor following the rules for oncologic limb sparing surgery whereas 19 biopsy tracks were not resected because of different situations. Sometimes, after a percutaneous biopsy had been performed, mainly when the patients are referred from other centers, we were not able to find reliably the biopsy track. Even when we could identify the superficial scar it was difficult to know the true deep tridimensional shape. In other patients, the biopsies were performed far away from the surgical approach or even through the neurovascular bundle and they would have required an amputation to resect the biopsy track. In this second case, after discussing the problem with the patient, some of them refused to be amputated. In those special cases the percutaneous biopsy track was not resected in definitive limb sparing surgery. All patients were aware of the procedure, the details of the surgery (specially the biopsy track resection or not) and the potential risks. All patients gave consent for the data collection.

The consultant musculoskeletal radiologist (DB), with more than ten years of experience in musculoskeletal radiology performed all the biopsies in our center (first biopsy in new cases or second biopsy if needed in the cases that are referred). Bone biopsies were performed in most cases under computed tomography (CT) guidance but, in some cases where cortical breakout was present, ultrasound (US) guidance was employed. For soft-tissue malignancies US guidance was employed in most cases. Local anesthetic (bupivacaine or lidocaine) was used to infiltrate the entire needle pathway, from skin to tumor. In bone biopsies, an extra 3-4ml of bupivacaine was used to infiltrate the periosteal layer. The vast majority of soft-tissue biopsies were performed using a coaxial technique, i.e., inserting a sheath to the edge of the lesion or just inside the lesion and then advancing a cutting needle through the sheath into the lesion to obtain the biopsy samples. From 2006 to 2010 a TruCore-II™ (Argon Medical Devices, Texas, USA) was used; after 2010 we use the Speedy Bell™ (Biopsy Bell, Mirandola, Italy) needle. Bone biopsy was performed using a T-Lok™ (Argon Medical Devices, Texas, USA) or a Bonopty™ (Apriomed, Uppsala, Sweden) coaxial needle. The consultant radiologist (DB) determines the needle gauge, the number of acquired samples and the dressing type. The samples were placed in a 10% formalin solution and hand-delivered to the pathology unit for analysis. The same oncologic orthopedic team (EJOC, IBR, JSM) performed the oncological surgery as well as the biopsy track resections. The patient was prepared and the best position was selected for each procedure. The biopsy was drawn on the skin before the patient was draped.

Table 1: Population Baseline characteristics.

Sarcoma location	
Upper limbs	21,95%
Lower limbs	66,66%
Axial	2,43%
Extra compartmental	8,94%
Bone sarcoma Enneking	39.9%
IA	14,54%
IB	23,63%
IIA	7,27%
IIB	52,72%
III	1,81%
Soft tissue sarcoma AJCC	60,1%
IA	1,47%
IB	13,23%
IIA	8,82%
IIB	16,17%
III	51,47%
IV	8,82%
Histological grade	
Grade 1	8,94%
Grade 2	23,57%
Grade 3	64,22%
Grade 4	3,25%
Histological Diagnosis	
Osteosarcoma	21,13%
Chondrosarcoma	18,70%
Ewing sarcoma	4,88%
UPS[1]	17,88%
Liposarcoma	17,03%
Leyomiosarcoma	7,31%
Synovial sarcoma	3,25%
Fibrosarcoma	3,25%
MPNST[2]	2,44%
Others[3]	4,06%
Biopsy center	
Our center	82,11%
Others	17.88%
Number of percutaneous biopsies	
1	82,92%
2	13,82%
3 or more	3,25%
Biopsy tract resection	
YES	**84,55% (104)**
NO	**15,44% (19)**

[1]Undifferenciated pleomorphic sarcoma
[2]Malignant peripheral nerve sheat tumor
[3]Soft tissue sarcoma: Alveolar sarcoma, mioepithelial sarcoma, clear cell sarcoma, Epitheliod Hemangioendothelioma.

The track was resected following the most direct path line to the tumor, taking care to resect all the fibrous tissue surrounding the theoretical biopsy path. The resected tracks were sent and reviewed by a senior consultant pathologist to study the local seeding of tumoral cells (Figure 1). Regarding surgical margins, all surgeries were performed following the oncological surgery principles. Factors concerning the surgical and medical treatment are recorded in (Table 2). The wide resection was noted (R0 margins) when the margin is free of microscopic disease in the final specimen. We consider that a margin is free of microscopic disease when there is at least 1 cm of tissue from the closer margin to the pseudocapsule in soft tissue sarcoma or 2 cm of non-affected bone from the margin to the tumor in bone sarcoma. Radiotherapy and chemotherapy were used according to the decision in multidisciplinary meeting that was discussed for each patient and based in actual guidelines. The biopsy track reception was not a factor that we consider for the adyuvant or neoadyuvant therapies.

Routine follow up consists of a local image test with Magnetic resonance images (MRI) or ultrasonography, and a systemic follow-up test with chest-CT every three months for 2 years, every six months for second to fifth year and annually for 5 additional years. We noted any local event or complication appearing during the follow-up. We analyzed the time to the local recurrence appearance to determine the survival free time of local event. For our statistical analysis we used SAS 9.3 (SAS Institute, Cary, NC, USA). We performed a multivariate analysis with Kaplan Meier method to assess the incidence of local relapses for different factors and a Cox regression model to analyze the influence on the time to local recurrence of each factor. Statistical significance was accepted for p values of < 0.05.

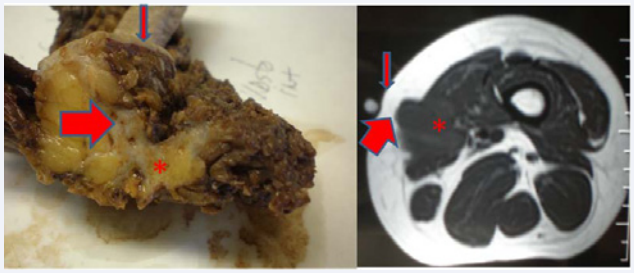

Figure 1 Local recurrence: MRI and macroscopic piece, Asterisk: Local Recurrence, Thick arrow: Contamination of the biopsy track, Thin arrow: Skin.

Table 2: Surgical, neo-adjuvant and adjuvant treatments.

MARGINS	
Wide resection R0	83,73%
Marginal resection R1	15,44%
Radical resection	0.81%
NEO-ADJUVANT	
Chemotherapy	27,64%
Radiotherapy	8,94%
NO	59,34%
Both	4,06%
ADJUVANT	
Chemotherapy	30,08%
Radiotherapy	17.88%
NO	41,46%
Both	9,75%

RESULTS

The local recurrences are affected exclusively by margin status (p=0.003). There is a trend in high-grade sarcomas to a higher local recurrence rate but it does not reach statistical significance. This is shown in (Table 3). Patients without biopsy track resection had 5 local recurrences (26,3%) and patients with biopsy track resection had 18 cases of local recurrence (17,3%). The difference between the two groups was not statistically significant (p=0,999). Furthermore, the local recurrence free survival time was not statistically significant between patients with and without biopsy track resection, with the mean local recurrence free survival was 100,87 ± 12,8 months (95% Confidence Interval: 75.7-125,9) for patients were biopsy track were resected and 74,23 ± 11,61 months (95% Confidence Interval: 51,4-96,9) for patients without resection of the biopsy track (p=0,99) (Figure 2).

We also noted the location of the local recurrence, understanding that local recurrences located in the deep tissues are probably not related to the biopsy track. In patients where the biopsy track was not resected, 1 out of 5 local recurrences were located next to the previous biopsy track. In patients where biopsy tracks were resected according to oncologic rules, 4 out to 19 local recurrences were located near the previously resected biopsy.

DISCUSSION

Percutaneous biopsy has proven to be as effective as incisional biopsy and in turn more efficient [6,7]. The diagnostic yield of image guided core needle biopsy has been reported to be up to 97% for musculoskeletal tumors, and complications resulting from needle biopsies occurs at rates ranging from 0 to 1,1% [11,12]. In our center, we usually perform percutaneous biopsy for the diagnosis of musculoskeletal tumors, even if more than a single procedure is needed. We did not find a statistical significant increased rate of local recurrence and survival without relapses in the cases with percutaneous core needle biopsy left after the oncological surgery. In our series, exclusively margin status and histological diagnosis type are associated with relapse. Histological grade is also associated with higher rates of local recurrence in some series but we cannot assert it in the present study. The higher rates of local recurrences in our cases with adjuvant therapies, although not statistically significant, could be due to a selection bias; the cases that received neoadjuvant therapies were the big tumors in which the surgery with wide margins was not possible at first and adjuvant therapies were necessary to perform a limb sparing surgery. We could also detect that adjuvant therapies were also more frequent in the patients who have worse prognosis. Nevertheless, a specifically designed article should be conducted to clarify the influence of adjuvant therapies. These results are consistent with other author's findings. Saghieh et al. [13], reported that limb-salvage operations could be performed safely using standard approaches without the need for percutaneous biopsy track excision in pediatric population, as the incidence of tumor cell seeding was believed to be low. However, this study included only 10 cases. Binitie et

al. [14], did not find an increased rate of local recurrence in soft tissue sarcoma treated with adjuvant therapies without resection of the biopsy track. Several reports have recommended resecting the biopsy track to decrease the incidence of tumor relapse on the needle track [15-18] but they are mainly case report studies.

Our local recurrence rate in the retained biopsy tract was 26,3% (5/19) and in the resected biopsy tract this was 17,3% (18/104). These local recurrence rates are considered high for both bone and soft tissue sarcomas. One of the factors influencing our results might be the fact that many of these patients are referred from other institutions and therefore the time until percutaneous diagnosis is usually long, and may determine a bigger tumor size. Moreover, in our country, there is no formal patient referral pathway. As a consequence, the cases that are finally referred are usually the ones with worst prognosis. Some authors propose different techniques in order to eliminate possible tumoral remains. Li et al. [19], have used an Adriamicin loaded gelatin sponge to decrease local relapse along biopsy tracks, and Wiksell et al. [20], reported that no tumor cells were found in needle tracks after treatment with radiofrequency pulses.

Wilkinson et al. [21], studied 90 retroperitoneal sarcomas diagnosed by core needle biopsy. They did not resect the biopsy track in definitive surgery and they could not find local recurrence in any track or any different survival rate in these patients. In our opinion the fact that retaining the biopsy track does not increase the local recurrence in this series can be explained because (1) percutaneous biopsy track has a low probability of tumor cell seeding and (2) because the surgeon rarely is able to resect completely the biopsy path. In our hands, complete resection of the tridimensional tract is rarely achieved, even when we believe that we have removed it completely. We find that the position of the limb during the procedure of the biopsy may influence the definitive track. Also, entry angle and the number of cylinders that are taken can also change the shape of the tissue to resect. The surgeon has only a reference on the superficial scar, so some portion of the biopsy track remains in the patient even if the purpose is a entire resection. In our study we analyzed how many recurrences were located next to the previous biopsy track to distinguish them from the relapses related to causes other than the biopsy. We did not find any difference in the recurrence next to the track between the group with resected biopsy tracks and the patients that did not have a biopsy track resection. This study

Table 3: Cox regression model analysis of variables in the study and the time to local recurrences (OR: ODDS RATIO confidence interval 95%. Asterisk: Reference Group. Bold: Significant factors).

VARIABLE	LOCAL RECURRENCE	STATISTICAL SIGNIFICANCE	OR (95% CI)
TRACT RESECTED			
YES	17.3%	P=0.999	
NO	26.3%		
GRADE			
Grade 1	7.69%	P=0.333	
Grade 2	16.6%	P=0.524	
Grade 3	22.7%	P=0.177	
Grade 4	25%	P=0.285	
Number of biopsies			
1	18.81%		
2	22.22%	P=0.638	
3 or more	25%		
MARGINS			
MARGINAL (MR) *	41.66%	**P=o,oo1**	
WIDE (WR)	13.86%	**P=0.001**	**WR Diminish RISK**
IL	1/1	**P=0.003**	**3,513 (1,536-8,034)**
NEOADJUVANT TREATMENT			
NO*	16,43%	p= 0,482	
RT + QT	40%	p= 0,166	2.882 (0.644-12.902)
QT	20,58%	p= 0,977	1,013 (0,403-2,548)
RT	27,27%	p= 0,404	1,712 (0.484- 6.056)
ADJUVANT TREATMENT			
NO*	19,60%	P=0,237	
RT + QT	41,66%	P=0,176	2,117 (0,715- 6,265)
QT	21,62%	P=0,969	0,982 (0,387-2,489)
RT	4,54%	P=0,250	0,409 (0,891-0,874)
LOCATION			
Upper limbs	19,23%	P=,913	
Lower limbs	20,00%	P=,468	1,451 ,531 3,966
Extracompart	22,22%	P=,724	1,347 ,257 7,052
Axial	0%	P= ,981	0
BIOPSY HOSPITAL			
Our center*	18,81%	P=0,619	
Referal hospital	21,03%	P=0,516	1,430 (0,486-4,211)
Both	33,33%	P=0,430	2,253(0,30016,912)

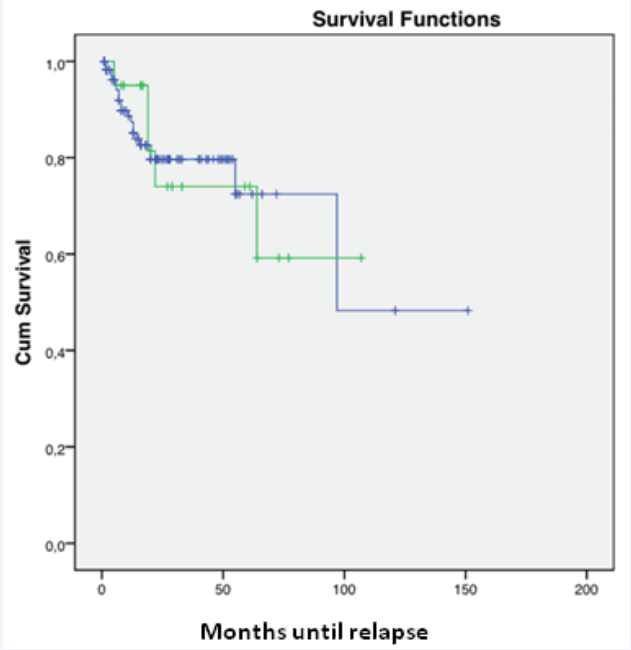

Figure 2 Kaplan Meier survival analysis until the development of local relapses. Blue: Resected tracks. Green: Not resected tracks.

has some limitations. First, this is a retrospective observational study. Second, the study population without resection of the biopsy path is not elevated because the conventional resection of the biopsy track together with the tumor is generally planned in the definitive surgery, this can affect the power of the study to detect differences. However, to our knowledge, our study has the largest series in literature of patients with retained core needle biopsy track of sarcomas in extremities or trunk comparing with those treated with conventional biopsy path resection. Third, we have analyzed together different histological types of sarcomas. Bone tumors and soft tissue tumors have been analyzed together, due to the rarity of the situation in which the biopsy track was not resected in definitive surgery in an attempt to get enough number of patents in two groups.

CONCLUSIONS

The data in this study suggest that percutaneous core needle biopsy track may be left unresected in selected cases without an increase in local recurrence risk. These situations have to be managed by many centers in the daily practice. In our hands the most important point to diminish the local recurrence is the correctly performed percutaneous biopsy and an oncological surgery with wide margins.

Multicenter studies with larger numbers of patients and more homogeneous groups are necessary to achieve greater statistical value and to achieve more reliable data that can help to clarify this question. This study aims to be a starting point to propose prospective randomized studies in this field.

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REFERENCES

1. Mankin HJ, Lange TA, Spanier SS. The hazards of biopsy in patients with malignant primary bone and soft-tissue tumors. J Bone Joint Surg Am. 1982; 64: 1121-1127.
2. Mankin HJ, Mankin CJ, Simon MA. The hazards of the biopsy, revisited. Members of the Musculoskeletal Tumor Society. J Bone Joint Surg Am. 1996; 78: 656-663.
3. Campanacci M. Bone and Soft Tissue Tumors: Clinical Features, Imaging, Pathology and Treatment. Picnic Nuova Libraria, Padova. 2nd Edition. 1999. Springer-Verlag Wien. New York.
4. Malawer MM, Sugarbaker PH. Musculoskeletal Cancer Surgery Treatment of Sarcomas and Allied Diseases. Kluwer Academic Publishers. 2001.
5. Liu PT, Valadez SD, Chivers FS, Roberts CC, Beauchamp CP, et al. Anatomically based guidelines for core needle biopsy of bone tumors: implications for limb-sparing surgery. Radiographics. 2007; 27: 189-205.
6. Welker JA, Henshaw RM, Jelinek J, Shmookler BM, Malawer MM. The percutaneous needle biopsy is safe and recommended in the diagnosis of musculoskeletal masses. Cancer. 2000; 89: 2677-2686.
7. Skrzynski MC, Biermann JS, Montag A, Simon MA. Diagnostic accuracy and charge-savings of outpatient core needle biopsy compared with open biopsy of musculoskeletal tumors. J Bone Joint Surg Am. 1996; 78: 644-649.
8. Schwartz HS, Spengler DM. Needle tract recurrences after closed biopsy for sarcoma: three cases and review of the literature. Ann Surg Oncol. 1997; 4: 228-236.
9. Davies NM, Livesley PJ, Cannon SR. Recurrence of an osteosarcoma in a needle biopsy track. J Bone Joint Surg Br. 1993; 75: 977-978.
10. Edge SB, Byrd DR, Compton CC, Fritz AG, Greene F, Trotti A, et al. AJCC cancer staging manual (7th ed). New York, NY: Springer; 2010.
11. Sung KS, Seo SW, Shon MS. The diagnostic value of needle biopsy for musculoskeletal lesions. Int Orthop. 2009; 33: 1701-1706.
12. Pohlig F, Kirchhoff C, Lenze U, Schauwecker J, Burgkart R, Rechl H, et al. Percutaneous core needle biopsy versus open biopsy in diagnostics of bone and soft tissue sarcoma: a retrospective study. Eur J Med Res. 2012; 17: 29.
13. Saghieh S, Masrouha KZ, Musallam KM, Mahfouz R, Abboud M, Khoury NJ, et al. The risk of local recurrence along the core-needle biopsy tract in patients with bone sarcomas. Iowa Orthop J. 2010; 30: 80-83.
14. Binitie O, Tejiram S, Conway S, Cheong D, Temple HT, Letson GD, et al. Adult soft tissue sarcoma local recurrence after adjuvant treatment without resection of core needle biopsy tract. Clin Orthop Relat Res. 2013; 471: 891-898.
15. Huang AJ, Kattapuram S. Musculoskeletal neoplasms: biopsy and intervention. Radiol Clin North Am. 2011; 49: 1287-1305.
16. Carmine Z, Umberto P, Fabio E. Biopsy can determinate tumoral track contamination: a case report of chondrosarcoma. Eur J Radiol. Extra 2009; 72: 79-81.
17. Iemsawatdikul K, Gooding CA, Twomey EL, Kim GE, Goldsby RE, Cohen I, et al. Seeding of osteosarcoma in the biopsy tract of a patient with multifocal osteosarcoma. Pediatr Radiol. 2005; 35: 717-721.
18. Robertson EG, Baxter G. Tumour seeding following percutaneous needle biopsy: the real story! Clin Radiol. 2011; 66: 1007-1014.

19. Li ZF, Li JM, Yan J, Yang ZP, Li X, Yang Q, et al. Prevention of contamination by biopsy needle track contamination using a novel adriamycin-loaded gelatin sponge. World J Surg Oncol. 2013; 11:169.

20. Wiksell H, Schässburger KU, Janicijevic M, Leifland K, Löfgren L, Rotstein S, et al. Prevention of tumour cell dissemination in diagnostic needle procedures. Br J Cancer. 2010; 103: 1706-1709.

21. Wilkinson MJ, Martin JL, Khan AA, Hayes AJ, Thomas JM, Strauss DC, et al. Percutaneous core needle biopsy in retroperitoneal sarcomas does not influence local recurrence or overall survival. Ann Surg Oncol. 2015; 22: 853-858.

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