Comparison of the histopathological results of the radioguided percutaneous microbiopsies and the operative specimens of soft tissue tumors of limbs, trunk and retroperitoneum

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Summary

Introduction > Suspicious lesions of sarcoma require preoperative biopsies. If surgical biopsies remain the gold standard, radioguided percutaneous microbiopsies are gaining an increasing importance. The purpose of this study was to compare histopathological results of percutaneous biopsies of soft tissues, trunk and retroperitoneal tumors with the histopathological results of operative specimens.

Methods > This is a retrospective study including 84 patients treated in our institution. The concordance between the results of the microbiopsy and the operative specimen for the benign–malignant differentiation and the histological type was evaluated. The microbiopsy accuracy was calculated. The sensitivity and the specificity of the microbiopsies compared to the operative specimen were also evaluated for the benign–malignant differentiation.

Results > The concordance was 0.92 [0.79–1] for the benign–malignant differentiation, 0.97 [0.92–1] for the histological type. The accuracy of microbiopsies was therefore 96% (sensibility = 97.0%; specificity = 94.1%) for the benign–malignant detection and 97.8% for the histological type.
Conclusion > Percutaneous microbiopsies play an important part in the diagnosis of soft tissue tumors of the limbs, trunk and retroperitoneum, in particular as a replacement to more invasive surgical biopsies. This study evidences the increasing importance of the collaboration between radiologist, surgeon and pathologist in the diagnosis of sarcoma.

Résumé

Comparaison des résultats histologiques des microbiopsies percutanées radioguidées et des pièces opératoires des lésions des parties molles des membres, du tronc et rétropéritonéales

Introduction > Les lésions suspectes de sarcome nécessitent des biopsies avant la chirurgie. Si les biopsies chirurgicales restent le gold standard, les biopsies radioguidées percutanées sont de plus en plus utilisées. Le but de cette étude est de comparer les résultats histologiques des microbiopsies percutanées des lésions des parties molles des membres, du tronc et rétropéritonéales avec ceux des pièces opératoires.

Méthodes > Il s’agit d’une étude rétrospective incluant 84 patients traités dans notre établissement. La concordance entre les résultats des microbiopsies et des pièces opératoires pour la distinction bénin-malin et pour le type histologique a été évaluée. L’efficacité diagnostique a été calculée. La sensibilité et la spécificité des microbiopsies comparées à celles des pièces opératoires ont également été évaluées pour la distinction bénin-malin.

Résultats > La concordance était de 0,92 [0,79–1] pour la distinction bénin-malin et 0,97 [0,92–1] pour le type histologique. L’efficacité diagnostique était de 96 % (sensibilité = 97 % ; spécificité = 94,1 %) pour la distinction bénin-malin et 97,8 % pour le type histologique.

Conclusion > Les microbiopsies percutanées jouent un rôle important dans le diagnostic des lésions des parties molles des membres, du tronc et rétropéritonéales, en particulier en remplacement des biopsies chirurgicales plus invasives. Cette étude a mis en évidence la nécessité de plus en plus importante de la collaboration entre radiologue, chirurgien et pathologiste dans le diagnostic de sarcome.

Soft tissue sarcomas are rare cancers [1–6] that sometimes appear falsely benign. Their diagnostic and therapeutic strategy is complex. The treatment is based mainly on surgery and radiotherapy [1,7,8]. A preoperative imaging is necessary [4,9]. The quality of initial care determines prognosis since tumor control is closely related to the first surgical gesture [1,10,11]. Historically, the biopsies of these tumors were surgical [12] and they remain the gold standard [13]. They tend more and more often to be replaced by less invasive radioguided percutaneous microbiopsies [14] that yield fewer complications [13] and they are now proposed in 2nd intention after failure of percutaneous microbiopsies. The cost of percutaneous microbiopsies is lower, they are less time-consuming and there is a lesser risk of tumor dissemination, infections and/or wound breakdown [13]. The microbiopsies route is discussed with the surgeon who will perform the resection in case of suspicion of sarcoma in order not to compromise the later resection (generally from bottom up in the limb axis). They are performed under radiological control in order to sample the most representative tissue zones of the tumor and to avoid sampling only necrosis using a coaxial big caliber needle [16 Gauges (G) or 14 G] [15] by taking several samples through the same orifice. The biopsy must be carried out in specialized referral centers to reduce the risk of misdiagnosis, non-representative biopsies, related complications and overall consequent changes in treatment and prognosis [14]. We compared the histopathological results of radioguided percutaneous biopsies of soft tissue tumors of the limbs, trunk and retroperitoneum with the histopathological results of the corresponding operative specimens and to validate their interest as a replacement to surgical biopsies.

Methods

All patients who underwent radioguided percutaneous biopsies of soft tissue tumors of the limbs, trunk and retroperitoneum between June 2011 and August 2014 in our institution were analyzed retrospectively. The study protocol was approved by the French Data Protection Authority ("Commission Nationale de l’Informatique et des Libertés") on January 2014. This study included patients treated consecutively for a soft tissue lesion of the limbs, trunk or extrarenal retroperitoneum by consulting
our Information Technology database. All the cases were discussed in a multidisciplinary sarcoma board to validate the necessity of a radioguided percutaneous biopsy and to discuss the surgical approach in agreement with the surgeon treating the patient. Microbiopsies were performed with ultrasound or CT guidance under local anesthesia. The calibers of needles ranged from 11 to 18 G with a coaxial system to avoid tumors spreading. At least 4 samples were performed (except per-procedural problem): two fixed in formaldehyde and the two fresh ones delivered immediately to the laboratory and generally frozen. The histological analysis was carried out in our pathology laboratory with molecular biology (MDM2 amplification for example). All cases were discussed in a multidisciplinary sarcoma board after the results of the microbiopsies to validate concordance with imaging.

The comparison concerned the distinction benign–malignant, the histological type and the histological rank when available or applicable.

**Statistical analysis**

The qualitative parameters were described according to frequency and percentage; the quantitative parameters by median and range. The concordance between the results of the microbiopsy and those of the operative specimen for the distinction benign–malignant and for the histological type was estimated using the Kappa coefficient and its confidence interval at 95%. A value superior to 0.8 was considered as an almost perfect correlation [16]. The accuracy of the microbiopsy was calculated and corresponds to the percentage of classified as “good” between the microbiopsy and the operative specimen. The sensitivity (se) and the specificity (sp) of the microbiopsy with regards to the operative specimen were also calculated for the distinction benign–malignant. Statistical analyses were performed using SAS software version 9.2 (SAS, Cary, NC, USA).

**Results**

Eighty-four patients were included (figure 1). Fifty-one patients had a surgical procedure afterwards (histology on table I). The approach of percutaneous biopsy was systematically resected during surgery especially for sarcoma of the limbs. In 33 patients (histology on table II), no surgical procedure was performed for various reasons: benign results or metastases ruling out the local surgical gesture in particular.

Twenty-two women (43.1%) and 29 men (56.9%) were enrolled in this study. The median age was 54 years [range 21–75]. The median tumor size was 103 mm [range 31–500].

**Figure 1**

Flow chart
Among the 51 patients who had a surgical procedure, there was a discordance in two cases (location: shoulder and thigh) and one lesion was tumor-free after targeted therapy on the analysis of the operative specimen. In one case, there was a low amplification of MDM2 not allowing to eliminate formally an atypical lipomatous tumor with a diagnosis of lipoma on the operative specimen. The second discordant case detected an ischemic necrosis on the microbiopsies requiring new biopsy but finally a surgical gesture was performed with a final diagnosis of atypical lipomatous tumor. The kappa coefficient was 0.97 [0.92–1] for the histological type. For retroperitoneal lesions, there was no discordant case for distinction benign–malignant, for the histological type and even for the distinction well differentiated–dedifferentiated liposarcoma. The accuracy of the microbiopsies was therefore 96% (se = 97.0%; sp = 94.1%) for the detection benign–malignant and 97.8% for the histological type. The histological grade was available for 13 tumors for both the microbiopsies and the operative specimen. In 12 cases, it was concordant. The "discordant" case corresponds to a lesion with a grade of at least two on the microbiopsy and that of 3 on the operative specimen.

### Discussion

There is a more and more significant development of radio-guided percutaneous biopsy in suspicious lesions of sarcoma. The purpose of percutaneous biopsy is to differentiate malignant from benign lesions and to determine the histological type [17] before any surgical gesture. Their main advantage is to be less invasive than surgical biopsies. Furthermore, the use of ultrasound or CT guidance allows improving the diagnostic accuracy and the safety of the percutaneous biopsy [12]. Indeed, to prevent sampling error, images, including CT and/or MRI, need to be thoroughly reviewed at the time of biopsy [18]. There are some reports on the simultaneously performed cytological analysis [17].

The histological diagnostic efficiency of the percutaneous microbiopsies is satisfactory compared to the analysis of operative specimens with an excellent concordance either for the distinction benign–malignant or for the histological type. The accuracy of microbiopsies in our study is higher than 95%, which is consistent with the literature data since this rate ranges between 80 and 97% [13].

We did not evidence any influence of the size of the biopsies on the final result. However, it seems necessary to use the largest possible caliber (14 G for limbs and 16 G for retroperitoneum) and to take at least 4 samples as in our institution: 2 fresh and 2 fixed in formaldehyde to have the maximum possible material as there are more and more techniques of analysis, in particular

### Table I

<table>
<thead>
<tr>
<th>Histology</th>
<th>Number of cases (percentage) for microbiopsy</th>
<th>Number of cases (percentage) for surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwannoma</td>
<td>2 (4)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Solitary fibrous tumor</td>
<td>3 (6)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Giant cells tumor</td>
<td>1 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Myxoma</td>
<td>1 (2)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>1 (2)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Lipoma</td>
<td>8 (16)</td>
<td>9 (18)</td>
</tr>
<tr>
<td>Atypical lipomatous tumor</td>
<td>11 (22)</td>
<td>11 (22)</td>
</tr>
<tr>
<td>Liposarcoma</td>
<td>8 (16)</td>
<td>8 (16)</td>
</tr>
<tr>
<td>Synovial sarcoma</td>
<td>2 (4)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Malignant peripheral nerve sheath tumors</td>
<td>1 (2)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Other sarcoma</td>
<td>12 (22)</td>
<td>12 (22)</td>
</tr>
<tr>
<td>Necrosis</td>
<td>1 (2)</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>

The caliber of the microbiopsies was distributed as follows: 2 with 11 G (3.9%), 22 with 14 G (43.1%), 18 with 16 G (35.3%) and 9 with 18 G (17.7%). In one patient, the biopsy was repeated because the histological results were not in accordance with the imaging data. There was no complication after microbiopsies.

Among the 51 patients who had a surgical procedure, there were 29 lesions of the limbs and 22 axial ones including 7 retroperitoneal lesions. Forty-six (90.2%) were subaponeurotic and 5 (9.8%) superficial. The histological types were described in Table I: 66% of malignant lesions and 34% of benign lesions. There were no tumors spreading secondary to the microbiopsies on histological analysis of operative specimens.

Out of these 51 lesions, the kappa coefficient was 0.92 [0.79–1] for the distinction benign–malignant. There was discordance in two cases (location: shoulder and thigh) and one lesion was tumor-free after targeted therapy on the analysis of the operative specimen. In one case, there was a low amplification of MDM2 not allowing to eliminate formally an atypical lipomatous tumor with a diagnosis of lipoma on the operative specimen.

The second discordant case detected an ischemic necrosis on the microbiopsies requiring new biopsy but finally a surgical gesture was performed with a final diagnosis of atypical lipomatous tumor. The kappa coefficient was 0.97 [0.92–1] for the histological type. For retroperitoneal lesions, there was no discordant case for distinction benign–malignant, for the histological type and even for the distinction well differentiated–dedifferentiated liposarcoma. The accuracy of the microbiopsies was therefore 96% (se = 97.0%; sp = 94.1%) for the detection benign–malignant and 97.8% for the histological type. The histological grade was available for 13 tumors for both the microbiopsies and the operative specimen. In 12 cases, it was concordant. The "discordant" case corresponds to a lesion with a grade of at least two on the microbiopsy and that of 3 on the operative specimen.

### Table II

<table>
<thead>
<tr>
<th>Histology</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipoma</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>Desmoid tumor</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Atypical lipomatous tumor</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Liposarcoma</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Leiomyosarcoma</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Abrikossoff's tumor</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Other sarcoma</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>
with the use of molecular biology. This is consistent with the opinion of Wu et al. [19] who recommended 4 samples for soft tissues lesions for optimal tissue representation and with recommendations of European Sarcoma Network Working Group [15].

In case of discordance between the histopathological analysis and the imaging data and considering the potentially cramped character of the samples, it is necessary in this case to perform new percutaneous or surgical samples. Indeed, in our study, the diagnosis of synovial sarcoma for a lesion of a limb was obtained after two biopsies because the lesion was essentially hemorrhagic. It shows the increasing importance of a multidisciplinary care with multidirectional exchanges between surgeon, oncologist, pathologist and radiologist. It allowed us to better direct the samples to obtain relevant histological results including for tumors known to be difficult to yield a correct diagnosis or grading as in particular schwannomas and synovial sarcomas which may consist of heterogenic cells or myxoid areas [20]. Even for retroperitoneal liposarcoma, the diagnostic accuracy was 100%, which is contradictory with results of Ikoma et al. [18] but the number of retroperitoneal lesions was very small in our study (7 cases).

Didolkar et al. [21] found that malignant lesions had higher diagnostic yield than benign lesions (94% against 58%), which was less evident in our study (respectively 94 and 97%) with a global value in 82% for soft tissue tumors (versus 97.8% here).

We demonstrated two nuanced discordances between percutaneous biopsies and the analysis of operative specimens. The first one relates to the ischemic necrosis, where new samples were recommended. In the second case, the diagnosis of atypical lipomatous tumor could not be formally eliminated considering a low amplification of MDM2 that did not allow deciding between the two hypotheses: lipoma (definitive diagnosis on the operative specimen) and atypical lipomatous tumor.

Concerning the histological rank, we considered a "discordant" case. In fact, this choice is probably excessive because the histological analysis of the microbiopsies concluded in a rank at least two with a rank three on the operative specimen. Besides its retrospective feature, a main limit of this study is the limited number of tumors with microbiopsy and surgical correlations. Second, we investigated a quite heterogeneous study population in terms of tumors entities.

Conclusion

The percutaneous microbiopsies play an important part in the diagnosis of soft tissue tumors of the limbs, trunk and retroperitoneum in particular as a replacement to surgical biopsies, which are more invasive, as in our institution, for soft tissue lesions because of good diagnostic accuracy. The microbiopsies must be discussed beforehand on multidisciplinary meeting in particular to determine their route. This study showed the high importance of collaboration between radiologist, surgeon and pathologist in the diagnosis of sarcomas.

Disclosure of interest: the authors declare that they have no competing interest.

References


