Core Biopsy of Solid Renal Masses under CT Guidance

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Abstract

Objectives: To determine for which tumors a percutaneous computed tomography (CT)-guided biopsy might be beneficial to distinguish between benign and malignant lesions.

Methods: The author analyzed the international literature since 2000 that deals with biopsy of renal masses, which involved more than 1000 patients. He reports also on his own experience.

Results: The accuracy of renal biopsy to differentiate malignant and benign tumors is 90%. The accuracy of renal biopsy for the subtype pathologic evaluation of tumors is 80–90%, but the accuracy for nuclear grade is only 50–75%. However, all renal masses do not deserve biopsy, and this evaluation should be restricted to only intermediate masses that cannot be clearly classified by the imaging technologies. On CT scan, intermediate masses were solid tumors with no hypervascularization, with no early or intense enhancement, with homogenous enhancement but no negative density. The size of the tumor must be considered (<4 cm) to indicate biopsy. These intermediate tumors accounted for 25% of the whole renal masses.

Conclusions: Core biopsy of renal tumor is accurate and safe for the diagnosis of renal masses. It can be indicated for intermediate masses.

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1. Introduction

Renal tumors are probably one of the last tumors that are still commonly managed without preoperative diagnosis. A 3-cm solid renal mass can be removed by a partial nephrectomy, a total nephrectomy can be preformed for a 7 cm solid renal mass, or a metastatic renal tumor can be treated with a medical treatment without any histologic diagnosis. Would these managements be the same if the kidney were a single organ? Probably not. All of these attitudes are based on old rules stating that greater than 90% of solid renal tumors are uniformly malignant and need the same treatment. Today before any renal surgery, especially if a nephrectomy is planned, the renal function must be evaluated, and some patients with a renal tumor are potentially renal-insufficient patients. Recent data reported that, according to tumor size, the probability of malignant renal tumor changes [1,2]. Nowadays it is admitted that there are different histologic types of malignant renal tumors and that benign tumors are not exceptional [1,2]. Nephron-sparing surgery became a standard approach for some renal masses [2,3]. The rule of systematic surgery for solid renal masses is questionable,
and preoperative diagnosis is becoming necessary to tailor the treatment to the histologic type of the tumor and to inform the patient before any treatment.

2. Methods

In the English literature since 2000, more than 20 articles were published on biopsy of renal masses from North American and European centers, showing that renal tumor biopsy is not anecdotal anymore. More than 1000 patients having a biopsy of a renal mass were reported in these papers.

3. Results

Recent advances in imaging technology with modern computed tomography (CT) scans or ultrasound allowed accurate performance of biopsy of solid renal masses [4–6]. Renal tumor biopsies were mostly performed with CT scan guidance, with local anaesthesia in an outpatient setting. The diagnostic value of renal tumor biopsy was greater than 80% [4,6–10]. The location of the tumor in the kidney was not a real contraindication, but there could have been a need to adapt the biopsy tract with the CT guidance. In 20% of cases, the biopsy did not provide any diagnosis: in 15% because of noncontributive biopsy (fibrosis, inflammation) and in 5% because of true failed biopsy (no tissue, normal renal parenchyma [4,7,8]. The biopsy core material allowed use of the standard (HES) and specific (immunohistochemistry: Ki67, CK 7, vimentin, anti-CD10, and genetic) pathologic techniques.

In 10–40% of solid renal tumors, the biopsy revealed a benign lesion, especially in case of <4 cm or homogenous tumor [5,7,11,12]. Most of these benign tumors were oncocytoma (60%) but could have been angiomyolipomas with no classic radiologic features (30%) [4,7,10]. The diagnostic accuracy of biopsy for benign tumors was greater than 90% [5].

The accuracy of renal biopsy to differentiate malignant and benign tumors was 90% [10]. For malignant tumors the diagnostic accuracy of biopsy was greater than 90%, and sensitivity and specificity were greater than 90% [5,8–10,13]. The accuracy of renal biopsy for the subtype histologic evaluation of renal cell carcinomas was 80–90% [4,7,14,15].

4. Discussion

Some points about these results deserve discussion. One point is about oncocytic tumors. There is a possible association or a misdiagnosis of oncocytoma with chromophobe renal cell cancer. Some similar genetic abnormalities (1 and Y chromosome loss) can exist in these two tumors [10,15]. Chromophobe renal cell carcinoma can be associated with an oncocytoma in 10% of cases [10]. In the Neuzillet et al paper [16], 40% of biopsy-diagnosed oncocytomas needed surgery during active surveillance, and in one case a chromophobe carcinoma was associated with an oncocytoma. The second point is about the nuclear grade of renal cell carcinoma on biopsy. The accuracy of biopsy for nuclear grade ranges from 50% to 75% [4,6,7,14]. Even when grades 1–2 and 3–4 were pooled together, the accuracy was slightly improved. This low accuracy is due to the heterogenicity of renal cell carcinomas [10]. The grade evaluation on biopsy could be improved if more biopsy cores would be performed or if specific pathologic techniques are used. The last point is about the accuracy of biopsy in cystic lesions. Lechevallier et al [4] reported on a 50% diagnostic accuracy for biopsies of cystic renal masses. More recently Harisinghani et al [17] reported 100% accuracy in biopsy of category III cystic masses with 60% of cancers.

No major complication after biopsy of renal masses was reported in the literature. A systematic postbiopsy CT helix was routinely performed, showing a mild perirenal hematoma but generally with no clinical significance. In our center, we reviewed 565 renal mass biopsies; there were two cases of symptomatic perirenal hematoma necessitating hospitalization for surveillance but no surgery. In other series the complications were rare and mild [7,9,10].

One point of major concern about morbidity is tumor tract seeding after biopsy. No case of tumor tract seeding after renal tumor biopsy was reported in the recent literature. The use of small 18F coaxial needles protects the tract [6]. Suspicion for transitional cell tumors is a contraindication for biopsy. Somani et al [18] reported no specific survival difference after nephrectomy between patients without and with preoperative biopsy.

Do all renal masses need a biopsy? Probably not. In case of a typical renal mass on CT scan, a biopsy is probably not necessary, especially if the management is not modified by the biopsy result. Actually a biopsy could be recommended for renal masses that cannot be clearly classified by the imaging technologies (ultrasound, CT, magnetic resonance imaging) [7–10,19]. These tumors are classified as indeterminate masses [8]. On CT scan indeterminate masses are solid tumors with no hypervascularization, with no early or intense enhancement, with
homogenous enhancement, with no negative density, with central scar or spoke wheel tumor. In the Poulain et al [7] series, these tumors accounted for 25% of renal masses. On ultrasonography, Reichelt et al [19] recommended biopsy of small (<4 cm) homogenous solid tumors.

Finally, why biopsy a renal mass? The answer could be why not? Systematic evaluation of renal function before total nephrectomy induces an over diagnosis of patients with some degree of renal failure for whom surveillance or partial nephrectomy could be preferable. Biopsy could give arguments to avoid total nephrectomy (histology, grade). Twenty percent to 30% of small solid renal tumors are pT3 or G3 tumors, which are not good indications for partial surgery [20,21]. Preoperative biopsy could modify the initial indication. Conversely the incidence of chromophobe carcinoma seems to be increasing. Because of the good prognosis of chromophobe cancers, they could be managed with partial nephrectomy whatever the tumor size [22]. Frozen section of renal tumor at the time of surgery has an error rate for benign versus malignant diagnosis of 20–30%, which is much higher than the error rate of biopsy [23]. Biopsy gives information on strong prognostic factors, histologic subtype, and nuclear grade [22]. Grade is one of the prognostic factors for local recurrence after partial nephrectomy [2]. Biopsy could modify the management of a solid renal tumor in 20–40% of cases [4,7,14]. Finally, with the preoperative diagnosis, the patient can be clearly informed of the planned management of the tumor and the therapeutic options.

5. Conclusions

Core biopsy of renal tumor is accurate and safe for the diagnosis of renal masses. Renal tumor biopsy gives diagnostic and prognostic parameters. It can be indicated for indeterminate masses. The patient management can be tailored according to the findings of the renal tumor biopsy.

References


