

# A Retrospective Comparison of 2 Methods of Intraoperative Margin Evaluation During Partial Nephrectomy

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## Abbreviations and Acronyms

GIC = gross intraoperative consultation

GIC-WWF = GIC with or without frozen section

RCC = renal cell carcinoma

TBB = tumor bed biopsy

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**Purpose:** Intraoperative pathological consultation is often used to achieve negative margins during partial nephrectomy. Commonly a tumor bed biopsy for frozen section is taken from the most suspicious area of the defect. Alternatively the pathologist may perform prosection of the intact partial nephrectomy specimen and prepare frozen sections of suspicious areas. We determined the sensitivity and specificity of these 2 methods and a combined method.

**Materials and Methods:** Records of 251 cases performed at a single institution between 2005 and 2007 were retrospectively analyzed.

**Results:** Of the patients 56% were male. Mean age was 58.8 years. Laparoscopic resection was performed in 76% of cases. Mean greatest tumor dimension was 2.9 cm. Tumor bed biopsy was done in 120 cases, of which 15 (12.5%) showed positive final margins. With permanent section as the gold standard, tumor bed biopsy was 25% sensitive (95% CI 6–46) and 100% specific (95% CI 96–100) for detecting positive margins. In contrast, gross intraoperative consultation with or without frozen section in 163 cases, including 112 with gross intraoperative consultation only and 51 with frozen section, revealed positive final margins in 16 (9.8%) and was 75% sensitive (95% CI 50–90) and 100% specific (95% CI 97–100). The combined method involving tumor bed biopsy plus gross intraoperative consultation was 100% sensitive (95% CI 60–100) and 100% specific (95% CI 89–100).

**Conclusions:** The data support the routine practice of combined gross pathological consultation and tumor bed biopsy. When the combined method is not used, gross intraoperative consultation is more diagnostically accurate than tumor bed biopsy. The data do not support the common practice of examining the tumor bed biopsy alone.

**Key Words:** kidney, nephrectomy, biopsy, frozen sections, predictive value of tests

PARTIAL nephrectomy or nephron sparing surgery, which is now commonly used to manage T1a disease, provides a cure rate equivalent to that of radical nephrectomy.<sup>1–3</sup> Partial resection is also appropriate for some larger lesions,<sup>4</sup> for bilateral disease, in the setting of a single kidney or in other cases in which nephron loss must be minimized.<sup>1</sup> As with other cancers, margin-negative resection is an onco-

logical goal. Intraoperative pathological consultation (frozen section) is often performed to assess the putative margins but practices for using these consultations vary among surgeons. Two frozen sectioning practices are commonly seen in this context.

Most often surgeons submit a biopsy of the residual kidney as a deep tissue margin or TBB using the rationale that a tumor bed without disease

indicates a negative resection margin. The alternative approach is intraoperative gross pathological consultation, in which the pathologist inks and sections the specimen to identify areas of most concern in regard to margin involvement. These areas can then be specifically evaluated by frozen section, which is performed if the tumor is within a few mm of the margin. Otherwise an assessment of free margins is made based on gross findings only and relayed to the surgeon (see figure). We refer to this method as GIC-WWF.

There is currently little evidence to support the use of 1 method over the other. While the choice is partly determined by whether a laparoscopic or an open approach is used, surgeon preference has a role. Previously investigators have examined the usefulness of frozen section during partial nephrectomy but these studies have generally focused on TBB alone<sup>5-10</sup> or have conflated the 2 methods.<sup>11</sup> It remains unknown from these previous series whether the methods are equivalent. We determined the operating characteristics of TBB and GIC-WWF to define best practices for margin-negative resection during partial nephrectomy.

## METHODS

We retrospectively examined all partial nephrectomies performed at our institution between 2005 and 2007. Institutional review board approval was obtained. The Cerner CoPath™ database at our pathology laboratory was queried for surgical cases with final diagnostic terms that included “kidney” or “nephrectomy.” These results were manually curated to identify partial nephrectomies and extract relevant data.

Inclusion criteria were partial nephrectomy for a suspected benign or malignant renal tumor, accession be-

tween 2005 and 2007, and final pathological margins stated for partial resection. We included cases that started as partial nephrectomy but were converted to total or radical nephrectomy when the final diagnosis included a description of the margins of the partial nephrectomy specimen.

For cases meeting inclusion criteria we extracted patient demographics (age and sex), surgical technique (open or laparoscopic), type and results of intraoperative pathological consultations, biopsy, tumor and specimen size, and final pathological diagnosis, including the margin description. Tumor bed biopsies were modeled as thin cuboidal slabs. To estimate the area of each biopsy we calculated the product of its 2 greatest dimensions. In the few cases in which more than 1 TBB was performed the size of the first biopsy examined was multiplied by the number of biopsies to estimate the total area examined.

Frozen section analysis at our institution involves microscopic examination of 2 hematoxylin and eosin stained sections of the frozen tissue block. In cases in which TBB plus GIC-WWF were used the results of each method were extracted and tabulated separately. In addition, we tabulated these cases as having undergone a combined method of intraoperative consultation. As is customary, the peripheral soft tissue margin was not interpreted as a true surgical margin. We did not include frozen sections that were not performed to assess surgical margins, ie those that were performed only to identify tumor histology.

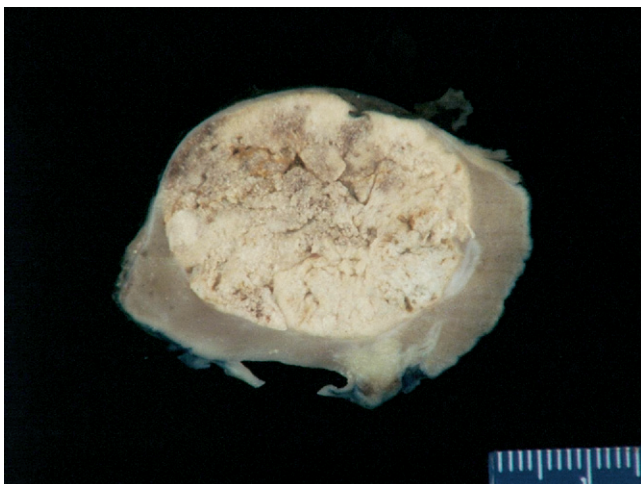
Statistical calculations were performed using Prism® 4. Clinicopathological data were analyzed by the 2-tailed Student t test or ANOVA for continuous variables, and by the 2-tailed chi-square or Fisher exact test for contingency tables. The CI for proportions was determined by the modified Wald method.

## RESULTS

### Clinicopathological Summary

We identified 301 partial nephrectomies performed between 2005 and 2007 for all indications at our institution. Our interest was in cases performed for resection of a suspected renal tumor. Therefore, we excluded from study 33 cases that were performed for obviously benign indications, such as simple cysts, chronic kidney inflammation or trauma, including those in which the nonneoplastic nature of the disease became apparent intraoperatively. Nine resections were excluded from analysis because the final pathological margins were not clearly stated, usually in the context of a diagnosis of oncocytoma. Four specimens were morcellated, making it impossible to ascertain the final resection margin. A further 4 cases were excluded from study for miscellaneous reasons. This left 251 cases meeting our inclusion criteria. All cases were performed by urological surgeons at our institution except 3 that were performed by the gynecologic oncology service.

Table 1 lists the clinicopathological characteristics of the data set. The patients were 56% male and 44% female with a mean age of 58.8 years. The



Gross photograph of partial nephrectomy specimen with widely tumor-free parenchymal margin.

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