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ORIGINAL ARTICLE

Smears are important for adequate cytologic diagnosis of kidney lesions

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Introduction Traditionally at our institution, smears with or without liquid-based cytology (LBC) and core biopsies (CBs) have been obtained by radiologists performing image-guided fine-needle aspiration biopsies (FNABs) of deep organs. Since 2015, however, there has been a shift to providing cytology with samples for LBC only when obtaining CBs. The impression among our institution's cytologists is that LBC alone is less often adequate for diagnosis compared with smears and LBC together. We examined a series of kidney FNABs pre- and post-"LBC only" to evaluate this impression.

Materials and methods With institutional review board approval, we compared all kidney FNABs from 2012 to those from 2015. We recorded the type(s) of cytology preparation(s), the number of cytology slides, the cytology diagnosis, the concurrent CB diagnosis, and whether there was a subsequent excision and the excision diagnosis. We examined cytology and CB slides as needed.

Results In 2012, 105 patients underwent 111 kidney biopsies, 109 with smears made. In 2015, 58 patients underwent 62 kidney biopsies, 7 with smears made. In 2012, there were 13 (12%) nondiagnostic (ND) cytology cases and 19 (17%) cases where the cytology and CB diagnoses were discrepant. By comparison, in 2015, there were 20 (32%) ND cytology cases and 21 (33%) discrepant cases.

Conclusions There were more cytology slides per case and fewer ND diagnoses in 2012 compared with 2015 (12% versus 32%, respectively, $P = 0.001$). Concordance was also better in 2012 (83% versus 67%, $P = 0.015$). We believe that our metrics would improve if we returned to the procedures followed in 2012.

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Introduction

The incidence of malignant renal tumors has increased to 62,700 new cases in 2016 in the United States.[1] Renal cell carcinoma (RCC) is the most common malignant tumor, with clear-cell subtype predominating, although the relative proportion of clear-cell RCCs has fallen as the World Health Organization has expanded the number of subtypes of RCC from 4 in 1997 to 12 in the current classification.[2] Over the last 50 years, RCCs are increasingly incidentally detected, up from 10% of renal tumors in 1960 to 70% in 2016. This has led to a smaller average size at diagnosis, with tumors falling from a mean size of 7.8 cm in 1989 to less than 4 cm today, resulting in lower disease stage at diagnosis.[3-5]

Management options for renal masses range from surgical resection to minimally invasive ablation to active surveillance, depending on clinical and biological factors.[6,7] A 2014 international consensus panel of urologists, radiologists, and pathologists strongly recommended biopsy of solid renal masses in patients without stereotypical clinical history, such as von Hippel-Lindau syndrome, or imaging findings, such as fat in an angiomyolipoma, for pathologic diagnosis in order to guide treatment decisions.[6] They noted that models have demonstrated the cost-effectiveness of tissue sampling, even if 90% of biopsies resulted in surgery.[6,8] In addition, targeted therapies for different RCC types are becoming a reality and require tissue for genetic testing.[9] Of note, a potential complication of renal mass biopsy, needle-tract seeding of malignant cells, is quite rare, although reports of seeding continue to appear.[10-13]

Either image-guided fine-needle aspiration biopsies (FNABs) and/or core biopsies (CBs) of renal masses are performed at hospitals around the country. Whereas older studies showed dubious utility to FNAB of renal masses,[14,15] more recent ones have shown good-to-excellent sensitivity, specificity, and/or diagnostic accuracy.[16-20] Traditionally at our institution, radiologists performing FNABs of deep organs, like the kidney, have obtained smears with or without liquid-based cytology (LBC) and CBs. Since 2015, however, there has been a shift to providing FNA passes for LBC only, without making smears, when obtaining CBs. The impression among our institution's cytologists is that LBC alone is less often adequate for diagnosis compared with smears and LBC combined. We examined a series of kidney biopsies pre- and post-"LBC only" to confirm or refute this impression.

Materials and methods

With institutional review board approval, we compared the diagnosis of all kidney biopsies with a cytology component (smears and/or LBC) from 2012 with those from 2015. We recorded the type(s) of cytology preparation(s) and the number of cytology slides, the cytology diagnosis, whether a concurrent CB was performed and the CB diagnosis, and whether there was a subsequent excision and the excision diagnosis. We also recorded the pre-biopsy lesion size as measured by radiology.

All cytology (smears and/or LBC) and CB specimens were obtained by an abdominal radiologist per the following protocol: (1) image-guided placement of a 17-gauge coaxial needle into the kidney lesion, (2) removal of the inner stylette of the coaxial needle and replacement with an 18-gauge cutting needle, (3) acquisition of 2-4 core biopsies at the radiologist's discretion (typically 2 if the cores are solid and up to 4 if they are markedly fragmented), (4) replacement of the 18-gauge cutting needle with a 22-gauge Chiba biopsy needle, and (5) movement of the Chiba needle in rapid "to-and-fro" motions for 15-20 seconds per FNAB pass, with up to 4 passes total. All CBs were immediately placed into 10% neutral-buffered formalin and processed per routine for histology (automated processing, embedding in paraffin blocks, and cutting at 5 microns for staining with hematoxylin and eosin). The first 2 FNAB passes were used for alcohol-fixed smear slides if smears were made; these smears were prepared by the radiologist, immediately placed into 95% ethanol for fixation, and stained with Papanicoloaou stain upon receipt in the lab. The next 2 FNAB passes were rinsed into CytoRich Red (Thermo Fisher Scientific, Waltham, MA), from which either a SurePath (Becton, Dickinson and Company, Franklin Lakes, NJ) or ThinPrep (Hologic, Bedford, MA) slide was prepared. Immunohistochemistry (IHC) using an automated stainer (Bond-III; Leica Microsystems, Bannockburn, IL) was performed on select core biopsies at the discretion of the sign-out cytopathologist.

Differences between the number of slides obtained for all cases and nondiagnostic cases from 2012 versus 2015 were determined using unpaired two-tailed t tests. Concordance between cytology, CB, and surgical excision/resection was determined as stated in Table 1. Fisher's exact test was used to compare metrics from 2012 with those from 2015. Wilcoxon rank sum test was used to evaluate whether there was a relationship between mass size and adequacy of the cytology specimen. Differences for which $P < 0.05$ were considered significant.

Results

In 2012, 105 patients underwent 111 kidney FNABs, 109 with smears and all with samples for LBC and CBs obtained. An additional 2 patients with one kidney lesion each had CBs only; thus, as they did not have cytology specimens, they were excluded from analysis. In contrast, in 2015, 58 patients underwent 62 kidney FNABs, all with samples for LBC and CBs obtained, but only 7 with smears made. That year, an additional 52 patients underwent 57 biopsies with only CBs obtained; these 57 cases were excluded because of their lack of cytology specimens. Table 2 summarizes the adequacy of the cytology and CB