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● *Original Contribution*

MINIMALLY COMPLEX RENAL CYSTS: OUTCOMES AND ULTRASOUND EVALUATION COMPARED WITH CONTRAST-ENHANCED CROSS-SECTIONAL IMAGING BOSNIAK CLASSIFICATION

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Abstract—We correlated contrast-enhanced cross-sectional imaging and outcomes to assess the reproducibility of ultrasonographic criteria for renal minimally complex (MC) cysts. From 2003 to 2015, 143 cysts were described as complex or MC by ultrasound (US). After exclusions, 98 US studies were retrospectively evaluated and compared with computed tomography (CT)/magnetic resonance imaging (MRI). At sonography, 51 were MC cysts and 47 were complexes according to two independent observers. Inter-observer agreement for US was 0.704 and 0.745 for CT/MRI. Of 51 cysts classified as MC by US, 38 were Bosniak I/II and 6 were Bosniak IIF by CT/MRI. In 7, there were no cross-sectional images; however, they were stable for at least 2 y. Of 47 complex cysts, 9 were Bosniak II, 22 Bosniak IIF, 8 Bosniak III and 8 Bosniak IV. No Bosniak III/IV cysts by CT/MRI were classified as MC by US. Our results indicate that US offers reproducible criteria for MC cysts and may be used alone for these lesions. (E-mail: fmuglia@fmrp.usp.br) © **2017 World Federation for Ultrasound in Medicine & Biology.**

Key Words: **Renal cysts, Minimally complex cysts, Bosniak classification, Computed tomography, Ultrasonography.**

INTRODUCTION

Renal cysts are frequently found in abdominal ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) examinations (Carrim and Murchison 2003). The great majority are simple cysts that do not require any further study or follow-up (Park and Kim 2015), even when they present as large lesions. A small fraction of renal cysts have internal contents other than fluid with septae and/or solid components. These are considered complex. Nonetheless, despite their low prevalence, complex renal cysts have always been a matter of concern because of the associated risk of malignancy (Huber et al. 2014; Reese et al. 2014).

The differentiation between benign and malignant etiology for complex cysts, as well as management of complex cysts, has been extensively debated in the urologic literature, but without a consensus until Morton Bosniak published his renal cyst classification in 1986. This was based on tomographic findings of an examination performed with intravenous iodinated contrast medium (Bosniak 1986). This scoring system provided specific criteria for stratifying a complex cyst's risk of malignancy. The five grades of Bosniak classification increase according to the complexity of the cysts. Indeed, a key feature of this system is the presence of contrast enhancement of a septum, a thickened wall or a solid component (Curry et al. 2000; Israel and Bosniak 2005a, 2005b).

Although the standard approach to renal cysts is based on CT findings, many Bosniak descriptors can also be seen with US. However, to date, US has not been recommended for classification of complex cysts, mainly because US fails to provide all parameters used in the Bosniak classification (Hindman 2016; Whelan 2010). Arguably, the limited sensitivity of color Doppler in depiction of flow within septa or solid areas, which would be the equivalent of contrast-enhanced areas in CT (and/or MRI) examinations, is the rationale for

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preventing the use of Bosniak classification in ultrasound reports (Israel and Bosniak 2005a, 2005b). However, a different situation is seen when US is performed with a contrast agent. In these situations, the reported diagnostic accuracy is similar to that of CT and MRI (Defortescu et al. 2017; Graumann et al. 2016).

Therefore, the accepted role for US when evaluating renal cysts is only in differentiation of simple from complex cysts (Hindman 2016). In addition, US can be used for the follow-up of complex cysts already evaluated (and graded) by CT or MRI (Hindman 2016; Silverman et al. 2008). Although it is possible to find some sporadic reports on the use of US for classifying minimally complex (MC) cysts (Di Vece et al. 2016), this recommendation is not supported by the literature because there is no consensus on the definition of MC cysts (O'Connor et al. 2013). To date, only one study has assessed the outcomes of such cysts (Gabr et al. 2009).

Accordingly, we conducted this study to assess the reproducibility of sonographic criteria in defining a cyst as MC, to evaluate the outcomes of these cysts and to correlate sonographic features with CT and/or MRI findings.

METHODS

Patient selection

Our institutional review board approved this retrospective study with a waiver of informed consent. We searched our Radiologic Information System (RIS) from January 2003 to July 2015 using the entries: "renal" and "kidney" along "minimally complex cysts," "complex cysts," "cystic lesions" and "complex cystic lesions." The search retrieved a total of 2259 patients with renal cysts. Of these, 143 cysts were described as complex or MC cysts.

Included in our study were (i) patients who had been previously reported to have an MC renal cyst by US followed by cross-sectional imaging (CT and/or MRI) with intravenous contrast medium, with the examinations no longer than 6 mo apart; and (ii) patients who had been diagnosed with an MC cyst by US without correspondent cross-sectional imaging, but with at least a 2-y follow-up. Our standard of reference was surgery and follow-up of at least 2 y, except for cysts classified as Bosniak category II by CT/MRI, for which no minimum follow-up is required according to Bosniak classification rules (Israel and Bosniak 2005a, 2005b). Interval follow-up was not previously defined because of the retrospective nature of the study, but 79.5% had a 6-mo interval for imaging examination.

Excluded from this study were (i) patients with cysts that were previously manipulated by aspiration or sclerotherapy; (ii) patients without cross-sectional imaging and without imaging follow-up; (iii) patients with CT or MRI without intravenous contrast or with poor quality and follow-up shorter than 2 y; and (iv) patients with complex/minimally complex cysts who had polycystic kidneys, as in autosomal dominant polycystic kidney disease and von Hippel–Lindau.

For patients with more than one complex/MC cyst, we evaluated only one from each kidney—the one with the highest classification. After application of the inclusion and exclusion criteria, cysts from 98 patients were enrolled in this study (Fig. 1).

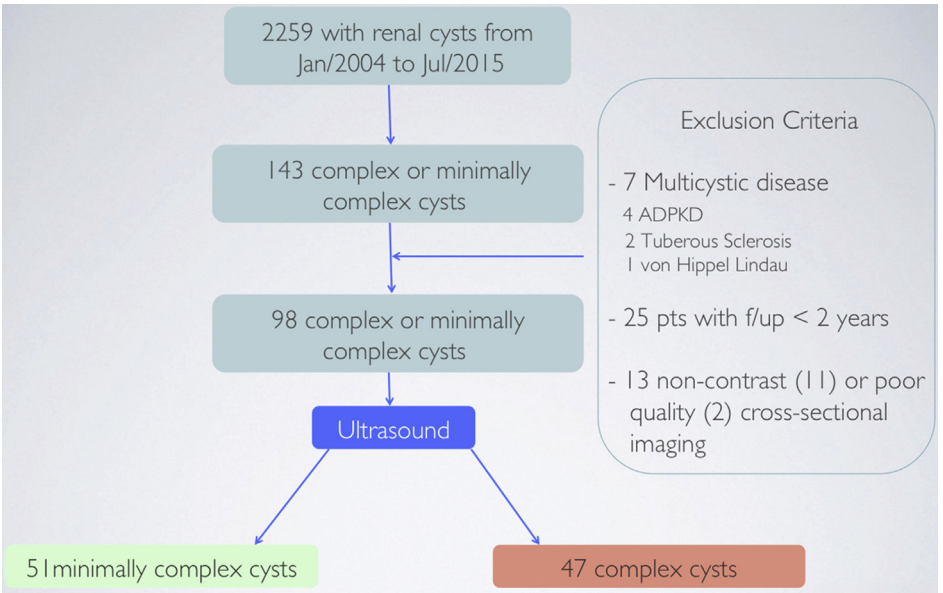

Fig. 1. Flow chart of patient selection and exclusion with respective criteria.

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