Updates on diagnosis and prognosis of renal cell carcinoma

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ABSTRACT

Renal cell carcinoma (RCC) represents the most frequent form of kidney cancer, with its incidence steadily increasing globally [1, 2]. There have been significant strides made in enhancing the diagnosis and prognosis of RCC, driven by advances in biomarker research and artificial intelligence (AI) [3]. Here we aim to provide an overview of the current status in regards to diagnosis and prognosis of RCC. Our own work has investigated molecules involved in apoptosis and tumor-promoting inflammation [4-13] as well as obesity-related factors. Measurements such as body mass index, waist circumference, and waist-hip ratio, when combined with other risk factors like age and sex, have shown validity in predicting RCC outcomes [14]. Notably, adipokines like adiponectin [15] and tissue leptin/leptin receptor have emerged as potential biomarkers, aiding in distinguishing RCC subtypes and assessing disease progression [16-18]. Given these advances, the prognostic capabilities of other adipokines, including omentin, visfatin, apelin, and resistin, warrant further investigation [19]. In parallel, advances in liquid biopsy techniques offer a less invasive alternative to traditional tissue biopsies for RCC diagnosis and prognosis. Analytes derived from urine, plasma, serum, and feces, such as circulating cell-free DNAs and RNAs, exosomes and proteins, have shown promising clinical outcomes. Despite these advances, the integration of liquid biopsies into routine clinical practice is hindered by the need for standardized protocols and larger, multi-center studies to validate their efficacy [20]. Furthermore, the integration of AI, particularly deep learning models, has revolutionized RCC diagnostics, predicting patient survival hence holds potential value in personalized medicine [21]. Collectively, these advances will be highlighted to demonstrate a transformative era in RCC management, emphasizing the importance of multidisciplinary approaches that combine biomarker research, liquid biopsy innovations, and AI-driven diagnostics to enhance patient outcomes.

Keywords: Biomarker, diagnosis, kidney, obesity, urology