

Research Progress of Renal Cancer

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Abstract: Renal cell carcinoma (RCC) is one of the most common tumors of the urinary system. With the development of medical technology, the diagnostic rate and incidence of RCC are increasing year by year. This article reviews the latest research progress in the diagnosis and treatment of renal cell carcinoma.

Keywords: Renal cell carcinoma; Diagnosis; Treatment; Research progress

Publication date: November 2021; **Online publication:** November 30, 2021

1. Background

Renal cell carcinoma (RCC) is a malignant cell mass in the kidney. All along, China has a low incidence of renal cancer, but its incidence is rising in recent years. The number of new cases and deaths from kidney cancer ranked 15th and 17th, respectively, accounting for 2%-3% of all cancers, with more men than women [1]. The incidence in urban areas is also higher than that in rural areas. Renal cancer is known as a “silent cancer.” Among the patients diagnosed with renal cancer, 20%-30% have advanced cancer, about a quarter have metastasis at initial diagnosis, and for patients with advanced or end-stage metastatic RCC, the 5-year survival rate is only approximately 13%. Therefore, this article reviews the research progress in the diagnosis and treatment of renal cancer in recent years to provide a reference for further individualized treatment options for patients with renal cancer in the future.

2. Etiology of renal cancer

Dong Lao and other researchers proposed that renal cancer is related to genetics, obesity, smoking, hypertension, and long-term antihypertensive treatment [2]. Only a few renal cancers are related to genetic factors. Most of the urinary system tumors have the possibility of genetic abnormalities; hence, genetic screening or testing is recommended for accurate diagnosis and treatment of specific tumors [3]. The etiological study of renal cell carcinoma can provide a theoretical basis for clinical diagnosis and treatment.

3. Clinical manifestations

In the early stage, patients with renal cancer do not usually have any obvious discomfort, so it is common to miss the diagnosis of renal cancer. Most patients presenting with the three typical symptoms – pain, hematuria, and mass are at an advanced stage. The common clinical manifestations of renal cancer include low back pain, hematuria, fever, fatigue, weight loss, loss of appetite, anemia, cough, hemoptysis, mass, night sweats, lower limb edema, and paraneoplastic syndrome (hypercalcemia, polycythemia, diabetes, and hypertension). These clinical manifestations can only be used as a reference for diagnosing renal cancer and making a prognosis. As mentioned, most patients with renal cancer have no obvious clinical symptoms; hence, once there is a manifestation of the symptoms, it is important to be vigilant, and regular physical

examinations should be performed.

4. Diagnosis

4.1. B ultrasound

Ultrasonography is the first choice for renal tumors. Ultrasound is relatively clear for identifying the source, location, and size of the tumor as well as the erosion of the surrounding tissues ^[4]. It is easy to operate, has no radiation, and does not demand a high cost. It can be used to dynamically observe the lesion and the relationship between the lesion and adjacent organs through the patient's respiratory movement, in order to appreciate the source of the lesion and the erosion of the surrounding tissues. It has no obvious contraindications for patients. However, it has its limitations, B ultrasound has a weak stereoscopic sense, and the level of the operator can affect the interpretation of the results, with slightly greater subjectivity and limited sensitivity for the diagnosis of renal cancer ^[5].

4.2. Computerized tomography (CT)

When ultrasonographic evidence does not provide a diagnosis, CT enhanced scan can be used. Some studies have found that the diagnostic coincidence rate of 128-slice spiral CT enhanced scan is 96%, without any significant difference with the results of pathological examination. This investigation has certain advantages, such as easy operability, repeatability, high resolution, clear display of the lesion, and conducive for clinical staging, surgical decision ^[6], as well as guidance in the treatment and prognosis of renal cancer.

4.3. Magnetic resonance imaging (MRI)

For patients who still do not have a clear diagnosis from CT enhanced scan, magnetic resonance imaging can play a role in supplementary diagnosis. The accuracy and specificity for small renal tumors and tumor thrombus are slightly higher than those of CT ^[7]. MRI has a higher resolution in soft tissue examination and a clearer display of the pseudocapsule. Therefore, it can accurately locate the origin of renal cancer and adjacent tissue invasion or distant metastases of cancer cells if present. For bulky tumors, they can be better detected without further enhanced scanning. Even if patients are examined with contrast-enhanced scans, the toxicity of the contrast to the human body is almost negligible. In patients with renal insufficiency or iodine allergy, contrast-enhanced MRI scans are friendly, and patients do not have to worry about ionizing radiation injury ^[8].

4.4. Renal biopsy

Pathological diagnosis is the gold standard in diagnosis RCC. Renal biopsy is an effective method to confirm the nature and type of renal tumors. At present, B-ultrasound-guided renal biopsy, which has a high safety profile, is commonly used in clinical practice. It does not only improve the accuracy of puncture, but also clearly show the tissues around the renal tumor. It provides the basis for the clinical treatment of renal tumors and is also the premise for the designation of clinical treatment options ^[9].

5. Treatment

5.1. Surgical treatment

Radical nephrectomy is the most fundamental and effective method for the treatment of renal cell carcinoma. For RCC, there are two main surgical methods: partial nephrectomy and radical nephrectomy. In a research, 30 patients with localized renal cell carcinoma were selected to compare two surgical methods – partial

nephrectomy and radical nephrectomy. It was found that the 2-year survival rate of the patients after laparoscopic partial nephrectomy was higher than those after radical nephrectomy; moreover, the hospital stay, operation time, and intraoperative blood loss of the patients who underwent partial nephrectomy were shorter/less than those who underwent radical nephrectomy, indicating that the preservation of functional nephrons can improve the prognosis of patients with localized renal cell carcinoma ^[10].

5.2. Biologic therapy

On January 21, 2021, the US Food and Drug Administration (FDA) approved cabozantinib plus nivolumab as the first-line treatment for advanced renal cell carcinoma. Results from a study data have shown that cabozantinib plus nivolumab as first-line therapy doubled the progression-free survival (PFS) in patients with advanced RCC compared with sunitinib, reaching the primary endpoint. In addition, the overall response rate (ORR) also doubled, and the overall survival significantly improved in the cabozantinib plus nivolumab group, although the OS of both groups were immature. In terms of safety, cabozantinib plus nivolumab was well tolerated, and the safety profile was consistent with previously reported results. The most common adverse reactions, which occurred in greater than 20% of the patients, included diarrhea, fatigue, hepatotoxicity, hypothyroidism, musculoskeletal pain, decreased appetite, nausea, stuttering, abdominal pain, cough, and upper respiratory tract infection. Cabozantinib plus nivolumab is currently the only combination therapy that can double both the PFS and ORR compared with sunitinib while significantly improving the overall survival in patients with advanced RCC ^[11]. This approval has landmark implications for such patients.

5.3. Renal autograft transplantation

Autologous renal transplantation is the final choice for patients when other surgical methods cannot ensure a complete resection of the tumor, preservation of adequate nephrons, and the reduction of renal ischemia-reperfusion injury. Autologous renal transplantation can reduce renal ischemia-reperfusion injury, avoid the spread of tumors, easily identify the presence or absence of residual tumors at the surgical margin, greatly improve the quality of life of patients, as well as avoid the necessity of premature dialysis ^[12].

6. Conclusion and prospect

With the development of medical technology, although the diagnostic rate of renal cell carcinoma is increasing, pathological examination via renal biopsy is still the gold standard for diagnosis. There is no specific clinical manifestation in the early stage of renal cell carcinoma, and most patients are found to have advanced cancer with metastasis upon diagnosis. In the early stage of renal cell carcinoma, surgical treatment is an effective method, and the prognosis is better; if there is metastasis, most patients would require immunosuppressive agents combined with chemotherapy to control the lesion, resulting in more adverse reactions. Therefore, it is necessary to continue to explore new treatment methods to reduce the suffering of patients and improve the survival rate.

Disclosure statement

The authors declare that there is no conflict of interest.

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