

Study on the therapeutic effect of laparoscopic partial resection on elderly patients with renal cancer and its impact on GDF-15 and VEGF levels

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Introduction. To investigate the therapeutic effect of laparoscopic partial nephrectomy in elderly patients with renal cancer and the effects on serum growth differentiation factor 15 (GDF-15) and vascular endothelial growth factor (VEGF) levels.

Methods. 92 elderly patients with renal cancer from April 2021 to December 2023 were selected as subjects, and 46 cases were divided into two groups by envelope method. The control group was treated with open partial nephrectomy, and the observation group was treated with laparoscopic partial nephrectomy. The effects of the two groups were evaluated 7 days after surgery, and the surgical indicators, kidney function, GDF-15, VEGF, quality of life and postoperative complication rate of the two groups were compared.

Results. Blood loss, drainage volume, operation, getting out of bed, hospitalization and bowel sound recovery time in observation group were shorter than those in control group ($P<0.05$). After intervention, renal function was improved, GDF-15 and VEGF levels were decreased in both groups. Scr, BUN, GDF-15 and VEGF in observation group were lower than those in control group ($P<0.05$). The quality of life was improved in both groups after intervention. The scores of physiological, psychological and social fields and social relations in the observation group were higher than those in the control group ($P<0.05$). There was no significant difference in surgical safety between the two groups ($P>0.05$).

Conclusion. Laparoscopic partial nephrectomy has significant effects in elderly patients with renal cancer, which can help alleviate surgical trauma, improve the level of renal function, reduce the level of GDF-15 and VEGF, improve the quality of life of patients and reduce the incidence of postoperative complications, and is worthy of promotion and application.

Keywords. Laparoscopic partial nephrectomy; Senile renal carcinoma; Serum growth

differentiation factor 15; Vascular endothelial growth factor; Kidney function; Quality of life; Postoperative complication

INTRODUCTION

Renal cancer is a malignant tumor originating from the tubular epithelium of the kidney, accounting for 80.0% to 90.0% of renal malignant tumors in the elderly population [1]. Clear cell carcinoma and papillary renal cell carcinoma were the main pathologic types of elderly renal cell carcinoma, but collecting duct carcinoma was relatively rare. At present, the pathogenesis of senile renal carcinoma has not been clarified clinically, and it is generally believed that it is related to smoking, heredity, obesity, antihypertensive drugs and hypertension. Its clinical manifestations are complex and variable, most of which are caused by renal tumor itself, and some of which are caused by hormones secreted by renal cancer cells or metastases [2]. Open partial nephrectomy, as a traditional treatment for senile-aged renal cancer, can remove the lesion while preserving part of the nephron, which is helpful to improve the prognosis of patients, and most patients can benefit from it. However, open partial nephrectomy has high risk and trauma, and the postoperative recovery time is longer, so it is often difficult to obtain a good prognosis [3]. With the continuous development and completion of laparoscopic technology, laparoscopic partial nephrectomy has been applied in clinical practice [4]. Compared with traditional open surgery, laparoscopic partial nephrectomy has the advantages of surgical trauma, rapid postoperative recovery and more accurate operation. Through the magnification of laparoscopy, it can be observed from multiple angles, which helps to expand the surgical field of view and facilitates perioperative minimally invasive operations [5-6]. This study focuses on the therapeutic effect of laparoscopic partial nephrectomy in elderly patients with renal cancer, as reported below.

1. DATA AND METHODS

1.1 General Information

Ninety-two elderly patients with renal cancer from April 2021 to December 2023 were selected as subjects, and 46 patients were divided into two groups by envelope method. There was no statistical difference in general data between the two groups ($P>0.05$), as shown in Table 1.

Table 1 Comparison of general information between the two groups

General information		Observation group (n=46)	Control group (n=46)	χ^2/t	p-value
sex	male	31 (67.39)	29 (63.04)	0.719	0.545
	female	15 (32.61)	17 (36.96)		
Age (years)		70.39±6.28	70.41±6.31	0.034	0.671
Body mass index (BMI) (kg/m ²)		22.41±3.25	22.43±3.27	0.081	0.572
Tumor diameter (cm)		4.39±0.52	4.41±0.54	0.073	0.596
RENAL Score (points)		4.10±0.61	4.12±0.63	0.027	0.634
Smoking history	There are	15 (32.51)	17 (36.96)	1.215	0.783
	There is no	31 (67.39)	29 (63.04)		
Drinking history	There are	11 (23.91)	13 (28.26)	0.958	0.617
	There is no	35 (76.09)	33 (71.74)		
Complication	hypertension	14 (30.43)	12 (26.09)	0.629	0.562
	diabetes	5 (10.87)	7 (15.22)	0.526	0.893
	other	9 (19.57)	11 (23.91)	0.674	0.771

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) All elderly patients with renal cancer admitted to our hospital [7] had complete pathological examination results; (2) All cases were unilateral, and no suspected nodules were found on chest CT examination. (3) There were no contraindications for laparoscopic partial nephrectomy and open partial

nephrectomy, and all patients could tolerate them; Exclusion criteria: (1) mental disorders, difficult to cooperate with treatment or accompanied by infectious diseases; (2) severe liver and kidney dysfunction, surgical contraindications or immune system diseases; (3) organic diseases of the brain, malignant tumors in other parts or survival time <3 months.

1.3 Methods

Preoperative examination was completed in both groups to determine the location of the lesion and its relationship with the surrounding tissue, and to formulate a detailed surgical plan. Control group: patients in this group were given partial open nephrectomy. Endotracheal intubation anesthesia was performed to assist the patient to maintain a healthy lateral position; The surgical site is routinely disinfected with a towel, and the patient's waist is appropriately raised during the Genu operation. Peritoneum was used as the surgical approach to make surgical incision from the 12th rib to fully reveal the perirenal fascia. With the help of automatic retractions, the lesion site was further determined, the lesion edge morphology and the relationship with surrounding tissues were clearly defined, Gerota fascia was cut, and the surrounding fat and perirenal fascia were separated to fully free the kidney artery and kidney tissue. After the lesion tissue was determined, the renal capsule was incised with the help of an electrocoagulation knife to expand the lesion by 5mm and the marked area was excised. After the renal artery was blocked, the lesion tissue and a few surrounding tissues were further excised, the surgical incision was sutured, and drainage tube was prevented for patients without active bleeding to complete the operation.

Observation group: The patients in this group were given laparoscopic partial nephrectomy. Preoperative operation was the same as control group. After determining the location of the lesion, laparoscope and supporting instruments were placed in the middle, front and back of the axillary respectively, and CO₂ was filled to help the patient complete the establishment of artificial pneumoperitoneum, and the pneumoperitoneum pressure was 10-12mmHg, so as to obtain a good operating space.

With the help of ultrasonic knife, the fascia around the kidney was removed, the adhesive tissue was separated, and a little normal kidney tissue was found. After the blood flow of the kidney artery was blocked, 0.5-1.0cm was dilated from the lesion site, the complete lesion tissue was removed, and the kidney wound was continuously sutured and the surgical incision was closed. For patients without active bleeding, The drainage tube was prevented, the operation was completed, and the effects of the two groups were evaluated 7 days after surgery.

1.4 Observation Indicators

(1) Surgical indicators. Intraoperative bleeding and postoperative drainage, operation, getting out of bed, hospitalization and bowel sound recovery time were counted in the two groups. (2) Renal function, GDF-15 and VEGF. Serum creatinine (Scr) and blood urea nitrogen (BUN) levels were detected by automatic biochemical analyzer before and after intervention in the two groups [8]. The levels of GDF-15 and VEGF were detected by enzyme-linked immunosorbent assay [9]. (3) Quality of life. The quality of life of the patients in the two groups was assessed from the physiological, psychological and social fields and social relations before and after intervention, with 100 points for each item, and the higher the score, the better [10]. (4) Postoperative complications. The incidence of urinary tract infection, incision infection, fat liquefaction, subcutaneous edema and urinary extravasation were analyzed.

1.5 Statistical Analysis

SPSS26.0 software was used for processing. The χ^2 test of counting data was used as n (%), and the t test of measurement data was used as. The difference was statistically significant at $P < 0.05$.

2 RESULTS

2.1 Comparison of surgical indexes between the two groups

Blood loss, drainage volume, operation, getting out of bed activity,

hospitalization and bowel sound recovery time in the observation group were shorter than those in the control group ($P < 0.05$), as shown in Table 2.

Table 2 Comparison of surgical indexes between the two groups ($\bar{x} \pm s$)

Group	Example number	Intraoperati ve blood loss (mL)	Had the traffic (mL)	The operation time (min)	Time to get out of bed (d)	Length of stay (d)	Bowel sounds recovery time (d)
Observation group	46	75.37±6.52	3.24±0.63	70.39±4.51	1.83±0.61	6.49±0.78	24.31±3.69
Control group	46	121.59±12.15	5.78±0.71	85.47±6.84	2.72±0.72	9.56±0.93	38.75±5.53
t	/	5.636	6.029	6.121	5.784	5.663	6.341
P	/	0.000	0.000	0.000	0.000	0.000	0.000

2.2 two groups of kidney function, GDF - 15 and VEGF

After intervention, the renal function of the two groups was improved, and the levels of GDF-15 and VEGF were decreased. Observation group of Scr, BUN, GDF - 15 and VEGF is lower than the control group ($P < 0.05$), are shown in table 3.

Table 3 Comparison of renal function, GDF-15 and VEGF between the two groups ($\bar{x} \pm s$)

Group	Point of time	Scr ($\mu\text{mol/L}$)	BUN (mmol/L)	GDF-15 (ng/mL)	VEGF(ng/mL)
Observation group (n=46)	Before intervention	93.52±5.67	5.74±0.83	263.25±35.18	462.59±43.36
	After the	68.31±3.59**	4.12±0.52**	171.41±12.15**	283.15±24.31**

	intervention				
	Before				
Control	intervention	93.55±5.69	5.76±0.85	265.51±35.21	463.11±43.41
group (n=46)	After the				
	intervention	81.14±4.74*	5.02±0.73*	201.59±18.84*	367.39±32.69*

Compared with control group, #P<0.05; Compared with before intervention, *P<0.05

2.3 Comparison of life quality between the two groups

The quality of life of the two groups was improved after intervention. Observation group physiological, psychological and social fields and social relationship score higher than the control group (P < 0.05), are shown in table 4.

Table 4 Comparison of quality of life between the two groups (score, $\bar{x} \pm s$)

Group	Point of time	Physical field	Domain of psychology	Social domain	Social relation
Observation group (n=46)	Before				
	intervention	73.49±4.52	73.51±4.54	74.16±4.53	72.63±4.34
group (n=46)	After the				
	intervention	89.46±5.81**	85.67±6.03**	88.74±5.96**	87.57±5.52**
Control group (n=46)	Before				
	intervention	73.51±4.54	73.54±4.56	74.18±4.55	72.65±4.36
group (n=46)	After the				
	intervention	80.11±5.23*	79.45±5.61*	81.21±5.23*	81.26±5.02*

Compared with control group, #P<0.05; Compared with before intervention, *P<0.05

2.4 Comparison of postoperative complications between the two groups

There was no statistical difference in the incidence of postoperative complications between the two groups (P>0.05), as shown in Table 5.

Table 5 Comparison of postoperative complications between the two groups [n (%)]

Group	Example number	Fat liquefaction	Subcutaneous edema	Urinary tract infection	Incision infection	Urinary exosmosis	Incidence rate
Observation group	46	0 (0.0)	1 (2.17)	0 (0.00)	1 (2.17)	0 (0.00)	2 (4.35)
Control group	46	1 (2.17)	1 (2.17)	1 (2.17)	1 (2.17)	1 (2.17)	5 (10.87)
χ^2	/	/	/	/	/	/	0.451
P	/	/	/	/	/	/	0.319

3 DISCUSSION

As a malignant tumor with high clinical incidence, elderly renal cancer accounts for 80.0% of all renal tumors [11]. At present, the pathogenesis of senile renal cancer has not been clarified clinically, which is mostly related to acquired cystic kidney disease, heredity, smoking, obesity and other factors, and most patients have not obvious symptoms at the early stage of the disease, resulting in greater difficulty in clinical diagnosis and treatment [12]. In the past, open partial nephrectomy was the main treatment for elderly patients with renal cancer. With the help of surgery, lesions

and surrounding tissues can be completely removed, and lymph node dissection can be completed simultaneously. However, this operation is relatively traumatic, which is not conducive to the improvement of postoperative life quality of patients [13]. At the same time, the implementation of this operation increases the burden on the healthy kidney, causing large blood pressure flow, and increasing the incidence of postoperative hypertension and cardiovascular and cerebrovascular diseases [14]. In this study, the surgical indexes in the observation group were shorter than those in the control group ($P < 0.05$). The quality of life was improved in both groups after intervention. The scores of physiological, psychological and social fields and social relations in the observation group were higher than those in the control group ($P < 0.05$). It can be seen from these results that laparoscopic partial nephrectomy can alleviate surgical trauma in elderly patients with renal cancer, help to improve the quality of life of patients and facilitate their recovery. Analysis of reasons: With the continuous development of medical technology, laparoscopic partial nephrectomy has been applied to elderly patients with renal cancer, which can preserve part of the function of the affected kidney to the maximum extent, reduce the burden on the healthy kidney, relieve the normal blood perfusion of the healthy kidney, and thus reduce the incidence of postoperative complications [15]. As a special medical instrument, laparoscopy is equipped with a miniature camera, which can obtain a clear surgical field of view through its magnification. Images captured through the lens of laparoscopy can be transmitted through the optical fiber, and after processing by the signal system, lesions can be displayed on the dedicated monitor, which is helpful to judge the patient's condition and guide the doctor's operation [16].

GDF-15 can participate in the differentiation, proliferation and repair of cardiomyocytes. As a stress cytokine, GDF-15 is more expressed in prostate and placental tissues in normal human beings, but it will cause the level of GDF-15 to increase in inflammatory immune response and in solid tumors such as senile kidney cancer [17]. Studies by Leng Xueyan et al. [18] showed that serum GDF-15 was significantly elevated in elderly patients with renal cancer, and its expression level

was related to the progression of the disease and was a risk factor for the treatment and prognosis of patients. Studies by Herrmann K et al. [19] showed that GDF-15, as a hypoxia-inducing gene, is related to the body's immune system and can directly participate in the regulation of lipid metabolism. In elderly patients with renal cancer, tumor cells and cells in the surrounding microenvironment can secrete GDF-15 in large quantities and participate in the invasion and metastasis of cancer cells. As a vascular permeability factor, VEGF is mainly secreted by tumor itself or tumor-related stroma, and can bind to heparin protein on the cell membrane to accelerate the formation of new blood vessels at the lesion site, thus promoting the proliferation and migration of cancer cells [20]. At the same time, the sustained stress response of elderly patients with renal cancer can improve the permeability of tumor blood vessels, stimulate the proliferation and division of vascular endothelial cells, and thus induce the formation of new blood vessels, which plays an important role in the occurrence and development of the disease. In this study, renal function was improved and GDF-15 and VEGF levels were decreased after intervention in both groups. Scr, BUN, GDF-15 and VEGF in observation group were lower than those in control group ($P < 0.05$). There was no statistical difference in the incidence of postoperative complications between the two groups ($P > 0.05$). According to the results, laparoscopic partial nephrectomy can improve the kidney function and reduce the levels of GDF-15 and VEGF in elderly patients with renal cancer, and most patients can benefit from it. Therefore, when elderly patients with renal cancer are treated with laparoscopic partial nephrectomy, the levels of GDF-15 and VEGF can be dynamically monitored, the patient's condition can be evaluated, and the treatment plan can be adjusted according to the measured results to consolidate the surgical treatment, so as to obtain a good prognosis.

In summary, laparoscopic partial nephrectomy has significant effects in elderly patients with renal cancer, which can help alleviate surgical trauma, improve renal function, reduce GDF-15 and VEGF levels, improve patients' quality of life and reduce the incidence of postoperative complications, and is worthy of promotion and

application.

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