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Evaluation of the Effect of Transurethral Resection of Bladder Tumors in the Treatment of Bladder Cancer and its Impact on CA19-9 and CA125 Levels

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Abstract: *Objective:* To evaluate the impact of transurethral resection of bladder tumors on surgical outcomes and serum tumor markers CA19-9 and CA125 in patients with bladder cancer. *Methods:* 80 patients with bladder cancer admitted to our hospital were selected and divided into two groups according to different treatment methods, with 40 cases in each group. The control group underwent open resection of bladder tumor, and the observation group adopted transurethral resection of bladder tumors. The two groups' surgical indicators and levels of serum tumor markers CA19-9 and CA125 before and after treatment were observed and compared. *Results:* The operation time, bladder irrigation time, and intraoperative bleeding volume of the observation group were less than those of the control group, and the difference was statistically significant ($P < 0.05$); Before surgery, there was no statistically significant difference in serum CA19-9 and CA125 levels ($P > 0.05$). After surgery, the serum CA19-9 and CA125 levels of the two groups of patients were significantly lower than those before surgery. Moreover, the serum CA19-9 and CA125 levels in the observation group were significantly lower than those in the control group after surgery ($P < 0.05$). *Conclusion:* Transurethral resection of bladder tumors in the treatment of bladder cancer can significantly improve various surgical indicators and reduce the levels of bladder cancer tumor markers CA19-9 and CA125. The surgical effect and prognosis are good and it is worthy of clinical application and promotion.

Keywords: Transurethral resection of bladder tumors; Bladder cancer; Effect; Serum tumor marker; CA19-9; CA125

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1. Introduction

Bladder cancer is a common malignant disease of the urinary system. The pathogenesis of this disease is still unknown. However, in recent years, the incidence of bladder cancer has gradually increased, with an elevated incidence rate in younger individuals [1]. Tumor resection is the primary method for the treatment of bladder cancer. However, open surgery has several disadvantages, such as large incisions, slow recovery, many

complications, and high recurrence rate. This treatment approach has limited efficacy and causes patients to suffer from great pain [2]. While transurethral resection of bladder tumors, as a minimally invasive surgery, not only improves patient safety but also removes tumors more thoroughly, with a lower recurrence rate [3]. Monitoring the levels of tumor markers CA19-9 and CA125 can reflect the effect of cancer treatment and control [4]. This study was conducted to evaluate the impact of transurethral resection of bladder tumors on the levels of tumor markers CA19-9 and CA125 in patients with bladder cancer and to explore its application value in improving the efficacy and prognosis of patients with bladder cancer.

2. Materials and methods

2.1. Clinical data

80 bladder cancer patients treated with surgical treatment in our hospital from January 2019 to December 2022 were selected. They were divided into two groups according to different treatment methods, with 40 cases in each group. The control group underwent open resection of bladder tumor. This group included 25 males and 15 females, aged 34–76 years old, with an average of 52.7 ± 3.8 years old; duration of disease was 12–182 days, with an average of 91.8 ± 28.5 days. There were 21 cases of single bladder tumor and 19 cases of multiple bladder tumors; 23 cases of TNM (Tumor, Node, Metastasis) stage II cancer, 13 cases of stage III, and 4 cases of stage IV. The observation group adopted transurethral resection of bladder tumors. There were 29 males and 11 females in this group, aged 32–77 years old, with an average of 52.5 ± 3.5 years old; a disease duration of 10–191 days, and an average of 92.3 ± 29.1 days. There were 21 cases of single bladder tumor and 19 cases of multiple bladder tumors; 22 cases of TNM stage II cancer, 14 cases of stage III, and 4 cases of stage IV. After statistical comparative analysis, there was no statistically significant difference in general information such as gender, age, disease duration, tumor stage, and tumor type between the two groups of patients ($P > 0.05$).

Inclusion criteria:

(1) The study subjects were treated for symptoms such as hematuria, urinary tract pain, urinary retention, and urinary tract obstruction. Tumor lesions were found through laboratory and imaging examinations. They were confirmed to be malignant tumors by surgical pathological examination, which is consistent with the clinical diagnosis of bladder cancer.
(2) The tumor TNM stage of the selected patients is stage II–IV.
(3) The selected subjects all received tumor resection surgery and met the surgical indications.
(4) The patients and their families were informed of the purpose and methods of the research before all studies were conducted; they voluntarily choose the surgical plan, join the trial, and sign the informed consent form, which is reviewed and approved by the hospital ethics committee.

Exclusion criteria:

(1) Patients with other malignant diseases.
(2) Patients with contraindications to the corresponding surgical procedures and anesthetic drugs and unable to meet the surgical requirements.
(3) Patients with heart, brain, liver, and kidney dysfunction.
(4) Patients with mental illness and unclear autonomous consciousness.

2.2. Treatment methods

Both groups of patients underwent hemodynamic index examinations, imaging examinations, blood tests, etc., before surgery. The tumor lesions were located through imaging examinations, the nature, shape, size, number, etc., of the tumors were evaluated, and surgical plans were formulated accordingly. Antibiotics were given to

prevent infection.

The control group was treated with open resection of bladder tumor. During the operation, they were placed in a supine position, and general anesthesia was used. After the anesthesia was in effect, an incision was made through the middle of the pubic bone, the bladder was incised, the tumor focus and surrounding tissue were fully exposed, and the tumor focus was partially removed. Part of the malignant tumor and the surrounding 2–3 cm bladder wall tissue were removed together with the adhesive peritoneal tissue. If the tumor was located at the ureteral orifice, the ureter should also be removed. An anastomosis was performed, the bladder cavity was flushed, and a fistula was made. Following these, the abdomen was closed, the incision was sutured, and a ureteral catheter was placed.

The observation group underwent transurethral resection of bladder tumors, using combined spinal and epidural anesthesia with the patient taking the lithotomy position. Under the guidance of the resectoscope, the actual condition of the tumor was explored and the surgical location was determined. A resectoscope electrode was used to remove the tumor and surrounding tissue, and cutting to the muscle layer. The resection ring has both the functions of electrocution and electrocoagulation. A resector was used to remove the tumor, the power of the resector was 260W. Electrocoagulation was used to stop the bleeding after resection of the tumor focus and surrounding tissue. The power of electrocoagulation was about 180W. After sufficient hemostasis, a three-lumen urinary catheter was placed for irrigation.

2.3. Observation indicators

2.3.1. Surgical indicators

The operation time, bladder irrigation time, intraoperative bleeding volume, and other surgical index values of each patient in the two groups were measured and recorded, and the average value was calculated. The intraoperative bleeding volume = 5 ml × the number of sterile hemostatic gauze used during the operation.

2.3.2. Tumor marker levels

Before surgery and 72 hours after surgery, ELISA (enzyme-linked immunosorbent assay) was used to measure the levels of tumor markers CA19-9 (cancer antigen 19-9) and CA125 (carbohydrate antigen 125) in patients with bladder cancer. The patients were tested early in the morning on the test day. 3 ml of fasting venous blood was collected using the cubital vein blood collection method. The blood sample was centrifuged at 1000 rpm for 10 minutes, and the serum was taken for tumor markers detection in the machine. A multifunctional microplate reader was used to measure the absorbance values of CA19-9 and CA125 in the serum at a (according to horseradish peroxidase marker luminescence intensity measurement) and convert to the corresponding concentration value. Human CA19-9 and CA125 ELISA detection kits were purchased from Shanghai Enzyme Biotechnology Co., Ltd. They were measured at a wavelength of 450 nm, and the clinical reference range was 0–40 U/ml for serum CA19-9 and 0–35 U/ml for serum CA125.

2.4. Statistical methods

The research database was established by integrating the input research data with Excel 2022 software. The SPSS25.0 software package was used to perform statistical comparative analysis on different research data. Measurement data such as operation time, bladder irrigation time, serum concentrations of CA19-9 and CA125, etc., were expressed in the form of mean ± standard deviation (SD), *t*-test was used for paired comparison of data between groups, and ANOVA was used for pairwise comparison of data within groups. When $P < 0.05$, the difference was statistically significant.

3. Results

3.1. Analysis of the impacts of two surgical methods for treating bladder cancer on surgical indicators

Based on **Table 1**, the operation time, bladder irrigation time, and intraoperative bleeding volume in the observation group were significantly less than those of the control group ($P < 0.05$).

Table 1. Comparison of various surgical index data of patients in the observation group and the control group (mean ± SD)

Group	Operation time (minutes)	Bladder irrigation time (days)	Intraoperative blood loss (ml)
Observation group (n = 40)	42.7 ± 7.4	1.6 ± 0.3	48.1 ± 7.2
Control group (n = 40)	76.4 ± 8.1	2.3 ± 0.6	102.3 ± 12.8
t value	16.252	5.524	19.531
P value	0.000	0.000	0.000

3.2. Analysis of the effects of two surgical treatments for bladder cancer on serum tumor markers CA19-9 and CA125 levels

Compared with before treatment, the relevant indicators of both groups of patients were reduced after treatment, and the serum CA19-9 and CA125 levels in the observation group were also significantly lower than those in the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of serum CA19-9 and CA125 levels of patients in the observation group and the control group before and after surgery (U/ml, mean ± SD)

Group	Serum CA19-9		Serum CA125	
	Before surgery	72 hours after surgery	Before surgery	72 hours after surgery
Observation group (n = 40)	90.1 ± 8.2	58.1 ± 6.2 *	82.4 ± 6.9	49.7 ± 5.3 **
Control group (n = 40)	88.8 ± 8.5	69.2 ± 7.6 $^{\triangle}$	81.9 ± 6.6	63.2 ± 7.1 $^{\triangle\triangle}$
t value	0.581	5.986	0.273	8.068
P value	0.564	0.000	0.789	0.000

Note: Pairwise comparison of data within the group, in the observation group: *$P < 0.05$ and **$P < 0.05$ compared with before surgery; in the control group: $^{\triangle}P < 0.05$ and $^{\triangle\triangle}P < 0.05$ compared with before surgery.

4. Discussion

Many surveys and research results show that more than 90% of bladder cancers originate from epithelial tissue [5]. In the early stage of the disease, urinary disorder, urinary retention, and painless hematuria are present. When diagnosed, it is generally in the middle and late stages. The clinical treatment and control methods are tumor resection combined with radiotherapy and chemotherapy [6-8].

In terms of surgical methods, they include open resection and minimally invasive transurethral resection of bladder tumors. Open resection involves large trauma and a long recovery time, demonstrating obvious shortcomings in safety and effectiveness. Patients often need multiple surgeries and one-time open surgeries are not thorough enough to remove tumor lesions, thus the recurrence rate is higher and the patient's postoperative recovery time is also longer [9]. The results of this study showed that the operation time, bladder irrigation time, and intraoperative blood loss in the observation group were less than those of the control group, and

the difference was statistically significant ($P < 0.05$). This reflects the advantages of transurethral resection, which is minimally invasive, less time-consuming, and has less intraoperative bleeding. This is because, under the guidance of the resectoscope, the surgical field of view becomes clearer during transurethral resection of bladder tumors. The observation range is increased, which not only helps to completely remove the tumor and surrounding tissue to prevent recurrence but also reduces the damage to normal tissue and facilitates postoperative recovery, thus the surgical effect is significantly better [10].

From a predictive perspective, CA19-9 and CA125 are new observation indicators for bladder cancer. Among them, serum CA19-9 originates from the embryonic stage of tissues such as the pancreas, gallbladder, and liver, and its content in normal tissues is low. When carcinogenesis occurs, its concentration in malignant tumor will increase significantly, but a single CA19-9 is not highly sensitive for early diagnosis of bladder cancer and is mainly used to monitor and predict the development of the disease [11]; CA125 is widely distributed among skin tissue, and has high sensitivity but insufficient specificity. The use of the above two indicators can help to judge the surgical effect and prognosis more accurately and with strong reliability [12]. The results of this study showed that after surgery, the serum CA19-9 and CA125 levels in the observation group were also significantly better than those in the control group ($P < 0.05$), which reflects the positive short-term effect of transurethral resection of bladder tumor in the treatment of bladder cancer. It has again been confirmed that transurethral resection is more thorough in removing tumors. In addition to the wider visual field, it avoids damage to normal tissue and reduces surgical inflammatory stress response, thus improving patient tolerance and promoting postoperative recovery. It is related to the enhancement of autoimmune function. However, there were no simultaneous statistics and group studies on the tumor recurrence rate in this study, and the selection of time points was relatively short. However, transurethral resection treatment reduces the levels of tumor markers CA19-9 and CA125. Immune regulation mechanisms involved need to be further explored.

5. Conclusion

In summary, transurethral resection of bladder tumors in the treatment of bladder cancer can significantly improve various surgical indicators and reduce the levels of tumor markers CA19-9 and CA125. The surgical effect and prognosis are good and it is worthy of clinical application and promotion.

Disclosure statement

The author declares no conflict of interest.

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