Effect of Raykeen holmium laser electric resection and conventional electric resection on malignant degree and immune function of non-invasive bladder cancer

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Objective: To analyze the effect of Raykeen holmium laser electric resection and conventional electric resection on the malignant degree and immune function of non-invasive bladder cancer.

Methods: A total of 96 cases of patients with non-invasive bladder cancer were included for study and divided into observation group 46 cases who received Raykeen holmium laser resection treatment and control group 50 cases who received conventional electric resection treatment. Differences in postoperative illness-related indexes, serum adhesion molecule levels, urinary sediment miRNA and immune function-related indexes were compared between two groups.

Results: Serum DKK-3 and Endostatin values of observation group after treatment were higher than those of control group while CIP2A, DKK-1 and sFasL values were lower than those of control group; serum CD44v6, E-cadherin and hepaCAM values of observation group after treatment were higher than those of control group while EpCAM, sVCAM-1 and sICAM-1 values were lower than those of control group; urinary sediment miR-129, miR-125b, miR-720, miR-191 and miR-107 expression levels of observation group after treatment were lower than those of control group; serum IgG, IgA, IgM, C3, C4, CD4+ and CD4+/CD8+ values of observation group after treatment were higher than those of control group while CD8+ value was lower than that of control group.

Conclusions: Raykeen holmium laser electric resection treatment of patients with non-invasive bladder cancer can effectively reduce the malignant degree of tumor and improve body's immune function, and it has positive clinical significance.

1. Introduction

Non-invasive bladder cancer is the most common type of bladder cancer, it can obtain ideal therapeutic effect after partial tumor resection, and the clinical cure rate is high. Both Raykeen holmium laser electric resection and conventional electric resection are the most common ways to treat non-invasive bladder cancer. Conventional electric resection is widely applied in clinical practice, and at the same time of obtaining certain therapeutic effects, it also has certain probability of complications such as bleeding and bladder perforation[1,2]. Raykeen holmium laser electric resection works by using the continuous wave of laser, and has advantages in stopping bleeding, reducing the surgical trauma, decreasing postoperative obturator nerve reflex and bladder perforation, etc. In the research, the effect of Raykeen holmium laser electric resection and conventional electric resection on the malignant degree and immune function of non-invasive bladder cancer was mainly analyzed, hereby reported as follows.

2. Materials and methods

2.1. General information

Including criteria: 1) confirmed as non-muscle invasive bladder cancer through pathology, and being primary attack; 2) not
complicated with hematological system diseases; 3) not complicated with heart, lung, liver, kidney and other important organ dysfunction; 4) not with pregnancy or breast-feeding; 5) patients and families completely learned about the research process and signed informed consent forms.

A total of 96 cases of patients with non-invasive bladder cancer who met the requirement were included for study, the treatment interval was from July 2013 to July 2015, the surgical methods and results of related examination they received were retrospectively analyzed, and then patients were divided into observation group 46 cases who received Raykeen holmium laser electric resection treatment and control group 50 cases who received conventional electric resection treatment. Observation group included 29 male cases and 17 female cases, they were 37-70 years old, the average was (54.38±7.05) years, tumor diameter was 0.5-2.0 cm, the average was (1.19±0.17) cm, and tumor location: 13 cases in trigone of urinary bladder, 20 cases in lateral wall of urinary bladder, 7 cases in posterior wall of urinary bladder, and others 6 cases; control group included 31 male cases and 19 female cases, they were 39-72 years old, the average was (53.69±7.11) years, tumor diameter was 0.6-2.3 cm, the average was (1.24±0.19) cm, and tumor location: 14 cases in trigone of urinary bladder, 19 cases in lateral wall of urinary bladder, 9 cases in posterior wall of urinary bladder, and others 8 cases. Differences in baseline information were not significant between two groups (P>0.05).

2.2. Electric resection

Control group received conventional electric resection, specifically as follows: after general anesthesia intubation, patients took lithotomy position, continuous lavage resectoscope entered into the bladder to probe the tumor size, location, excision scope and other basic situation, and then normal saline was infused to make the bladder in half-filling state. Electric resection power was set to 140 W and the computer power to 60 W, tumor was removed at first, normal mucosa tissue within 2 cm around the tumor were fulgurized when reaching the muscular layer, and catheter was routinely placed after operation.

Observation group received Raykeen holmium laser electric resection treatment, specifically as follows: after general anesthesia intubation, patients took lithotomy position, Germany Wolf F21 cystoscope was placed through urethra, Raykeen holmium laser continuous wave treatment system was used, and power parameter settings were as follows: pulse energy 1.5 J, frequency 12 Hz and power 20 W. Laser cutting mirror was used to probe the basic situation of bladder tumor, and optical fiber was used to remove tumor from the root. The base of tumor and normal mucosa tissues 2 cm around the tumor were vaporized by laser to the muscular layer, laser was used for coagulation hemostasis, and catheter was routinely placed after operation.

2.3. Observation indexes

Illness-related indexes: cancerous inhibitor (CIP2A), Dickkopf (DKK)-1, DKK-3, soluble FasL (sFasL) and endostatin.

Serum adhesion molecules: cell adhesion molecule (CD44v6), epithelial cell adhesion molecule (EpCAM), E-cadherin, soluble vascular cell adhesion molecule-1 (sVCAM-1), hepatocyte cell adhesion molecule (hepaCAM) and soluble intercellular adhesion molecule-1 (sICAM-1).

Urinary sediment microRNA (miRNA): 1 week after two groups received treatment, 50 mL midstream urine was collected in the morning and centrifuged with 2 000 r/min at 4 ℃ for 15 min, the urinary sediment was collected to extract RNA, and RNA concentration was determined by spectrophotometry. Extracted urinary sediment RNA was cryopreserved at -80 ℃ for PCR detection. miR-129, miR-125b, miR-720, miR-191 and miR-107 expression levels were specifically detected.

Immune function-related indexes: immunoglobulin (IgG, IgM, IgA), complements (C3, C4) and T cell subsets (CD4+, CD8+).

2.4. Statistical methods

Data obtained in the research was analyzed by SPSS 23.0 software, measurement data was in terms of Mean ± SD, comparison between two groups was performed by t test, and P<0.05 was set as the standard of statistical significant differences.

3. Results

3.1. Illness-related indexes

It showed that serum DKK-3 and Endostatin values of observation group after treatment were higher than those of control group while CIP2A, DKK-1 and sFasL values were lower than those of control group (P<0.05), shown in Table 1.

3.2. Serum adhesion molecule levels

It showed that serum CD44v6, E-cadherin and hepaCAM values of observation group after treatment were higher than those of control group while EpCAM, sVCAM-1 and sICAM-1 values were lower than those of control group (P<0.05), shown in Table 2.

3.3. Urinary sediment miRNA

Detection of RNA contents by PCR showed that urinary sediment miR-129, miR-125b, miR-720, miR-191 and miR-107 expression levels of observation group after treatment were lower than those of control group (P<0.05), shown in Table 3.
3.4. Immune function-related indexes

Detection showed that serum IgG, IgA, IgM, C3, C4, CD4⁺ and CD4⁺/CD8⁺ values of observation group after treatment were higher than those of control group while CD8⁺ value was lower than that of control group \((P<0.05)\), shown in Table 4.

4. Discussion

Non-invasive bladder cancer accounts for about 70%-80% of bladder cancer, clinical treatment is mostly surgical resection, electric resection is the most common way, and while retaining the bladder, it is with convenient operation, small trauma and other advantages. Conventional electric resection is wide in clinical application, it removes tumor through electrode vaporization effect, and study shows that when the vaporization effect is not at its high point, electric resection easily leads to bladder bleeding and perforation, and even obturator nerve reflex⁴. Raykeen holmium laser electric resection is a new way of electric resection, continuous wave causes no tearing to the tissue and the coagulation tissue left after resection can achieve better hemostatic effect. Laser radiation range is mostly less than 2mm, and the flushing fluid in the process of surgical treatment can effectively absorb the laser energy and reduce normal tissue damage around the tumor⁴. In the research, Raykeen holmium laser electric resection and conventional electric resection were applied respectively to the treatment of patients with non-invasive bladder cancer, and the differences in clinical application effect were compared between the two.

CIP2A is necessary to the malignant transformation of human cells, and its over-expression can transform people immortal cells into malignant cells. Research has confirmed that CIP2A is highly expressed in squamous carcinoma, gastric cancer and other tumor samples, so it is believed that CIP2A may be the common carcinogenic factor in human malignant tumors⁵,⁶. Both DKK-1 and DKK-3 belong to human DKK family, and they have important influence on cell proliferation and polarity control. DKK-1 shows significantly high expression in lung cancer, ovarian cancer, liver cancer and many other tumors, and it has strong Wnt signaling pathway inhibitory activity. DKK-3 expression is down-regulated in human prostate cancer cells, but is up-regulated in colon cancer tissue and adjacent tissue. DKK-3 is involved in the remodeling of tumor blood vessels, and has the effect of promoting tumor angiogenesis as well as tumor infiltration and metastasis. Tumor cells can increase their own sFasL expression, induce the sFasL-expressed lymphocyte apoptosis, lead to tumor infiltration and escape immune surveillance⁷. Endostatin is currently known strongest and the most

Table 1
Comparison of serum illness-related index values between two groups after treatment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>CIP2A (pg/mL)</th>
<th>DKK-1 (ng/mL)</th>
<th>DKK-3 (ng/mL)</th>
<th>sFasL (μg/L)</th>
<th>Endostatin (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>4.39±0.46</td>
<td>5.73±0.52</td>
<td>8.12±0.76</td>
<td>4.73±0.52</td>
<td>42.38±4.11</td>
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<tr>
<td>Control</td>
<td>9.27±0.81</td>
<td>7.11±0.69</td>
<td>6.05±0.58</td>
<td>7.51±0.68</td>
<td>31.75±4.95</td>
</tr>
<tr>
<td>(t)</td>
<td>7.293</td>
<td>6.172</td>
<td>8.093</td>
<td>7.382</td>
<td>9.281</td>
</tr>
<tr>
<td>(P)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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Table 2
Comparison of serum adhesion molecule levels between two groups after treatment (ng/L).

<table>
<thead>
<tr>
<th>Groups</th>
<th>CD44v6</th>
<th>EpCAM</th>
<th>E-cadherin</th>
<th>sVCAM-1</th>
<th>hepaCAM</th>
<th>sICAM-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>79.38±7.11</td>
<td>32.17±3.08</td>
<td>73.05±6.81</td>
<td>51.28±5.05</td>
<td>85.39±8.05</td>
<td>63.27±5.48</td>
</tr>
<tr>
<td>Control</td>
<td>45.76±5.09</td>
<td>57.53±5.29</td>
<td>39.62±3.28</td>
<td>116.49±10.53</td>
<td>46.25±4.09</td>
<td>101.28±10.33</td>
</tr>
<tr>
<td>(P)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Table 3
Comparison of urinary sediment miRNA expression levels between two groups after treatment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>miR-129</th>
<th>miR-125b</th>
<th>miR-720</th>
<th>miR-191</th>
<th>miR-107</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>68.21±7.49</td>
<td>75.49±6.04</td>
<td>54.93±4.77</td>
<td>61.09±5.84</td>
<td>63.75±6.11</td>
</tr>
<tr>
<td>Control</td>
<td>119.75±14.28</td>
<td>98.75±9.11</td>
<td>92.06±8.59</td>
<td>103.27±10.92</td>
<td>95.61±8.48</td>
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<tr>
<td>(t)</td>
<td>10.292</td>
<td>9.372</td>
<td>8.293</td>
<td>9.124</td>
<td>8.982</td>
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<tr>
<td>(P)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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Table 4
Comparison of immune function-related index values between two groups after treatment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Humoral immunity (g/L)</th>
<th>Complement (g/L)</th>
<th>Cellular immunity (%)</th>
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</thead>
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<tr>
<td>Observation</td>
<td>10.23±0.94</td>
<td>1.78±0.14</td>
<td>1.14±0.13</td>
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<tr>
<td>Control</td>
<td>8.12±0.76</td>
<td>1.13±0.14</td>
<td>0.89±0.09</td>
</tr>
<tr>
<td>(t)</td>
<td>6.923</td>
<td>5.384</td>
<td>5.092</td>
</tr>
<tr>
<td>(P)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
specific angiogenesis-inhibiting factor, it directly or indirectly acts on endothelial cells and play the role of inhibiting angiogenesis, and at the same time, it participates in the body’s autoregulation. Above research results showed that serum DKK-3 and Endostatin values of observation group after treatment were higher while CIP2A, DKK-1 and sFasL values were lower, indicating that the curative effect of Raykeen holmium laser electric resection on patients with bladder cancer was better, and tumor activity was significantly inhibited.

Tumor invasion and metastasis is closely related to tumor cell-cell adhesion ability, and tumor cell adhesion ability is regulated by a series of cell adhesion molecules. Dynamic detection of the levels of adhesion-related factors in circulating blood can judge the tumor malignancy and the possibility of metastasis. Bladder cancer invades bladder wall, it is prone to infiltration and metastasis if not removed thoroughly, and therefore, early postoperative monitoring of serum adhesion-related factor levels is of great significance[8,9]. CD44v6 is a kind of transmembrane glycoprotein on cell surface, is closely related to the occurrence and metastasis of a variety of tumors, and with the reduced tumor cell differentiation, its expression is weakened. EpCAM is a single transmembrane protein encoded and expressed by tumor-related calcium signal transduction genes, and can activate many proto-oncogenes and be tumorigenic. E-cadherin is a kind of calcium-dependent cell adhesion molecule that can mediate homocellular junction and maintain normal cell morphology, and E-cadherin expression deletion is the sign of the tumor progression[10]. sVCAM-1 is one of the tumor cell surface antigens that produce certain effect on tumor immune response, and its level is related to tumor size and tumor malignancy, hepaCAM belongs to the immunoglobulin superfamily, which enhances cell-matrix adhesion and inhibits cell proliferation so as to inhibit tumor invasion and metastasis, sICAM-1 plays an important role in monitoring and regulating a variety of inflammatory immune responses, and also plays an important role in tumor growth and metastasis[11]. Research has confirmed that sICAM-1 expression level rises significantly in serum of patients with lung cancer, esophageal cancer and other malignant tumors. Above research results showed that serum CD44v6, E-cadherin and hepaCAM values of observation group after treatment were higher while EpCAM, sVCAM-1 and sICAM-1 values were lower, indicating that after bladder cancer patients received Raykeen holmium laser electric resection, tumor cell invasion and metastasis ability was weakened and tumor malignancy was reduced, and it was the sign of good prognosis.

miRNA is an endogenous and small non-coding RNA with 19-22 nucleotides, a large number of studies have shown that the miRNA plays a significant role in the occurrence and development of bladder cancer, and there is differential expression of miRNA in bladder cancer and healthy people. Study has shown that miR-129 is associated with bladder cancer grading and staging, and can be a noninvasive diagnostic index to judge the prognosis of bladder cancer. Urinary sediment miR-125b is associated with postoperative recurrence of non-invasive bladder cancer, and can be used as a minimally invasive diagnostic indicator to guide postoperative cystoscopy and determine subsequent treatment[12]. miR-720 and miR-191 are highly expressed in bladder cancer tissues, miR-720 is regulated by tumor suppressor gene p53, can inhibit the target protein expression and promote tumor cell proliferation, and has the function of oncogene; miR-191 expression level significantly increases in invasive bladder cancer and non-invasive bladder cancer, miR-191 expression is relatively lower in invasive bladder cancer, and it can be used as a tissue marker to judge whether the bladder cancer is invasive[13]. miR-107 is a newly discovered small molecule miRNA that exists in a variety of normal human tissues and cancer tissues, and is involved in glucose-lipid metabolism, neural development and carcinogenesis. miR-107 expression can increase in bladder cancer tissues, is positively correlated with illness development, and is one of the indicators to judge the trend and prognosis of disease. Above research results showed that urinary sediment miR-129, miR-125b, miR-720, miR-191 and miR-107 expression levels of observation group after treatment were lower, indicating that the application of Raykeen holmium laser electric resection to patients with non-invasive bladder cancer could reduce tumor malignancy from the gene expression level.

Cancer patients are mostly in a state of high consumption, and tumor cell proliferation, metastasis and other behaviors can all reduce the body’s immune function and weaken the immune surveillance function on tumor cells. Surgical removal of the tumor and interruption of tumor cell erosion to the body is one of the most effective ways to protect the body's immune function, and the monitoring of body's immune status is also one of the most important way to judge the effect of tumor resection[14]. Humoral immunity, cellular immunity and complements are all involved in the detection of tumor cells, and study has shown that body’s immune state is inversely proportional to tumor invasion. Humoral immunity includes IgG, IgA and IgM, cellular immunity includes CD4+, CD8+ and CD4+/CD8+, and above research results showed that IgG, IgA, IgM, CD4+ and CD4+/CD8+ levels of observation group after treatment were higher while CD8+ level was lower, indicating that after Raykeen holmium laser electric resection treatment, both humoral immune and cellular immune function in patients with non-invasive bladder cancer were enhanced[15]. There is also close connection between tumor malignancy and complement levels, and studies have shown that complements C3 and C4 levels significantly decrease in patients with liver cancer, cervical cancer, lung cancer and other malignant tumors. In the research, serum C3 and C4 levels of observation group after treatment were higher, indicating that effective tumor tissue resection by Raykeen holmium laser could improve the body’s complement status, and it was one of the signs of enhanced immune function and improved illness in patients.

To sum up, it is concluded as follows: Raykeen holmium laser electric resection treatment of patients with non-invasive bladder cancer can effectively reduce the malignant degree of tumor and improve body’s immune function, and it’s worth popularization and
application in clinical practice in the future.

References


