Effect of uterine water bag + gauze packing on coagulation function and stress response of patients with postpartum hemorrhage

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ABSTRACT

Objective: To study the effect of uterine water bag + gauze packing on coagulation function and stress response of patients with postpartum hemorrhage. Methods: Patients who gave birth and had postpartum hemorrhage in the hospital between June 2014 and May 2017 were selected as the research subjects and divided into the combined group who received uterine water bag + gauze packing hemostasis, the control group 1 who received uterine water bag hemostasis and the control group 2 who received gauze packing hemostasis. The overall clinical efficacy was observed, and the serum levels of blood coagulation function indexes and stress response indexes were determined before treatment and after hemostatic treatment. Results: The intraoperative blood loss, postoperative blood loss and the change of hemoglobin after treatment and after hemostatic treatment of combined group were less than those of control group 1 and control group 2; compared with those of same group before treatment, serum APTT and PT levels as well as FDP, ET-1, ANG-II, ALD, NE, E, TNF-α, IL-6, ICAM1 and VCAM1 contents after hemostatic treatment were significantly lower whereas PAI-1 and AT-III contents were significantly higher, and serum APTT and PT levels as well as FDP, ET-1, ANG-II, ALD, NE, E, TNF-α, IL-6, ICAM1 and VCAM1 contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2 whereas PAI-1 and AT-III contents were significantly higher than those of control group 1 and control group 2. Conclusion: uterine water bag + gauze packing treatment of postpartum hemorrhage can achieve better efficacy than monotherapy and improve the coagulation function and stress response.

1. Introduction

Postpartum hemorrhage is a common complication in puerperae after childbirth and also a common cause of postpartum death. In clinical practice, the routine therapies for postpartum hemorrhage include uterine massage, uterotonic application, etc., but there are still some patients with postpartum hemorrhage failed to achieve effective hemostasis after conventional treatment, and they need further surgical intervention[1-2]. Balloon packing, gauze packing, B-Lynch suture and uterine artery embolization are common ways of surgical intervention, water bag and gauze packing stop hemostasis by physical oppression, and both have been proven to be able to obtain exact hemostatic effect[3]. Continuous postpartum hemorrhage will lead to maternal coagulation dysfunction and stress response over-activation, and I specifically analyzed the effect of uterine water bag plus gauze packing on coagulation function and stress response of patients with postpartum hemorrhage in the following study.

2. Case information and research methods

2.1 General case information

Patients who gave birth and had postpartum hemorrhage in the hospital between June 2014 and May 2017 were selected as the research subjects, all patients had hemorrhage after childbirth and blood loss over 400mL, and the treatments such as hemostatic drug application and uterine massage were invalid. A total of 93 patients were enrolled, and the random number table method was used to divide them into 3 groups, with 31 cases in each group. Combined group were 25-35 years old, and the average gravidity was
(2.16±0.35); control group 1 were 24-33 years old, and the average gravidity was (2.21±0.32); control group 2 were 26-34 years old, and the average gravidity was (2.19±0.32). There was no significant difference in the general data among the three groups (P>0.05).

2.2 Hemostatic therapy

The hemostatic method for combined group was uterine water bag plus gauze packing, and the water bag was implanted into the bottom of the uterus cavity, the preheated saline was injected via the catheter, and the total volume was about 500-800 mL; the annular gauze was then placed in the posterior vaginal fornix, and the thickness of the gauze was 4 layers. Control group 1 and control group 2 underwent hemostasis in a single way, the methods were uterine water bag and gauze packing respectively, and the operation methods were the same as those of combined group.

2.3 Clinical effect observation

During and after treatment, the blood loss of three groups was observed, including intraoperative blood loss and postoperative blood loss; dynamic changes of blood routine were observed before and after treatment, and the changes of hemoglobin were calculated before treatment and after hemostatic treatment.

2.4 Serum index detection

Before treatment and after hemostatic treatment, 5-6 mL of cubital venous blood was collected respectively, full-automatic coagulation analyzer was used for the detection of APTT and PT levels as well as FDP, PAI-1 and AT-III contents, and microplate reader was used for the determination of ET-1, ANG-II, ALD, NE, E, TNF-α, IL-6, ICAM1 and VCAM1 contents.

2.5 Statistical methods

Software SPSS 19.0 was used to input data, the differences in measurement data among the three groups were by variance analysis and P<0.05 indicated statistical significance in differences.

3. Results

3.1 Overall clinical effect

The intraoperative blood loss of combined group, control group 1 and control group 2 were (637.6±78.2) mL, (936.1±112.6) mL and (941.5±106.4) mL respectively, the postoperative blood loss were (69.7±8.6) mL, (87.9±10.4) mL and (88.6±10.9) mL respectively, and the changes of hemoglobin before treatment and after hemostatic treatment were (14.7±1.9) g/L, (20.6±3.1) g/L and (20.1±3.5) g/L respectively. After variance analysis, the intraoperative blood loss, postoperative blood loss and the change of hemoglobin before treatment and after hemostatic treatment of combined group were less than those of control group 1 and control group 2.

3.2 Serum coagulation function indexes

Before treatment and after hemostatic treatment, analysis of serum coagulation function indexes APTT (s), PT (s), FDP (g/L), PAI-1 (μg/L) and AT-III (mg/L) among the three groups of patients was as follows: serum APTT and PT levels as well as FDP, PAI-1 and AT-III contents of three groups of patients were significantly different between before and after treatment (P<0.05); serum APTT and PT levels as well as FDP, PAI-1 and AT-III contents were not significantly different among the three groups of patients before treatment (P>0.05) whereas they were significantly different after hemostatic treatment (P<0.05), and serum APTT and PT levels as well as FDP content of combined group after hemostatic treatment

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Time</th>
<th>APTT (s)</th>
<th>PT (s)</th>
<th>FDP (g/L)</th>
<th>PAI-1 (μg/L)</th>
<th>AT-III (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined group</td>
<td>31</td>
<td>Before treatment</td>
<td>40.8±5.5</td>
<td>19.8±2.5</td>
<td>4.92±0.52</td>
<td>13.1±1.7</td>
<td>241.3±32.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>22.1±3.4</td>
<td>9.1±1.1</td>
<td>2.31±0.35</td>
<td>20.5±2.9</td>
<td>309.5±42.6</td>
</tr>
<tr>
<td>Control group 1</td>
<td>31</td>
<td>Before treatment</td>
<td>41.2±5.8</td>
<td>20.2±2.7</td>
<td>4.98±0.59</td>
<td>12.8±1.5</td>
<td>238.4±33.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>30.8±4.1</td>
<td>14.1±1.8</td>
<td>3.12±0.35</td>
<td>15.2±1.8</td>
<td>262.3±31.4</td>
</tr>
<tr>
<td>Control group 2</td>
<td>31</td>
<td>Before treatment</td>
<td>41.0±5.2</td>
<td>20.4±2.4</td>
<td>5.01±0.61</td>
<td>13.3±1.4</td>
<td>240.2±35.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>31.2±4.7</td>
<td>14.3±1.7</td>
<td>3.20±0.47</td>
<td>15.7±2.4</td>
<td>261.8±29.5</td>
</tr>
</tbody>
</table>

*ab: compared with control group 1 after treatment, P<0.05; b: compared with control group 2 after treatment, P<0.05.

Table 2.

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Time</th>
<th>ET-1</th>
<th>ANG-II</th>
<th>ALD</th>
<th>NE</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined group</td>
<td>31</td>
<td>Before treatment</td>
<td>0.98±0.12</td>
<td>70.4±39.3</td>
<td>226.4±33.1</td>
<td>216.4±29.5</td>
<td>264.1±22.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>0.42±0.07</td>
<td>45.4±6.8</td>
<td>147.5±22.5</td>
<td>129.5±16.2</td>
<td>152.1±17.8</td>
</tr>
<tr>
<td>Control group 1</td>
<td>31</td>
<td>Before treatment</td>
<td>1.01±0.13</td>
<td>70.8±9.1</td>
<td>229.1±28.4</td>
<td>218.7±27.5</td>
<td>265.2±26.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>0.76±0.09</td>
<td>61.3±8.3</td>
<td>199.3±23.1</td>
<td>161.2±20.3</td>
<td>203.6±27.5</td>
</tr>
<tr>
<td>Control group 2</td>
<td>31</td>
<td>Before treatment</td>
<td>0.97±0.11</td>
<td>71.1±9.8</td>
<td>227.9±31.5</td>
<td>217.2±25.2</td>
<td>266.5±29.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After treatment</td>
<td>0.69±0.07</td>
<td>61.3±8.9</td>
<td>194.2±17.8</td>
<td>163.8±20.3</td>
<td>204.1±28.6</td>
</tr>
</tbody>
</table>

*ab: compared with control group 1 after treatment, P<0.05; b: compared with control group 2 after treatment, P<0.05.

Table 2.
that uterine water bag packing and gauze packing can achieve exact complete, and the hemostatic effect is better. It has been reported uterine water bag oppression on the uterine cavity is all-sided and but it is easy to leave cavity and influences hemostatic effect; the gauze packing is convenient and quick to operate and widely used, death, and surgical intervention is required after routine uterine

4. Discussion

Before treatment and after hemostatic treatment, analysis of serum stress indexes ET-1 (ng/mL), ANG-II (pg/mL), ALD (pg/mL), NE (ng/mL) and E (ng/mL) among the three groups of patients was as follows: serum ET-1, ANG-II, ALD, NE and E contents of three groups of patients were significantly different between before and after treatment ($P<0.05$); serum ET-1, ANG-II, ALD, NE and E contents were not significantly different among the three groups of patients before treatment ($P>0.05$) whereas they were significantly different after hemostatic treatment ($P<0.05$), and serum ET-1, ANG-II, ALD, NE and E contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2.

3.4 Serum inflammatory factor contents

Before treatment and after hemostatic treatment, analysis of serum inflammatory factors TNF-α (ng/L), IL-6, ICAM1 (μg/L) and VCAM1 (μg/L) among the three groups of patients was as follows: serum TNF-α, IL-6, ICAM1 and VCAM1 contents of three groups of patients were significantly different between before and after treatment ($P<0.05$); serum TNF-α, IL-6, ICAM1 and VCAM1 contents were not significantly different among the three groups of patients before treatment ($P>0.05$) whereas they were significantly different after hemostatic treatment ($P<0.05$), and serum TNF-α, IL-6, ICAM1 and VCAM1 contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2.

3.5 Serum stress index contents

Before treatment and after hemostatic treatment, analysis of serum stress indexes ET-1 (ng/mL), ANG-II (pg/mL), ALD (pg/mL), NE (ng/mL) and E (ng/mL) among the three groups of patients was as follows: serum ET-1, ANG-II, ALD, NE and E contents of three groups of patients were significantly different between before and after treatment ($P<0.05$); serum ET-1, ANG-II, ALD, NE and E contents were not significantly different among the three groups of patients before treatment ($P>0.05$) whereas they were significantly different after hemostatic treatment ($P<0.05$), and serum ET-1, ANG-II, ALD, NE and E contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2.

Table 3.

Changes of serum inflammatory factors before and after treatment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Time</th>
<th>TNF-α</th>
<th>IL-6</th>
<th>ICAM1</th>
<th>VCAM1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td>31</td>
<td>Before</td>
<td>57.4±7.7</td>
<td>20.3±3.6</td>
<td>252.3±33.5</td>
<td>216.4±29.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>58.1±7.9</td>
<td>21.1±3.2</td>
<td>255.4±36.2</td>
<td>220.1±30.2</td>
</tr>
<tr>
<td>Control 1</td>
<td>31</td>
<td>Before</td>
<td>41.5±5.7</td>
<td>15.2±1.9</td>
<td>187.4±22.3</td>
<td>167.2±20.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>40.8±4.9</td>
<td>15.9±2.2</td>
<td>190.3±19.4</td>
<td>165.2±17.9</td>
</tr>
</tbody>
</table>

*: comparison between before and after treatment within group, $P<0.05$; †: compared with control group 1 after treatment, $P<0.05$; ‡: compared with control group 2 after treatment, $P<0.05$.

were significantly lower than those of control group 1 and control group 2 whereas PAI-1 and AT-III contents were significantly higher than those of control group 1 and control group 2.

There is significant coagulation dysfunction in patients with postpartum hemorrhage, which is characterized by disorder of coagulation process and excessive hyperfunction of fibrinolytic system. APTT and PT are common indexes to evaluate coagulation function, and their time extension reflects the coagulation dysfunction[5,6]; FDP is a fibrinolytic product, and its generation significantly increases in the process of coagulation disorder and hyperfibrinolysis[7,8]; PAI-1 is a plasminogen activator inhibitor, it has inhibitory effect on the activation of plasminogen, and its lower content can lead to enhanced fibrinolytic activity and increased hemorrhage risk; AT-III is a molecule with thrombin-inhibiting activity, which inhibits the coagulation process and increases the hemorrhage risk by inhibiting the activity of thrombin. The analysis of the changes in above serum coagulation indexes before and after treatment showed that serum APTT and PT levels as well as FDP content of both groups were decreasing whereas PAI-1 and AT-III contents were increasing after treatment, and serum APTT and PT levels as well as FDP content of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2 whereas PAI-1 and AT-III contents were significantly higher than those of control group 1 and control group 2.

This indicates that uterine water bag + gauze packing treatment of postpartum hemorrhage is superior to monotherapy in improving the coagulation function.

Postpartum hemorrhage can cause circulating blood loss and result in a series of internal environment changes, and the excessive activation of stress response and the abnormal release of a variety of endocrine hormones are the important manifestations of internal environment disorder. ET-1 is a molecule with strong vasoconstrictor activity, and the circulating blood loss in the bleeding process can cause endothelial damage, which will cause the large release of ET-1, regulate vasoconstriction and keep blood pressure stable[9]; RAAS system is the endocrine system that is the most significantly affected by the circulating blood change, and circulating blood reduction can stimulate renin activation, then increase the ANG-
II and ALD, promote vasoconstriction and increase water sodium reabsorption[10,11]; NE and E are the hormones synthesized by adrenal medulla, which have the activity of strengthening the cardiac work and promoting vasoconstriction, and can ensure the hemodynamics in a relatively stable state under the condition of circulating blood loss[12]. Analysis of the changes in above serum stress indexes before and after treatment showed that serum ET-1, ANG-II, ALD, NE and E contents of both groups were decreasing after treatment, and serum ET-1, ANG-II, ALD, NE and E contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2. It shows that uterine water bag plus gauze packing treatment of postpartum hemorrhage is better than monotherapy in improving the stress response.

The persistent stress reaction in patients with postpartum hemorrhage has activating effect on the inflammatory response, and the excessive secretion of a variety of cytokines in inflammatory response activation process may further affect blood coagulation function and increase bleeding condition[13,14]. TNF-α and IL-6 are the cytokines with strong pro-inflammatory activity, which are massively secreted by mononuclear macrophages, lymphocytes and other inflammatory cells in the early stages of inflammatory response and can mediate the cascade amplification and activation of the inflammatory response[15,16]. ICAM1 and VCAM1 are cytokines with intercellular adhesion effect, which can promote the adhesion and infiltration of inflammatory cells in local inflammatory area and help to amplify inflammatory response[17]. Analysis of the changes in above serum inflammation indexes before and after treatment showed that serum TNF-α, IL-6, ICAM1 and VCAM1 contents of both groups were decreasing after treatment, and serum TNF-α, IL-6, ICAM1 and VCAM1 contents of combined group after hemostatic treatment were significantly lower than those of control group 1 and control group 2. It shows that uterine water bag plus gauze packing treatment of postpartum hemorrhage is better than monotherapy in improving the inflammatory response.

After above analysis of the clinical curative effect and serum indexes, it can be concluded that the uterine water bag plus gauze packing treatment of postpartum hemorrhage can obtain more ideal curative effect than monotherapy, and can also improve the blood coagulation function and reduce the stress and inflammatory response.

References