Effect of minimally invasive intracranial hematoma drainage on inflammatory factors, serum ferritin and serum P substance in patients with hypertensive cerebral hemorrhage

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Objective: To study the effect of minimally invasive intracranial hematoma drainage on inflammatory factors, serum ferritin and serum P substance in patients with hypertensive cerebral hemorrhage. Methods: 92 cases of hypertensive cerebral hemorrhage patients in our hospital were selected and randomly divided into 2 groups: minimally invasive group (51 cases) and routine group (41 cases). Minimally invasive intracranial hematoma drainage was performed on the minimally invasive group. Bone flap decompression or small bone window craniotomy were used in the routine group. Tumor necrosis factor α (TNF-α), interleukin-6 (IL-6), high sensitive C reactive protein (hs-CRP) and serum protein (SF), serum substance P (SP) in the 2 groups were detected before treatment and 2 weeks after treatment. Results: The comparison of TNF-α, IL-6, hs-CRP, SP, and SF in the two groups before treatment was not statistically significant (P>0.05). TNF-α, IL-6, hs-CRP and SF in both groups after treatment significantly decreased, compared with that before treatment (P<0.01, P<0.05). TNF-α, IL-6, and SF in minimally invasive group decreased more significantly than that in routine group (P<0.01); The comparison of SP in the two groups after treatment significantly increased compared with that before treatment (P<0.01, P<0.05). SP in minimally invasive group increased more significantly than that in routine group (P<0.05). Conclusions: Compared with bone flap decompression or small bone window craniotomy, minimally invasive intracranial hematoma drainage can inhibit inflammatory reaction, reduce the degree of nerve damage and alleviate clinical symptoms more effectively.

1. Introduction

Hypertensive cerebral hemorrhage is the most common seen intracerebral hemorrhage caused by hypertension clinically[1–3]. Nowadays, minimally invasive intracranial hematoma drainage, a minimally invasive operation method to the treatment of HICH, has been recognized at home and abroad[4]. With the in-depth research, we found that tumor necrosis factor α (TNF-α), interleukin-6 (IL-6), and high sensitive C reactive protein (hs-CRP) have a close relationship to the formation of hydrocephalus around hematoma[5–7]. In this research, inflammatory factor and serum ferritin, serum P substance (SP) in the patients with HICH was detected, though the performance of minimally invasive intracranial hematoma drainage

2. Materials and methods

2.1. General information

92 cases of hypertensive cerebral hemorrhage patients GuangXi People’s Hospital of Baise from August 2013 to November 2015 were selected. Inclusion criteria: (1) first-episode within 24 h be hospitalized. (2) Amount of bleeding: 30–45 mL. (3) No obvious
2.3. Observation indexes

Invasive group. The remaining treatment methods were the same as the minimally invasive group (minimally invasive intracranial hematoma drainage was operated) and the routine group. In the minimally invasive group, there were 51 patients, 27 males and 24 females, aged from 47 to 69 years old. Hematoma included: basal ganglia in 21 cases, thalamus in 19 cases, and lobe of brain in 11 cases. The volume of hematoma was (37.3±6.2) mL. In the routine group, there were 41 patients, 22 males and 19 females, aged from 49 to 68 years old. Hematoma included: basal ganglia in 19 cases, thalamus in 13 cases, and lobe of brain in 9 cases. The volume of hematoma was (36.1±6.9) mL. There were no differences in the sex, age and type of volume of the hematoma, and there was no statistical significance (P>0.05).

2.4. Statistical analysis

SPSS 18.0 statistical package was conducted for statistical analysis. Measurement data were described as mean±standard deviation with variance analysis, inter-group comparison was conducted by t test, and values of P<0.05 were considered to be statistically significant.

3. Results

3.1. Comparison of inflammatory factors in the two groups

The comparison of TNF-α, IL-6, and hs-CRP in the two groups before treatment was not statistically significant (P>0.05). TNF-α, IL-6, and hs-CRP in both groups after treatment significantly decreased, compared with that before treatment (P<0.01, P<0.05). TNF-α, IL-6, and hs-CRP in minimally invasive group after treatment were respectively (39.02±3.03) μg/L, (15.06±2.69) μg/L, and (6.87±1.99) mg/L. TNF-α and IL-6 were significantly lower in minimally invasive group than in the routine group (P<0.01) (Table 1).

3.2. Comparison of SF and SP in the two groups

The comparison of SP, SF in the two groups before treatment was not statistically significant (P>0.05). SP in both groups after treatment significantly increased, compared with that before treatment (P<0.01, P<0.05). SF in both groups after treatment significantly decreased, compared with that before treatment (P<0.01, P<0.05). SP in minimally invasive group after treatment was significantly higher than that the routine group (P<0.01). SF in minimally invasive group after treatment was significantly lower than that in the routine group (P<0.01) (Table 2).
Compared with that before treatment, \( P < 0.05 \), \( P < 0.01 \); Compared with routine group after treatment, \( P < 0.01 \).

### Table 1
Comparison of inflammatory factors in the two groups (\( \bar{x} \pm s \)).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Time</th>
<th>TNF-( \alpha ) (( \mu g /L ))</th>
<th>IL-6 (( \mu g /L ))</th>
<th>hs-CRP (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimally invasive group</td>
<td>51</td>
<td>Before treatment</td>
<td>64.25±3.91</td>
<td>47.30±4.05</td>
<td>17.06±3.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 weeks after treatment</td>
<td>39.02±3.03**</td>
<td>15.06±2.69**</td>
<td>6.87±1.99**</td>
</tr>
<tr>
<td>Routine group</td>
<td>41</td>
<td>Before treatment</td>
<td>63.97±3.77</td>
<td>46.51±4.11</td>
<td>16.97±3.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 weeks after treatment</td>
<td>51.48±3.15**</td>
<td>29.85±3.40**</td>
<td>7.70±1.84**</td>
</tr>
</tbody>
</table>

4. Discussion

The main pathologic process of HICH: Long term hypertension causes intracranial atherosclerosis, which makes vessel wall weakened. And then, the microaneurysm appears. Sudden rise of blood pressure and rupture of microaneurysm make the primary injury of cerebral hemorrhage; After that, haematoma form in the bleeding area. Then, it expand, leading to edema of surrounding brain tissue, which causes the secondary injury of brain[8,9] and is the main cause of the condition aggravation[10,11]. More and more studies have showed that TNF-\( \alpha \), IL-6, and hs-CRP, as the important regulatory factors, play important roles in the immune response of secondary brain injury of HICH[12]. So, TNF-\( \alpha \), IL-6, and hs-CRP can reflect the surrounding edema condition of intracranial hematoma.

TNF-\( \alpha \) is one of the polypeptide cytokines produced by polypeptide cell factor, whose biologic activity mainly expressed in two sides: Under physiological condition, TNF-\( \alpha \) has the important function of maintaining cell differentiation and survival; Under pathological state, it acts as an important role of tumor killer factor, regulatory factors of inflammation and immune response[13]. IL-6 is an inflammatory factor, which has various kinds of biological activities. It can repair nervous system and mediate immunology response. The rapid increase of IL-6 will activate macrophage and impair nervous system; break blood-brain barrier and cause cerebral edema[14,15]. hs-CRP is a high sensitive reactive proteins, which can active the injury of cerebral vascular intima caused by complement system. And then it will promote the formation and development of atherosclerosis, and increase the severity of cerebral hemorrhage[16].

The study found that TNF-\( \alpha \), IL-6, and hs-CRP in both groups after treatment significantly decreased, compared with that before treatment (\( P < 0.01 \), \( P < 0.05 \)). And TNF-\( \alpha \) and IL-6 in the minimally invasive group were significantly lower than that in the routine group (\( P < 0.01 \)). It indicates that minimally invasive intracranial hematoma drainage can remove intracerebral hematoma, relieve inflammation, and avoid brain tissue injuries and bleeding. The cause of the effect may be that the damage of minimally invasive surgery on the brain tissue is not large. It can promptly remove the necrotic tissue and the hematoma oppression, which makes the level of inflammatory factors low. Minimally invasive puncture hematoma drainage can effectively reduce the HICH of the inflammatory response, which is consistent with the previous views[17–19].

In addition, studies have showed that SF, a marker of glial damage, with the increased expression of HICH induced damage to the nerve, will cause the rise of serum SF after been released to the blood[20].

The level of SP and the severity of HICH are inversely proportional. It means that cerebral hypoxia and cerebral edema of HICH make the SP significantly decreased. Also, increased brain diseases make SP decreased further. The low level of SP will cause other neurotransmitter metabolic disorders. Therefore, with the decrease of SP level, cerebral edema and intracranial pressure will increase. The comparison of SP in the two groups after treatment significantly increased, compared with that before treatment (\( P < 0.01 \), \( P < 0.05 \)). The comparison of SF in the two groups after treatment significantly decreased, compared with that before treatment (\( P < 0.01 \), \( P < 0.05 \)). SP in minimally invasive group increased more significantly than that in routine group (\( P < 0.05 \)). SF in minimally invasive group decreased more significantly than that in routine group (\( P < 0.05 \)).

This further shows that the intracranial minimally invasive puncture hematoma drainage is conducive to the recovery of damaged nerve glial cells, effectively alleviating the brain edema and reducing the intracranial pressure. At the same time, SF, SP level can reflect the situation of HICH patients with intracranial hematoma edema.

In conclusion, minimally invasive intracranial hematoma drainage can significantly improve the inflammatory factors, SP, and SF levels.
in patients with hypertensive cerebral hemorrhage, which relieves cerebral edema and reduces the intracranial pressure. Minimally invasive surgery is a good choice.

References


