The efficacy of febuxostat and allopurinol in the treatment of gout with hyperuricemia

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Abstract: The aim of this research work was to observe and analyze the efficacy of febuxostat and allopurinol in the treatment of gout with hyperuricemia. The 160 patients who has been diagnosed with gout and hyperuricemia in our hospital were selected as research objects. They were randomly divided into research group and control group, each containing 80. The control group received conventional allopurinol treatment, while the research group was treated with febuxostat. Then, the treatment efficacy was compared between the two groups. Through comparison of blood uric acid levels between the two groups after treatment, it can be known that improvement was more significant in the research group, P<0.05. The adverse reaction rate in the research group was significantly lower, P<0.05. For patients with gout and hyperuricemia, febuxostat therapy has better efficacy than that of allopurinol.

Keywords: Febuxostat, allopurinol, gout with hyperuricemia, efficacy.

INTRODUCTION

The rapid development of social economy increases people’s living standard in recent years, people’s lifestyle and dietary structure has been significantly changed, which leads a rising trend of gout disease. Gout can trigger various complications and cause serious impact on the normal life of patients (Liu and Liu, 2017; Zhu and Li, 2017; He, 2017; Ma, 2017). Therefore, it is of great significant to control this disease and reduce the occurrence of other diseases using active and effective programs.

Gout belongs to crystal-associated arthropathy caused by the deposition of monosodium urate, and is closely related to hyperuricemia caused by purine metabolic disturbance or reduced uric acid excretion. Gout (fig. 1) can be accompanied by hyperuricemia (fig. 2), and also manifest as acute arthritis, tophi, chronic arthritis, joint malformations, etc. In addition, gout can also be associated with renal lesions (fig. 3), resulting in kidney function damage and joint destruction, hypertension, hyperlipidemia and diabetes, etc (Xu et al., 2015; Elsayed, 2017). This study investigates the efficacy of febuxostat and allopurinol in the treatment of gout with hyperuricemia (Arif et al., 2017; Hanafiah et al., 2017).

MATERIALS AND METHODS

The research objects were 160 patients who have been diagnosed with gout and hyperuricemia in our hospital from January 2016 to December 2017. The inclusion criteria are: meeting the diagnostic criteria of acute gouty arthritis of the American College of Rheumatology, history of gout attack; in the gout remission period before admission; signed formal informed consent; no liver and kidney dysfunction; no contraindications to the use of febuxostat or allopurinol; no severe abnormality in white blood cells or platelet counts; no coagulation disorder. The patients were randomly divided into research group and control group, each containing 80. In the research group, there were 43 males and 37 females, with age ranging from 45 to 80 years, averaging at (60.8±3.2). In the control group, there were 45 males and 35 females, with age ranging from 44 to 78 years, averaging at (62.5±4.0). There was no significant difference in general data between two groups, P>0.05 (Alhawassi et al., 2018; Afzal et al., 2017). This paper has a rigorous structure, and the conclusion has been approved by relevant ethics and relevant departments.

Fig. 1: A case of gout.
The efficacy of febuxostat and allopurinol in the treatment of gout with hyperuricemia

The patients in the control group were medicated with allopurinol 100mg each time, three times a day. During the treatment period, both groups were applied with health publicity and education, scientific diet program was developed and the patients were asked to quit smoking and alcohol, reduce the intake of high purine foods, such as animal organs, seafood and soy products, avoid excessive exercise, maintain good sleep (Aldosari 2018; Shen et al., 2017; Jamal et al., 2017).

Fig. 2: Gout with hyperuricemia.

Fig. 3: Renal lesion.

Fig. 4: Acute arthritis.

Observation indicators
The blood uric acid levels before treatment, 1 month, 3 months and 6 months after treatment were observed. The criterion of meeting standard is that blood uric acid level drops to below 6mg/dL (360µmol/L) (Chen, Wu, Bi, et al., 2017). The rate of acute gout and the adverse reaction rate during the treatment were recorded.

Fig. 5: Joint deformity.

STATISTICAL ANALYSIS
The software SPSS 21.0 was used for statistical analysis. The measurement data were expressed as means ± average (x±s), and t was used for comparison between groups; the count data was expressed in the form of numbers (n) + percentages (%) and the comparison between groups was performed using the chi-square. P<0.05 indicates statistical significance (Alnaim and Almaz 2017; Rashid et al., 2017).

RESULTS
Comparison of blood uric acid levels before and after treatment in the two groups
As shown in table 1, there was no significant difference in blood uric acid level before and after the treatment between two groups, P>0.05; after different treatment, the improvement of the research group was significantly superior to that of control group in all periods, and the intergroup difference was of statistical significance, P<0.05.

Comparison of control rate of blood uric acid after treatment in the two groups
As shown in table 2, the control rate of blood uric acid levels after accepting for 1, 3, 6 months was significantly higher than that of control group, P<0.05.

Comparison of acute gout attack rate between the two groups
As shown in table 3, the acute gout attack rate in the research group (3.75%) was lower than that in the control group (12.50%), P<0.05, with statistical significance.

Comparison of adverse reaction rate between the two groups
As shown in table 4, there were 3 cases of adverse reaction in research group during the treatment period, with adverse reaction rate of 3.75%; there were 11 cases...
of adverse reactions in the control group, with adverse reaction rate of 13.75%. The adverse reaction rate in the research group was significantly lower than that in the control group, \(P<0.05\), with statistical significance (Xie 2018; Sarwar et al., 2017).

**DISCUSSION**

Gout with hyperuricemia is a life-long disease. Acute arthritis (fig. 4) and joint deformity (fig. 5) will greatly reduce patients’ quality of life. Complicated renal injury will hinder the effectiveness of prognosis. The main pathogenic factor of gout is hyperuricemia. Related studies indicate that the level of blood uric acid is closely related to the frequency of gout attacks (Kamatani et al., 2016). Therefore, it is crucial to control the level of blood uric acid in a timely and effective manner, prevent gout, effectively improve the patient's clinical symptoms and thus improve their quality of life (Li and Qiu, 2017).

The most common way to treat gout is drug therapy and febuxostat and allopurinol are commonly used drugs. Both febuxostat and allopurinol are xanthine oxidase inhibitors and have been widely used to decrease uric acid. Febuxostat is a selective inhibitor of non-purine xanthine oxidase. It was first marketed as a drug therapy in the United States to treat hyperuricemia in patients with gout (Xie 2017). Unlike allopurinol, febuxostat has a higher affinity for xanthine oxidase and xanthine dehydrogenase, while allopurinol has relatively low affinity for xanthine dehydrogenase. Hence, it is necessary to take repeated large dosage to well maintain the drug efficacy. Febuxostat enjoys better advantages in this regard (Fujimori et al., 2017; Mineo et al., 2017). In terms of structure, febuxostat also differs from purines or pyrimidines, and will not exert a serious influence on many enzymes involved in purine and pyridine metabolism \(in\ vivo\). However, allopurinol and oxypurinal have the same structure as purine, and exert certain influence on normal purine metabolism \(in\ vivo\). According to relevant data, the absorptivity of febuxostat can reach about 85% one hour after administration. With a half-life phase of 4 to 18 hours, febuxostat can be administered once a day and can be metabolized by the liver. At the same time, the excretion amount of febuxostat through the intestine is basically the same as that through urinary tract. Moreover, febuxostat can significantly reduce the high uric acid level in patients, provide good safety and

<table>
<thead>
<tr>
<th>Group</th>
<th>Case number</th>
<th>Before treatment</th>
<th>After 1 month’s treatment</th>
<th>After 3 months’ treatment</th>
<th>After 6 months’ treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research group</td>
<td>80</td>
<td>614.39±80.13</td>
<td>420.57±90.58</td>
<td>403.29±90.16</td>
<td>372.06±76.46</td>
</tr>
<tr>
<td>Control group</td>
<td>80</td>
<td>620.55±78.05</td>
<td>467.89±92.03</td>
<td>430.68±88.32</td>
<td>400.03±75.48</td>
</tr>
</tbody>
</table>

| t          | 0.20        | 14.69            | 19.35                     | 22.46                     |
| P          | >0.05       | <0.05            | <0.05                     | <0.05                     |

**Table 2**: Comparison of control rate of blood uric acid after treatment in the two groups [n(%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>Case number</th>
<th>Control rate at 1st month</th>
<th>Control rate at 3rd month</th>
<th>Control rate at 6th month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research group</td>
<td>80</td>
<td>60(75.00)</td>
<td>73(91.25)</td>
<td>80(100.00)</td>
</tr>
<tr>
<td>Control group</td>
<td>80</td>
<td>45(56.25)</td>
<td>55(78.57)</td>
<td>70(87.50)</td>
</tr>
</tbody>
</table>

| X²         | 8.34        | 9.66                       | 7.41                      |
| P          | <0.05       | <0.05                      | <0.05                     |

**Table 3**: Comparison of acute gout attack rate between the two groups [n(%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>Case number</th>
<th>Acute gout attack rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research group</td>
<td>80</td>
<td>3(3.75)</td>
</tr>
<tr>
<td>Control group</td>
<td>80</td>
<td>10(12.50)</td>
</tr>
</tbody>
</table>

| X²         | 10.42       |
| P          | <0.05       |

**Table 4**: Comparison of adverse reaction rate between the two groups [n(%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>Case number</th>
<th>Digestive tract symptom</th>
<th>Liver dysfunction</th>
<th>Rash</th>
<th>Incidence of adverse reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research group</td>
<td>80</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3(3.75)</td>
</tr>
<tr>
<td>Control group</td>
<td>80</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>11(13.75)</td>
</tr>
</tbody>
</table>

| X²         | 9.30        |
| P          | <0.05       |
reliability for patients with allopurinol allergy, without causing damage to liver and kidney. Therefore, the application of febuxostat is more effective in the treatment of gout with hyperuricemia.

There was no significant difference in blood uric acid level between two groups before treatment, \( P > 0.05 \). After accepting different treatment schemes, the improvement in research group was more significant than control group, \( P < 0.05 \) and the intergroup difference was of statistical significance. Through comparison of control rate of blood uric acid level between two groups after treatment, it can be known that the control rate of blood uric acid level in research group after accepting for 1, 3, 6 months was significantly higher than that of control group, \( P < 0.05 \) and the intergroup difference was of statistical significance. The acute attack rate of research group was \( 3.75\% \), which was lower than that \( (12.50\%) \) of control group, \( P < 0.05 \). In terms of adverse reaction rate, the acute attack rate of research group during treatment was 3, the adverse reaction rate was 3.75\%, while the case number of adverse reaction for research group was 3.75\%, which was lower than that \( (12.50\%) \) of control group, \( P < 0.05 \) and the intergroup difference was of statistical significance, \( P < 0.05 \). The results of research fully demonstrate the advantage of febuxostat therapy.

**CONCLUSION**

In summary, febuxostat has a better effect in the treatment of gout with hyperuricemia, which can actively improve the level of blood uric acid and reduce the acute recurrence rate of gout with higher safety and reliability.

**REFERENCES**


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