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

Sufang Wang*
Department of Pharmacy, Linfen Central Hospital, Linfen, China

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.

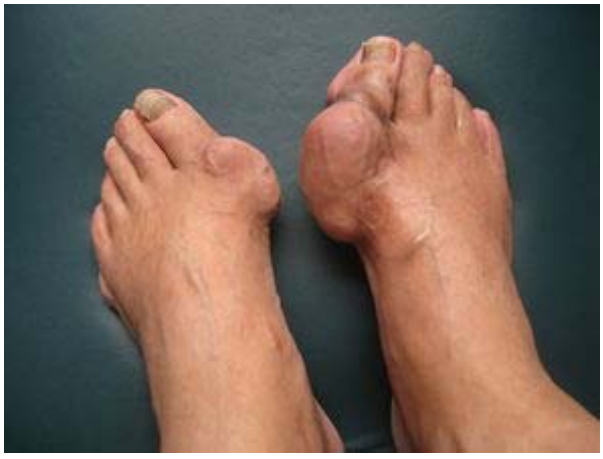

Fig. 1: A case of gout.`

The two groups were subjected to different treatment schemes, namely, the control group was treated with allopurinol therapy while the research group was treated with febuxostat therapy. The patients in research group were medicated with febuxostat 80mg each time, once a

*Corresponding author: e-mail: wangsf661@163.com

day; the patients in the control group was 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).

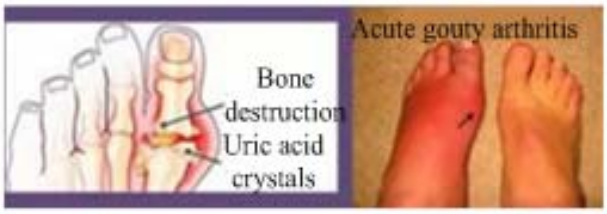

Fig. 2: Gout with hyperuricemia.

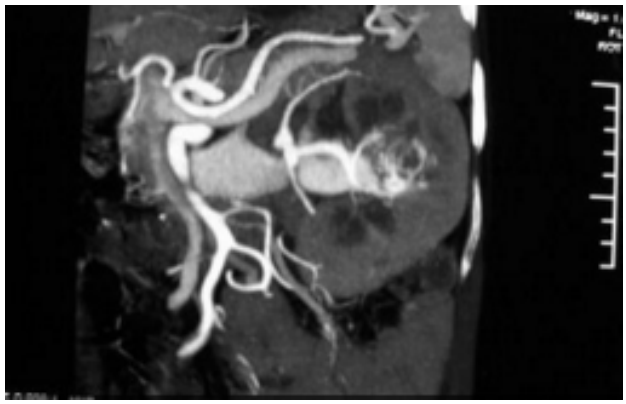

Fig. 3: Renal lesion.

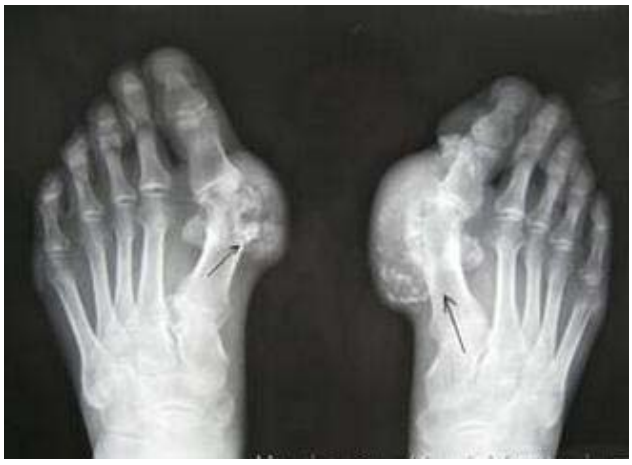

Fig. 4: Acute arthritis.

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.

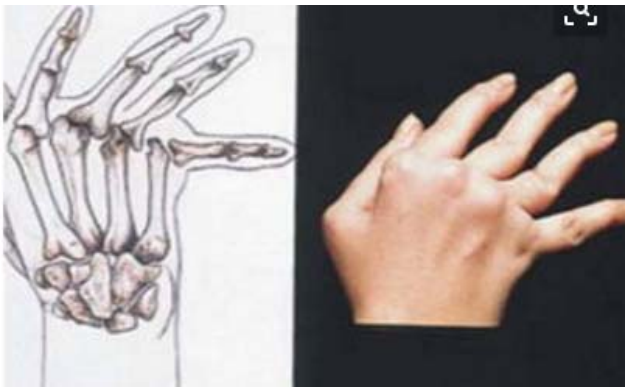

Fig. 5: Joint deformity.

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 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

Table 1: Comparison of blood uric acid levels before and after treatment in the two groups (x±s)

Group	Case number	Before treatment	After 1 month's treatment	After 3 months' treatment	After 6 months' treatment
Research group	80	614.39±80.13	420.57±90.58	403.29±90.16	372.06±76.46
Control group	80	620.55±78.05	467.89±92.03	430.68±88.32	400.03±75.48
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(%)]

Group	Case number	Control rate at 1st month	Control rate at 3rd month	Control rate at 6th month
Research group	80	60(75.00)	73(91.25)	80(100.00)
Control group	80	45(56.25)	55(78.57)	70(87.50)
X^2		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(%)]

Group	Case number	Acute gout attack rate
Research group	80	3(3.75)
Control group	80	10(12.50)
X^2		10.42
P		<0.05

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

Group	Case number	Digestive tract symptom	Liver dysfunction	Rash	Incidence of adverse reactions
Research group	80	1	2	0	3(3.75)
Control group	80	4	3	4	11(13.75)
X^2					9.30
P					<0.05

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 oxypurional 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

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 case number of adverse reaction for research group during treatment was 3, the adverse reaction rate was 3.75%, while the case number of adverse reaction for control group was 11, with adverse reaction rate of 13.75%, the intergroup different in adverse reaction rate 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

Afzal J, Ullah N, Hussain Z, Rukh S, Ayaz M, Akbar A, and Zaman A (2017). Phytochemical analysis and antibacterial potential of leaf extract of *Bauhinia* Linn.: an ethnomedicinal plant. *Matrix Science Pharma*, **1**(2): 17-19.

Aldosari FO (2018). Gender participation in sheep and goat farming in najran, southern saudi arabia. *Saudi J. Biol. Sci.*, **25**: 144-148.

Alhawassi TM, Abuelizz HA, Almetwazi M, Mahmoud MA, Alghamdi A, Alruthia YS, BinDhim N, Alburikan KA, Asiri YA and Pitts PJ (2018). Advancing pharmaceuticals and patient safety in Saudi Arabia: A 2030 vision initiative. *Saudi Pharm. J.*, **26**: 71-74.

Alnaim L and Almaz S (2017). A study of barriers and facilitators of clinical practice guidelines implementation among physicians. *Indian J. Pharm. Sci.*, **79**: 923-929.

Arif M, Jabeen F, Saeed A, Qureshi IZ and Mushtaq N (2017). A new class of potential antidiabetic acetohydrazides: synthesis, *in vivo* antidiabetic activity and molecular docking studies. *Bangl. J. Pharmacol.*, **12**: 319-332.

Chen WJ, Wu Y and Bi RB *et al* (2017). Therapeutic Effects of *Selaginella tamariscina* on the model of acute gout with hyperuricemia in rats based on metabolomics analysis. *Chinese Journal of Chemistry,* **35**(7): 156-160.

Elsayed J (2017). Bio-chemical biomarkers in algae *Scenedesmus obliquus* exposed to heavy metals Cd, Cu and Zn. *Acta. Chemica Malaysia*, **1**(1): 16-20.

Fujimori S, Hada T, Hosoya T, Kohri K, Nakamura T and Ueda T *et al* (2017). Placebo-controlled double-blind dose-response study of the non-purine-selective xanthine oxidase inhibitor febuxostat in patients with hyperuricemia (including gout patients) in Japan: Late Phase 2 Clinical Study. *Journal of Clinical Rheumatology,* **18**(02): 340-346.

Hanafiah MM, Ali MYM, Aziz NIHA, and John K (2017). Biogas production from agrowaste and effluents. *Acta. Chemica Malaysia*, **1**(1): 13-15.

He JF (2017). Comparison of efficacy and safety of febuxostat and allopurinol in decreasing uric acid in the treatment of gout. *Chinese Journal of Clinical Rational Drug Use*, **10**(17):12-13.

Jamal M, Shareef M and Sajid S (2017). Lincomycin and tetracycline resistance in poultry. Review. *Matrix Science Pharma*, **1**(1): 33-38.

Kamatani N, Fujimori S and Hada T *et al* (2016). Placebo-controlled, double-blind study of the non-purine-selective xanthine oxidase inhibitor febuxostat (tmx-67) in patients with hyperuricemia including those with gout in Japan: Phase 3 Clinical Study. *J. Clin. Rheumatol*., **17**(02): 246-250.

Li KJ and Qiu XL (2017). Clinical efficacy of febuxostat in the treatment of gout with hyperuricemia. *Chinese Journal of Clinical Rational Drug Use*, **10**(30): 86-87.

Liu J and Liu Y (2017). Comparative analysis of the efficacy of febuxostat and allopurinol in the treatment of gout with hyperuricemia. *Chinese Journal of School Doctor,* **31**(03): 228-229.

Ma H (2017). Experimental Study on Simultaneous Desulfurization and Denitrification of Doped Tio2 Based on Photocatalysis. *Acta. Chemica. Malaysia*, **1**(2): 06-07.

Mineo I, Kamiya H and Tsukuda A (2017). [Practical strategies for lifestyle modification in people with hyperuricemia and gout treatment through diet, physical activity, and reduced alcohol consumption. *Nippon Rinsho*, **66**(4): 512-515.

Rashid M, Saleem MI, Deeba F, Khan MS, Mahfooz SA, Butt AA and Abbas MW (2017). Effect of season on occurrence of caprine mastitis in beetal in faisalabad premises. *Matrix Science Medica.*, **1**(1): 19-21.

Sarwar MS, Subhani Z, Bilal M and Nazir QA (2017). Medicinal efficacy of antihypertensive agents for acute inflammation: An associated risk factor of hypertension. *Matrix Science Medica*, **1**(2): 13-15.

Shen Y, Mi W and Zhang Z (2017). A positioning lockholes of container corner castings method based on image recognition. *Pol. Marit. Res.*, **24**: 95-101.

Xie SW (2017). Meta-analysis and cost-effectiveness analysis of the efficacy and safety of febuxostat in the treatment of primary gout with hyperuricemia. ***Jinan University***, 23:43-49.

Xie Y, Ge S, Jiang S, Liu Z, Chen L, Wang L, Chen J, Qin L and Peng W (2018). Study on biomolecules in extractives of *Camellia oleifera* fruit shell by GC-MS. *Saudi J. Biol. Sci.*, **25**: 234-236.

Xu SY, Liu XY and Ming J *et al* (2015). A phase 3, multicenter, randomized, allopurinol controlled study assessing the safety and efficacy of oral febuxostat in Chinese gout patients with hyperuricemia. *Int. J. Rheum. Dis.*, **18**(6): 1230-1236.

Zhu HT and Li XW (2017). Therapeutic efficacy and safety of febuxostat combined with allopurinol in the treatment of chronic kidney disease with hyperuricemia. *Evaluation and Analysis of Drug-use in Hospitals of China*, **17**(07): 892 -894.