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CLINICAL STUDY TO ASSESS THE EFFICACY OF ARTHROSCOPIC DEBRIDEMENT IN COMBINATION WITH SIHUANG POWDER(四黄散) IN PATIENTS WITH GOUTY KNEE ARTHRITIS

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ABSTRACT

Objective: To study the clinical efficacy of arthroscopic debridement in combination with Sihuang Powder(四黄散SHP) external in the treatment of acute gouty arthritis. **Methods:** Retrospective comparative study were performed with clinical data of 90 patients with gouty knee arthritis, 30 cases received arthroscopic debridement in combination with SHP(group I), 30 cases received arthroscopic debridement plus the standard drug therapy(group II) and 30 cases took the standard drug administration(group III). The angle of motion(ROM), visual analog scale (VAS) and score of clinical symptoms were collected and compared prior to treatment and at 2,20,48 weeks post-treatment among the three groups. **Results:** All patients were followed up for 48 weeks at least. Markedly statistic differences in flexion and extension of the knee joint and VAS scores were detected in group I comparison with group II and group III at each time of post-treatment($P<0.05$). Remarkable differences in the indices above were observed between group II and group III at each time of post-treatment ($P<0.05$). Statistically significant differences in ROM and VAS scores were observed between two times points at least in each group($P<0.05$). In terms of the curation efficacy, the total clinical efficacy of group I, group II, group III was 96.7%,86.7% and 70.0% at 48 weeks post-treatment, respectively. It was indicated that there was significant difference in the clinical efficacy among the three groups($P<0.05$). **Conclusion:** Arthroscopic debridement in combination with SHP external did show a better efficacy than arthroscopic debridement plus the standard drug therapy and the standard Western medicine orally in this clinical trial. Arthroscopic debridement in combination with SHP external has a promising prospect for the treatment of acute gouty knee arthritis and is worthy of further blind trials with larger samples.

KEYWORDS: Clinical trial. Gouty knee arthritis. Arthroscopic debridement. Sihuang Powder(四黄散SHP) external.

INTRODUCTION

Coincident with the advancement of economy, irregular dietary habits and lifespans extension as well as environmental agents, has been the increasing incidence of gouty arthritis. Gouty arthritis is a common disease characterized by inflammation and high skin temperature, joint swelling, burning pain when monosodium urate (MSU) crystals deposit in joints and periarticular tissues, which generally occurring at night[1]. It mostly affects the metatarsophalangeal joint first, followed by the dorsum of the foot, and then the ankle, knee, wrist, and elbow joints in sequence. It can develop into gouty chalkstone after repeated attacks, even induce joint deformity dyskinesia, seriously affecting the normal life. Clinically such agents as urate-lowing, hormone and colchicine were most frequently used to the treatment of gouty knee arthritis.[2][3] However, sustained and long-term administration of such agents may produce a series of adverse effect and drug tolerance.[4] In the recent years, with the rapidly development of minimally invasive technique, more and more surgeons prefer in combination with arthroscopic debridement to treat gouty knee arthritis. In our local hospitals, arthroscopic debridement in combination with

SHP external and dietary therapy has received favorable outcomes in the treatment of gouty knee arthritis. While, to our knowledge, there have been few reports of an comparative study of outcomes between arthroscopic debridement in combination with SHP external and other therapies.

The purpose of this retrospective study was to objectively compare the clinical efficacy among arthroscopic debridement in combination with SHP external, arthroscopic debridement plus the standard drug and the standard drug administration for gouty knee arthritis. It was hypothesized that the use of the first approach achieved acceptable clinical efficacy. This study was believed to be significant for decision-making for gouty knee arthritis.

DATE AND METHODS

Diagnostic Criteria

This was based on the Classification Criteria for Gouty Arthritis of American College of Rheumatology.[5]

1. Specific Uric acid salt crystal in bursal fluid;2.Sodium urate crystals noted by chemical method or polarizing microscope from tophus;3.[1] Acute arthritis attacks more than one time;[2] Inflammation achieve to the peak in one day;[3] Monarthritis attacks;[4] The suffered joint skin manifested dark red;[5] Pain or swelling of the first metatarsophalangeal joint;[6] Unilateral joint attacks involving the first metatarsophalangeal joint;[7] Unilateral joint attacks involving tarsal joint;[8] Detect suspected tophus;[9] Hyperuricemia;[10] X-ray showing un-symmetrical swelling of joint;[11] X-ray showing cystis under bone cortex, but without bone corrosion[12] The joint fluid show negative through biological culture during the inflammation attacks. The diagnosis can be made by 1 or 2 or any six of[1]-[12]

Inclusion Criteria

1The knee joint show obvious symptoms and sings, such as erythema, swelling, warm sensation and pain; 2Primary or recurrent attack of acute gouty arthritis; The patients have no severe heart, liver, renal or brain disease.

Exclusion Criteria

1.Attack at intermission period; 2.Joint deformity induced by rheumatic, rheumatoid or trauma; 3.Secondary gouty arthritis induced by medicine, kidney failure or tumor-related radiotherapy and chemotherapy; 3.Combined with psychosis, senile dementia or other disease can not cooperate with physician; 4.Pregnancy females.

General Data

According to the criteria above, from October 2011 to October 2015, 90 outpatients with acute gouty knee arthritis were included in this study. Informed consents were obtained from all the participants. In the 90 subjects, 84 were males,6 were females, with ages between 23 to 82 years and an average age of 54.5 years;12 cases were first attacks while 78 cases were recurrent attacks with frequency >2 and single course >7 days. In the arthroscopic debridement in combination with SHP external group(group I, n=30), 29 cases were male and 3 were female, average age (50.1±12.7), with the recurrent attacks cases in 25; arthroscopic debridement plus the standard drug therapy group(group II, n=30), 27 cases were male and 1 were female, average age (51.8±11.2), with the recurrent attacks cases in 27; the standard drug administration group(group III, n=30), 28 cases were male and 2 were female, average age (48.9±13.4), with the recurrent attacks cases in 26. All patients performed with red, swelling, warm sensation, pain of joint, as well as limitation of activity.

Treatment Method

1. Arthroscopic Procedures: Patients were all conducted by combined spinal and epidural anesthesia(CSEA), with a suprine position. The upper thigh was placed with a pneumatic tourniquet at a pressure of approximately 37.32 to 39.99 kPa, within 90 min in the first time use pneumatic tourniquet. Routine anterolateral approaches were used. Firstly, the turbid fluid inside the knee joint was frequently rinsed. Then, the sodium urate crystals depositing in the suprapatellar bursa, meniscus, anterior and posterior ligament, femoral trochlea, intercondylar fossa and cartilage were completely removed with a curette, and the inflammatory hyperplastic synovial membrane were removed with a shaver or vaporizer(figure 1-3). A large number of physiological saline rinsing the joint after completely cleaning, and then lowering the water pressure and radio frequency hemostasis three times. Postsurgery, a catheter was routinely placed at intercondylar fossa, as a water enter cube, and the water exit catheter was placed at suprapatellar bursa, to rinse the knee joint cavity for 3 to 5 days.

Postoperative management involving pressure dressing of the incision for 24 hours, suffered limb elevation, quadriceps contraction, straight leg raising, and ankle and toe joint movement to relief the diseased limb swelling.

2. Standard medicine administration: The patients were taken orally with allopurinol for 0.1g per day, three times

one day[6], and colchicine for 0.5-1.5mg per day.[7] Meanwhile, strict diet plans were informed to suffers to avoid high purine intake.[8]

3. SHP external: Radix scutellaria 30 g, Rhizoma coptis 30 g, Cortex phellodendri 30 g, Gardenia jasminoides 30g, Monkshood 30g, Frankincense 30g, Myrrh 30g, Herba Lycopi 30g and Rhizoma Atractylodes, the herbs were fixed together and ground to powder, putting in suitable warm water and honey to mix well into paste, and then place it to knee joint, keep away from the incision, for 2 hours, once a day.

Observation Items

1. Range of motion(ROM)—knee joint flexion: referring to the maximal angle of autonomic flexion of the knee joint.
2. Range of motion(ROM)—knee joint extension: referring to the maximal angle of autonomic extension of the knee joint.
3. Visual analog scale (VAS): referring to the patients choose a digit from 0-11 to describe the grade of pain(o as no pain and 11 as maximal pain).
4. Clinical efficacy evaluation: referring to the criteria of "Guiding Principle of Clinical Research on New Drugs of Traditional Chinese Medicine"[9].The marked effectiveness is manifested by disappearance of the clinical symptoms and signs, recovery to normal joint movement; effectiveness, by obviously relieved symptoms and signs and joint movement almost recovering to normal; ineffectiveness, by no obviously alleviated symptoms and signs.

Statistical Analysis

SPSS 13.0 Software was used for statistical analysis. Continuous variables were expressed as the mean ± standard deviation. Data between two groups were compared with the t test of independent samples. Data among three groups were compared with the analysis of variance. Data within the same group were compared with repetitive measure analysis of variance. . $P<0.05$ was considered statistically different(with $\alpha=0.05$).

RESULTS

Baseline Comparison

The demographic variables for this study group are listed in Table 1, with no statistic differences among the three groups($P>0.05$).

Table1. Comparison of baseline indexes among the three groups

	Group I(n=30)	Group II(n=30)	Group III(n=30)	P value
Gender(men%)	96.7	90.0	93.3	0.47
Age(years)	50.1±12.7	51.8±11.2	48.9±13.4	0.69
BMI(kg/cm^2)	25.9±3.2	25.5±3.8	25.7±3.5	0.43
Firstly attack(n)	5	3	4	0.26
Frequently attack(n)	25	27	26	0.64

Comparison of Clinical Efficacy

The clinical efficacy in Group I, Group II and Group III was 96.7%, 86.7% and 70.0%, respectively. Statistic differences were detected among the three groups($P<0.05$) (Table 2).

Table: 2. Comparison of clinical efficacy of the three groups

group	Case(n)	Therapeutic effect [(case%)]			Total effective rate(%)
		Markedly effective	effective	ineffective	
I	30	13（43.3）	16（53.3）	1（3.33）	96.7
II	30	9（30.0）	17（56.7）	4（13.3）	86.7
III	30	4（13.3）	17（56.7）	9（30.0）	70.0

Notes: P=0.008, comparison of total effective rate, total effective rate is markedly effective rate plus effective rate.

Comparison of ROM and VAS score

Within each group, significant differences in ROM and VAS scores were detected between two times points at least($P<0.05$). Statistical differences were observed in group I comparison with group II and group III in ROM and VAS scores at each time of post-treatment $P<0.05$). Significant differences in ROM and VAS scores were observed between group II and group III at each time of post-treatment ($P<0.05$) (Table 3).

DISCUSSION

Gouty arthritis is a common disease manifested by inflammation, tophi and joint abnormal, induced by purine metabolic disorder and or blood uric acid increasing. It usually initially affects the first metatarsophalangeal joint, however, firstly involving knee joint also. Gouty knee arthritis is characterized by inflammation, swelling, high skin temperature, dysfunction of the knee joint when monosodium urate crystals deposit in synovium, cruciate ligament,

suprapatellar bursa, femoral trochlea, meniscus, medial and lateral condylus of the knee joint.

Previously, the most commonly therapy of the disease including dietary control and oral medication such as NSAIDs, sodium bicarbonate, hormone, uric acid-lowering medicine and colchicine. However, it has been reported that the uric acid-lowering medicine may accelerate inflammation reaction and joint deformation during acute period due to the sharp drop of uric acid dissolving gout chalkstone surface and then becoming insoluble crystals.[10] Colchicine and hormone have been to the second-line medication as a result of their severe side effect.[11][12] Consequently, the oral medications alone have limited effects to the joint symptoms and function during acute arthritis period. Furthermore, intra-articular structure suffered sustained damage because of the persistent urate crystals, which involving with local PH value, temperature, weight and so on.[13]

Currently, with the development of minimally invasive technique, more and more clinicians prefer arthroscopic debridement to treat gouty knee arthritis. This procedure allows the removal of almost urate crystals and tophus through the shaver or vaporizer cutting and flowed fluid scouring. Additionally, it allows certainly surgical treatment in terms of cartilage or bone deficiency. Accordingly, the procedure acquired beneficial symptoms alleviation and improvement as the elimination of the pathogenic factor (urate crystals).[14] While, arthroscopic debridement, which can only improve the joint symptoms but not decrease the high purine level, has the limited effects to gouty arthritis, a generally metabolic disease.[15][16]

In the view of traditional Chinese medicine, acute gouty arthritis belongs to the "Bi(痹) syndrome" induced mainly by natural endowment deficiency and then excessive intake of sweet and greasy foods as the result of injury of spleen and stomach, leading to spleen failing to upbearing clear and stomach failing to downbearing turbid. Eventually, water and dampness transform to dampness-heat and phlegm-toxin, gathering in meridian, collateral, vessel, muscle and joint, manifested by swelling, erythema and pain.[17]

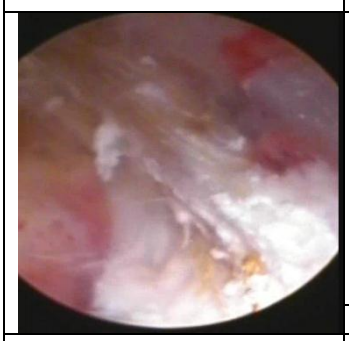
In our local hospital, we usually combined with SHP external to treat gouty knee arthritis. In the SHP, Radix Scutellariae, Rhizoma Coptidis, Cortex Phellodendri and Gardenia jasminoides, with cold and bitter properties, can clear heat and eliminate dampness, purge fire and remove toxin as well as. Monkshood, with pungent and heat properties, can dispel wind and eliminate dampness. Frankincense.

Table3. Comparison of ROM and VAS of the three groups

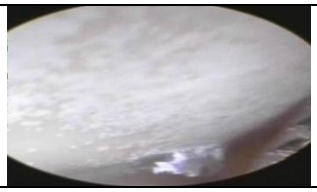
knee flexion			VAS		
II	III		I	II	III
91.2±4.3*	90.8±3.2*,**		8.4±1.2	8.2±1.8*	8.3±1.3*,**
115.8±5.4$^{\Delta,*}$	106.4±4.2$^{\Delta,*,**}$		4.0±0.5$^{\Delta}$	5.4±0.7$^{\Delta,*}$	6.3±0.4$^{\Delta,*,**}$
121.8±5.6$^{\Delta\cdot\Delta\Delta,*}$	115.2±3.0$^{\Delta\cdot\Delta\Delta,*,**}$		1.9±0.3$^{\Delta\cdot\Delta\Delta}$	3.0±0.8$^{\Delta\cdot\Delta\Delta,*}$	4.5±0.5$^{\Delta\cdot\Delta\Delta,*,**}$
136.2±4.3$^{\Delta\cdot\Delta\Delta,\#,*}$	130.2±3.1$^{\Delta\cdot\Delta\Delta,\#,*,**}$		0.8±0.5$^{\Delta\cdot\Delta\Delta,\#}$	1.5±0.9$^{\Delta\cdot\Delta\Delta,\#,*}$	2.1±0.8$^{\Delta\cdot\Delta\Delta,\#,*,**}$

Notes:*p<0.05,compared with group I;**p<0.05,compared with group II;Δp<0.05,compared with pre-treatment in the same group;

ΔΔp<0.05, compared with 2 weeks post-treatment in the same group;# p<0.05, compared with 4 weeks post-treatment in the same group.



Picture3 Anterior cruciate ligament



Picture2 Femoral trochlea

time	knee extension				
	I	II	III	I	
pre-treatment	28.1±4.2	27.8±3.6*	27.9±3.8*,**	90.8±5.8	
2 weeks	10.1±3.2$^{\Delta}$	15.2±3.4$^{\Delta,*}$	18.1±2.4$^{\Delta,*,**}$	120.1±3.2$^{\Delta}$	
20 weeks	7.2±2.1$^{\Delta,\Delta\Delta}$	11.0±3.8$^{\Delta,\Delta\Delta,*}$	14.1±3.1$^{\Delta,\Delta\Delta,*,**}$	127.2±3.4$^{\Delta,\Delta\Delta}$	
48 weeks	2.1±1.3$^{\Delta,\Delta\Delta,\#}$	6.4±1.2$^{\Delta,\Delta\Delta,\#,*}$	7.8±1.8$^{\Delta,\Delta\Delta,\#,*,**}$	141.3±2.8$^{\Delta,\Delta\Delta,\#}$	

Picture1 Meniscus、tibial plateau and femoral condylus

and Myrrh, with pungent and bitter properties, can promote blood circulation to remove blood stasis. Herba Lycopi and Rhizoma Atractylodes can dry dampness and strengthen spleen.[18] Therefore, the herbs in combination can clear heat, detoxify and eliminate dampness, aiming directly at the pathological factors of acute gouty arthritis. Especially, when external therapy, medication arrive to the diseased region directly to maximize curative effect. Modern pharmacological studies indicate that the herbs above possess the characteristics of anti-inflammatory, diminishing swelling and antisepsis at different degree.[19][20]

In conclusion, arthroscopic debridement in combination with SHP external did show a beneficial efficacy in the treatment of gouty knee arthritis, which is worthy of application and generalization in the clinic. While, the current study is lack of large samples and long-term follow-up and need further study with larger cases and longer-term follow-up.

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