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A Comparative Study of the Effect of TCM External Therapy on Patients with Type A and Type C Colles Fracture

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Keywords

extension type of distal radius fractures, manual reduction, external application of traditional Chinese medicine

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Abstract

Background To compare the clinical efficacy of TCM external therapy on patients with type A and type C Colles fracture. **Methods:** A total of 97 patients with Colles fracture, who were admitted to our hospital from Jan. 2017 to Mar. 2018, were selected and divided into type A group (50 cases) and type C group (47 cases) according to the fracture types of the patients. Patients in the two groups were treated with external treatment of traditional Chinese medicine, namely external application of traditional Chinese medicine combined with manual reduction. The clinical efficacy, the degree of fracture swelling and the imaging-related indexes before and after treatment were compared between patients in both groups. **Results:** The total effective rate of patients in type A group and type C group was 96% and 74.47% respectively, and the rate in type A group was markedly higher than that in type C group (P<0.05). Two weeks after the treatment, the degree of fracture swelling in two groups was obviously lower than that before the treatment (P<0.05), and the degree of fracture swelling in type A group was signally lower than that in type C group (P<0.05). Two weeks after the treatment, the ulnar inclination angle, palm inclination angle, relative height of the radius, and collapse of the joint surface in two groups were remarkably better than that before the treatment (P<0.05), where the condition in these aspects of type A group was significantly better than that of type C group (P<0.05). **Conclusion:** The clinical efficiency of TCM external treatment on patients with type A Colles fracture is better than that on patients with type C Colles fracture.

1 Introduction

Extension type of distal radial fracture, namely the Colles fracture, is one of the most common fractures in clinical practice. It usually occurs in the cancellous part of the radius within 2-3 cm of the lower end of radius, accounting for about 10% of all fractures, and is more common in the elderly [1]. In recent years, with the aging of our country's population and the increase in the population of osteoporosis, the incidence of Colles fracture has been increasing year by year. Colles fracture are mainly manifested by pain, swelling, and limited joint mobility and function clinically in patients, and it not only brings serious damage to the patient, but also seriously affects the quality of life of the patient [2]. Therefore, timely and effective treatment of Colles fracture is particularly important. At present, the clinical treatment of Colles fracture mainly relies in conservative treatment of manual reduction combined with external fixation. In addition, the external application of traditional Chinese medicine is also an important method to treat Colles fracture. Thus, this study discussed the difference in the curative effect of TCM external treatment for patients with type A and type C Colles fracture.

2 Materials and Methods

2.1 Clinical data

2.1.1 General information

A total of 97 patients with Colles fracture, who were admitted to our hospital from January 2017 to March 2018, were selected and divided into type A group (50 cases) and type C group (47 cases) according to different fracture types. In type A group, there were 21 males and 29 females who aged 37 to 72 years old, with an average age of 55.43±15.64 years old. As for the fracture sites, there were 24 cases on the right side and 26 cases on the left side. When it came to the reasons for fractures, there were 31 cases of slips, 3 cases of traffic accidents cases, and 16 cases of other cases. In type C group, there were 19 males and 28 females who aged 39-74 years old, with an average age of 54.82±14.93, In regard to fracture site, there were 21 cases on the right side and 26 cases on the left side. With respect to the reasons for fractures, there were 29 cases of slips, 2 cases of traffic accidents, and 16 cases of other cases.

2.1.2 Diagnostic criteria

①Having a clear history of trauma; ②With palpable sensation of bone rubbing via physical examination; ③With significant pain, swelling, and limited wrist movement and function after trauma; ④Under diagnosis of X-ray examination

2.1.3 Inclusion and exclusion criteria

Inclusion criteria: ①Meeting the diagnostic criteria above; ②Complying to the type A/C criteria of the subtype from Association for the Study of Internal Fracture Fixation (ASIF); ③Closed Colles fracture. Exclusion criteria: ①Patients with open fractures; ②Patients with pathological fractures; ③Patients with severe nerve and vascular injury; ④Patients with fractures in other parts in addition to the affected upper limb; ⑤Patients with mental disorders.

2.2 Methods

Manual reduction [3]: (1) Traction: the patient was told to lie in the pronation position of the forearm. One assistant held the upper end of the patient's affected limb, and the other assistant held the patient's wrist for anti-extension traction, and put a gauze bandage on the holding part to prevent slippage. The traction process lasted 1-2 min, during which a moderate and stable traction force was ensured to correct the insertion and overlapping at the fracture end. The physician put both hands together at the fracture end, and squeezes the radioulnar side and the dorsal side of the palm in opposite directions. (2) Restoration: the physician placed the thumbs of his/her both hands on the dorsal side of the patients' distal radius, and pressed the other four fingers against the big and small thenar of the wrist to achieve quick and extreme palm flexion, thereby correcting the radial displacement of the radial fracture block to the dorsal side and angular deformity, namely restoring the ulnar inclination angle and palm inclination angle as much as possible. (3) Pinching bones and sorting

tendons: the assistant helped to maintain the above-mentioned traction state, and the physician held the fractured end of the affected limb with one hand, with the other hand holding the palm of the affected limb, doing swing and ring rotation and kneading the bone with appropriate strength to restore the flatness of the joint surface as far as possible. The physician forcefully pulled each finger of the affected limb, and performs pronation and supination of the forearm, straightening out the soft tissues such as the lower radioulnar joint and interosseous membrane to restore the bone to its normal position. After manual reduction, the affected limb of patients was applied externally with Chinese medicine and then fixed with a small splint.

External application of Chinese medicine: Huoxue Zhanjin powder was evenly smeared on the gauze and the gauze was externally applied on the fracture sites of the affected limb after a successful restoration. Small splint fixation: the affected limb was suspended and fixed in neutral position with 4 small splints that exceeded the size of the wrist joint, and then tied with 4 straps with the tightness appropriately adjusted.

2.3 Determination of clinical efficacy

The therapeutic effect of all patients was determined. Cure: satisfactory fracture reduction, well-formed bone callus, fully restored wrist function, and no obvious deformities, pain, and swelling; Markedly validity: relatively satisfactory fracture reduction, relatively well-formed bone callus, basically recovered wrist function, and mild deformity, pain and swelling; Validity: poor fracture reduction, moderate bone callus formation, limited wrist function and obvious deformities, pain and swelling; Invalidity: nonunion of fractures, wrist dysfunction, and obvious deformities, pain, and swelling. Total effective rate (%) = cases of (Cure + Markedly validity + Validity)/Total number of cases×100%.

2.4 Observational index

According to the score of fracture swelling degree, the fracture swelling degree was assessed before and 2 weeks after treatment, respectively. 0 points referred to that compared with the health side, the affected side had no obvious swelling. 1 point indicated that compared with that of the healthy side, the skin of the affected side was swollen and still had wrinkles, with the center height of the skin swelling less than 0.5 cm. 2 points denoted that the skin wrinkles disappeared, and the height of the center of the swelling was 0.5-1.0 cm. 3 points presented that the skin wrinkles disappeared and blisters appeared, with the center height of the skin swelling greater than 1.0 cm. (2) Imaging-related indicators: before and 2 weeks after treatment, the frontal and lateral X-ray films were taken for the measurement of ulnar inclination angle, palm inclination angle, relative height of the ulnar angle, and collapse of the joint surface.

2.5 Statistical analysis

SPSS 20.0 software was used for statistical analysis. Measurement data were presented as the mean ± standard deviation ($\bar{x}\pm s$), and compared by the *t*-test. The counting data were contrasted by the $\chi 2$ method. $P<0.05$ was considered to be statistically significant.

3 Results

The total effective rates of patients in the type A Group and type C Group were 96% and 74.47%, respectively, with the percent in the type C Group prominently higher than that in the type C Group ($P<0.05$), as shown in Table 1.

Table 1 Comparison between the two groups of patients in clinical efficacy

Groups	cases	Cure	Markedly validity	Validity	Invalidity	Total effective rate
Type A group	50	23 (46.00)	16 (32.00)	9 (18.00)	2 (4.00)	48 (96.00)
Type C group	47	13 (27.66)	16 (34.04)	6 (12.77)	12 (25.53)	35 (74.47)
χ^2 value						9.095
P value						0.003

3.1 Comparison between the two groups of patients in the degree of fracture swelling

Before treatment, there was no significant difference in the degree of fracture swelling between patients in the two groups (P>0.05). 2 weeks after treatment, the degree of fracture swelling in both groups was significantly lower than that before treatment (P<0.05), with the degree of fracture swelling in the type A group overtly lower than that in type C group (P<0.05), as shown in Table 2.

3.2 Comparison between the two groups of patients in the changes in imaging-related indicators

Before treatment, there was no obvious difference between the two groups of patients in the ulnar inclination angle, palm inclination angle, relative height of the radius, and the collapse of joint surface (P>0.05). 2 weeks after treatment, the above indicators in both groups were remarkably better than those before treatment (P<0.05) and the indicators in the type A group were markedly better than those in the type C group (P<05), as shown in Table 3.

Table 2 Comparison between the two groups of patients in the degree of fracture swelling

Groups	Cases	Before treatment	2 weeks after treatment	t value	*P* value
Type A group	50	2.45±0.42	0.14±0.06	38.500	0.000
Type C group	47	2.47±0.46	0.53±0.10	28.253	0.000
t value		0.224	23.454		
P value		0.823	0.000		

Table 3 Comparison between the two groups of patients in the changes in imaging-related indicators

Groups	cases	Ulnar inclination angle (°)		t value	*P* value	Palm inclination angle (°)		t value	*P* value
		before treatment	2 weeks after treatment			before treatment	2 weeks after treatment		
Type A group	50	9.48±1.63	21.43±3.76	19.998	0.000	-12.81±4.35	12.79±2.87	34.735	0.000
Type C group	47	9.76±1.60	19.13±3.14	18.228	0.000	-12.49±4.26	10.48±2.39	32.239	0.000
t value		2.610	3.259			0.366	4.293		
P value		0.808	0.002			0.715	0.000		
Groups	cases	Relative height of the radius (mm)		t value	*P* value	Collapse of the joint surface (mm)		t value	*P* value
		before treatment	2 weeks after treatment			before treatment	2 weeks after treatment		
Type A group	50	6.29±1.23	15.63±2.14	26.184	0.000	5.24±1.03	0.32±0.13	34.737	0.000
Type C group	47	6.54±1.26	13.16±1.93	19.691	0.000	5.39±1.04	0.95±0.37	27.575	0.000
t value		0.198	5.957			0.143	11.323		
P value		0.844	0.000			0.887	0.000		

4 Discussion

Fractures are mostly caused by low energy injuries, and generally corrected by manual reduction in clinical practice, followed by external fixation with splints to prevent the deformity of the affected limb [4]. Traditional Chinese Medicine believes that the treatment of fracture should focus on promoting blood circulation, removing blood stasis, reducing swelling, relieving pain, and renewing tendons and bones [5]. A previous study has demonstrated that external application of traditional Chinese medicine has effects of promoting blood circulation, removing blood stasis, reducing swelling and pain, and promoting bone healing [6]. Therefore, in this study, manual reduction combined with external application of traditional Chinese medicine was employed to treat type A and type C Colles fractures, and the therapeutic effect was compared.

Colles fractures are often accompanied by changes in the length of the radius. Meanwhile the ulnar inclination angle and palm inclination angle will also change due to the shortening of the radius. Moreover, there will also be changes or even loss of the distal radius, and collapse of the articular surface [7]. If the abnormal length or angle of the radius cannot be corrected in time, it is easy to cause complications such as chronic pain, traumatic arthritis, wrist deformity and limited movement, which will seriously affect the life quality of patients [8]. The change of axial force after radius shortening is closely related to the long-term degenerative changes after Colles fracture surgery [9]. Restoring the length of radius is beneficial to the restoration of the normal anatomical relation of the wrist joint, and plays an important role in the restoration of the joint space and ulnar inclination angle. Our results showed that the total effective rate in type A group was notably higher than that in type C group. Two weeks after treatment, the ulnar inclination angle, palm inclination angle, the relative height of the radius and the collapse of the joint surface in patients with type A and type C Colles fractures were explicitly better than those before treatment, and the condition of these aspects in type A group was significantly better than that in type C group. These results indicates that external application of traditional Chinese medicine can effectively restore the local anatomical relationship between type A and type C fractures, and the therapeutic effect is more significant for patients with type A Colles fracture relative to those with type C fracture, which is probably because type A Colles fracture is relatively stable with less loss of radius length, while type C fracture is comminuted intra-articular fracture, which is difficult to obtain an effective anatomical reduction through manual reduction, or because the occurrence of local displacement in the process of small splint fixation results in loss of the length of the radius. In addition, a prior study have confirmed that small splint external fixation can intermittently stimulate the broken ends of fractures, promote the generation of osteocytes, and thus accelerate fracture healing to achieve good therapeutic effects [10].

Modern medicine believes that fracture swelling is caused by the release of related inflammatory substances from the soft tissue after injury and the infiltration of blood and lymph fluid in the interstitial space that did not dissipate in time [11, 12]. The external ointment used in this study is Huoxue Zhanjin powder, which is mainly composed of traditional Chinese medicine such as Er Cha (Pasta Acaciae seu Uncariae), Zi Jing Pi (Cortex Kadsurae Radicis) and Du Zhong (Eucommia ulmoides). Pasta Acaciae seu Uncariae has effects such as promoting blood circulation, removing blood stasis, extending bone and building muscle; Cortex Kadsurae Radicis has effects such as promoting blood circulation, dredging lymphoid, and relieving swelling; Eucommia ulmoides has effects such as tonifying liver and kidney and strengthening muscles and bones. The combination of these components in Huoxue Zhanjin powder had the therapeutic effects of reducing swelling and relieving pain. The results of this study revealed that 2 weeks after treatment, the degree of fracture and swelling in patients with type A and type C Colles fractures was visibly lower than that before treatment, and the degree of fracture and swelling in the type A group was obviously better than that in the type C group, indicating that external application of

Huoxue Zhanjin powder could effectively reduce the swelling of patients with Colles fracture, and has a more prominent effect on patients with type A Colles fracture.

In conclusion, the external treatment of traditional Chinese medicine can effectively improve the fracture and swelling of patients with type A and type C Colles fractures, and the clinical efficacy of patients with type A Colles fracture is better than that of patients with type C fracture patients.

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Not applicable.

Conflict of Interest

The authors declare no conflicts of interest.

Author contributions

Conceptualization, C.F.H and W.X.Y; Data curation,C.F.H; Formal analysis, W.X.Y Methodology, C.F.H; Writing-Original draft, W.X.Y and C.F.H; Writing-review and editing, W.X.Y and C.F.H; All authors have read and agreed to the published version of the manuscript.

Ethics Approval and Consent to Participate

The study was approved by the Medical Ethics Committee, and the patients were informed and consented.

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Availability of Data and Materials

The data presented in this study are available on request from the corresponding author.

Supplementary Material

Not applicable

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