

# Clinical curative effect observation of therapy of Chinese drug iontophoresis in treatment of degenerative osteoarthropathy

Xiao-Lin Geng, Tan Lu, Li-Bin Yang, Qin-Lan Zhou, Hua Qin and Qiudong Liang\*

Department of Orthopedic Surgery, First Affiliated Hospital of Xinxiang Medical University, Weihui, China

**Abstract:** Degenerative osteoarthropathy is a kind of arthrosis induced by various factors, with main pathological feature of articular cartilage and syndesmophyte formation. In recent years, its morbidity increases year by year and tend to appear more among young people. Its curative effect has yet to be improved. This paper mainly discussed the clinical curative effect of therapy of Chinese drug iontophoresis in degenerative osteoarthropathy. A total of 296 cases of degenerative osteoarthropathy was randomly divided into two groups (with no consideration on gender): Chinese drug iontophoresis group: joint was treated by therapy of Chinese drug iontophoresis and MTZ-F experiment; frequency electrotherapy group: joint was only treated by medium frequency electrotherapy. Two groups were both treated for 30min for one time, 1 time for a day, total for 4 weeks. Result of the study found that, total effective rate of medium frequency electrotherapy group was 74.3%, Chinese medicine iontophoresis group was 93.2%; curative effect of Chinese medicine iontophoresis group was superior to electrotherapy group. It indicates that, Chinese medicine iontophoresis has good clinical effect in the treatment of osteoarthropathy and deserves to be popularized and applied.

**Keywords:** Degenerative osteoarthropathy; Chinese medicine iontophoresis; middle frequency electrotherapy.

## INTRODUCTION

Degenerative osteoarthropathy that is also called osteoarthropathy, retrograde osteoarthritis and senile osteoarthritis is a common chronic joint disease. It has high morbidity and often occurred in middle aged and elderly. It results from the degeneration, hyperplasia of cartilago articularis and osteophyte formation caused by cartilago articularis degeneration and chronic damage on joint. It is characterized by arthralgia, degeneration and activity limitation. Research data indicates that, prevalence rate of 40 years old people is 10% to 17%, above 60 years old is 50%, above 75 years old is 80%; in addition, the disease has certain disability rate (Wei, 2010). With the development of aging of population, the prevalence rate of this disease becomes higher and higher, which severely threatens people's health. Several scholars hold that, gender, age, job, race, body mass index, obesity and over exercise are the possible cause for degenerative osteoarthropathy. Christian *et al* (Christian *et al*, 2012) studied the mechanism for changing weight of lower limb weight-bearing joint and found that, increasing mechanical motion and changing biomechanics is the important factors for the occurrence and development of osteoarthritis. Moreover, trauma such as intra-articular fracture often induces articular cartilage injury and even deep injury, which will affect subchondral bone and blood supply. Its reaction is hematoma, formation and fibrosis of granulation tissue and new bone. The complex function between intra-articular tissue and mechanical stress can lead to meniscus crush injury. Studies indicated that, meniscus crush injury may be related to meniscus tear,

bad knee force line and cartilage injury (Crema *et al*, 2012). Shi Xiaoming (Shi and Yu, 2013) *et al* made a summary on the pathogenesis of osteoarthritis in aspects of the structure of cartilago articularis, theory of cytokines, free radical theory, and concluded that, its pathogenesis is complex and multifactorial.

Western medicine focuses on symptomatic and pain relief in treatment of osteoarthritis, and uses nonsteroidal anti-inflammatory drugs (Sawitzke *et al*, 2010). Some also adopt surgery such as joint replacement that brings heavy economic burden and large pain for patients. The treatment of Chinese medicine is characterized by convenience, little side effect, low expense, etc.. At present, the application of Chinese medicine iontophoresis is also accepted and recognized by patients. In addition, clinical data shows it has good curative effect. This paper further explored the clinical curative effect of Chinese medicine iontophoresis based on certain practices.

## MATERIAL AND METHOD

### *General materials*

A total of 296 cases of chronic degenerative osteoarthritis received and cured in clinic between Oct., 2010 and Sep., 2012 was recruited in this study. Random numeric representation was used for grouping. There were 148 cases in Chinese drug iontophoresis group and 148 cases in medium frequency electrotherapy group. The two groups had no significant difference in gender, age and medical history, thus have comparability. Pathogenic site was the most common on neck, waist and knee, accounting for 91.6%. (1) There were 70 cases of

\*Corresponding author: e-mail zmlqd163@163.com

**Table 1:** Comparison of VAS before and after the treatment ( $\bar{x} \pm s$ )

Group	Case	Before treatment	After treatment
Chinese drug iontophoresis group	148	6.50±0.58	1.99±1.78
Medium frequency electrotherapy group	148	6.44±0.76	3.15±2.28

**Table 2:** Comparison of two groups after the treatment

Group	Case	Cure	Obvious effect	Effective	No effect	Total effective rate (%)
Chinese drug iontophoresis group	148	47	60	31	10	93.2%
Medium frequency electrotherapy group	148	28	35	47	38	74.3%

**Table 3:** Comparison of joint movement degree at 4 weeks after treatment

Groups	Case	Excellent (case)	Good (case)	Poor (case)	Total effective rate (%)
Chinese drug iontophoresis group	148	50	89	9	93.9
Medium frequency electrotherapy group	148	28	85	35	76.4

lumbocrural pain, including protrusion of lumbar intervertebral disc, lumbar intervertebral disk prominence, lumbar retrogression, vertebral compression fractures, lumbar spondylolisthesis, etc.; patients mainly presents as lumbago, lower limb radiation pain, pressing pain on ischiadic nerve; sometimes both lower extremities have intermittent or alternating pain; patients are found with lumbar intervertebral space or foraminal stenosis, protrusion or bulging of intervertebral disc, vertebral arch fracture, compression fracture in CR and CT examination. (2) There were 75 cases of cervical spondylosis, including herniation of cervical disc, cervical facet disorder and dislocation, cervical degenerative lesion; patients mainly presents as neck and shoulder pain, upper limb numb and pain, neck aching and limp, dizzy and headache, giddy, nausea, chest distress or pain; patients are found with vertebral artery blood-supply schemia, protrusion or bulging of cervical intervertebral disc, cervical degenerative lesion in CR and CT examination. (3) There were 126 cases of knee osteoarthritis, including meniscus injury, bone degeneration; patients present as knee pain, pain increasing when loading or going up and down, joint swelling and stiffness, fricative or crepitation when moving joint; patients are found with meniscus injury, hyperostosis, uneven articular surface, synovial hypertrophy or episome formation. (4) There were 25 cases with pathogenic site on other parts, including thoracic vertebra, shoulder, elbow, wrist, etc.

**Therapeutic method**

Chinese drug iontophoresis group: local bone joint was treated with Chinese drug iontophoresis liquid+medium frequency electrotherapy, with 30 min/time, 1 time/ day, total for 4 weeks; medium frequency electrotherapy group: the electro-therapeutic apparatus used in medium frequency eletrotherapy group was the same as Chinese drug iontophoresis group. This group was treated with medium frequency electrotherapy, with 30 min/time, 1

time/day, total for 4 weeks. There was no other intervention treatment on osteoarthritis in two groups during treatment period.

Formula of Chinese drug iontophoresis liquid is: fructus psoraleae 30g, angelica sinensis 20g, ligusticum wallichii 15g, radix achyranthis bidentatae 15g, flowers carthami 10g, frankincense 10g, myrrh 10g, notopterygium root 15g, radix angelicae pubescentis 15g, radix sileris 15g, spina gleditsiae 10g, woodlouse 10g, teasel 20g, rhizoma cibotii 20g, garden balsam stem 30g, liquorice 10g. These herbs were soaked in water for 30 min, cooked with high heat to boil and then decocted for 1h. Finally, filter out concoction. The herbs were cooked again for 30min according to the above method. The obtained liquid was mixed and externally applied on joint. Electrode slice connected with iontophoresis apparatus. The bigger the frequency was, the deeper the stimulus was. Medium frequency electrotherapy was performed 1~2 times/ day, 30 min/time. Tolerance value of frequency for patients was selected according to the illness condition and tolerance degree of patients. Generally, body was ranging from 40 to 60 MA, the four limbs from 35 to 50 MA.

**Judgment criteria of curative effect**

Clinical cure: Joint swelling and pain completely disappear, and joint movement return to normal (improvement rate ≥95%); significant effect: Joint swelling and pain relieve with no ambulatory pain (70%≤improvement rate <95%); effective: local has pain or light tenderness, and the movement range improves (30%≤improvement <70%); no effect: symptoms and signs have no improvement (improvement rate <30%). Final effective rate = (clinical cure + obvious effect + effective)/n ×100%. Pain score adopts visual analogue scale (VAS) (Zhang *et al*, 2011). A 10 cm line segment with two ends marking with “0” and “10”: 0 stands for no pain, 1-4 for light pain, 5-7 for medium pain, and 10 for

intense pain. Patients were asked to mark the painful site. Length of the distance is measured for expressing the pain degree.

#### ***Assessment of joint mobility***

Joint mobility of patients was compared before and after the treatment with grades of excellent, good and poor.

### **STATISTICAL ANALYSIS**

SPSS 17.0 statistical software was used to process data, compare joint mobility, clinical evaluation.  $P < 0.05$  was considered as statistical significance.

### **RESULTS**

Statistical analysis was performed at 4<sup>th</sup> weeks after the treatment for two groups.

#### ***Comparisons of VAS score before and after the treatment (shown table 1).***

After one-way analysis of variance on result, it was found that, VAS score of Chinese drug iontophoresis group before the treatment was similar to the control group, thus it has comparability. VAS score of Chinese drug iontophoresis group significantly lowered after the treatment, and its curative effect was significantly superior to the medium frequency electrotherapy group.

#### ***Comparison of effective rate after treatment (shown in table 2)***

As shown in table 2, the curative effect of Chinese drug iontophoresis group was significantly better than medium frequency electrotherapy group. Among them, the total effective rate of Chinese drug iontophoresis group was 93.2%, while that of medium frequency electrotherapy group was 74.3%.

#### ***Comparison of joint movement degree***

The illness condition of people treated with Chinese drug iontophoresis significantly improved at 3<sup>rd</sup> or 5<sup>th</sup> week after the treatment; 4 weeks later, the cure effect of Chinese drug iontophoresis group was significantly better than medium frequency electrotherapy group. The result is shown in table 3.

### **DISCUSSION**

#### ***Degenerative osteoarthritis***

Degenerative osteoarthritis is a chronic and progressive arthropathy with primary changes of degenerative change of joint surface and secondary hyperostosis (Zhang *et al*, 2010). It mostly occurs among population. Osteoarthritis can be divided into primary and secondary. Primary osteoarthritis (Jin, 2013) refers to senile osteoarthritis that is related to the age rather than other diseases; its pathogenesis is not known, but may be related to

advanced age, gender and jobs. Secondary osteoarthritis is caused by systematic diseases, acute trauma, such as trauma, rheumatoid arthritis, nerve and hormonal diseases (Li and Yu, 2010; Huang and Huang, 2010). Clinical features of osteoarthritis include joint pain, joint swelling, movement limitation and joint deformity. Under X ray, it is characterized by joint space narrowing, subchondral bone compact, bone trabecula fracture, hardening and cystic degeneration, lip-like hyperplasia on joint edge, later-period extremities deformation, uneven joint surface. The treatment can be divided into conservative treatment and operative treatment. Conservative treatment includes physical therapy, nonsteroidal anti-inflammatory drugs, cortisone injection into joint; operative treatment includes joint clear operation, osteotomy, joint replacement, joint fusion, etc. (Zhang *et al*, 2012). However, conservative treatment for osteoarthritis has slow effect, long treatment course, and easy recurrence after stopping drugs; moreover, it costs a lot and brings huge pain for patients. Traditional Chinese medicine holds that, osteoarthritis has deficient root with overdo superficial; therefore, its treatment should take care of inside and outside, and treat both symptoms and root causes. Chinese drug iontophoresis can significantly improve blood circulation and nutrition metabolism, change permeability of cytomembrane, speed up injury repair, thus to treat an internal illness by external treatment.

#### ***Analysis of Chinese drug iontophoresis***

Chinese drug iontophoresis is a unique therapy that integrates traditional Chinese medicine, acupoint, meridians and voltaic physics action together. It can directly lead drugs that can promote circulation and remove stasis, relieve swelling and pain into the lesion site forcibly. During local definitive therapy, the effective components of drugs can play direct pharmacological effects after absorbing by tissue and organ. High concentration of drugs on local part has long accumulation time within body and function performing time, which prolongs treatment effect, reduce side effects, and avoid toxic and side effect and disease resistance generated by intestines and stomach, vein, muscle. Therapy of Chinese drug iontophoresis has clinical research on multiple subjects. Yang Min (Yang *et al*, 2010) *et al* used rhizoma alismatis and salvia with therapy of Chinese drug iontophoresis to treat fatty liver accompanied by metabolic syndrome. The total effective rate of treatment group was 83.93% while control group was 59.52%; curative effect of the treatment group was significantly higher than control group, and had less untoward effects. Wang Xihong (Wang and Yang, 2014) *et al* applied angelica, salvia, safflower, peach kernel, uncaria, Chinese starjasmine and notopterygium with therapy of Chinese drug iontophoresis to treat 120 cases of angina pectoris. Through 15 days of treatment, total effective rate of treatment group for angina improvement was 91.67% while control group was 66.67%. Total

effective rate of treatment group for electrocardiogram improvement was 90.0% while control group was 65.0%. The experiment demonstrated that, Chinese drug iontophoresis is a safety and effective therapy for angina pectoris. In Chinese drug iontophoresis liquid adopted by this paper, angelica has functions of enriching and activating blood, dispelling dampness and relieving pain which can improve microcirculation of lesion part, decrease platelet aggregation; safflower, frankincense, myrrh, ligusticum wallichii, radix achyranthis bidentatae and peach kernel can activate blood and remove stasis; garden balsam stem, radix angelicae pubescentis and radix puerariae play functions of expelling wind-damp and cold, removing numbness, relaxing tendons and relieving pain. Chinese drug iontophoresis liquid also effectively inhibit exudation of joint inflammatory substance and reduce subchondral bone edema while delaying joint cartilage degeneration. MTZ-F applies electric field effect of direct current and poles repel principle to push drugs with negative charge into human body by negative electrode of direct-current electric field, and drugs with positive charge into human body by positive electrode. In addition, medium frequency electrotherapy itself can effectively improve blood circulation on joint local, warm meridian and dredge stasis, lower pressure within bone, promote metastasis, diminish inflammation and relieve pain.

## CONCLUSION

Experimental research in this paper demonstrated that, during the treatment for osteoarthritis patients, medium frequency electrotherapy group and Chinese drug iontophoresis group both can improve the disease. Total effective rate of Chinese drug iontophoresis group in treating osteoarthritis was 93.2% and cure rate was 31.8%. Its curative effect was superior to medium frequency electrotherapy group. As to VAS score and joint movement degree, there was significant difference of Chinese drug iontophoresis before and after the treatment; the result after the treatment was better than before the treatment and its curative effect is superior to medium frequency electrotherapy group. All these findings suggested that, therapy of Chinese drug iontophoresis has good curative effect on treating osteoarthritis and is beneficial for joint pain and functions. Due to the characteristics of joint structure, therapy of Chinese drug iontophoresis is good to absorption of effective components of drugs, meanwhile, avoid stimulation of drugs to digestive system, and reduce toxin and side effect. It has high potency ratio and deserves to be promoted in clinic.

## REFERENCES

- Christian E, Thomas H and Victor V (2012). Biomechanics and pathomechanisms of osteoarthritis. *Swiss. Med. Wkly.*, **142**: 13583.
- Crema MD, Roemer FW and Felson DT *et al* (2012). Factors associated with meniscal extrusion in knees with or at risk for osteoarthritis: The multicenter osteoarthritis study. *Radiology*, **264**: 494-503.
- Huang J and Huang CB (2010). Improvement in diagnosis and treatment of rheumatoid arthritis. *Clinical Medication Journal*, **8**(1): 1-5.
- Jin FY (2013). Non-operation treatment of primary knee osteoarthritis. *Journal of Clinical Rehabilitative Tissue Engineering Research*, **17**(30): 5531-5538.
- Li KC and Yu Q (2010). CT evaluation of osteoarthritis secondary to adults with severe developmental dysplasia of hip. *Chinese Computed Medical Imaging*, **16**(2): 139-141.
- Sawitzke AD, Shi H and Finco MF *et al* (2010). Clinical efficacy and safety of glucosamine, Chondroitin sulphate, their combination, celecoxib or placebo taken to treat osteoarthritis of the knee: 2-year results from GAIT. *Ann. Rheum. Dis.*, **69**(8): 1459-1464.
- Shi XM and Yu ZG (2013). The research progress of osteoarthritis pathogenesis. *Chinese Journal of Clinicians (Electronic Version)*, **7**(24): 11607-11610.
- Wang CH and Yang GF (2014). Observation of 120 cases of angina pectoris treated by iontophoresis of Chinese medicine. *Chinese Journal of Modern Drug Application*, **4**(15): 111-112.
- Wei L (2010). Pathogenesis and clinical research progress of osteoarthritis. *Hebei. Medical Journal*, **32**(5): 611-614.
- Yang M, Yang DP and Xu LP (2010). Iontophoresis of Chinese medicine in treatment of fatty liver accompanied by metabolic syndrome. *Practical Clinical Journal of Integrated Traditional Chinese and Western Medicine*, **10**(1): 82.
- Zhang CL, Lu JH and Zhang XG (2012). The minimally invasive operation of arthroscope for knee osteoarthritis. *Sichuan Journal of Anatomy*, **20**(2): 44-45.
- Zhang JH, Li L and Liu JZ (2010). Correlative factors of degenerative gonarthrosis. *Modern Clinical Nursing*, **9**(2): 10-11.
- Zhang T, Wang RT and Hu YJ *et al* (2011). Song JF, Ma CZ. The visual analogue scale in the knee arthroplasty after analgesia. *Progress in Modern Biomedicine*, **11**(22): 4362-4363.