

# Effects of Herbal Medicines on Pain Management

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**Abstract:** Pain is an unpleasant sensory and emotional experience in many diseases and is often caused by intense or damaging stimuli. Pain negatively affects the quality of life and increases high health expenditures. Drugs with analgesic properties are commonly used to relieve pain, but these Western medications could be overwhelmed by side effects including tolerance and addiction. Herbal medicines may provide alternative measures for pain management. In this review paper, after introduction of Chinese medicine theory and treatment modality, emphasis is placed on the application of Chinese herbs and herbal formulations in pain management. Three of the most commonly used herbs, i.e., *Corydalis yanhusuo*, *Ligusticum chuanxiong*, and *Aconitum carmichaeli*, are reviewed. Subsequently, using this ancient medical remedy, Chinese herbal formulation in treating common medical conditions associated with pain, such as headache/migraine, chest pain, abdominal pain, low back pain, neuropathic pain, osteoarthritis, and cancer pain, is presented. Chinese herbal medicines

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could be considered as a complementary and integrative approach in the modern armamentarium in combating pain.

*Keywords:* Pain; Nociception; NSAIDs; Opioids; Herbal Medicine; Chinese Medicine; *Corydalis yanhusuo*; *Ligusticum chuanxiong*; *Aconitum carmichaeli*; Chinese Herbal Formulation; Review.

## Introduction

Pain, associated with many medical conditions, is an unpleasant sensory and emotional experience often caused by intense or damaging stimuli. Pain reduces the quality of life and increases high health expenditures (Williams and Craig, 2016). Pain can be differentiated into nociceptive pain, which represents an acute response to a mechanical insult or noxious stimuli; inflammatory pain, which is associated with tissue damage and the infiltration of immune cells; and pathological pain (neuropathic pain), which is caused by damage to the nervous system (Woolf, 2010; Sommer, 2016). Pain sensation is transmitted by afferent neurons from the periphery to the spinal cord and from there to the brain with feedback loops modifying the input (Peirs and Seal, 2016).

Drugs with analgesic activities are commonly used to relieve pain. Analgesic drugs act in various ways on the peripheral and central nervous systems. Painkillers include acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) such as the salicylates, ibuprofen and COX-2 inhibitors, and opioid drugs such as morphine and oxycodone. Current pain management strategies rely primarily on anti-inflammatory and anti-nociceptive NSAIDs (Moore *et al.*, 2015; Demsie *et al.*, 2019). These drugs are the first line of therapy against mild or moderate pain, followed, if unsuccessful, by the more potent opioids. However, opioids are plagued by side effects and drug addiction. Opioids induce sedation, nausea/vomiting, constipation, tolerance, physical dependence, and respiratory depression (Martyn *et al.*, 2019). Thus, searching for alternative measures, especially botanicals, for pain management is critically important.

In the West, herbal medicines and other complementary and integrative remedies have been used to treat pain symptoms. Most reported pain-relieving herbs are boswellia, capsaicin, Devil's claw, essential oils, feverfew, ginger, St. John's Wort, turmeric, valerian root, and willow bark (Everyday Health, 2019; Medical News Today, 2019). In this paper, emphasis will be placed on the application of Chinese herbal medications in pain management. We will first introduce Chinese medicine theory and herbal medicine treatment modality. The most commonly used Chinese medicinal herbs will be reviewed. Subsequently, using this ancient medical therapy, herbal treatment of variable medical conditions associated with pain will be presented.

## Traditional Chinese Medicine

Traditional Chinese Medicine (TCM) embodies a mixture of ancient philosophy, culture, art, and science (Xiong *et al.*, 2018; Huang *et al.*, 2019; Luo *et al.*, 2019). The

Yin-Yang and Five-Element theories describe everything in the cosmos (Wang *et al.*, 2018c; Li *et al.*, 2019). Today's TCM practice still largely follows its original theory in pain treatment.

In contrast to Western medicine's organ systems and disease classification, TCM views the human body as a whole (Xu *et al.*, 2018b; Chen *et al.*, 2019). According to TCM theory, *Qi* or vital energy maintains the essential activities of the body. In contrast to Western medicine painkillers on nociceptive receptors and pain pathways, TCM believes pain can be caused by the obstructions of *Qi*, blood, body fluids, or the meridians, and cold can also provoke and intensify the pain while heat can reverse it. TCM emphasizes the individualization of pain conditions based on body balance and mind-body interaction (Fung and Linn, 2015; Luo *et al.*, 2019).

The most commonly used TCM pain treatment modes are herbs and acupuncture (Lin *et al.*, 2018; Luan *et al.*, 2019). Herbal formula, or a TCM prescription, is usually composed of a number of different herbs (Tomioka, 2017; Fang *et al.*, 2018). Acupuncture is also a very important TCM pain treatment modality (Cai and Shen, 2018; Pan *et al.*, 2018), which is well accepted in the Western countries with recognized efficacy (Patil *et al.*, 2016; Wang *et al.*, 2018b), but it will not be discussed in this paper.

### Commonly Used Chinese Herbs for Pain Management

Medicinal plants have been used in Chinese medicine, and some of these plants display analgesic properties. These medicinal plants also offer an opportunity for identifying new analgesic compounds in modern pharmaceuticals. Finding new analgesics requires a strategy that combines phytochemical purification and pharmacological analyses of the botanicals in question. Three of most studied Chinese herbs with analgesic activities are discussed below.

#### *Corydalis yanhusuo*

*Corydalis* Rhizome (延胡索), the dried root of *Corydalis yanhusuo* W.T. Wang, is an important herb for its antinociceptive property in Chinese medicine practice. This botanical, in its powder or decoction forms, has been widely used for treatment of pain and inflammation. Based on TCM theory, *C. yanhusuo* invigorates the blood and alleviates pain caused by blood stasis. This herb promotes the movement of *Qi* and alleviates pain caused by the *Qi* stagnation that manifests with symptoms such as chest pain, abdominal pain, and menstrual pain. *C. yanhusuo* may be used alone or in combination with other appropriate Chinese herbs for better therapeutic effects (Wang *et al.*, 2016b).

The chemical structures of several major constituents from *C. yanhusuo* are shown in Fig. 1. Biological properties of *C. yanhusuo* are mainly associated with alkaloids such as corydaline (Wu *et al.*, 2018). Tetrahydropalmatine is an active ingredient, known to bind to dopamine receptors, and it also has analgesic effects (Guo *et al.*, 2014). Another analgesic

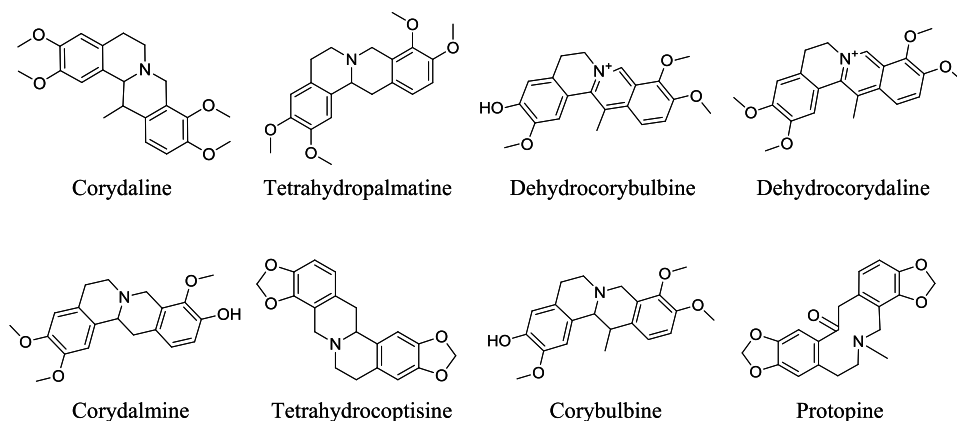


Figure 1. Chemical structures of major constituents in *Corydalis yanhusuo*.

alkaloid compound is dehydrocorybulbine, which is effective on inflammatory pain and injury induced neuropathic pain with limited tolerance. The compound attenuates bone cancer pain by shifting microglial polarization toward the M2 phenotype in the spinal cord (Huo *et al.*, 2018).

### *Ligusticum chuanxiong*

Chuanxiong Rhizome (川芎) is the dried rhizome of *Ligusticum chuanxiong* Hort., a very commonly used botanical for invigorating blood circulation and eliminating stasis (Chen *et al.*, 2018b). *L. chuanxiong* promotes the movement of *Qi* for any blood stasis pattern with pain and soreness in the head, chest, flanks, and hypochondria (Peng *et al.*, 2009).

*L. chuanxiong* is considered as a top selection for treating various types of headache, migraine, and female disorders. *L. chuanxiong* is often used in gynecological problems such as dysmenorrhea, amenorrhea, difficult labor, or lochioschisis (Yeh *et al.*, 2007). The herb is prescribed in combination with herbs including but not limited to *Gastrodia elata*, *Angelica dahurica*, or *Angelica sinensis* (Zhan *et al.*, 2013).

The chemical structures of major constituents of *L. chuanxiong* are shown in Fig. 2. Phytochemical studies indicated that alkaloids, phthalides, and phenolic acids are the predominant bioactive constituent groups of *L. chuanxiong* (Ran *et al.*, 2011). Tetramethylpyrazine has various activities on cardiovascular system against ischemic stroke due to antiplatelet aggregation and neuroprotective effects (Wang *et al.*, 2017). Ligustilide alleviates inflammatory pain partly through pro-inflammatory cytokine inhibition and inhibits NF $\kappa$ B-mediated chemokines production in spinal astrocytes (Zhao *et al.*, 2014; Zhu *et al.*, 2014). Ferulic acid possesses activities on neuropathic pain, potentially mediated via amelioration of descending monoaminergic system that coupled with downstream  $\delta$ - and  $\mu$ -opioid activities (Xu *et al.*, 2016).

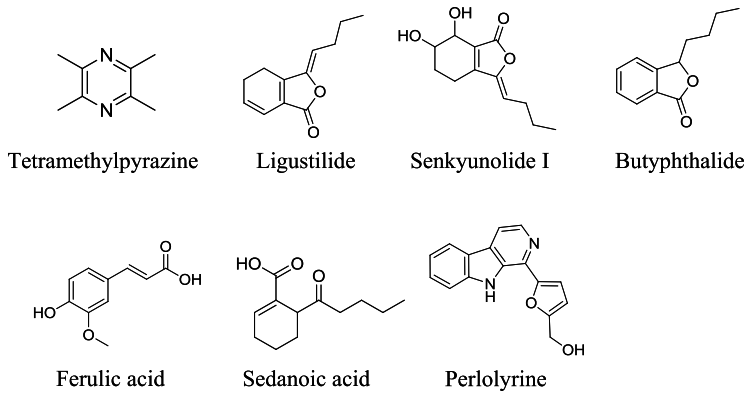


Figure 2. Chemical structures of major constituents in *Ligusticum chuanxiong*.

### *Aconitum carmichaeli*

*Aconiti Radix* (川乌), the dried principal root of *Aconitum carmichaeli* Debx., can be applied to peripheral neuropathic pain and painful arthritis possibly due to its anti-inflammatory actions in addition to other diseases (Feng *et al.*, 2014; Liu *et al.*, 2017). This herb disperses cold, warms the channels, and thus alleviates pain for wind-damp-cold painful obstruction, especially when the cold is predominant (Suzuki *et al.*, 2016).

The chemical structures of major constituents of *A. carmichaeli* are shown in Fig. 3. Several main aconite alkaloids, such as aconitine, hyaconitine, mesaconitine, and songorine, are able to induce obvious antinociceptive effects in animal pain models. However, their cardiotoxicity and neurotoxicity limit their clinical use (Singhuber *et al.*, 2009).

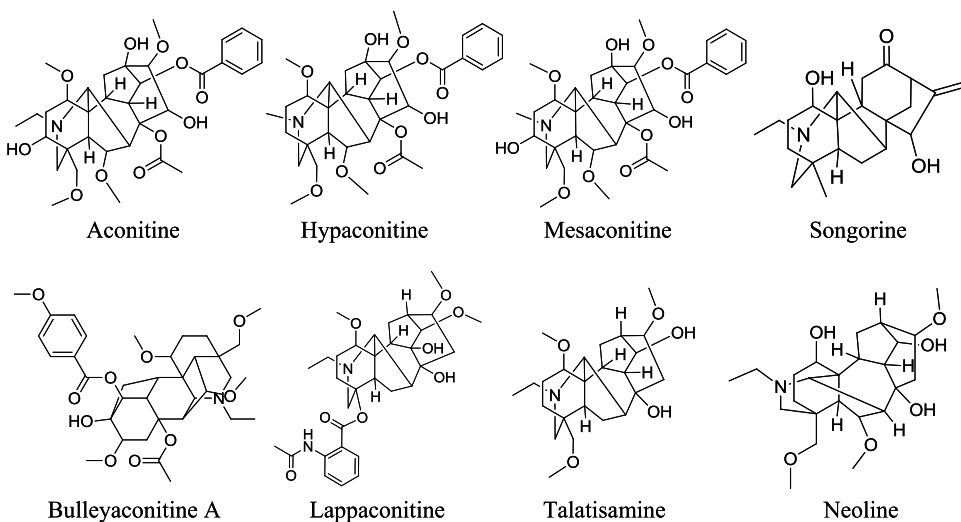


Figure 3. Chemical structures of major constituents in *Aconitum carmichaeli*.

Bulleyaconitine A is effective for treating chronic pain, including back pain and neuropathic pain in patients with minimal side effects (Xie *et al.*, 2018). This compound inhibits long-term potentiation at C-fiber synapses in spinal dorsal horn and facilitates the analgesic effect of morphine (Zhu *et al.*, 2015; Xie *et al.*, 2018). Lappaconitine exhibits antinociception through directly stimulating spinal microglial dynorphin A expression (Sun *et al.*, 2018).

## Pain Treatment for Common Disorders

### Headache

Headache may occur on one or both sides of the head, and it may appear as a sharp pain, a throbbing sensation, or a dull ache, while a tension-type headache is the most common. Causes of headache may include dehydration, fatigue, stress, infection, side-effects of medications, loud noises, and dental or sinus issues (Straube and Andreou, 2019). The prevalence of headache is really high in the United States where roughly 20% men and women have been suffering from this disorder (Burch *et al.*, 2018).

The efficacy and safety of Duliang Soft Capsule (DSC, 都梁软胶囊) were reported for prophylactic treatment of chronic daily headache. DSC contains *L. chuanxiong* and *A. dahurica* by a ratio of 1:4. In a multi-center-controlled study, 338 patients received DSC, while 111 patients were assigned in the placebo group. The primary efficacy measure was headache-free rate and the secondary efficacy measures included the change of headache days, attacks, severity, analgesic usage, and quality of life. Following 4-week treatment, there was a 17% difference in headache-free rate favoring DSC over placebo ( $p < 0.01$ ). No severe adverse effects were observed. Thus, DSC might be an effective option for the prophylactic headache treatment of patients (Yu *et al.*, 2015).

Chuanxiong Chadio Powder (CXCP, 川芎茶调散) is a well-known classic Chinese herbal prescription in treating headache. CXCP contains *L. chuanxiong*, *Mentha haplocalyx*, *Schizonepeta tenuifolia*, and five other herbs. Using meta-analyses of 37 studies with 3,680 participants, data found significant effects of CXCP for reducing headache frequency and duration and the total clinical effective rate ( $p < 0.01$ ) without major adverse events. However, for the data analysis, methodological flaws exist (Li *et al.*, 2015).

### Migraine

Migraine is another common headache, often affecting one side of the head. Migraine is a recurring head aching with moderate to severe throbbing or pulsing pain, and it affects approximately 10% of the adult population (Charles, 2017).

A controlled trial was conducted to assess whether Zhengtian Capsule (ZTC, 正天胶囊) was non-inferior to flunarizine (a calcium antagonist for the prophylaxis of migraine) for prevention of migraine in adults. The ZTC is composed of 15 herbal compositions, including *L. chuanxiong*, *A. carmichaelii*, and *A. dahurica*. 360 patients were randomized in a 1:1 to receive either ZTC or flunarizine in 12-week intervention and

4-week follow-up. The primary outcome measure was responder rate, and the secondary outcome measures include migraine attack frequency and duration, visual analogue scale (VAS) of pain, and analgesic use. Data indicated that ZTC was non-inferior to flunarizine in responder rate at week 12 and follow-up period (both  $p < 0.01$ ) with no severe adverse events (Cao *et al.*, 2016).

Chuanxiong Dingtong Granule (CXDT, 川芎定痛颗粒) is a Chinese medicinal drug composed of nine herbs including *L. chuanxiong*, *Cyathula officinalis*, and *Uncaria rhynchophylla*. The efficacy of CXDT for migraine patients with syndrome of liver wind and blood stasis was reported. 150 migraine patients in a controlled study received CXDT ( $n = 99$ ) plus necessary analgesics, or placebo ( $n = 51$ ) plus necessary analgesics for 12 weeks intervention and 4 weeks follow up. Outcome measures included migraine days, frequency of attacks, analgesics consumption for acute treatment, and VAS for pain intensity. Compared with the placebo, the CXDT group showed significant reduction in migraine days and frequency of attacks at week 12 and follow-up period ( $p < 0.05$ ). Also, there was a reduction of VAS scores during the follow-up period. No significant differences between the two groups in analgesics consumption (Fu *et al.*, 2012). However, like many reported Chinese herbal formula clinical studies, quality control of the testing herbs is a challenge issue.

### Chest Pain

Chest pain may be a symptom of a number of serious disorders and can be differentiated into heart related and non-heart related (Abrams, 2005). Only cardiac chest pain is referred to as angina pectoris or angina and will be discussed below.

The Danlou Tablet (DLT, 丹葵片) is a Chinese herbal formulation for patients with coronary heart disease and angina, consisting of 10 botanicals including *L. chuanxiong*, *Salvia miltiorrhiza*, and *Trichosanthes kirilowii*. One study investigated the cardioprotection of DLT in 219 patients with acute coronary syndrome. The patients undergoing percutaneous coronary intervention (PCI) were randomized in a 1:1 to receive either DLT or placebo, and all the patients also received atorvastatin. The main endpoint was the composite incidence of major adverse cardiac events (MACEs) within 30 days after PCI. Data showed that the MACEs occurred in 22% of the DLT group and 34% in the placebo group ( $p = 0.06$ ), but the incidence of MACEs at 90-day follow-up was significantly decreased (24% vs. 37%,  $p < 0.05$ ) (Wang *et al.*, 2016a).

*S. miltiorrhiza* is widely used in treating cardiovascular diseases in China. Salvianolate, composed of magnesium lithospermate B, rosmarinic acid, and lithospermic acid, is clinically used in treating coronary heart disease (Dong *et al.*, 2018). Salvianolate Injection (SI) is widely used for cardiovascular and stroke patients (Qi *et al.*, 2018). One review paper evaluated SI in the treatment of unstable angina pectoris. A total of 22 RCTs with 2050 participants were included in the analysis, and the data indicated that the combined use of SI and Western medicine can achieve a superior effect in angina pectoris total effectiveness rate and the ECG improvement (both  $p < 0.01$ ). Adverse events were reported in 15 cases, but none were serious (Zhang *et al.*, 2016a). Xinxuekang capsule (XC, 心血康胶囊) is a Chinese medicine oral drug for treating angina pectoris.



A controlled study with over 700 patients with symptomatic chronic stable angina showed that XC achieved overall better effectiveness compared to Compound Danshen Tablet which also contain *S. miltiorrhiza* as a major ingredient (Yu *et al.*, 2014).

*Panax notoginseng* is another well-known Chinese herbal medicine for several indications including cardiovascular diseases, and *P. notoginseng* saponins (PNS) is the most important active ingredients in this botanical (Xu *et al.*, 2018a). A paper reviewed 17 studies and indicated that PNS has promising therapeutic effects on symptom reduction, ECG improvement, and nitroglycerin dose reduction (all  $p < 0.01$ ) with a good safety record (Duan *et al.*, 2018).

### Abdominal Pain

Abdominal pain can be referred to as visceral pain or peritoneal pain. The most frequent reasons for abdominal pain are gastroenteritis, ulcerative colitis, irritable bowel syndrome (IBS), and urinary tract problems (Viniol *et al.*, 2014).

A controlled trial aimed to determine the effects of the Jianpi Qingchang Decoction (JQD, 健脾清肠汤) on the quality of life of patients with spleen deficiency and dampness-heat syndrome with ulcerative colitis. The JQD is composed of nine herbs including *Astragalus membranaceus*, *Portulaca oleracea*, and *Codonopsis pilosula*. 120 active ulcerative colitis patients were randomly divided into JQD group and control group in 1:1 ratio. Patients in the control group received 5-amino salicylic acid. After an 8-week treatment, differences in inflammatory bowel disease questionnaire (IBDQ) score and Sutherland Disease Activity Index (DAI) values were compared between these two groups. Data showed that after the treatment, the difference in IBDQ score between two groups were statistically significant ( $p < 0.05$ ) but the DAI decrease was not significant (Dai *et al.*, 2017).

A controlled trial has been reported to compare the efficacy of the herb formulation Tongxie (痛泻方) vs. placebo or pinaverium (an antispasmodic agent) in reducing symptoms of IBS, a most common chronic gastrointestinal disorder. The Tongxie formula is a combination of eight Chinese herbs such as *Atractylodes macrocephalae*, *Paeonia lactiflora*, and *Citrus Reticulata*. 1044 adult patients with IBS (based on Rome III criteria) were randomly assigned (1:1:1) to groups given Tongxie, placebo, or pinaverium (50 mg TID) for 4 weeks. Primary end points were significantly greater reductions in abdominal pain and Bristol stool score. Secondary end points were reductions in pain and stool frequencies and abdominal discomfort and its frequency. Subjects given Tongxie had significant reductions, before vs. after the study period, in all symptoms assessed compared to placebo ( $p < 0.01$ ). A significantly higher proportion of patients given Tongxie had increased stool consistency than patients given pinaverium (76% vs. 51%;  $p < 0.01$ ), and a significantly higher proportion of patients given Tongxie had fewer daily stools than subjects given pinaverium (73% vs. 58%;  $p < 0.01$ ). However, higher proportions of patients given pinaverium had reduced pain and pain frequency than patients given Tongxie (64% vs. 51% and 70% vs. 59%, respectively). Tongxie likely can be considered as an effective integrative therapy for patients with IBS who do not respond well to conventional therapies (Fan *et al.*, 2017).

A recently published study reported the efficacy of another Chinese herbal formula for treating diarrhea-predominant irritable bowel syndrome (IBS-D). 155 patients completed a



4-week controlled trial, and patients in the herbal group received Tong-Xie-Yao-Fang (TXYF, 痛泻要方) consisting of *A. macrocephalae*, *P. lactiflora*, *C. Reticulata*, and *Saposhnikovia divaricata*. Significant differences for the symptom improvements were observed (all  $p < 0.05$ ) (Chen *et al.*, 2018a).

### Lower Back Pain

Lower back pain is a troublesome chronic condition all over the world. Although Western medicine management is available, herbal medicines also play a role in treating it with or without a combination use of acupuncture.

A review paper that selected 14 RCTs with 2050 participants showed that *Capsicum frutescens* reduces pain more than a placebo. Additionally, *Harpagophytum procumbens*, *Salix alba*, *Symphytum officinale*, *Solidago chilensis*, and lavender essential oil also seem to reduce pain better than the placebo. No significant adverse events were noted in these trials. However, well-designed trials are needed to test these herbal medicines compared with current standard treatments (Gagnier *et al.*, 2016).

A study aimed to assess the efficacy of topical rose oil in women with pregnancy-related lower back pain. 120 women with pregnancy-related lower back pain were allocated to three parallel groups to receive topical rose oil, placebo (carrier oil), or no intervention for 4 weeks. Significant decrease in pain intensity compared to placebo or no intervention was observed (both  $p < 0.01$ ) without any significant adverse effect (Shirazi *et al.*, 2017).

Kampo medicine is widely prescribed and covered by health insurance in Japan. Goshajinki-gan (牛车肾气丸), a Kampo formula consisting of 10 herbs including *A. carmichaelii*, *Rehmannia glutinosa*, *Cornus officinalis*, *Poria cocos*, and *Paeonia suffruticosa*, is commonly used to treat back pain. Significant relief of back pain was observed in an observatory study, particularly in patients without any spine disease (Hamaguchi *et al.*, 2017). Another Kampo medicine, Shakuyaku-kanzo-to (Shao-Yao-Gan-Cao-Tang, 芍药甘草汤) has been used effectively for painful muscle cramps associated with lumbar spinal stenosis (Takao *et al.*, 2015).

### Neuropathic Pain

Neuropathic pain, due to damage or disease in the peripheral and central nervous system, is a common complication of cancer, diabetes, infection, and degenerative spine disorder (Gilron *et al.*, 2005). Various medications have been used in an attempt to treat neuropathic pain but often achieve limited satisfaction. Chinese herbal medicines have been studied, especially for diabetic patients suffering from neuropathic pain.

The effects on neuropathic pain in diabetic patients were reported by using a modified Huangqi Guizhi Wuwu Tang (MHGWT, 黄芪桂枝五物汤). This herbal formulation consists of seven herbs such as *A. membranaceus*, *Cinnamomum cassia*, and *P. lactiflora*. 112 diabetic participants were randomly assigned (1:1) to either the MHGWT group or placebo group. Diabetic neuropathic pain was rated including the 15-item Short-Form Brief Pain Inventory (SF-BPI) and the 17-item Short-Form McGill Pain Questionnaire

(SF-MPQ). Nerve conduction studies were performed. After 12 weeks of treatment, the SF-BPI and SF-MPQ scores of the MHGWT group were significantly reduced (both  $p < 0.05$ ), but the nerve conduction was not significantly changed (Tsai *et al.*, 2013).

Diabetic peripheral neuropathy leads to numbness, loss of sensation, and often pain in the extremities. Using a high dose of a traditional Chinese medicine, aconitum (including both *A. carmichaelii* and *A. kusnezoffii*), in combination with MHGWT formula, was assessed. In order to achieve stronger analgesic effects, the investigators increased the aconitum dose from 15 to 120 g. The aconitum was boiled for 6–8 h, and licorice was also used to reduce potential toxicities of aconitum. In the four reported cases, the patients' neuropathic pain was remarkably reduced, and the EMG profile was also improved. Adverse reactions were not observed even with a high dose of aconitum. The addition of aconitum seemed to be a promising treatment for the well-being of patients with diabetic peripheral neuropathic pain. Future controlled clinical trials using Chinese medicines containing high dose of aconitum are warranted (Feng *et al.*, 2014).

### Osteoarthritis

A multicenter controlled trial was conducted to examine the efficacy and safety of Huoluoxiaolingdan (HLXL, 活络效灵丹), consisting of 11 herbs including *C. yanhusuo*, *L. chuanxiong*, and *Boswellia carterii*, in patients with knee osteoarthritis. Eligible patients who fulfilled American College of Rheumatology criteria were randomized to receive either HLXL or placebo. Clinical assessments included measurement of knee pain and function with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), patient global assessment (PGA), and knee pain scores every 2 weeks. In the first stage, 28 participants were randomized to receive either low-dose HLXL (2.4 g/day) or placebo for 6 weeks. Since no statistical difference between the two groups was observed, the study was then re-designed, and 92 patients were enrolled in the second stage and were randomized to receive either high-dose HLXL up to 5.6 g/day for 8 weeks. Although improvement was observed in the high dose HLXL group, no statistically significant between-group differences were observed in this outcome study, and the study design should be noted in future studies (Lao *et al.*, 2015).

Duhuo Jisheng Decoction (DJD, 独活寄生汤), a Chinese herbal recipe consisting of 15 commonly used herbs including *L. chuanxiong*, *Angelica pubescens*, and *Taxillus chinensis*, is considered beneficial for controlling knee osteoarthritis-related symptoms in some Asian countries. A review of 12 studies with 982 participants found that DJD combined with glucosamine or DJD plus meloxicam and glucosamine had a more significant effect in improving the WOMAC scores (both  $p < 0.01$ ). Also, remarkable pain improvement when DJD plus sodium hyaluronate injection was used ( $p < 0.01$ ). However, some studies data would be questionable due to low methodological quality (Zhang *et al.*, 2016b).

A recent study provided evidence of efficacy of Xianlinggubao Capsule (XLGB, 仙灵骨葆胶囊) for treatment of osteoarthritis. XLGB is composed of six herbs including *Epimedium brevicornum*, *Dipsacus asper*, and *S. miltiorrhiza*. Adults over 40 years old diagnosed with osteoarthritis of the knee or hand were randomly assigned to the XLGB

treatment group or control group. Main outcome measures were the changes in the numeric pain rating scales (NPRS), WOMAC, and the Australian/Canadian Osteoarthritis Hand Index (AUSCAN) scores from baseline to 6 months. In total, 534 patients (1:1 ratio) were enrolled. Participants in the XLGB group exhibited significant improvement in NPRS, WOMAC score, and AUSCAN score (all  $p < 0.01$ ) compared to the control group, suggesting that XLGB could be an alternative treatment for these patients (Wang *et al.*, 2018a).

### *Others*

Cancer pain may arise from a tumor compressing or infiltrating nearby tissue or by a hormone imbalance or immune response. Radiotherapy, chemotherapy, and surgery may also produce short or long lasting painful conditions. To manage the cancer pain in different body regions, Chinese herbs have been used in combination with chemotherapy in cancer patients with noticeable results. Selected herbs, herbal formulations, or dietary supplements were capable of reducing cancer pain including the post-operative symptoms (Bardia *et al.*, 2006; Qi *et al.*, 2015).

Dysmenorrhea or menstrual cramps is one of common gynecological diseases, affecting the normal work and quality of life of women. Chinese medicine theory provides an understanding of the etiology and pathogenesis of dysmenorrhea, and herbal treatment of dysmenorrhea has received various satisfactory results (Jia *et al.*, 2006; Lee *et al.*, 2016).

### **Summary**

Drugs are commonly used to relieve pain in the West, but these medications inevitably have side effects including tolerance and addiction. We discussed commonly used Chinese medicinal herbs with analgesic effects which can be used alone or in combination with other herbs to form herbal formulas based on traditional Chinese medicine theory. The Chinese medicine formulations in treating variable common medical conditions associated with pain were presented. Data from previous human studies suggested clinical effectiveness of these herbal medicines with limited side effects. However, better botanical quality control and improved clinical trial design and execution should be reflected in future RCTs for further promoting Chinese medicine use in combating pain and related illnesses.

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