

EFFECT OF ACUPUNCTURE ON CHRONIC SHOULDER PAIN: A REVIEW

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ABSTRACT

Effect of acupuncture on chronic pain is being fiercely discussed globally since it is increasingly understood that many treatment methods are limited in their ability to achieve beneficial results without having side-effects. This concern has increased the interest in developing alternative medicine such as acupuncture, which potentially offer acceptable outcome in the longer term. This paper reviews the current status of acupuncture use for chronic shoulder pain. The acupuncture methods and some chronic shoulder pains are presented and their main advantages described in comparison with other available treatments. The various aspects associated with the acupuncture treatments are described, giving an overview of the current state of this treatment method. One can make the conclusion that different types of Acupuncture can be effective in relieving the chronic shoulder pain.

Keywords: *Acupuncture, Chronic Shoulder Pain, Alternative Medicine, Side Effect, Musculoskeletal Shoulder Pain*

INTRODUCTION

Acupuncture has gained increasing admiration in the United States as a treatment for pain. One advantage of acupuncture is the lower incidence of detrimental effects as compared with many drugs or other accepted medical procedures used for the same condition. A national Institutes of Health Consensus Development Panel described that acupuncture may be beneficial as an adjunct or acceptable alternative in the treatment of some types of musculoskeletal pain. A Cochrane analysis of clinical trials that evaluated the effectiveness of acupuncture in adults with shoulder pain reported that there may be short-term benefits with respect to shoulder pain and function.

A prospective, single-subject, clinical trial found that acupuncture was effective in decreasing chronic musculoskeletal shoulder pain in SCI subjects. A limitation of that study, however, was the absence of a separate group to control for nonspecific treatment factors. Because acupuncture interventions are moderately invasive, somewhat time consuming, and administered by an enthusiastic and empathetic therapist, they have the potential to function as a strong placebo.

Chronic shoulder pain (CSP) is a prevalent condition. In Great Britain, about 17% of all chronic pain patients of general practitioners had suffered from shoulder pain in the previous 4 weeks and in the US about 7 billion dollars are paid annually on direct cost of intervention of disorders associated to the shoulder joint (Center, 2008). The reported incidence of shoulder pain has augmented 100% over the last 10 years, predominantly because of changing work habits and sports activities, but also because of more sensitive diagnostic procedures. While in the 70s orthopedic interest concentrated on the hip joint, highlighting shifted to the knee in the 80s and then to the shoulder in the 90s (Kadar *et al.*, 2007). Pain and stiffness of the shoulder is usually triggered by rotator cuff disorders including tendonitis and bursitis, by adhesive capsulitis and by osteoarthritis of the gleno-humeral joint (Huguet, 2008). The normal course of the disease consists of a gradual or sudden beginning accompanied by night pain and pain on moving the affected joint. The mobility of the shoulder joint then becomes progressively more limited until in many cases a “frozen” or stiff shoulder is the result. The process, according to most of the literature, is generally “self-limiting”, lasting for about 1–3 years. Nevertheless, significant number of patients suffers from a residual, clinically detectable restriction of movement beyond three years (Kelly, 2009). The

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common treatments for shoulder pain are NSAIDs, physiotherapy, cortisone injections and “wait and see” (King *et al.*, 2011). Unfortunately, none of these treatments is clearly proven to be effective for CSP in the long run, calling for new treatment strategies to improve the situation of CSP sufferers (2012).

In Chinese Medicine, CSP is considered one of the signs most agreeable to treatment with acupuncture. Small number of clinical and methodologically diverse trials have been published recently which show little evidence to support or refute the use of acupuncture for shoulder pain and, as Green *et al.*, concluded, there is a need for further well-designed clinical tests. The German Randomized Acupuncture Trial for chronic shoulder pain (GRASP), a pragmatic, patient-blinded, three-armed, multi-center trial, tested pain reduction of Chinese acupuncture 3 months and directly after treatment in comparison to sham acupuncture and conventional orthopedic treatment in 31 orthopedic centers for outpatient care in Germany. We used an outpatient care setting because it resembles the environment in which acupuncture is normally delivered. The multi-center design gives the trial a high external validity and allowed us to include 424 patients, making GRASP one of the largest pragmatic RCTs to date to examine acupuncture for chronic pain of the shoulder joint. GRASP was sponsored by the German Ministry of Education, Science and Research.

With a reported clinical incidence of 12%-34%, shoulder-hand syndrome is a major implication occurring within 2 weeks to 15 months after stroke. Clinical treatments include sympathetic neural blockage, Western medicines (non-steroidal oxaprozin and steroid drugs), physical and recuperative therapies (such as electric therapy at low or moderate frequency, ultrasound therapy, wax therapy, electric stimulation of the transcutaneous nerve, biological feedback therapy, centripetal pressurized winding therapy and soaking in ice water) and acupuncture. However, studies suggest that the curative effects of these therapies need to be confirmed by clinical evidence. In this two-center randomized controlled clinical trial, the curative effects of acupuncture and massage for shoulder-hand syndrome were evaluated in hemiplegia patients.

Musculoskeletal Pain

Studies of pain in children and adolescents have found that the incidence of musculoskeletal pain rises with age and is predominantly prevalent among adolescents. A 4-year prospective study reported that the existence of new-onset low back pain increased with age from 12.5% in subjects aged 12 years to 24.1% in those aged 15 years. A study examining the prevalence of chronic pain (regardless of location) in children and adolescents (age birth to 18 years) reported that prevalence increased with age, peaking in the 12–15-years group in which more than 33% of adolescents reported chronic pain. Whether female adolescents are more likely to report pain than males is unclear. Diepenmaat *et al.*, reported a higher incidence of low back pain and neck/shoulder pain amongst girls compared to boys. Correspondingly, Perquin *et al.*, reported a significantly higher incidence of chronic pain in female adolescents than males. On the other hand, some studies have reported a higher prevalence of low back pain in males. A 5-year prospective study of low back pain reported a similar lifetime prevalence of low back pain between boys and girls at age 11, but afterward the incidence was higher in boys. By age 15 the lifetime prevalence of back pain was 60% in boys, while 40% of girls had reported symptoms. Finally, some studies of musculoskeletal pain have not conveyed a gender difference. A Swedish study of 9–15-year-olds found no differences in the incidence of ‘occasional’ musculoskeletal pain. At present it is difficult to determine the relationship between gender and pain because there is a lack of population-based research in this area. In adults the relationships with gender are clear, although the female excess observed in community-based studies is often less marked than that observed in clinic populations. Many studies reveal an excess occurrence of shoulder pain in women, and it is generally accepted that the incidence of shoulder pain increases with age. Trends in low back pain have also been reported according to age and gender. A community-based study in the UK reported a higher 1-month prevalence of low back pain in females compared to males, and found that for both sexes it increased with age up until the sixth decade before decreasing slightly in those aged 60 years and over. A similar pattern has been reported for 1-week prevalence; however, low back pain peaked for females aged 64–66 years and in males the peak was at 54–56 years. Women are also more likely to report chronic widespread pain and to satisfy criteria for

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fibromyalgia on examination 18, 19. In the study of new prevalent cases of fibromyalgia conducted by Weir and colleagues and described above, women were 1.6 times (95% CI 1.6, 1.7) more likely to have fibromyalgia. For both women and men, self-reported widespread pain symptoms increase with age 18, as does the reporting of new prevalent cases over a 12-month period among subjects who were initially symptom free (McBeth, 2007).

What mechanisms could explain these differences? Ageing is associated with degenerative processes, and these may explain the observed increase in symptom reporting as we age. Alternatively, following symptom onset it is likely that symptoms will become chronic, and the increase with age is the result of an accumulation of cases that have persisted over time. In older age groups we tend to observe a fall-off in symptoms, and that could be attributed to a change in those risk factors associated with further symptom beginning or perseverance (for example, a change in workplace factors after retirement from the staff). A number of hypotheses may clarify the excess symptom reporting among women, including a tendency to evaluate and label stimuli as being more harmful, an increased exposure to risk factors for symptom onset, and an increased sensitivity to pain or lower pain thresholds. Wijnhoven and colleagues have reported that gender differences in the reporting of musculoskeletal pain, including shoulder pain, could not be clarified by differences in the distribution of recognized risk factors such as age, educational level and smoking status. However, women may be exposed to elevated rates of occupational exposures, such as repetitive work, that would increase the risk of having musculoskeletal pain. One hypothesis proposes that men and women may be differentially 'vulnerable' to emerging pain, and that factors such as hormonal grade may act to surge vulnerability. This hormonal diathesis hypothesis has been examined in adolescent and adult populations. In a study of 11–21-year-olds, Rhee reported that pubertal status was associated with the incidence of a number of physical symptoms, including musculoskeletal pain. In a small clinic-based study of 16 adult patients with fibromyalgia, participants reported noteworthy variations in pain symptoms during the menstrual cycle. Fibromyalgia patients are also more expected to retrospectively recall a worsening of pain and associated symptoms throughout pregnancy and the postpartum period, to have a later menarche, or to have never been pregnant. Yet, a recent population-based study has found that hormonal factors were not related with the reporting of chronic prevalent pain (Molsberger, 2010).

Individual Causes: Smoking, Diet, and Mental Status

A body of research has studied the connotation between health behaviors – e.g. Smoking and obesity – and musculoskeletal pain. A cross-sectional study of Danish adolescents reported that daily smoking was related with drastic low back pain. In a prospective study of Canadian teenagers free of low back pain, smoking was found to be a risk cause for the start of low back pain, with participants who smoked being more than twice as likely to report symptoms when compared to non-smokers (OR ¼ 2.49, 95% CI 1.0–6.1). This relationship persisted after adjusting for other risk factors such as mental health status, growth, and activity. A Brazilian study of 96 children and adolescents aged 7–14 years found that obese subjects reported more back pain and lower-extremity pain than controls. A medical chart review of 227 overweight and 128 non-overweight children participating in clinical test revealed a higher incidence of musculoskeletal pain in the overweight children and teenagers. The prevalence of musculoskeletal pain (including knee, back, ankle and foot pain) in the overweight adolescent group was 18.3% compared to 4.8% in the non-obese group (OR ¼ 4.41, 95%CI 1.3–15.0). The overweight teenagers also reported a greater weakening in movement and had a greater incidence of abnormal lower-extremity alignment. In adults, a number of reports have suggested an association between smoking and low back pain, although a systematic analysis of the evidence concluded that the connotation was feeble and unreliable. In a large study of just under 13,000 subjects, current smoking was found to be associated with an increased prevalence of shoulder pain (prevalence ratio (PR) ¼ 1.2, 95% CI 1.2, 1.3) and low back pain (PR 1.2, 95% CI 1.1, 1.2). Despite moderate associations, these relationships persisted after adjustment for other factors, including age, gender, reporting other somatic symptoms, and stress. Remarkably, augmented rates of neck, elbow, hand, and hip and knee pain were also found to be connected with current smoking, designating a possible association with a more common pain disorder. Smoking may act as an effect

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moderator. A study of 562 currently employed subjects assessed low back pain status, occupational exposures and smoking behavior at baseline and 4 years later. 70 among subjects free of low back pain at baseline, exposure to heavy physical work increased the risk of developing symptoms at follow up (OR ¼ 2.3, 95% CI 1.2, 4.3). However, this relationship was much stronger in those subjects who reported smoking at baseline (OR ¼ 5.5, 95% CI 1.9, 15.8) and was absent in non-smokers (OR ¼ 1.2, 95% CI 0.5, 2.6). Others have demonstrated that, amongst a group of fibromyalgia patients, factors such as smoking 71 and a high body mass index (BMI) 72 are associated with symptom severity.

However, prospective data are absent and are essential to determine whether these factors predict the start of pain symptoms. One area of research that has received attention has been the elevated rate of musculoskeletal pain among individuals with high levels of psychological distress. Several cross-sectional studies have reported a connotation between anxiety and depression and musculoskeletal pain in adolescents. For example, a large cross-sectional study conducted in the Netherlands found that stress and depression were related with neck/shoulder and low back pain in 12–16-year-old teenagers. A study of British school children aged 11–14 years reported an association between low back pain and emotional problems, conduct problems, and daytime tiredness. Psychosocial problems have also been revealed to be risk factors for new-onset musculoskeletal pain. Feldman *et al.*, reported that poor mental health (measured using the mental health index from the short form 3677 was associated with an increased risk of developing musculoskeletal pain at 1 year follow-up. Others have reported that the presence of conduct problems (e.g. anger, disobedience) and hyperactivity (e.g. restlessness, lack of concentration) are associated with an increased risk of developing low back pain 8, whilst adolescents with high levels of ‘pro-social’ (i.e. positive) behavior have a reduced risk of developing widespread pain. Prospective studies have gone some way towards untangling the temporal relationship between psychosocial factors and chronic widespread pain. Among asymptomatic subjects, compared to non-depressed subjects those with depressive symptoms have an increased risk of developing chronic musculoskeletal pain 8 years later. Somatization, marked by a high rate of consultations to health-care providers and reports of high rates of somatic symptoms, is also associated with the onset of chronic pain. Among subjects who were free of chronic common pain, those who had a bent to frequently visit their general practitioner were 9 times more probable (OR ¼ 9.0; 95% CI 3.7–22.2) to develop symptoms 12 months later when compared to infrequent consulters, while those reporting other (non-pain) somatic symptoms were more than 3 times as probable (OR ¼ 3.3; 95% CI 1.5–7.4). A recent study of fibromyalgia patients reported that about 80% of all co-morbid cases of major mood, anxiety or eating disorders started at least 12 months before the reported onset of fibromyalgia symptoms. The prevalence of musculoskeletal pain differs significantly across studies. This is probably due to a number of factors, including the different definitions of pain used. There are also a number of measurement issues which make it difficult to make comparisons (Trescot, 2011).

Many of the studies examining pain in adolescents have only studied the occurrence/non-occurrence of pain, and have not examined duration, frequency or intensity. Also, the majority of epidemiological studies of musculoskeletal pain have asked subjects to recall pain over different time periods (e.g. pain in the last week, month or year), not only making it difficult to compare across studies but increasing the probability of memory partiality over lengthy time periods. However, despite these issues, it is clear that chronic musculoskeletal pain is common amongst adolescents and adults. The incidence of chronic pain is influenced by a number of factors: it tends to rise with age, is more common in women, in subjects from lower socioeconomic groups, and in psychologically stressed populations. However, the precise nature of these relationships, and particularly the mechanisms of association, are unclear and require further rigorous investigation.

Treatment Overview

A growing array of pharmaceutical, surgical, neuroaugmentative, somatic, behavioral, rehabilitative, and complementary and alternative treatment options are available for the addressing patients with chronic pain. However, overall treatment effectiveness remains inconsistent and fairly poor. Moreover, even when treatments effectively reduce pain, they often do not produce simultaneous improvements in physical and

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emotional functioning and overall health-related quality of life. The focus of this paper is to provide an overview of current practices and concerns in the management of patients with chronic non-cancer pain. Notably, chronic non-cancer pain is a broad category, and disorders tend to be classified on the basis of anatomy (e.g., body location), cause (e.g., nociceptive, neuropathic), neurophysiology, or body system involved. Various classes of pain disorders have potentially distinct underlying mechanisms, and as a result drawing of overarching conclusions on any one particular treatment modality is difficult. Management options, however, overlap substantially, so we present results on the basis of therapeutic modality. We provide a contemporary survey of some of the most common pharmacological, interventional, and non-interventional treatments. A comprehensive systematic review of the effectiveness of treatments for specific diagnoses is beyond the scope of this report. We focus mainly on the categories of musculoskeletal pain (e.g., osteoarthritis), neuropathic pain (e.g., post herpetic neuralgia and diabetic painful neuropathy), chronic widespread pain (e.g., fibromyalgia), and non-specific low-back pain on the basis of their prevalence in clinical practice and in research into treatment.

Pharmacological treatments Background Oral drugs have been the backbone of treatment for pain during past centuries, and the use of drugs to treat pain has expanded exponentially in recent years, with increases in expenditures of 188% between 1996 and 2005. Review evidence for classes of drugs most commonly used for treatment of chronic non-cancer pain. Opioids Retail sales for opioids, the most common class of drug prescribed in the USA, increased by 176% from 1997 to 2006. 8 Despite this striking escalation, their use remains controversial both with respect to efficacy and adverse physical effects and to aberrant behaviours. A metaanalysis of 41 randomized controlled trials evaluating the effectiveness of opioids for the treatment of various forms of chronic non-cancer pain, including osteoarthritis, diabetic painful neuropathy, low-back pain, and rheumatoid arthritis, concluded that on average opioids result in a small improvement in pain severity and functional improvement compared with placebo, and similar reductions in pain, but less improvement in function compared with other analgesic drugs. On the basis of similar conclusions from a systematic review of the use of opioids in osteoarthritis, Neush and colleagues concluded that opioids should not be routinely used. Guidelines from both the Neuropathic Pain Special Interest Group of the International Association for the Study of Pain and the European Federation of Neurological Societies Task Force recommend opioids as second-line or third-line treatment that can be considered for first-line treatment in specific clinical circumstances, such as during episodic exacerbation of severe neuropathic pain. On the basis of scarcity of evidence, opioids are not strongly recommended for use in patients with fibromyalgia in any of the three most recent evidence based guidelines published by professional societies for the management of this disorder. Tramadol, a combination of a serotonin and noradrenaline reuptake inhibitor and a μ -opioid agonist, is notable because its mechanism of action is distinct from those of other opioids. Tramadol reduces pain substantially in osteoarthritis, fibromyalgia, and neuropathic pains. Side-effects associated with opioids (e.g., nausea, constipation, and somnolence) contribute to attrition during randomised controlled trials and are often important enough to prevent patients from remaining on opioid treatment. In a meta-analysis of 17 studies 24 concerning efficacy of long-term opioid use for chronic non-cancer pain, 44% of patients abandon treatment 7–24 months into open-label extensions. A few patients opting to remain on long-term opioid treatment can develop opioid-induced hyperalgesia, which occurs when patients taking opioids become hypersensitive to nociceptive stimuli. Opioid-induced hyperalgesia is postulated to result from changes in the peripheral and central nervous system that lead to facilitation of nociceptive pathways. Aside from the physical adverse events, opioids carry a substantial risk of misuse. Studies of patients with chronic non-cancer pain taking opioids on a long-term basis suggest that as many as 45% could be engaging in aberrant drug-taking behaviors. In the USA, the misuse of prescription opioids is the fastest growing form of drug misuse and is the leading cause of accidental overdose and mortality, and there is increasing concern about diversion and criminal trafficking by patients and physicians. Emergency room visits involving narcotic analgesic substances increased 274% in 11 years, from 1995 to 2005, and from 1999 to 2004, the number of all poisoning deaths increased 54%, whereas the number of methadone-related deaths rose 390%. These concerns, as well as restricted efficacy, have resulted in some re-

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assessment and debate regarding practices surrounding opioid use. Manchikanti and colleagues provide a detailed discussion of the complexities and complications of therapeutic use, misuse, and nonmedical use of prescription opioids.

Non-Steroidal Anti-Inflammatory Drugs

The efficacy of non-steroidal anti-inflammatory drugs (NSAIDs) has been reported for patients with osteoarthritis and rheumatoid arthritis 31 and back pain. NSAIDs are generally accepted to be ineffective for neuropathic pain; however, this belief is not founded on published evidence, and research is needed to establish the efficacy of NSAIDs for this class of disorders. NSAIDs are not included in any of the three most recent guidelines for treatment of fibromyalgia. The widespread use of paracetamol, combined with the small margin of safety between therapeutic and toxic dose, often result in unintentional overdose. On the basis of growing rates of unintentional overdose and hepatic failure associated with paracetamol, the FDA revised the drug's warning label in April, 2010.

Antidepressant Drugs

Antidepressants have diverse effects that might contribute to their analgesic effect, including effects on N-methyl-D-aspartate (NMDA) and adenosine receptors, sodium channels, and serotonin, noradrenaline, and opioid systems. Meta-analyses suggest that antidepressants are superior to placebo for the treatment of chronic non-cancer pain, resulting in moderate symptom reduction. Efficacy is most well researched for neuropathic pain, fibromyalgia, low-back pain, and headaches. Evidence is particularly strong for use of antidepressants in neuropathic pain.

Skeletal Muscle Relaxants

The mechanisms of action of skeletal muscle relaxants is unclear, but could be related in part to sedative effects. Studies have not shown significant differences among this category of agents in their efficacy, adverse events, or safety. Most frequently, they are recommended as adjuvant therapy for short-term relief. Cyclobenzaprine is the best studied muscle relaxant in musculoskeletal disorders. The drug seems to have a restricted role in the treatment of chronic non-cancer pain, with the exception of fibromyalgia. In studies of fair quality, it has consistently proven superior to placebo for fibromyalgia, as well as pain relief, muscle spasms, and functional status in other disorders. Sedation is a common side-effect, making long-term therapy problematic.

Topical Agents

Topical agents have been advocated for the treatment of chronic non-cancer pain when localized pain is present. They have the potential advantage of avoiding the systemic side-effects that are often associated with oral drugs.

Capsaicin is an alkaloid derived from chili peppers, and repeated application is thought to deplete substance P from primary afferent neurons. By comparison with placebo, topical agents effectively reduce pain in both neuropathic pain and musculoskeletal disorders including osteoarthritis. Topical salicylate has also proved superior to placebo in six trials of chronic non-cancer pain.

Interventional Treatments

Background

Interventional pain medicine involves application of various techniques that can be used to diagnose or locate an individual's source of pain or provide therapeutic pain relief. Interventional medicine is most frequently used when a specific area of the spine is thought to be contributing to an individual's pain (i.e., discogenic or sacroiliac joint pain) and there is no consensus with respect to optimum diagnostic criteria. The focus of our review is therapeutic intervention, so we will not address diagnostic uses of interventional pain medicine. We refer readers to Chou and colleagues and Manchikanti and colleagues 50 for discussion and recommendations regarding diagnostic interventions for back pain. In this section, we focus on the most common therapeutic interventions, injection therapy, surgical intervention, and implantable devices, with a primary focus on low back pain. For a more in-depth discussion of interventional therapeutic techniques for low-back pain, we refer readers to the American Pain Society (APS) and the American Society of Interventional Pain Medicine systematic review and evidence-based guidelines.

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Injection Therapy

Nerve blocks involve the delivery of various anesthetics to visceral and peripheral nerves and muscles to interrupt nociceptive input, reduce inflammation, or destroy neurons at the source of pain. The procedures vary with respect to patient-selection criteria, location (epidural, facet joint, local site), agent, and dose. The deviations in methods make assessment of outcomes difficult. There is no consensus about technical aspects of injection therapies, and no guidelines for optimum diagnostic criteria for patient selection, frequency, number, or timing of injections. In the USA, epidural steroid injections are the most commonly performed pain management procedures; however, evidence is not unequivocal for their use as long-term monotherapy. Recent APS guidelines report that fair evidence exists for their use in patients with radiculopathy with prolapsed lumbar disc, although there is no evidence supporting their use in non-specific low back pain or failed back surgery syndrome. Facet injections are the second most commonly performed pain management procedure in the USA. Luijsterburg and colleagues undertook a systematic review for their use in lumbosacral radicular syndrome, and they were not clearly shown to be effective. However, Chou and colleagues conclude that there is fair evidence for their use in presumed facet joint pain. With respect to intradiscal steroid injections, they report good evidence for the use of intradiscal steroid injections in presumed discogenic low-back pain, and fair evidence in radiculopathy with prolapsed lumbar disc. Superficial and deep infections are a potential side-effect of injection therapies. Rare but serious problems (caudaequine syndrome, septic facet joint arthritis, discitis, paraplegia, paraspinal abscesses, meningitis) have also been reported. The decision to use an injection therapy needs to balance the potential for some patients to benefit against these serious adverse events and costs.

Surgery

Chronic non-cancer pain that persists despite conservative efforts often leads to surgery. Lumbar fusion for non-radicular low-back pain with degenerative changes is one of the most rapidly increasing types of surgery. In 2001, more than 122000 lumbar fusions were performed in the USA, a 220% increase from 1990, 59 and rates of cervical fusions rose 206% from 1992 to 2005. Artificial disc replacement is one alternative to fusion surgeries.

Other common surgeries include discectomy for radiculopathy with herniated lumbar disc, decompressive laminectomy for spinal stenosis, and an interspinous spacer device as an alternative to decompressed laminectomy (Turk *et al.*, 2011).

Physical, Rehabilitation and Psychological Approaches

Psychological treatments can generally be separated into theoretically-based approaches and specific techniques. The most common theoretical approaches are operant conditioning and cognitive-behavioral therapy (including acceptance-based and mindfulness based therapy). All of these approaches emphasize patient coping, adaptation, self-management, and reduction of disability related with symptoms, rather than removal of physical causes of pain per se. The most commonly used psychological techniques used to achieve these goals include cognitive therapy, relaxation, and hypnosis to help patients to shift their stance from being passive, reactive, dependent, and helpless in the face of pain, to being active and resourceful in coping with their symptoms and their lives, and to replace their more typical feelings of hopelessness.

The results of meta-analyses and systematic reviews of adult patients with chronic pain suggest that psychological treatment as whole results in modest benefits in improvement of pain and physical and emotional functioning. However, evidence for the long-term effects is inadequate, and evidence is somewhat contradictory for effects on vocationally relevant outcomes. There is insufficient evidence to recommend any one therapeutic approach or modality over another. The possibility that patients with different characteristics might derive benefits from treatments with different foci and targets is reasonable to consider. Psychological approaches are usually included as components of interdisciplinary pain rehabilitation programs (IPRPs).

Rehabilitation programs are often supposed as a salvage approach after the alternatives described previously have proven inadequate. Thus, patients treated at IPRPs have some of the most unruly problems. Although there is no single format for IPRPs, they offer an integrated method that involves

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close harmonization between physicians, psychologists, physical therapists, and other health-care suppliers.

Complementary and alternative medicine and other non-pharmacological approaches Complementary and alternative medicine (CAM) includes a wide range of treatments that are not regarded as part of conventional medicine. An all-inclusive review of all modalities is beyond the scope of this work, but we address three of the most common modalities used, as well as those with the best evidence for treatment of chronic non-cancer pain. The evidence that we review is largely based on a recent systematic review of CAM efficiency for chronic non-cancer pain. Spinal manipulation is the most commonly used CAM therapy for low-back pain. Tan and colleagues concluded on the basis of two systematic reviews that spinal manipulation therapy is more effective than are sham manipulations and treatments such as bed rest and traction, but not more effective than other recommended treatments for low-back pain. Evidence for other chronic non-cancer pain disorders is scarce.

Massage is another modality commonly used by patients with chronic non-cancer pain as a supplemental treatment. Wide variations in massage techniques make generalization from studies difficult. Tan and colleagues reviewed all published evidence for massage therapy for chronic non-cancer pain and concluded that evidence supports benefit in low-back and shoulder pain, and possibly provides benefit for fibromyalgia and neck pain, but more research is needed.

Acupuncture has been used for thousands of years in the treatment of pain, although mechanisms remain unclear. Evidence supports the effectiveness of acupuncture for the treatment of chronic low-back pain, and results are promising for the effectiveness in reduction of pain associated with fibromyalgia and neck pain. There is, however, little evidence reported to support improvements in physical or emotional functioning after acupuncture treatment of patients with chronic non-cancer pain. However, acupuncture trials have typically not focused on function as an outcome. Transcutaneous electric nerve stimulation (TENS) has been applied for diverse pain states since its introduction in the early 1970s, but there have been few large, randomized controlled trials to evaluate its effectiveness in pain management.

DISCUSSION AND CONCLUSION

In a study named Acupuncture for Chronic Shoulder Pain in Persons with Spinal Cord Injury: A Small-Scale Clinical Trial carried out by Trevor A *et al.*, the effect of acupuncture is measured on shoulder pain among mentioned patients. To be eligible, they had to be between 18 and 70 years of age, have had no experience with acupuncture, have had chronic musculoskeletal shoulder pain (defined as a history of musculoskeletal shoulder pain for more than 3 months and that physical examination found to be localized to the subacromial space and/or to the regional muscles of shoulder complex), were at least 1 year post-SCI, and used a manual wheelchair as their chief means of mobility (40h/wk). Subjects were excluded if they were pregnant or had a medical condition that would impede with the study or the interpretation of the study's results. All respondents provided written informed agreement, in accordance with procedures approved by the suitable institutional review board. We used a combined version of a thoroughly individualized acupuncture needle treatment and a standardized acupuncture needle treatment to accommodate the differences between participants and changes in symptoms throughout the treatment period, while still providing some consistency in the treatment. This protocol, described elsewhere, is briefly summarized here. Before each treatment, up to 6 local points and 2 distal points were chosen per painful shoulder, according to the distribution of shoulder pain or tenderness on palpation in individual participants. Points were chosen from a list of points believed to relieve shoulder or upper limb pain and were based on traditional Chinese medicine methods. Our study is the first randomized, double blind (evaluator, participant), placebo (invasive, sham) controlled trial to evaluate the efficacy of acupuncture for chronic musculoskeletal shoulder pain in subjects with SCI. We found a significant decrease in shoulder pain intensity with acupuncture; however, this change did not differ significantly from the decrease with sham acupuncture. Because pain relief did not differ significantly between the 2 groups, our results may be interpreted in 2 ways. One, acupuncture is no more effective than sham acupuncture in reducing chronic shoulder pain (i.e., point location does not make a difference). An equally plausible

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interpretation, however, is that acupuncture at both specific and nonspecific anatomic sites can relieve pain? We saw a medium to large effect associated with the acupuncture treatment, indicating that it was superior to sham acupuncture in relieving shoulder pain. Because our sample size was small and SDs were large, however, our study lacked adequate power to detect the differences between acupuncture (ie, needling at acupoints) and sham acupuncture (ie, needling at nonacupoints), thus increasing the risk of a false-negative conclusion (type II error). We observed a significant decrease in shoulder pain intensity with acupuncture treatment; however, this change did not differ significantly from that resulting from sham acupuncture. There appears to be an analgesic effect or a powerful placebo effect associated with both acupuncture and sham acupuncture. There was a medium to large effect associated with the acupuncture treatment, suggesting that it may be superior to sham acupuncture in relieving shoulder pain in subjects with SCI. Our sample size limited the study's power to detect significant differences between the groups, increasing the risk of a type II error.

Albrecht et al in 2009 conducted a study named German Randomized Acupuncture Trial for chronic shoulder pain (GRASP) – A pragmatic, controlled, patient-blinded, multi-centre trial in an outpatient care environment. In this study Acupuncture-naïve patients were recruited from office-based orthopedic physicians between 1997 and 1999 (last patient out 8/99). Data from the medical examinations were sent via fax to the Department of Statistics in Medicine, Heinrich Heine University Düsseldorf, and measured for eligibility according to the following criteria: one-sided shoulder pain for at least 6 weeks and up to two years; an average pain score of 50 mm or more on a 100-mm visual analogue scale (VAS) in the past week; age between 25 and 65 years; the ability to communicate in German; no neurological disorders causing shoulder pain. Using central telephone randomization (Department of Statistics in Medicine, Heinrich Heine University Düsseldorf), the patients were randomly allocated to treatment groups and informed via fax. The randomization list was prepared with the SAS software package, version 6.12, and was concealed and recorded on a secure central database. Treatment assignment to one of verum acupuncture (verum), sham acupuncture (sham), or conventional orthopedic conservative treatment (COT) was known to the acupuncturist. Randomization was stratified in two balanced strata according to patient age: 25 to 645 years (stratum 1) and 46 to 665 years (stratum 2). The patients were blinded to whether they received verum or sham acupuncture, but were not blinded to COT. Therapy was administered by 31 office-based orthopedists that all had passed nationally recognized acupuncture examinations with a minimum of 140 training hours, and additionally had attended a 1-day seminar explaining the specific modalities of the trial therapy.

The GRASP trial shows that a course of 15 acupuncture treatments more effectively reduces pain and improves mobility in patients with chronic shoulder pain than does standard therapy using NSAIDs and physiotherapy. The therapeutic effect can be observed immediately after the end of the treatment and for a period of up to 3 months, with the difference between acupuncture and standard therapy increasing over this time. Our results propose that verum acupuncture is superior to sham acupuncture. With 424 patients treated in 31 outpatient centers, the test has a high external validity, and shows that acupuncture can be effectively integrated into the medical setting of an outpatient care environment. To our knowledge this is the largest practical test on acupuncture for CSP conducted to date. The pragmatic GRASP trial showed that Chinese acupuncture is an effective alternative to conventional standard therapy in chronic shoulder pain. Fifteen Chinese acupuncture treatments over 6 weeks are more effective than conventional standard therapy with NSAIDs and physiotherapy. After the end of treatment, the therapeutic effect of acupuncture lasts for 3 months. The pragmatic trial shows that verum acupuncture is more effective than sham acupuncture at non-verum points located far away from the verum acupuncture points.

Mingle et al in 2012 have conducted a study named Therapeutic effect of acupuncture and massage for shoulder-hand syndrome in hemiplegia patients: a clinical two-center randomized controlled trial. In this study, One hundred and twenty hemiplegia patients with stage I shoulder-hand syndrome were randomly divided into a group treated with standardized electric acupuncture and massage, and a group treated with rehabilitation therapy for 6 weeks.

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The primary indices evaluated were pain on passive movement of the shoulder using the numeric pain rating scale (NPRS), and the number of patients with shoulder-hand syndrome at Steinbrocker stage II or III after treatment. The secondary indices were Fugl-Meyer evaluation of functional movement of the upper limb and hand using the modified Rankin scale (MRS).

Traditional Chinese Medicine (TCM) holds that shoulder-hand syndrome in hemiplegia is due to damage to the brain caused by blood stasis, which blocks the channels to cause pain, limited movement and edema in the affected limb. In acupuncture-massage therapy, acupuncture at special points can dredge the channels and stop the pain, while massage can relax the muscles and activate the collateral circulation. However, the acupuncture and massage procedures should be standardized. In this clinical trial, acupoints were selected according to TCM theory on root-stem and origin-end relationships. 17-19 Sanjian (LI 3), Houxi (SI 3), Zhongzhu (SJ 3), Jianzhongshu (SI 15), Jianliao (SJ14) and Jianyu (LI 15) were pricked rapidly with No. 28 filiform needles, and electro acupuncture at 50 Hz with a suitable electric current was used to make the muscles around the points tremble slightly and elicit mild pain. The members of our research group believe that the parameters adopted for electric acupuncture may be important in stopping pain and eliminating swelling.

After acupuncture, massage was performed from hand to shoulder. Points on the hand were pressed, rubbed and nipped, and the joints of the fingers, the palm and the wrist were flexed without pain. Rolling, pressing and rubbing manipulations were performed on the shoulder to stimulate the Three Yang Channels and to stop passive pain in the shoulder joint. At present, there is no adequate evidence in favor of any specific therapy for shoulder-hand syndrome in hemiplegia patients, so rehabilitation therapy is commonly used in clinical practice.

In the present study, with the use of PNF training, Bobath therapy, shoulder relaxation and other rehabilitation methods in the control group, we found that comprehensive therapy with acupuncture to dredge the channels and massage to relax the muscles was superior to rehabilitation therapy may improve movement, but acupuncture-massage therapy was superior to rehabilitation therapy in improving upper limb function (P<0.05). In our view, the reason may be that acupuncture and massage can alleviate pain and improve joint movement, but repeated stimulation may help more in restoring the nipping and clenching function of the hand. Combined therapy with acupuncture and massage can alleviate pain in the affected limb, prevent the condition from worsening, improve limb function, enhance quality of life and reduce the disability rate in hemiplegia patients with shoulder-hand syndrome and is therefore worthy of recommendation in clinical practice.

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