

How does Traditional Medicine Supplement Current Orthopaedic Practice and Rehabilitation?

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ABSTRACT

Orthopaedic practice has gained impressive advancements in the past decades and the most important achievements have been made after the two world wars, when the need for injury and fracture treatment was urgent and vast. Orthopaedic experts of today, might not realize that “Bone setting” used to be the main service provided to skeletal injuries and fractures. “Bone setters” have their special techniques and therapeutic agents (mostly topical) to ensure satisfactory results. They also provide various techniques for the control of pain and to facilitate recovering, i.e. rehabilitation.

Although the old traditional techniques have been replaced by modern hospital practice, they remain popular outside the hospital and specialist clinics because patients are in favour of additional treatment measures so that pain is better controlled, and healing and recovery could be quicker.

This review selected three important areas of Traditional Medicine that should contribute towards modern Orthopaedic Practice and discusses about the scientific evaluations being done to give evidence to those practices. It will be appropriate for the orthopaedic experts to get acquainted with the apparently unscientific traditional practices and consider making use of them under appropriate situations.

Key words: Traditional Medicine; Orthopaedics; Acupuncture; Topical Treatment; Rehabilitation; Tai Chi; Qi Gong

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INTRODUCTION

Bone and joint problems are probably the earliest sufferings related to human health that Mankind has experienced. Locomotor performances are always needed in activities of daily living, whether at home or outside, and musculo-skeletal injuries of different nature and severity would be encountered. It is not surprising that irrespective of the geographical or cultural differences, early traditional medicines are uniformly committed to injury management^[1]. Related to injuries, minor and major joint diseases would be closely involved. The concepts and experiences of treating musculo-skeletal diseases, from “bone-setting” to primitive practices given to joints, are therefore plentiful in all the four major streams of traditional practices, viz., Chinese, Egyptian, Greek and Indian^[2]. With regard to the availability of classical records and literature, however, Chinese medicine undoubtedly owns the most plentiful of valuable manuscripts and books^[3].

One might not realize that modern orthopaedic surgery is relatively new: in that injury treatment matured after the two world wars, to be followed gradually by the application of technology for different aspects of bone and joint diseases. Henceforth, in the long decades before the world wars, bone and joint problems, from injuries to other pathologies, have been served by “bone-setters” everywhere in the world. After the Swiss “AO-school” worked out the complete recommendations on operative fracture treatment in the 60-70’s of the last century, orthopedic surgeons no longer remember the old practices^[4]. Total joint replacement is considered one of the most important inventions in medical practice of the last century^[5,6]. Since then, endless applications of technological concepts and devices to orthopaedics have been creating wonderful new interventions for

different musculo-skeletal disorders. All these achievements outshone the traditional contributions in the past, which are nearly totally removed from the old memories of orthopaedic practitioners of today.

The current practice has made genuine contributions. If pathologies could all be thoroughly removed and if results of interventions are really perfect, traditional practices deserve an absolute elimination. However like other fields of medicine, in spite of the wonderful achievements, some specific, special problems remain not responsive or only partially responsive to all treatment options^[7]. Under such circumstances, some old, apparently unscientific practices could still be applied as supplementary services. The best way to endorse this practice is to identify the indicated areas and put the potentially favourable traditional methodology into scientific evaluations before its proper acceptance^[8].

In this communication, I am choosing three important areas in orthopaedic practice, where the need for complementary or supplementary therapy is vast, and although possibly yet unknown to some orthopaedic practitioners, popularity of such therapy is already rising. The areas are: Pain control, topical applications for inflammatory problems and Rehabilitation techniques.

PAIN CONTROL

Pain control in orthopaedics could be extremely complex: ranging from straightforward pain of pure somatic origin to chronic, long lasting disabling painful disorders arising from multiple tissues, pathologies and sometimes, carries strong psychological components. Attending personnels are accustomed to offer routine management of analgesia and then with today's subspecialisation of the "Pain management team", refer to the pain experts. Unfortunately, very often, the painexpert does not have an in depth understanding of the patient's primary condition, and the result of unfruitful treatment leads to more chronicity. If instead, the attending personnel, when the conventional options of pain control fails, could consider the alternative traditional options like acupuncture, better relief could be the outcome.

Acupuncture is a unique component of traditional Chinese medicine, that originated only in China, and its popularity has stood the test of time for over 3000 years. In 1979, the World Health Organization published guide-lines for the practice of acupuncture^[9]. In 1999, the National Institutes of Health in US called a Consensus Conference on the use of acupuncture. At that Conference, the use of acupuncture as a means to the control of pain was endorsed. Since that day, generalhospitals in the US, commonly used acupuncture as a treatment option, particularly in departments related to rehabilitation, orthopaedics, oncology, rheumatology and neurology.

Before we discuss research directions, we could look at the different theories developed to explain how acupuncture works. The theories include:

(a) Gate theory: Proprioceptive receptors in the limbs send messages up the spinal cord to a specific site within the mid-brain where other messages from the frontal, posterior and other lobes of the brain meet. The effect of this exchange of neurological messages is the establishment of a temporary "gate", which blocks off the interpretation of somatic pain. Neuro-physiologists have experimental proof of the Gate theory and many acupoints are closely related to skeletal sites, richly supplied with proprioceptive receptors^[10]. Two obvious examples include He-gu which is over the carpo-metacarpal joint of the hand and Ju-sanli which is below the proximal tibia-fibular joint.

(b) Neuro-humeral theory: Han JS of Beijing discovered that cerebral neurons produce endorphine in response to acupuncture, thus producing harmonizing effects^[11]. Subsequent research has shown via magnetic resonance various neurological activities in different cerebral zones in relation to acupuncture^[12].

(c) Traditional theory of Qi: The most classical description of acupuncture procedures is the feeling of something between 'soreness' and 'pain' immediately underneath the puncturing needle. This feeling corresponds to the initiation of a Qi current which travels along the meridians to produce the intended effects. The classical Qi concept provides most acupuncturists an operational base which also satisfies the recipient as a substantial partner in the course of event. Scientific studies are also pursuing the Qi Theory^[13] which has been assumed to follow the skin electrical impedance principles.

One may be skeptical about the use of acupuncture for pain control and neuromuscular recovery since the mechanisms of action of acupuncture are yet unknown. In reality, even for conventional treatment not infrequently, mechanisms of action could be unknown or only partially known. Distinct examples occur in the field of rehabilitation. Manual and gadget training for the physically disabled are yet primitive, and justifications are so incomplete with reference to the mechanisms of action. Nevertheless, recipients remain appreciative.

TOPICAL TREATMENT

Topical agents applied over sites of pathological manifestations are common practices in all streams of traditional medicine, of which traditional Chinese medicine possesses the richest collection of historical records. Topical materials being used are earning more and more modern scientific proofs and effective means of application are being developed.

For the less severe musculo-skeletal injuries and very often, during the rehabilitation period, the majority of people would administrate their own choice of treatment viz. use various forms of topical treatment – pastes, rubs, balms, patches etc. – to relieve pain and swelling. This art of healing must have existed ever since there is human civilization. Users in the ancient days feel better after application. Users today also feel better after application. However, is there ever scientific evidence that those agents are really helping with the pain, and the swelling?

To give light to the centuries long queries we need to sort out a number of fundamental issues:

- (I) Which herbs could be used for the Topical Applications?
- (II) What are the biological activities that the topical herbs generate?
- (III) Do the topical agents get across the skin surface to exert their biological effects?
- (IV) Are there clinical evidences of efficacy?

Which herbs could be used for the Topical Applications?

One branch of Traditional Chinese Medicine since 3,000 years ago is called "Bone Setting" Experts in Bone Setting serve patients suffering from injuries which include fractures, sprains and bruises. Theories and techniques involved in fracture treatment like reduction of fracture fragments, re-aligning, and stabilization, were well described. To supplement the techniques and to ensure secure healing, topical herbal applications were always used^[14]. Over one hundred medicinal herbs used for injury treatment have been described^[15]. It would be logical to screen out from the classical records, those items that have been most popular and are easily available today. In the past

twenty years, a lot of popular medicinal herbs have been tested on the biological platforms to identify their pharmacological activities. Results of the testings would further guide the choice of herbs to be studied today^[16].

The biological activities considered crucial for tissue healing must be emphasized during the screening process. In fact after any form of injury, three events are always involved in the repair process, viz. inflammation, vascularization and cellular regeneration. Clinically, inflammation is leading to pain and swelling in the acute phase of injury while vascularization and cellular regeneration are related to the subsequent stages of symptom improvement and functional return. With the guidance of these fundamental considerations, herb selection could follow. Ancient practices favour complex herbal formulae. However, modern biological research platforms would prefer the minimal number of herbs so that quality control and interpretation of activities could be easier. An ideal number could be 5-6 popular herbs to be tested for anti-inflammatory, angiogenic and cellular regeneration power in quality biological research platforms^[18-21].

We have done a thorough search from available literature and five herbs are selected, viz. *FlisCarthanic*, *Radix Dispaci*, *RhizomaRhei*, *Angelica sineuses*, and *AchyranthisBidentatae*, believed to be anti-inflammatory, angiogenic and regenerative.

What are the biological activities that the topical herbs generate?

In-vitro and in-vivo experiments will be required to illustrate the essential biological activities of the individual herbs and their combination^[17].

Results of the in-vitro studies showed that the individual herbs and the combined formula had remarkable suppressive effects on the NO (Nitrous Oxide) production in the RAW 264.7 cell line; and remarkable promotive effects on both the HUVEC (Human umbilical vascular endothelial cell) and UMR-106 cell lines. These results were consistent with earlier observations reported^[18-20]. In-vivo experiments included zebra fish embryo studies to verify the pro-angiogenic effects of the herbs and animal models on soft tissues injury and bone fractures, where a topical paste was applied to promote healing. Using radiological, biochemical and biomechanical (on the long bone after fracture healing) testings, the topical paste was demonstrated to have promoted the fracture callus formation, increased bone-specific alkaline phosphatase level and stronger fracture union^[17,21].

In-vivo experiments on the healing of soft tissues after injury under the influence of the herbal paste are still going on.

With the series of tests completed on inflammation, vascular regeneration and cellular proliferation, the five herbs selected for topical study could be considered suitable for further investigations.

Do the topical agents get across the skin surface to exert their biological effects?

Since transcutaneous delivery of medicinal material has become more popular, in-vitro and in-vivo testings of transcutaneous drug transport have become necessary. Special device like the Franz Diffusion cell gives in-vitro information about the diffusion of medicinal agent through a selected membrane, either artificial or prepared from the skin of an animal^[22]. In-vivo testing would involve the appearance of the medicinal agent, either within the subcutaneous tissue or in the circulation of the animal used for study. In order to facilitate the transcutaneous transfer, various enhancing material could be used. Ozone is a popular agent used for such purposes in commercial products. In traditional Chinese medicine, Borneol has been popular.

When the topical agent consists of a simple chemical compound, diffusion study is not complicated because a direct analysis of the

transfer of the compound would fulfill the requirement. To study the transport of herbal material across a membrane or skin, nevertheless, would be far more complicated because of the complexity of chemicals involved. Authentication of commonly used medicinal plants is dependent on the identification of specific markers for a particular plant. This practice is obviously a compromise since any plant contains numerous chemicals rather than a single one. However, before a better method is found, the appearance of a known chemical marker of a specific medicinal plant across a membrane, could be considered an objective proof about the transfer, although it is only a qualitative and partial demonstration.

All the five medicinal plants chosen for this study have officially recognized chemical markers and five of them are selected for the in-vitro and in-vivo studies^[23]. Using the Franz diffusion chamber and either an artificial or mouse skin membrane, the markers were identified in the receptor compartment, thus proving the across membrane transport. We cannot at this stage determine which of the herbs used, or which of the chemical markers, are mainly responsible for the healing effects. We have to assume that the observed efficacy is the result of combined influences.

Adding Borneol as the enhancer, the 5 herbs paste was applied to the rabbit leg over an artificially produced tibiae fracture. Sera were taken from the rabbit intermittently within 72 hours. The chemical markers were detected throughout with the peak concentration within the first 24 hours. It therefore demonstrated that the topical application of herbal paste did produce a transdermal transfer of chemicals across the skin barriers to the subcutaneous tissues, thence to the general circulation.

Are there clinical evidences of efficacy?

Clinical studies are essential for the proof of efficacy of any medication. Severe injuries would need hospitalization and proper modern managements. Studies on the topical use of herbal medicine should only be indicated for minor injuries or when the standard treatment fails to give perfect results and symptoms persist.

Acute minor injuries; viz. sprained ankle and fractured 5th metatarsal bone could be suitable conditions for trials. Carefully planned clinical trials using topical agents on these minor injuries and chronic inflammatory conditions showed impressive results on pain and swelling control^[24,25].

In the present era of multi-disciplinary collaboration, the future research on topical agents for injury management could start with the identification of more effective potent individual herbs and application of biophysical means to enhance the surface penetration and efficacy of biological activities. Many outstanding issues like the cellular and molecular mechanisms of tissue healing under the influence of topical agents, and the nature of bone healing, whether through the usual periosteal induction process or via stem cell activities, would all deserve thorough explorations^[26].

REHABILITATION TECHNIQUES

Traditional Chinese medicine has a rich variety of manoeuvres serving the different needs of rehabilitation after treatment for injuries or other pathologies of musculo-skeletal origin.

Rehabilitation procedures like Tai Chi and Qi Gong have become popular in Europe and America as means to maintain healthy aging^[27]. In 1999, the National Institutes of Health US, held a consensus conference, endorsing the use of acupuncture as effective means of pain and nausea control. Since then major hospitals in US all established acupuncture services. Acupuncture and manual

therapies of course are also useful for the promotion of neurological recovery^[28]. With the development of modern imaging techniques like functional MRI, and discoveries of unexpected neurological functional path-ways, the course of events of acupuncture is being revealed gradually^[29].

Normally orthopaedic surgeons organise their own operations and rehabilitation programs which consist of mainly physiotherapy and occupational therapies. While the acupuncturists serve their own clients with relatively milder presentation, they would refer them to the surgeons when complications occur. There is a lack of genuine dialogue between the orthopaedic surgeon and the acupuncturist. The former is busy with more and more advanced techniques in surgery and therapeutic measures while the latter feel isolated and not prepared to know more about modern informations and technologies.

A frank dialogue between the orthopedic surgeon and the traditional practitioner would bring a bright future to patients suffering from bone and joint diseases^[28]. The immediate result of the dialogue would be a reasonable division of labour. Emergencies and surgeries would follow strict indications and guidelines of modern practice to be executed by modern practitioners. Chronic problems and rehabilitation would need the input of traditional experts.

CONCEPTS OF NATURAL HEALING IN REHABILITATION

One of the mostly emphasized area of Health in the earliest classic of Chinese Medicine, Ne-jing, is Natural Healing. Natural Healing — maintaining a perfect state of physical and physiological survival, as well as a harmonious state of psychosocial well-being, is considered the goal of Health and longevity.

The overall concept involves the harmony between yin and yang; harmony between physique and psychosocial state; balanced nutrition, balanced exercises and recreation. The concept of qi is most important for Natural Healing. When qi remains healthy, abnormal physiological processes will not happen. Qi is the fundamental basis of survival, viability and vitality. Qi controls activities, changes and development. Qi has a direct form of respiration when air is inhaled through the nose to the lungs, thence, distributed throughout the body, along the meridians. Qi perpetuates on its own but needs continuous sustenance and reinforcement to maintain healthy development. Sustenance and reinforcement depends on repeated input of nutritional support and special exercises. Qi is not only the visible process of respiration which forms only the fundamental basis. Qi is also a state of physiological harmony expressed as perfect survival and wellness. Qi is at the same time an inner feeling of internal balance, well-being and capability^[30].

Natural Healing for Traditional Chinese Medicine, therefore, compile the three components of physical, physiological and psychosocial harmony which are all interlinked. The ancient healers, through so many years of practice, have worked out varieties of means to help boosting the state of harmony.

The two best-known varieties of Natural Healing today are Qi Gong and Tai Chi; the former allows a lot of practitioner's modifications while the latter follows a rigid system of chained activities.

QI GONG AND TAI CHI

The promotion of Natural Healing requires disciplined practices that would help bringing harmony in the human physiological processes.

STRETCHING

Historically, spiritual dancing could have been the very early practice of Natural Healing. Hence, stretching movements while adopting a variety of postures have become the most essential components of practice. Early limitation of the postures of different animals have later evolved into chains of movements copying animal activities. Later, still different groups of practitioners created their own system of activities and motions with different connotations and hallmarks. The uniform component of these different systems is that, all of them consist of stretching movements. As far as posture is concerned: some advocates natural postures like standing, sitting; modifications like "Buddha sitting", half-kneeling, animal postures, etc.

RESPIRATORY CONTROL

The practice of Natural Healing invariably included controlled breathing without which there will be little value of the stretching exercises. It is the sustenance and development of the qi, that requires simultaneous stretching, controlled respiration and meditation. It is believed that, with skilful control of breathing, qi is manipulated successfully, so that it not only circulates through the respiratory system, but, together with meditation, it reaches the different physiological systems to improve their metabolic state of balance.

Respiration is controlled so that the normal pattern is not followed. The recommended patterns include extra-long inspiration and/or extra-long expiration. Abdominal or diaphragmatic breathing is also practiced. While doing so, the pelvic diaphragm and anal sphincters are also squeezed at will.

So, respiratory control is executed simultaneously with the stretching movements in a smooth synchronized chain of activities under the individual's free will. It would be up to the individual to develop his/her own policy of training which could be amended from time to time^[31].

MEDITATION

Natural Healing aims at harmonizing physical, humoral and mental activities. Meditation is an indispensable component. The intersectional harmony must be promoted. The skilful practitioner attains a tranquility of the mind while stretching is being performed with controlled breathing. It must be understood that meditation requires the simultaneous support from stretching and breathing and vice versa. The apparently complicated system of movements in Tai Chi should not be hindering meditation. Rather, they provide a good initiating environment where the day to day mental pressure will not be felt. The material background for meditation is resting of the central nervous system. During the training, the intention is to give a good rest to the Central Nervous System: free it from motor and sensory burdens, (apart from the comforting limb movements) relieve it from complex memories, protect it from emotions and problem solving requirements. The assumption is: with this unchallenged mental state, a reorganization of the interacting neurological messages can take place, initiating an intense feeling of harmony and re-organized humoral state^[32].

Tai Chi requires a fully relaxed body. While the four limbs moves in semicircular and circular movements, the focus remains around the waist, which rotates left and right. The movements stimulate the 300 acupoints of the whole body in an orchestrated manner. The result is a concerted, systematic stimulation of the acupoints, each one of which is related to certain somatic or sympathetic functions. All Tai Chi

practitioners are aware of the circulatory activations once the Tai Chi exercises continue for a while. Recent functional magnetic resonance investigation on brain function have also preliminary evidences to show that the stimulation of acupuncture points does elicit functional changes in different parts of the brain^[33, 34].

People practicing Qi Gong and Tai Chi realize that through gentle, disciplined exercises, they gain sustained muscular strength, general vitality and mental tranquility. They have reasons to believe that they become healthier and would live longer. People practicing Tai Chi and Qi Gong also claim that they do not fall sick and are not vulnerable to diseases. Those might be simple evidences supporting the Chinese Way of Natural Healing as being good for the prevention of diseases.

Excavation of ancient tombs from 1000 BC has revealed pictures of self administered exercises and therapies of different nature, apparently of unique individual tastes. A close look at the procedures involved, however, revealed that they all include joint/tendon/muscle stretching and controlled breathing. Traditional Chinese Medicine emphasizes the maintenance of physiological balance as an effective means of disease prevention. Ancient exercises and manual therapies which are passed on to date, naturally fall into the broad, nonspecific area of rehabilitation.

CONCLUSION

Modern orthopaedics aim at immediate treatment effects which are made possible today using clearly targeted therapies like antibiotics for infection, accurate fracture fixation for bone injuries, and other high-tech therapies. Orthopedic surgeons therefore, tend to ignore the value of traditional Chinese Medicine (or bone-setting) in their routine practice. However, if we step back and ponder, our ancestors have been relying on the traditional methods of healing for treatment, training and prevention, there must be a lot of wisdom contained in these apparently obsolete procedures. In fact with regard to the use of topical agents, we have already started clinical trials on the use of herbal patches of the same selection for the treatment of soft tissue inflammations including plantar fasciitis, de-Quervain's disease and tennis elbow. The results have been promising.

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