Study strategies for bloodletting therapy in treatment of acute soft tissue injuries

Peng-dian Chen¹, Gui-zhen Chen¹, Yun-xiang Xu¹
1. Acupuncture and Massage College, Guangzhou University of Chinese Medicine, Guangzhou 510405, Guangdong Province, China
2. The Second Clinical Medical College, Guangzhou University of Chinese Medicine, Guangzhou 510405, Guangdong Province, China

Abstract: Bloodletting therapy is one of the typical treatment modes of traditional Chinese medicine, and acute soft tissue injury (ASTI) is one of the most common indications for acupuncture therapeutics. In this paper, the current situation of treatments and pathological mechanisms of ASTIs, the existing problems of bloodletting therapy in the treatment of ASTIs and the study strategies are systematically analyzed, indicating that bloodletting therapy is significantly effective in the treatment of ASTIs. Breakthroughs in the treatment of ASTIs will be achieved with the application of bloodletting therapy both in clinical practice and experimental research.

Keywords: pricking blood therapy; bloodletting; acupuncture therapy; soft tissue injuries

Acute soft tissue injuries (ASTIs) such as muscle-tendon strains, ligament sprains and ligament or tendon ruptures frequently occur during sports and exercise. They are marked by pressing pain, swelling, ecchymosis and loss of mobility functions to the local area. In clinic, these conditions are seldom life-threatening, but if treated incorrectly, can jeopardize the sporting career or cause chronic problems for years after the original injury. For these reasons, it is crucial to treat ASTIs at the acute phase. Recently, increasing clinical practice[13] has demonstrated the superiority and potentiality of bloodletting therapy in treating ASTIs, with its convenient manipulation, limited contra-indications, and fast therapeutic effect. Hence, by discussing the study strategies of bloodletting therapy in the treatment of ASTIs, improvements to the therapeutic effects could be made thereby further popularizing its use in clinic.

1 Bloodletting therapy and modern studies
1.1 Bloodletting therapy Bloodletting therapy is clinically applied by pricking certain acupoints, foci, pathological response points or superficial veins on the human body with a three-edged needle, a plum-blossom needle or a syringe needle. This causes slight bleeding and therefore treats the problems[41]. With skillful manipulation and drainage of an
The appropriate amount of blood, it has the functions of alleviating pain, activating blood flow, eliminating blood stasis and diminishing the inflammation. At present, bloodletting therapy is indicated to treat heat syndromes, excess syndromes and some deficiency syndromes. In the departments of acupuncture and orthopedics in Chinese hospitals, due to the simple manipulations and the fast therapeutic effects, this therapy is frequently applied to treat ASTIs. Some examples of typical cases are lumbar muscular strains, tibiofibular ligament sprains and wrist tendon sprains.

### 1.2 Modern studies of bloodletting therapy

In recent years, there has been extensive research on the mechanisms of bloodletting therapy, which could be summed up as follows\(^{(1)}\): (1) Bi-directional functions to the hematological system. Diverse studies have indicated that bloodletting therapy can accelerate the metabolism and stimulate the medullary hematopoiesis via neurohumoral regulation. This, therefore, improves the microcirculation and vascular functions, stimulates blood regeneration and helps rebuild homeostasis and recover normal physiological functions. By improving the microcirculation, it can inhibit excessive inflammatory reactions and promote the recovery. (2) Good analgesia. While pricking, algogenic substances such as prostaglandin E\(_2\) (PGE\(_2\)) may be discharged and the pain will be eased. (3) Improvement of human immunity and activation of the immune defense functions in the body.

### 2 Current status of ASTIs treatment

To ASTIs, clinically it is mainly treated by using anti-inflammatory analgesic methods such as anti-inflammatory analgesics, local blockade injections, binding and physiotherapy, which require long rehabilitation time\(^{(2)}\). Although the application of glucocorticoids can effectively diminish the inflammation and swelling and ease the pain, it can cause some serious adverse effects such as osteoporosis, osteonecrosis of the femoral head or Cushing syndrome, among others. An injection of prednisolone suspensions into the nerves may cause the crystals to separate out and accumulate in the nerves hence affecting the tissue repair\(^{(3)}\). Nonsteroidal anti-inflammatory drugs (NSAIDs) can inhibit the synthesis of the PGE\(_2\) by inhibiting the activity of the cyclooxygenase (Cox), hence demonstrating an anti-inflammatory analgesic function. However, the inhibition of the Cox can cause digestive or nephritic adverse effects, which have gained much attention by those in the field both at home and abroad.

In traditional Chinese medicine (TCM), ASTIs belong to the category of "tendon injury", which holds that the trauma could damage the tendons and collaterals. Consequently qi is obstructed and blood is stagnant hence leading the occurrence of swelling and pain. During the process, blood stasis obstructs the normal flow of qi and blood, affects the generation of fresh blood and stops the local foci obtaining the nutrition required for recovery\(^{(4)}\). Hence, the therapeutic principles of ASTIs are activating and cooling blood, eliminating blood stasis and unblocking the collaterals. Clinically, there are many commonly applied methods such as herbal applications and acupuncture. The herbs applied are mainly ointments or powders, which are inconvenient to utilize, easy to stain the clothes, a waste of herbs and hard to be popularized in clinic. Based on this, it is significant to discuss the application of other characteristic treatment methods of TCM such as bloodletting therapy in the treatment of ASTIs.

### 3 The pathological mechanisms of ASTIs

Modern medicine asserts that the main pathological changes of ASTIs are characterized by the local acute traumatic inflammation, cellular proliferation and tissue repair\(^{(4)}\). After an injury, the primary changes of the vessels appear as follows: (1) Hyperemia and ecchymosis. (2) The local capillaries break and the vascular permeability increases. Consequently, the exudates which contain electrolytes, plasma proteins, neutrophile granulocytes and monocytes permeate into the affected tissue spaces\(^{(10)}\). (3) Due to the stimulation form, hemorrhage, hyperemia, ecchymosis, and vasospasm may occur. As a result, angiogenesis decreases and blood flow slows, leading to the occurrence of capillary occlusions.

During traumatic reactions, changes in some inflammatory mediators are the material basis for the pathogenesis, which plays an important role in the generation of inflammation. These inflammatory mediators affect the local vessels on their own to strengthen the vascular permeability, affect the angiogenesis, promote the chemotaxis of leucocytes and stimulate the free nerve endings, thereby producing the algesia afferent impulses to the central nervous system and causing pain\(^{(11,12)}\). Among the mediators, the most important are histamine, 5-hydroxytryptamine (5-HT), PGE\(_2\) and bradykinin, which can cause manifestations such as erythema, swellings, increased temperature and pain of the local damaged regions.

After the injury, a series of stress responses exhibit\(^{(11)}\). The nervous system, firstly becomes excited then inhibited. The function of endocrine system is firstly improved then normalized or slightly inhibited. The glycolysis, lipolysis and proteolysis are firstly strengthened and accelerated, then normalized. In the circulatory system, vasoconstriction occurs to maintain the blood pressure of the aorta and the hemorrhology manifests as high consistency, high viscosity, high polymerization and high coagulation of the blood. In the immune system, phagocytosis of the neutrophile granulocytes is decreased and the immunity
of the transmission cells and the function of the complement components synthetized by the macrophages are inhibited.

The process of tissue repair is complicated with participating of numerous cytokines. Generally speaking, the soft tissue responds to trauma in three phases: the acute inflammatory phase (0 to 7 d), the proliferative phase (about 7 to 21 d), and the maturation and remodeling phase (21 d thereafter). With the progress of healing, the amount of the collagen fibers increases, the amount of the fibroblasts and capillaries decreases and finally the scar (adhesion) formation occurs[14]. If the acute inflammation was not treated appropriately within the first month, it could develop into the sub-acute type of inflammation, which lasts for several months or years. This can become chronic whereby the multiple tissue adhesions and scarring would seriously affect the body functions. In this regard, it is important to take proper measures immediately after the injury.

With the penetration of molecular biology into the medical field, studies of tissue repair have achieved significant development. According to the literature, tissue repair is to repair the active proliferation of cells. This is closely related to the direct stimulation and regulation of some growth factors, which promote tissue regeneration, and their receptor expressions. These include basic fibroblast growth factor (bFGFs) and their receptors. Diverse studies have indicated that bFGFs are a kind of "traumatic hormone" with wide biological activities[15, 16]. They constitute the mitogens, chemotaxis and regulatory protein of the cells used during healing and affect the whole process of repair, including the initial inflammatory reactions, the growth of granulation tissue, the re-epithelialization and the tissue remodeling[6].

4 Existing problems of bloodletting therapy in the studies on ASTIs treatment

Currently, bloodletting therapy is applied in the treatment of ASTIs in China. However, contemporary studies mainly focus on clinical therapeutic observation and theoretical hypothesis, which lack criteria for the therapeutic effect evaluation. Furthermore, most of the experimental studies stress the observation of the pathology and histology and seldom emphasize deeply the molecular biological standpoint from the perspective of cytokines and cell receptors. This consequently makes the mechanisms of this therapy in treating ASTIs unclear and the retrospective and prospective research becomes challenging. Studies have indicated that acupuncture has bi-directional functions in treating inflammatory conditions and widely affects the neuro-endocrine-immunity network[17]. Acupuncture can apparently diminish the swelling and alleviate pain, decrease the permeability of the capillary walls, accelerate the excretion of inflammatory exudation, improve the blood supply to the damaged regions, promote the secretion of endogenous analgesic materials such as beta-endorphin[18, 19] and enhance the transform functions of T lymphocytes[20]. However, there is still a lack of both experimental animal studies and research of the multiple effects of the network to the regulation of the tissue repair. What about the influence of this therapy on the contents of the local inflammatory mediators? What influences have the molecular mechanisms in regard to the promotion of tissue repair? Whether it can influence the growth factors and their receptors via the regulation of the neuro-endocrine-immunity network? Whether bFGFs have bi-directional functions? At present, these questions mentioned above are still unclear.

5 Study strategies of bloodletting therapy in the treatment of ASTIs

According to the modern theoretical and experimental studies on the use of bloodletting therapy in the treatment of ASTIs, there are two aspects that should be taken into consideration. On the one hand, after the injury, the vascular changes occur first. Hence, during the process of the trauma and the intervention of this therapy, we can clearly observe the changes to local blood flow and the influence of the prognosis. On the other hand, the injury is generally characterized by the local acute traumatic inflammation and tissue repair. The inflammatory mediators include 5-HT, PGE₂ and bFGF, among others which are key to the pathological process. During the process, multiple systems such as the nervous, endocrine and immune systems, participate in healing. Among the three systems, the nervous and endocrine systems transmit the message to the immune system via transmitters and hormones, and the immune system regulates the nervous and endocrine systems. Hence, during the studies, we have observed the multiple indexes of the neuro-endocrine-immune network and identified multi-layered relationships among them so as to explore the network regulatory mechanism of bloodletting therapy in the treatment of ASTIs.

Diverse studies have demonstrated the miraculous therapeutic effects of bloodletting therapy in the treatment of ASTIs, particularly when administered in the initial phase after injury. However, most of the current studies emphasize clinical observation, which lacks the rigorous study designs with normalized methods. In addition, during the treatment, the amount of blood let, the frequency of letting and the therapeutic sessions lack criteria. So, based on clinical practice, we could study the mutual relationships among the location of letting, the amount of blood let, the therapeutic sessions and the therapeutic effects
with rigorous objective data hence providing an objective basis for the clinical application. With the development of modern life sciences, multiple disciplines such as genomics, proteomics, metabolomics and bioinformatics, are currently integrated. The development of optical imaging techniques allows for in vivo, noninvasive and dynamic research, which provides a new method for the studies of bloodletting therapy. How this therapy affects the message transmission of growth factors, the regulation of local inflammatory reactions and the tissue repair are the main areas of focus. Under the theoretical guidance of TCM, taking advantage of the multiple disciplinary cross and modern science and technology such as thermal texture maps (TTM), laser-Doppler technique, high-performance liquid chromatography (HPLC), mass-spectrometric technique, a systematic observation of this therapy could be made. This would focus on the actions of alleviating pain, eliminating inflammation and swelling, activating blood stasis and promoting tissue repair, hence further understanding of the mechanisms involved in this therapy treating ASTIs from multiple perspectives (entirety, cellular, molecular and gene levels), multiple indexes (direct and indirect indexes) and multiple disciplinary cross. The development of theoretical and experimental studies has provided the study strategies for bloodletting therapy in the treatment of ASTIs. The authors firmly believe that research into this therapy would result in broader and longer-term application both in clinical and experimental studies.

REFERENCES

刺络放血疗法治疗急性软组织损伤的研究思路

陈鹏第1，陈贵珍2，许云祥1
1. 广州中医药大学针灸推拿学院，广东 广州 510405
2. 广州中医药大学第二临床医学院，广东 广州 510405

摘要：刺络放血疗法是中医外治法中的一种特色疗法，而急性软组织损伤是针灸治疗的常见适应证之一。本文分析了急性软组织损伤的治疗现状、急性软组织损伤的病理机制、刺络放血疗法治疗急性软组织损伤存在的问题及其研究思路，指出刺络放血疗法治疗急性软组织损伤有其独特疗效，具有广阔的发展前景。刺络放血疗法治疗急性软组织损伤的研究将对其进一步的临床及实验研究中取得进展。

关键词：刺络疗法；放血；针刺疗法；软组织损伤

Correction 更正

对“藤龙补中汤对结肠癌细胞 LS174T 增殖和凋亡的影响”[胡兵，安红梅，沈克平，杜琴．藤龙补中汤对结肠癌细胞 LS174T 增殖和凋亡的影响．中西医结合学报．2010；8(6)：575-580．]一文的更正

本刊 2010 年第 8 卷第 6 期 576 页，胡兵，安红梅，沈克平和杜琴“藤龙补中汤对结肠癌细胞 LS174T 增殖和凋亡的影响”一文中的“1.4 细胞增殖检测”部分存活率计算公式“存活率＝（1－实验组或对照组 OD 值/空白组 OD 值）×100%”应为“存活率＝实验组或对照组 OD 值/空白组 OD 值×100%”，特此更正。