DOI: 10.53469/jcmp.2024.06(10).10

Clinical Research Progress on Iliopsoas Dysfunction and Low Back Pain

Zequn Wang[1], Zhe Yuan[1], Zhou Zhou[1], Jichao Yin[2,*]

[1]Shaanxi University of Chinese Medicine, Xianyang 712046, Shaanxi, China
[2]Xi'an Health School, Xi'an 710054, Shaanxi, China
Correspondence Author

Abstract: ***This article systematically reviews the clinical application and latest research progress of iliopsoas muscle treatment strategies in relieving low back pain. By combing through existing domestic and foreign literature, this article explores its anatomy, function, efficacy mechanism and future research direction, aiming to provide clinicians with a more extensive academic reference.***

Keywords: Iliopsoas muscle dysfunction, Low back pain, Research progress**.**

1. Introduction

The incidence of low back pain is increasing, which can be caused by many factors, including but not limited to lumbar disc herniation, lumbar spinal stenosis and dysfunction of the waist and abdominal muscles. However, when discussing the waist and abdominal muscles, a key part that is often overlooked is the iliopsoas muscle, the core muscle of the spine. In view of this, this article aims to deeply analyze the anatomical structure, physiological and pathological functions of the iliopsoas muscle, and combine common treatment strategies in clinical practice to comprehensively explain the close connection between the iliopsoas muscle and low back pain.

2. Iliopsoas Anatomy and Function

2.1 Physiological Anatomy

The iliopsoas muscle is one of the core muscles of the spine and is composed of the iliacus and psoas major. The iliacus originates from the upper 2/3 of the iliac fossa and is arranged in a fan shape. The psoas major can be divided into two parts according to the direction of the muscle bundle. The deep part originates from the side of the T12-L3 vertebrae and the back of the transverse process, and the superficial part originates from the side of the L4-L5 vertebrae and the back of the transverse process [1]. The psoas major runs along the edge of the pelvis, passes through the pelvis in front of the top of the hip joint, and fuses with the iliacus. The two run downward, pass deep into the inguinal ligament and the anterior and medial side of the hip joint, and finally attach to the lesser trochanter of the femur. The muscle fibers are arranged in a feather-like shape.

It is worth noting that although some medical professionals tend to include the psoas minor in the category of the iliopsoas muscle, in fact, the presence of the psoas minor in humans is quite variable, with an incidence of only about 50%. The psoas minor is usually located on the anterior medial surface of the psoas major, originating from the lateral edge of the T12 cone, the L1 cone, and the lateral edge of the intervertebral disc between the two, and ending at the iliopectine eminence and pubic pecten [2]. Its main function is to maintain the tension of the iliac fascia [3]. Therefore, for those individuals who lack the psoas minor, due to the relatively weak elasticity of their iliac fascia, they may be more susceptible to problems such as low back pain.

2.2 Neuroanatomy

The innervation of iliopsoas muscle mainly comes from the lumbar plexus, in which the innervation of iliopsoas muscle is the branch of lumbar plexus (L1-L4), and the innervation of psoas major muscle is the branch of lumbar plexus. VAN et al.[4] found that most of the nerves came from L2 and L3 spinal nerves, and a few from L1 or L4 spinal nerves. As for the psoas minor, its innervation mainly comes from the anterior branch of L1 nerve. Iliac muscle and psoas major muscle, as two core components of iliopsoas muscle, show some differences in innervation, which is probably closely related to their differences in physiological functions. Therefore, the author thinks that it is of great significance to deeply explore and understand the innervation characteristics of each component of iliopsoas muscle for accurately evaluating neuromuscular diseases and formulating personalized rehabilitation programs.

2.3 Physiological Function and Dysfunction

The iliopsoas muscle is one of the most powerful hip flexor muscles. Together with the psoas major and minor muscles, the iliacus muscle forms the functional unit of the hip flexor muscles [1]. Its main physiological functions include flexion and external rotation of the hip joint, and it also participates in the forward tilt of the pelvis.In addition, the iliopsoas muscle also plays a key role in maintaining pelvic and spinal stability [5]. Other studies have shown that in addition to the above functions, the iliopsoas muscle also has the function of internal rotation of the hip joint [6].

Due to the sedentary lifestyle of modern people, the iliopsoas muscle is often in a state of shortening and tension [7], or suddenly twisted violently under high tension, or stretched and contracted for a long time, which may lead to a series of problems related to the hip joint, pelvis and spine, among which low back pain is the most common. Long-term strain of the iliopsoas muscle can easily lead to the formation of pain points. In addition, this muscle has important nerves such as the iliohypogastric nerve, ilioinguinal nerve and femoral nerve passing through it, which is one of the key factors that

cannot be ignored in causing low back pain. According to the author's clinical observation, in most patients with iliopsoas dysfunction, low back pain symptoms often go down along the midline of the spine to the sacroiliac joint and can spread to the middle and upper areas of the buttocks. In addition, some patients will show pain in the groin area, and a few patients will even experience paresthesia in the front of one or both thighs and calves. These patients are usually accompanied by symptoms such as difficulty in sitting up, which is consistent with the description of the muscle chain and trigger point theory [8]. In a few cases, patients may also have gastrointestinal symptoms such as nausea and bloating [9].

3. Treating Low Back Pain from the Perspective of the Iliopsoas Muscle

In the theoretical system of traditional Chinese medicine, iliopsoas muscle injury is classified into the categories of "low back pain" and "arthralgia syndrome". The pathological mechanism of this disease is mainly due to individual physical weakness and invasion of external evils, among which the cold-damp type is the most common. Insufficient kidney yang and the evil of cold and dampness penetrate deep into the body, the meridians are blocked, the flow of qi and blood is not smooth, and the blockage causes pain. In modern medical treatment, nonsteroidal anti-inflammatory drugs are commonly used treatments, but their long-term use can easily cause damage to the body. With the continuous progress of traditional Chinese medicine, traditional Chinese medicine treatment methods such as acupuncture, tuina, massage and bladed needle/needle knife techniques mainly focus on promoting blood circulation and removing blood stasis, regulating menstruation and relieving pain. They can not only significantly reduce pain, but also have almost no potential harm to the body. Negligible.

3.1 Blade Needle/Needle Knife Release

Professor Feng Zhengen [10], a famous TCM doctor in Zhejiang Province, thinks that the TCM pathogenesis of iliopsoas muscle strain is meridian disease. Following the treatment principle of "pain is the focus" for meridian disease, using blade needle to release the starting and ending points of iliopsoas muscle and muscle abdomen after palpation to find the tenderness point of the lesion can restore local mechanical balance and eliminate pain, which has achieved good clinical effect. Zhang Hao et al. [11] found that the treatment of low back pain caused by iliopsoas muscle strain by blade needle acupuncture combined with western medicine can improve the lumbar function of patients and relieve lumbar pain compared with the treatment of western medicine alone. Ye Yong et al. [12] adopted the "Hui" shape of needle knife combined with iliopsoas muscle release, which can improve the soft tissue stress around the spine and pelvis, eliminate the tension around the joints, break the fascia imbalance mode, correct the imbalance of biomechanical lines between the pelvis and lower limbs, and maintain the lasting stability of the internal and external balance of the spine to the greatest extent, thus alleviating the symptoms of low back pain. To sum up, the blade needle/needle knife therapy not only has the effect of traditional acupuncture to promote blood circulation, remove blood stasis, dredge collaterals and relieve pain, but also has the ability of "knife" to cut and peel off diseased tissues. This therapy can effectively reduce the tension of soft tissue, restore the mechanical balance of musculoskeletal, improve microcirculation, eliminate inflammatory mediators, and block the nerve conduction path of pain signals, thus achieving the purpose of relieving pain.

3.2 Acupuncture Iliopsoas Muscle

Acupuncture analgesia is widely used in clinic, and its curative effect is fully reliable. Li Yanjie et al. [13] used acupuncture at "three points of iliopsoas" to treat patients with iliopsoas muscle strain, which had remarkable effect in relieving pain and improving dysfunction. Wu Guoliang et al. [14], under the guidance of the concept of "qi reaches the disease center", used deep puncture with 75mm needles to stimulate the iliopsoas muscle, which can rebuild the vitality of the iliopsoas muscle and has definite curative effect. Other studies [15] have shown that acupuncture at iliopsoas acupoints can significantly reduce the tension of the iliopsoas muscles, promote local blood circulation and accelerate metabolism, and at the same time help the absorption and excretion of pain-causing substances, downregulate trigger point activity and accelerate muscle recovery. The role of repair. Lin Yu [16] acupuncture at iliopsoas points can effectively relieve the symptoms and signs of patients and relieve pain. Yang Yulong [17] and others put forward that the supplementary method of stabbing the iliopsoas muscle at an oblique angle of 75 degrees has remarkable curative effect. Compared with the traditional straight needling, the needling angle is more in line with the muscle direction of the iliopsoas muscle bundle descending obliquely outward, and can further enhance the needling feeling and promote blood supply. Zhang Rui [18] According to the theory of "anti-Ashi point", deep needling at the starting point of iliopsoas muscle can achieve good therapeutic effect on lumbago caused by strain of iliopsoas muscle. In addition, some scholars have also explored the application of other acupuncture methods in the treatment of iliopsoas muscle strain. For example, Tong Juan et al. [19] adopted electroacupuncture therapy to enhance the acupuncture effect through current stimulation, which can further promote the rehabilitation of iliopsoas muscle. They found that electroacupuncture therapy can not only effectively relieve patients' pain, but also effectively improve symptoms such as limited activity and function.

3.3 Manipulation Relaxation

Shiatsu massage of iliopsoas muscle, as a routine means to treat chronic lumbar muscle strain in massage department, usually has a rapid and remarkable effect. Numerous clinical studies have confirmed that massage therapy is effective in treating soft tissue injury. Tan Peng et al. [20] used iliopsoas muscle stretching therapy to treat low back pain. Through strong pressing, pulling and waist rotation, it can effectively change the physiological and pathological conditions of the body, relieve muscle spasms, straighten muscles, correct abnormal anatomical position, promote metabolism and reduce pain. Liu Donghui et al. [21] showed that the acupressure method of iliopsoas muscle is helpful to relieve the pain symptoms of patients with chronic lumbar muscle strain. The specific operation is to let patients bend their knees and hips by 45 degrees, then move their fingertips in a circular

way from the lower part of their umbilicus to push the internal organs away, and press the sensitive area to relax them when touching the iliopsoas muscle, which can restore the waist movement function and greatly improve the quality of life of patients with chronic lumbar muscle strain. Kong Linghao et al. [22] used lateral lumbar compression to treat low back pain caused by iliopsoas muscle injury, which has obvious effect on improving subjective pain symptoms and restoring objective lumbar functional activity. Another study shows that the iliopsoas muscle can be alternately transformed in tension and relaxation by the iliopsoas muscle stretching method, thus restoring the extensibility of the iliopsoas muscle and relieving the contracture of the iliopsoas muscle [23]. Fu Tao [24] and others adopted the "Huang's manipulation of treating injuries", advocated that static should be used instead of dynamic, and advocated slow pushing along tendons, fixed points with pain, static touching to be changed, and repeated pushing along tendons, and achieved good results in treating iliopsoas muscle strain. To sum up, for patients with chronic low back pain, applying some pressure, massage, massage and plucking directly to iliopsoas muscle can promote local blood circulation and accelerate the effective absorption and excretion of inflammatory media around the lesion. This method can also effectively relieve soft tissue adhesion, relax the iliopsoas muscle in a spastic state, thus promoting the smooth circulation of qi and blood and achieving the effect of gradually relieving pain.

3.4 Other Therapies

With the continuous development of medical technology, new treatment methods are constantly emerging. For example, the research of Pan Yanqun et al. [25] has clearly confirmed that for the treatment of patients with iliopsoas muscle injury, the pain point injection therapy under ultrasound guidance combined with traditional Chinese medicine massage therapy can effectively relieve the pain symptoms of patients and significantly accelerate the recovery of waist function. The specific operation is to massage the injured part along the Du meridian, then apply finger pressure to the pain point of iliopsoas muscle under ultrasound guidance, rest for 15 minutes after finger pressure, and then inject a long needle to the inflammatory part under ultrasound guidance. Xue et al. [26] have proved that intramuscular patch can improve low back pain and lumbar function. Wang Hongzhang et al. [27] confirmed that intramuscular patch combined with celecoxib capsule has a certain effect on the rehabilitation of patients with chronic iliopsoas muscle strain, which can relieve pain and improve lumbar function, and intramuscular patch belongs to hypoallergenic patch and generally does not have allergies. In addition, a variety of techniques are currently applied to the iliopsoas bursa injection, including ultrasound guidance, computed tomography (CT) guidance, fluoroscopy guidance, etc. These techniques are safe and effective in treating iliopsoas tendon lesions, and can significantly relieve patients' pain symptoms and restore hip joint function [28-31].

4. Discussion

Although the above treatment methods have achieved remarkable results in relieving pain and promoting functional recovery of patients with iliopsoas muscle injury, each treatment method has its own specific indications and contraindications. To sum up, for the treatment of iliopsoas muscle injury, the appropriate treatment method should be selected according to the specific situation of patients.

In addition, with the continuous progress of medical technology, new treatment methods are constantly emerging. For example, shock wave therapy and laser therapy, which are emerging in recent years, have also been widely used in the treatment of iliopsoas injury and achieved good results. Future clinical research should focus more on microscopic, kinematic and biomechanical analysis of iliopsoas muscle. High-resolution MRI and ultrasound imaging can be used to observe the microstructure of iliopsoas muscle in detail and understand its fiber arrangement, muscle density and blood supply characteristics. Through the motion capture system and biomechanical analysis software, the motion trajectory, power output and energy consumption of iliopsoas muscle during exercise can be accurately measured to further reveal its mechanism in the occurrence and development of low back pain, so as to treat various diseases from the angle of iliopsoas muscle.

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