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An Analysis of the Etiology and Pathogenesis of Chronic Musculoskeletal Diseases Based on the Foundation of Chinese Medicine

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Abstract: *Chronic musculoskeletal disease is the most common disease category in orthopedics, and belongs to the categories of "bone paralysis", "bone impotence", "neck and shoulder pain" or "low back pain" in Chinese medicine. "The disease involves several internal organs and many kinds of internal organs. The disease involves several internal organs and many kinds of essence substances, and is always the evidence of deficiency of the original, impotence and paralysis, with deficiency of qi and blood inside and external evil attacking outside, deficiency of liver, spleen and kidney as the root cause of the disease, wind, cold and dampness attacking the body, and phlegm and stasis blocking the flow of qi and blood. This paper summarizes and discusses the etiology and pathogenesis from several TCM perspectives, aiming to better guide people to understand chronic tendon and bone diseases and provide new directions and ideas for clinical prevention and treatment.*

Keywords: *Chronic musculoskeletal disease, etiology, Pathogenesis*

1. Introduction

Chronic musculoskeletal disorders are syndromes in which the balance of musculoskeletal forces in bone and joint areas is imbalanced due to many factors, such as aging of the human body, long-lasting injuries and external invasion, causing compression of nerves, blood vessels, and other tissues, which then manifest as pain, swelling, joint deformity, muscle atrophy, limitation of limb movement, and in severe cases, paralysis and other symptoms and signs [1]. Western medicine classifies these diseases as degenerative diseases of the bones and joints, such as cervical and lumbar spondylosis, osteoarthrosis, and osteoporosis, etc. [2]. It was first recorded in the Yellow Emperor's Classic of Internal Medicine, and in Chinese medicine it belonged to "bone impotence" and "bone paralysis" [3], and later, through the continuous deepening and standardization of chronic musculoskeletal diseases by successive generations of physicians, the etiology, treatment and prognosis of this disease have been systematically elaborated. The traditional Chinese medicine and the recent research on the disease, the mechanism of the disease has a clearer understanding, the author mainly from the "original deficiency" and "symptoms of the real" two major directions of chronic tendon disease to do a generalized analysis of the etiology of the disease.

2. Common pathogenic features of chronic musculoskeletal disorders

2.1. Slowness

Chronic musculoskeletal disorders, as the name suggests, are slow onset musculoskeletal disorders. These diseases have a slow onset, a long development process or recurrent attacks, and a chronic infiltrative pattern of invasion of the body's functions, resulting in long-term accumulation of damage to the body.

2.2. *Incognito*

At the beginning of the disease, no obvious symptoms or signs appear, and the disease has an insidious onset. With the slow development of the disease, the specific clinical manifestations of the disease gradually appear. Because of its slow and insidious onset, it does not attract the attention of patients at

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the beginning, and they fail to take corresponding measures in a timely and effective manner, thus delaying the best time for prevention and treatment, thus causing certain impact on their life and work later.

2.3. Ageing

Chronic musculoskeletal disorders also have a distinctive feature - ageing. That is, as age increases, the incidence and degree of injury also increases, mostly in primary lesions. With the change of modern lifestyle, more and more young people are being robbed in the number, and the age of onset is decreasing year by year.

2.4. Common clinical symptoms-pain

Among many chronic orthopedic conditions, there is a common clinical symptom-pain, which is the first perceived by patients and the main reason for their first visit [4]. The pain is characterized by chronic, persistent or recurrent attacks [5].

The onset of osteoporosis is characterized mostly by generalized bone pain [6]. Osteoarthritis is mostly seen as pain in diseased joints; cervical spondylosis is mostly seen as pain in the neck and involvement pain in the upper limbs; lumbar disc herniation is seen as pain in the lower back and radiating pain in the lower limbs; lumbar spinal stenosis is characterized by painful sensation in the lower back and lower limbs after activity and intermittent claudication as its typical symptoms; rheumatoid arthritis is seen as pain in diseased joints, etc.

2.5. Degenerative changes

Degenerative changes are the process of increasing and worsening wear and tear with old age, resulting in a series of signs and symptoms. The clinical manifestations of chronic musculoskeletal disorders are mostly caused by degenerative changes, or degenerative changes are one of the causes of morbidity.

Lumbar disc herniation is caused by the loss of elasticity due to degenerative lesions of the lumbar intervertebral disc, resulting in the rupture of the fibrous ring, causing the nucleus pulposus, fibrous ring, and cartilage to protrude outward and irritate or compress the nerves causing lumbar and leg pain [7].

Cervical spondylosis is caused by degeneration of the cervical spine and cervical intervertebral discs, resulting in nerve and vascular compression and corresponding symptoms [8-10].

Osteoarthritis is a degenerative disease with joint pain, mostly seen in the elderly, and the painful sites are mostly in joints that have been strained for a long time, such as the hands, knees, and hips [11-12].

2.6. Western medical pathogenesis factors

2.6.1. Endocrine and hormonal factors

Epidemiology and studies have proven that the decrease in estrogen secretion in women after menopause and the decrease in testosterone and estradiol secretion in older men can lead to endocrine disorders. The decrease in the amount of both secretions prompts osteoclasts to make them increase and osteoblasts to be inhibited, which results in impaired bone circulation metabolism and reduced bone mass resulting in osteoporosis [13].

Women have a higher prevalence of osteoarthrosis after menopause than men of the same age, which is sex-distributed and statistically significant [14].

2.6.2. Inflammatory factor expression factors

Among many chronic musculoskeletal diseases, there are many diseases related to inflammatory response, which are inseparable from inflammatory factors in the process of pathological changes, such as osteoarthritis, rheumatoid arthritis, ankylosing spondylitis and so on. Inflammatory factors such as IL-1β, IL-6 and tumor necrosis factor TNF-α are important players in the occurrence and development of diseases, and they have strong inflammatory effects and can induce the release of various inflammatory mediators, aggravating the disease and accelerating its course. After the onset of the disease, the values of these inflammatory factors were found to be significantly higher in the tests. For example, in the detection of serum inflammatory factors in patients with osteoarthritis and ankylosing spondylitis, the

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values of their content are higher than in normals, and conversely, if the inflammatory factors in the serum and joint fluid increase, they also increase the incidence of the disease [15-17].

3. This deficiency

3.1. Deficiency of liver, spleen and kidney

As stated in Ling Shu Jing - The Organ: "The Five Organs are the ones that collect the spirit, blood, energy, and soul". This means that the five viscera are interconnected, interact and cooperate with each other in terms of function and other aspects to provide the necessary support for the life activities of the body. If any one of them has a problem, it will affect the other internal organs and thus the corresponding pathological evidence, and the functional characteristics of kidney, liver and spleen are more closely related to orthopedics and are inseparable from the physiopathology of chronic tendon and bone diseases [18].

3.1.1. Kidney deficiency

There is a general consensus among successive generations of physicians and modern medical practitioners that the kidneys store essence, host bone and produce marrow, and that the relationship between the kidneys and bone is inseparable.

The kidney is the main reservoir of essence, and this essence is divided into congenital and acquired in the basis of Chinese medicine. The innate essence is mainly derived from the parents, whose reproductive essence determines whether the innate essence is abundant or not. At the same time, the congenital essence also needs constant nourishment from the later generations. If the congenital development is poor and the endowment is inadequate, the congenital essence will be lacking, which can be seen in young children with delayed closure of fontanelle, impotent bones, and middle-aged and elderly people with osteoporosis. The acquired essence comes from a wide range of sources, mainly from the intake of water and grain essence. The essence of the first and second heaven complement each other, promote each other, and depend on each other.

Modern research shows that the kidney is the master of bones, not only the bones, but also the cartilage, meniscus, intervertebral discs, etc. Therefore, when the kidney is deficient, not only the bones are affected, but also the cartilage, intervertebral discs and other tissues have various symptoms accordingly. The kidney is the master of bones through the essence it contains to produce marrow. If the physiological function of the kidney is normal, the essence is abundant, and the marrow can be produced with sufficient essence, and the marrow can provide strong nutrients for the bone, so that the bone is strong and the body grows and develops normally [19]. On the contrary, if the physiological function of the kidney is not normal and the source of kidney essence is lacking, the marrow cannot be transformed and the bone cannot be nourished, which leads to many diseases, such as osteoarthritis, osteoporosis and osteoporotic patients have a higher incidence of fractures than normal people.

The yang of the kidney is warm, exciting and upward, while the yin of the kidney is cold, inhibiting and downward. The yin and yang sympathetically balance each other's root and use, and each has its own function to maintain the function of the kidney and the normal operation of the body.

With increasing age, overwork, etc., the kidney essence chemistry decreases, the marrow has no source and is empty, and many symptoms appear. The deficiency of yin and yang shows different symptoms, while the deficiency of kidney yang is seen in cold pain in the waist and knee joints, fear of cold, and sunken pulse, etc. The deficiency of kidney yin is seen in bone steam, hot flashes, night sweats, and irritable heat in the five hearts. The pulse is fine [20].

Among women, during perimenopause and postmenopause, many symptoms similar to those described above occur due to kidney deficiency leading to the exhaustion of Tiankui. Similar to estrogen levels in modern medicine, diseases such as osteoporosis are mostly seen clinically in postmenopausal women.

From the anatomical point of view, the kidneys are located near the first and second lumbar vertebrae. In the Yellow Emperor's Classic of Internal Medicine, it is said that "the waist is the capital of the kidney". Located in the lower jiao, Yin, kidney is water, the five elements for water organs. If the fire is too strong and not subject to water, it will insult the water and cause damage to the water organs, dry kidney essence and no marrow, impotence and weakness of the bones. If Yin is deficient and internal heat is present, heat burns Yin and injures Kidney Yin, which is damaged and cannot be transformed into essence, which

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leads to bone marrow withering and weakness [21].

3.1.2. Liver deficiency

Liver, in the body together with tendons. In modern medicine, tendons refer to ligaments, tendons, Achilles tendons, etc., and are mostly located at the joints, which are inseparable from the body's daily activities. The liver is nourished by the essence and blood, and the tendons are nourished and strong when the liver has enough qi and blood, which is in line with the saying "bone is the stem, tendon is the rigid". If there is a source of liver essence, the tendons and veins are constantly moistened and nourished, and the limbs are strong, flexible and powerful; if there is not enough liver blood, the tendons and veins are not nourished by blood, then the tendons and veins become contracted and constricted, the limbs become numb, the flexion and extension activities are limited, and the tendons and veins become impotent over time [22]. "The knee is the capital of the tendons, meaning that the knee joint is the most weight-bearing joint in the body and has many tendons and veins inside and outside it. The tendons and veins of the knee joint are greatly affected when the liver is deficient in qi and blood, which can easily cause tendon disease in the knee.

Liver is wood, kidney is water, water produces wood, wood is the son of water, son disease and mother, liver disease and kidney. Liver deficiency leads to kidney deficiency, and kidney deficiency leads to less essence and less marrow, which leads to chronic tendon disease.

3.1.3. Spleen deficiency

The spleen, in the body, unites the muscles and dominates the extremities. The muscles, tendons and bones work together in the body's movement system, and when the muscles function properly, the limbs move freely. The spleen transports the essence of food to the whole body, nourishes the limbs and bones, provides energy to the muscles and tendons, and supports and maintains the body's daily activities, which is the "essence of the latter day".

If the Spleen Qi is weak, the water and grain essence is not properly transported, the muscles and limbs of the body are not moistened, and the limbs are weak, the muscles are wasted and atrophied, and in the long run, impotence is lost.

The spleen is earth, the kidney is water, and the earth is water. If the spleen and stomach function normally, the bones are strong and the tendons are strong. If the spleen and earth are not nourished, the latter does not nourish the first, the kidney water is insufficient, the essence is deficient and the marrow is scarce, the tendons and bones are not nourished. This is mostly seen in osteoporosis. Therefore, spleen disease can also cause kidney deficiency and lead to related chronic tendon and bone diseases [23].

3.2. Deficiency of qi and blood

Qi and blood play an important role in supporting normal human physiological activities. Both have factors that are produced by the spleen and stomach, so it is said that "qi and blood have the same origin".

Blood can moisten tendons, tendons and bones strong and powerful. On the contrary, if the blood is deficient, the palm can not grip, fingers can not take, tendons and bones out of balance and palms and fingers out of use. Qi deficiency will be unable to transport, blood deficiency will be stagnant, both deficiency will cause blood stasis accumulation, causing "pain if not pass" [24].

"Insufficient kidney qi is insufficient to promote bone growth, resulting in reduced bone density, osteoporosis and easy fracture; insufficient spleen qi, insufficient biochemistry of qi and blood, loss of nourishment of muscles and tendons, resulting in bone withering; insufficient liver qi leads to qi stagnation and blood stasis, resulting in bone pain [25], all of which The lack of liver qi leads to qi stagnation and blood stasis, resulting in bone pain [25], all of which illustrate the concept of "pain without honor".

4. The standard reality

Chronic musculoskeletal disorders belong to the category of "paralysis" in Chinese medicine, "Suwen-Theory of Paralysis", "wind, cold and moisture are mixed to the three gases, combined with paralysis." The wind is the dominant force, the cold is the pain, and the damp is the paralysis. When the internal organs are out of balance, Qi and chemistry are not conducive, and phlegm and beverages are generated internally; Qi stagnation and blood stasis slow down or stagnate the movement of Qi, blood, fluid and liquid, further aggravating the patient's symptoms. Many real evils invade the body, blocking

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the tendons and veins, and "if it does not pass, it hurts" [2, 26].

4.1. Wind-cold and damp paralysis, with dampness as the main cause.

4.1.1. Wind evil

Suwen - Wind Theory: "Wind is good at moving and changing several times." The main symptom is wandering pain in the spine, joints and other parts of the body, and the patient feels alternating pain in the joints of the whole body. The "number of changes" refers to the rapid onset of the disease caused by wind evil, the rapid and complex changes in the condition, that is, from the onset of the disease, the local pain develops to the whole body pain in a short time; and when the evil goes, the symptoms can quickly relieve or subside. The wind evil is often not a single causative factor, and when it acts on the body, if it comes with cold and dampness, cold pain, numbness and swelling in the joints of the limbs can be seen; if it comes with dampness and heat, or if cold and dampness turn into heat, it will manifest as redness, swelling and heat pain in the muscles, joints and limbs [27].

Wind evil causes or aggravates the symptoms of lumbago on the basis of kidney deficiency. Wind evil causes variable symptoms that involve the lower limbs and feet, such as radiating pain in the lower limbs. The acute onset of chronic low back pain often confirms the "several changes" of wind evil [28].

4.1.2. Cold evil

If cold evil causes pain in the body, it is mostly manifested as pain, and if pain occurs, it is mostly due to cold evil. Cold evil has the characteristics of cold and blockage, after attacking the body, it will cause the Qi and blood channels in the body to become blocked and painful, i.e. "if it does not pass, it hurts", and with its cold characteristics, the limb joints will have symptoms mainly characterized by cold pain. If the coldness is induced, the coldness in the tendons and joints can lead to joint contracture and unfavorable flexion and extension, etc.

Cold evil is easily combined with damp evil to become cold dampness and disease. When cold dampness injures the body surface, it will cause pain in the skin. If cold-dampness further attacks the muscles, muscle impotence is seen [29].

4.1.3. Dampness

Dampness is heavy and sticky, and when it is injured in a person, there is a feeling of heaviness and unpleasant adhesion, so it is called "turbid paralysis" or "paralysis with". The dampness is sticky, and after it is felt, it does not heal and has recurring attacks, resulting in a long course of illness; after it is felt, it is easy to cause the body's qi to become unstable, and "if the qi stops, the blood stops", the blood will move slowly or stagnate, and "if it does not pass, it hurts", which is manifested by the recurring pain in the joints and tendons of the patient and lasts This is manifested by repeated pain in the joints and tendons of the patient, which persists. When dampness is present in the neck and other peripheral joints, it is manifested by straightening and stiffness of the neck and pain in the joints [30]. It can be seen in diseases such as drop pillow and cervical spondylosis.

Rheumatoid arthritis, as one of the chronic musculoskeletal diseases, is characterized by recurrent pain in the joints with swelling and heaviness, and this type of feature has a high degree of compatibility with the pathogenesis of dampness [31].

4.2. Phlegm and blood stasis intertwine

The Yellow Emperor's Classic of Internal Medicine was the first to describe phlegm and stasis, and Zhang Zhongjing in the Eastern Han Dynasty believed that phlegm and stasis of blood caused disease together and focused on the treatment of phlegm and stasis of blood together, and the Danxi Xinfa in the Yuan Dynasty proposed that phlegm was accompanied by stasis of blood and stasis of blood was accompanied by phlegm, and the Treatise on the Origin of Diseases proposed that stasis of blood could cause phlegm [32].

There are many causes of phlegm generation, and cold condensation, damp stoppage, and heat refinement can all be phlegm. Phlegm and stasis are not only "blockage" caused by phlegm, but often accompanied by blood stasis, which aggravates the "blockage" and leads to "pain if not blocked". This is manifested by pain in the tendons and bones and joints that refuses to be pressed, and the type of pain is mostly stabbing, fixed and accompanied by swelling and petechiae [33].

Xu Zhengjin [34] and others believed that phlegm and stasis have the same origin, due to qi, cold, heat,

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deficiency, and longevity, and that they are interdependent and transform each other. Yin, Haibo [35] and others discussed phlegm and turbidity causing paralysis and concluded that phlegm and turbidity stagnate between muscles, tendons, bones, and joints, obstructing the flow of qi and blood, resulting in poor flow of qi and blood, and pain when it does not flow, which can be seen as skeletal joint pain, joint deformity, and unfavorable flexion and extension.

4.3. Qi stagnation and blood stasis

Yang Shiying of the Southern Song Dynasty pointed out that "if the qi stops, the blood stops." That is, qi stagnation cannot push blood and leads to slow blood flow or even stasis; conversely, poor blood flow will lead to qi obstruction and stasis in bones and joints over time, resulting in pain, deformity, and functional limitation due to loss of nourishment of local bones and muscles [36].

When Qi and blood flow smoothly along the meridians, the tendons and joints of the limbs function normally and are strong. Blood stasis blocks the peripheral meridians, preventing the smooth flow of qi and blood, resulting in pain throughout the body [37].

Jiang Yan [38] discussed in detail the factors that generate stasis of blood and described the clinical manifestations of different lesion sites, in which stasis of blood blocking muscles, tendons, bones and joints presents with stabbing pains, fixed pains, raised lumps, and purple and sallow color. Ding Juxian [39] et al. analyzed stasis of blood from the identification of internal organs and discussed the lung, spleen, and kidney, and concluded that stasis can be caused by the loss of lung qi, weakness of the spleen and stomach, and deficiency of kidney essence, and that stasis leads to obstruction, and "if it does not pass, it hurts".

5. Conclusion

In recent years, the incidence of chronic musculoskeletal disorders is increasing [40], and the etiology of chronic musculoskeletal disorders is diverse and complex, and the onset of the disease is caused by multiple etiologies together rather than a single etiology. Therefore, the analysis of the etiology and pathogenesis of chronic musculoskeletal diseases, especially from the perspective of Chinese medicine, has a positive effect on the prevention and treatment of chronic musculoskeletal diseases in Chinese medicine, and is conducive to a clear diagnosis and prescription of the right medicine. The basic pathogenesis of chronic musculoskeletal disorders is the original deficiency and the actual symptoms, and the original impotence and paralysis. The attack of wind, cold and dampness, deficiency of liver, kidney and spleen, old age, long duration of the disease and degenerative changes can cause a series of symptoms, but it is no more than "pain if it does not pass" and "pain if it does not glory". Prof. Shi Qi, Prof. Shi Yanshan and Prof. Li Yanmin have proposed a series of prevention and treatment measures for chronic tendon and bone diseases [2, 41-42]. Together with modern advanced testing and imaging equipment, timely and accurate diagnosis can be made. We insist on the "four early stages" [43-44] and practice "treating the disease before it happens" in order to achieve "neutralization of tendons and bones" [45].

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