

Clinical Research Progress of Hip-lumbar Combination Therapy for Low Back Pain

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Abstract: The clinical incidence rate of low back pain is high, and there is no specific plan for clinical diagnosis and treatment at present. Some studies have shown that hip joint disease will lead to the occurrence of low back pain. The author analyzed the research progress on combined treatment of hip joint and lumbar spine in improving lumbar spine symptoms in recent years, and expected to provide reference for clinical diagnosis and treatment of low back pain.

Keywords: Low back pain; Hip; Treat; Research progress

1. Introduction

Low back pain refers to the pain between the sacroiliac region, lumbosacral region and the lower edge of ribs. It is reported that the global incidence rate of low back pain is 38.1% [1]. Low back pain has been reported to occur as early as 9 years of age [2] and can persist for a long time. Despite the clinical treatment of low back pain is continuously developing, many new methods have also been adopted, but the prevalence is still increasing [3]. So far, the pathological mechanism of low back pain has not been fully understood, and there is no unified clinical diagnosis and treatment plan. Low back pain is not only affected by the structure of the lumbar spine itself, other structural lesions of the spine and trunk can also lead to the occurrence of it. Therefore, in the clinical diagnosis and treatment of low back pain, if we considered the lumbar spine itself only, the clinical effect might be not significant. Studies have shown that dysfunction of the hip joint can lead to the occurrence of low back pain, and degenerative changes of the hip joint, osteonecrosis of the femoral head and other perhip diseases usually affect the lumbar spine itself in clinical practice. The clinical symptoms of the hip joint are not clear, sometimes it may be confused with simple lumbar spine disease symptoms. Clinically hip joint disease combined with low back pain can be called hip-lumbar syndrome, which mostly characterizes by low back pain and lower limb pain. Hip joint lesion is easily misdiagnosed, resulting in error in treatment [4], as shown in Figure 1, and its classification is shown in Figure 2. In the early stage of the onset, detailed physical examination can early detect low back pain patients with hip dysfunction. And then, by intervening around the hip and waist to treat low back pain, the clinical effect is significant.

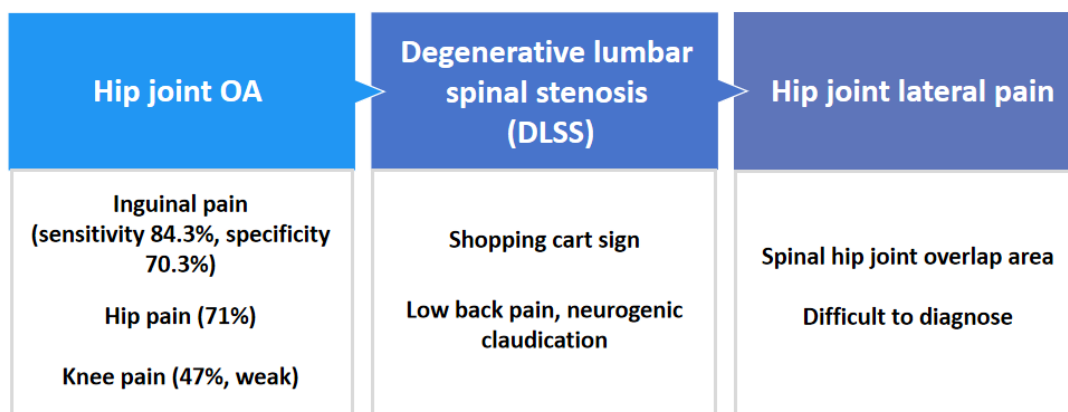


Figure 1: Source of pain

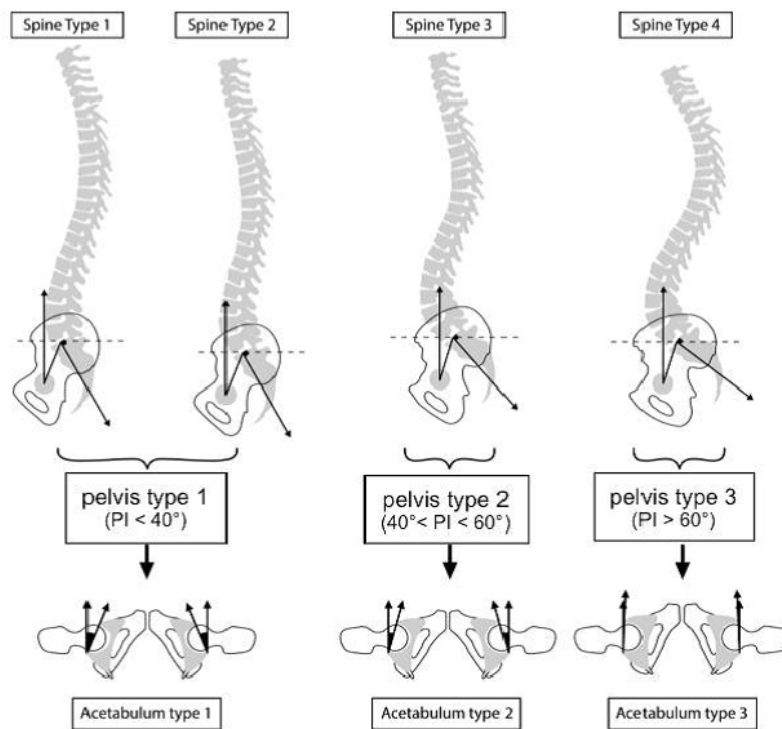
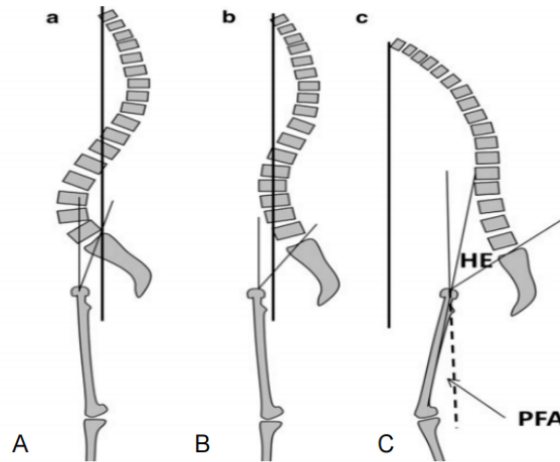


Figure 2: The classification of hip-lumbar syndrome

2. Straightening of bones

Studies have shown ^[5,6] that there is an inverse correlation between sagittal lumbar range of motion and hip range of motion: limited range of motion of the hip joint will lead to compensation of the lumbar spine, while excessive compensation will lead to lumbar injury and low back pain, as shown in Figure 3. Lu Qingwang et al. ^[7] included 30 patients with hip-lumbar syndrome, and used "Wechsler" tendon manipulation, orthopedic manipulation and symptomatic manipulation for treatment. It was found that the "Webster" manipulation could effectively alleviate the clinical symptoms around the waist and perihip, restore the spine-lower limb mechanical balance by observing the lumbar hip VAS score, improve Harris hip joint score and adjust lumbar spine Cobb angle. Tan Fuzhu ^[8] treated patients with lumbar tritransverse process syndrome by combining hip adjustment manoeuvre with pelvic selection manoeuvre and lumbar tendon manoeuvre. And this study found that it was possible to achieve spine-pelvis-hip mechanical balance and structural symmetry. Luo Shuohua ^[9] divided patients with lumbar disc herniation into two types: rotten pelvic upturned buttocks type, rotated lumbar and chest type. It was believed that the lumbar-pelvis-hip is a whole with linkage in movement. And through tendon manipulation, pelvic and thoracic vertebrae orthopedic manipulation can effectively improve the mechanical balance of the lumbo-pelvis-hip, achieve the effect of tendon and bone flexibility. Wang Cheng ^[10] randomly divided 43 patients into fascial release combined with perihip muscle group training group (n=21) and perihip muscle group training group (n=22), treated separately for 3 weeks. By comparing before and after treatment, it was found that the pain score after fascial release combined with perihip muscle group training group was better than that before treatment ($p < 0.05$), while the pain score in the perihip training group was not significantly improved after treatment ($p > 0.05$). And there was an increase in physical coordination after treatment in fascial release combined with perihip muscle group training group, which was considered to be related to the improvement of hip muscle group activation order. Wu Leadan et al. included 66 patients with postpartum low back pain, and randomly divided into 34 cases in the treatment group, 32 cases in the control group. The control group was treated with traditional tuina, and the treatment group was treated with lumbar orthopedic manipulation + pelvic manipulation + hip manipulation. After two weeks of treatment, the VAS score and ODI score of the two groups were improved compared with before treatment ($p < 0.05$), and the score of the treatment group was better than the control group ($p < 0.01$). This study indicated that the clinical efficacy of the hip-lumbar-pelvis combined manipulation was better than that of the control group. Yin Zishuai ^[11] randomly divided 60 patients with lumbar disc herniation with lumbo-hip-pelvic mechanical disorders into the treatment group (n=30) and the control

group (n=21), and used pelvic correction manoeuvre treatment and conventional Tuina treatment respectively. After two weeks of treatment, by comparing the overall efficacy, pain score and pelvic tilt parameters before and after treatment, it was found that the scores of the pelvic correction manoeuvre group were better than the conventional Tuina group, the difference was statistically significant ($P<0.05$).



Schematic diagram of the compensatory mechanism of sagittal balance of the spine-pelvis

Illustration: A: Normal spine; B: Compensate the spine; C: Decompensated spine; HE: Hip extension angle. The angle between the connection between the midpoint of the sacrum terminal plate and the midpoint of the bilateral femoral head and the longitudinal axis of the femur; PFA: The angle between the longitudinal axis of the femur and the perpendicular line. a, b, c: C7Plumb line.

Figure 3: Compensatory mechanisms for sagittal balance of the spine-pelvis

3. Kinesiatrics

The pelvis can be regarded as the base of the lumbar spine, and the pelvis is connected to the double lower limbs through the hip joint. The instability of the hip joint will affect the stability of the lumbar spine, and the decrease in the strength of the perhip muscles (see Figure 4) will lead to the occurrence of low back pain. Wang Bo et al. ^[12] randomly divided 108 patients with low back pain into conventional manipulation treatment group and control group. The conventional manipulation treatment group used conventional manipulation techniques such as plucking and kneading to act on the waist, the control group added hip exercise training on the basis of the conventional manipulation treatment group. Through observing the pain score before and after treatment, it was found that the control group score was better than the conventional manipulation group ($P<0.05$), which suggested that hip intervention can effectively improve the clinical symptoms of patients with low back pain. Wang Wei et al. ^[13] randomly divided 116 patients with low back pain into control group and experimental group. The control group was treated with lumbar training, lumbar traction, etc., and the experimental group was treated with perhip muscle training on the basis of the control group for two weeks. Resultly, the ODI and NPRS scores after treatment were better than before treatment, this suggested that hip exercise therapy can effectively improve the clinical pain symptoms of low back pain patients. Clinically, it has been found that clinical symptoms can be improved by training perhip muscle strength, but the long-term efficacy is unstable. And studies have shown that errors in the movement pattern of the perhip muscles can also lead to the occurrence of low back pain. By comparing the electromyography of the surface of the hip muscles under weight-bearing between patients with chronic low back pain and healthy people, some scholars ^[14] have found that the recruitment ability of the hip muscles of the former is worse than the latter. And the former has poorer endurance than the latter. Zhang Xu et al. ^[15] randomly divided 60 patients with low back pain into experimental group and control group. The experimental group used 8 weeks of prone hip external rotation extension training, and the control group used 8 weeks of prone hip extension exercise. The results showed that the low back pain of the two groups improved before and after treatment ($P<0.05$), and the improvement in the experimental group was better than that the control group. After 12 months of follow-up, the low back pain of the control group increased significantly, while there was no significant change in the low back pain of the experimental group. The exercise patterns before and after treatment in the experimental group were significantly different from those in the control group

($P < 0.05$). This is because the experimental group can better activate the hip stabilizing muscle group through hip abduction and external rotation, better recruit the strength of the gluteal muscle fibers, which can reduce the participation of the hamstring and erector spines to change the movement pattern. Some studies^[16] believed that injuries in distant anatomical positions that seem unrelated to the main symptoms may be the cause of the main symptoms. And under the guidance of this theory, on the basis of establishing lumbar spine stability, hip joint flexibility training is fully established. After 6 weeks of training, the pain score of the experimental group was significantly better than that of the control group, this suggested that hip stiffness affects lumbar mechanical conduction and hip flexibility training can improve lumbar symptoms.

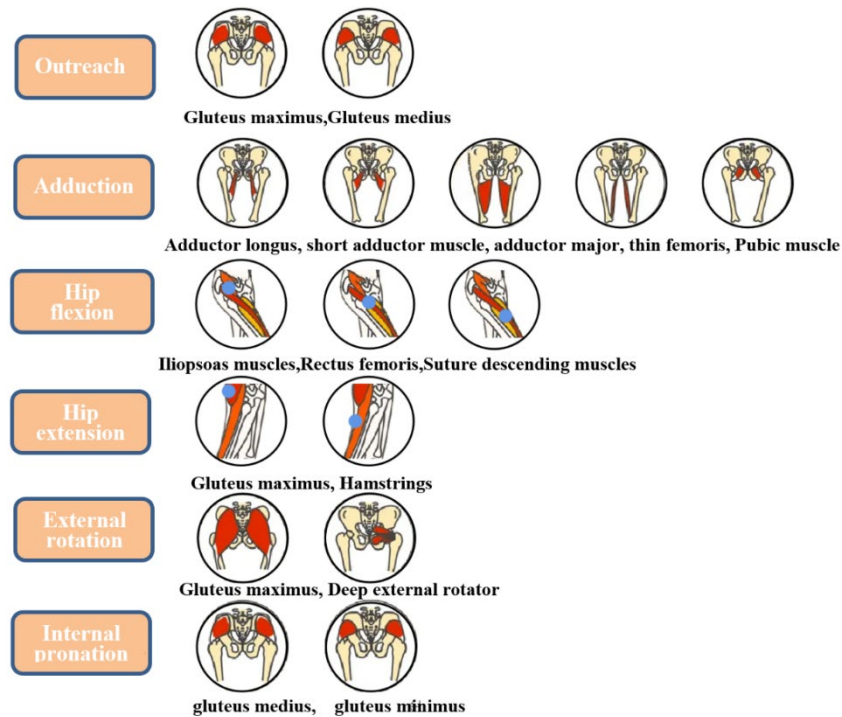


Figure 4: Movement of the hip joint

4. Physiotherapy

Physical therapy is the use of sound, light, magnetism, shock wave and other methods to treat diseases, which is widely used in clinical practice. Studies^[17] have recruited patients with chronic non-specific low back pain, and palpated the hip muscles and hip range of motion. It was found that gluteal muscle groups such as gluteus medius, gluteus minimus, piriformis muscle and so on may have trigger points in patients with low back pain, which will affect the mechanical changes of the lumbar muscle groups to appear clinical symptoms^[18]. Dong Bo et al.^[19] found diagnosis of hip joint lesions can lead to lower back pain. Based on Professor Sun Yindi's academic idea of "four-element balance", he used extracorporeal shock waves to treat the trigger points of the perhip muscle groups, combined with blade needles and perhip training, which can effectively improve the clinical symptoms of patients. An American doctor^[20] believed that the gluteal muscles around the hip and the asymmetry of the hip joint will lead to the destruction of the biomechanical balance of the hip and waist, thereby cause low back pain. The doctor recruited patients with chronic low back pain, used ultrasound-guided percutaneous nerves to control the gluteal muscles acting on the hip muscles, and tries to activate the buttocks by electrical stimulation of the fast-twitch fibers of the hips. The results of the study found that this treatment can improve hip strength, hip range of motion and pain level in patients with low back pain.

5. Surgical treatment

Some scholars^[21,22] believed that hip joint diseases caused hip flexion contracture, which can aggravate lumbar lordosis, change the mechanics of lumbar, and cause secondary low back pain.

Clinically, surgical treatment is often based on restoring spine-hip mechanics ^[23], which can better improve the clinical symptoms of patients, as shown in Figure 5. Ma Mingyang et al. ^[24] selected 30 patients with congenital hip dysplasia, divided them into the group with low back pain (n=16) and the group without low back pain (n=14), and both groups of patients underwent artificial total hip replacement. After 1 year after treatment, by observing the VAS score and ODI score before and after treatment of the two groups, it was found that the post-treatment score of both groups of patients was significantly improved ($P<0.05$). Ma Yangming et al. believed that by replacing the hip joint, the hip flexion contracture was relieved, and the mechanical balance of the spine was re-established, which was conducive to improving the symptoms of low back pain. Ye Jiajing et al. ^[25] included 22 patients with hip diseases such as osteonecrosis of the femoral head and hip osteoarthritis, and compared the parameters and pain scores of the lumbar spine-pelvic coronal and sagittal surfaces before and after the treatment by hip replacement. It was found that both the human body mechanical parameters and the pain score were improved compared with the preoperative ($P<0.05$), and the efficacy of short-term and medium-term follow-up was satisfactory. Li Xu et al. ^[26] performed total hip replacement surgery on 48 patients with severe hip arthritis and low back pain, and conducted follow-up visits 3 months and 2 years after surgery. It was found that the functional score of hip joint, lumbar pain score, and sagittal imaging angle of the spine were improved compared with before treatment, and the improvement after 2 years was better than 3 months. The improvement of the sagittal angle of the spine would affect the biological force line of the lumbar spine, relieve the muscle tension of the lower back, and thus improve the clinical symptoms.

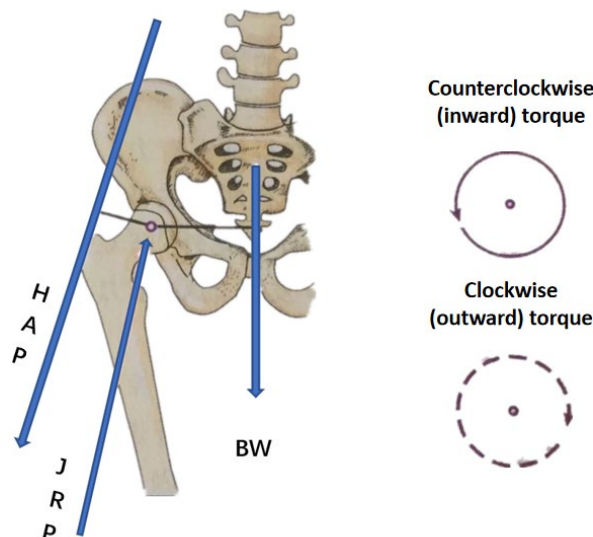


Figure 5: Spinal hip mechanics

6. Discussion

Below the lumbar spine is the pelvis, which can be used as the base of the lumbar spine, providing stability for lumbar spine movement from the structural point of view. The two also cooperate with each other, the curvature of the lumbar spine changes when the pelvis is tilted anteriorly and backward, which is called "lumbar spine-pelvis" rhythm clinically^[27]. The hip joint is connected below the pelvis, which plays an important role as a connecting joint between the pelvis and the lower limbs, and plays an important role in the normal movement of the lower limbs and pelvis. For example: in the process of walking, the force transmitted by the ground to the lower limbs will be conducted upward through the hip joint, the downward force generated by trunk vibration will be downward through the lumbar spine, the two opposite forces will be transformed and metabolized in the pelvis through the sacroiliac joint and pubic symphysis. The hip joint as a hub is particularly important in mechanical conduction, once the mechanical conduction is imbalanced, it can cause joint disorder the emergence of force concentration, which may directly damage the bone joint and the muscle itself. And the muscle in the process of mechanical conduction of the disorder will continue to activate muscle fibers to participate in stability, further aggravate muscle damage. While further muscle damage will fail to stabilize bones and joints, resulting in a vicious circle. Therefore, the three parts of the lumbar - pelvis - hip in the

human body movement, like a gear joint movement, any part of the three problems can lead to the other two parts of the compensation. While the core of the pelvis is the sacroiliac joint, which is a micro-motion joint and very stable, thus the pelvis is relatively stable than the waist, and clinically the interaction between the hip and waist is more obvious. In addition to the joint itself and the ligaments and joint capsules around the joints, the active protection of the hip joint comes from the contraction of the muscles. The muscles around the hip are very rich, which can provide stability to the hip joint, absorb excess shocks and provide protection for the hip joint in the process of movement. Modern people are used to sitting for a long time, resulting in gluteal muscle weakness, and even muscle group asymmetry on both sides are very common. However, the part of clinical conservative treatment is often revolves around the muscle itself, with few studies on the causes of low back pain to refer to in addition. As a result, the diagnosis and treatment of low back pain can not be limited to the waist, and further attention should be paid to the clinical treatment of hip joint lesions.

Clinical hip-waist combination treatment methods are abundant, Tuina, acupuncture and etc can improve clinical symptoms. Patients with mild symptoms and signs could choose traditional Chinese medicine treatment, and patients with severe symptoms and signs could choose surgical treatment. However, there is no standardized diagnosis and treatment plan for this type of disease, and there is no clear boundary between conservative treatment and surgical treatment. Hip joint movement, bilateral hip activity asymmetry, hip muscle group tenderness, hip muscle group muscle strength decline and other factors may lead to the occurrence of low back pain, which is our current thorny issue. There are few such studies at home and abroad, this situation needs us to continue our exploration to provide new ideas and methods for clinical treatment of low back pain.

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