

The Reviewed of Musculoskeletal Ultrasound in Diagnosis of the Causes of Low Back Pain

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Abstract: Magnetic resonance imaging (MRI), CT and X-ray are widely used in the diagnosis of the cause of low back pain. However, its limitations and contraindications limits the applications. Ultrasound is a safe, cheap and convenience technology shows great potential in the diagnosis and treatment of musculoskeletal diseases. This paper summarizes the research progress and application of ultrasound imaging in the diagnosis of low back pain, and provide reference for clinical work.

Keywords: Review of ultrasound examination; Diagnosis; Rehabilitation; Pain

1. Introduction

The vast majority of people will have the experience of low back pain in life, so low back pain is one of the most common musculoskeletal disorders in clinical work [1]. There are many reasons for the low back pain, such as muscle ligament injury, spinal stenosis, lumbar disc herniation, osteoarthritis, lumbar spondylolisthesis and other diseases [2]. Imaging examination is an indispensable means in the diagnosis and differential diagnosis of the disease [3]. At present, magnetic resonance imaging (MRI), CT and X-ray were used in etiological diagnosis of low back pain. But these inspection methods have certain limitations and contraindications, especially for pregnant women and children [4-5]. Researchers and clinicians found that ultrasound has the unique sensitivity and accuracy in the musculoskeletal system, it can provide anatomical and pathological information in detail, and can display the internal structure of tendon[6]. Ultrasound is a safe, inexpensive, and easy technology, which shows great potential in the diagnosis and treatment of musculoskeletal disorders.

2. Ultrasound Examination of Spinal Canal

Lumbar spinal stenosis is one of the common causes of low back pain, which often occurs on one side or both sides of the root cause of the pain. There may be severe lower extremity weakness, muscle relaxation, including about two obstacles or paresis; another main symptoms of spinal stenosis is intermittent claudication [7]. The earliest application of [8] in domestic kaio ultrasound on spinal canal diameters were measured, the examination method is: subjects prone, abdominal pad a flat pillow,

back straight as far as possible. The probe is placed in the two lumbar spines and the sound beam is vertically through the intervertebral space to reach the spinal canal. When the images clearly show the vertebral arch and posterior vertebral band, image freezing, electronic scale measurement of vertebral arch at the posterior margin of the vertebral body and the highest point band band mid-point distance between the lumbar spinal median sagittal diameter. The results showed that there was no significant difference in the diameter of lumbar spinal canal between adult men and women, and the average value was 1.6 cm, while the average value of low back pain group was less than 1.4 cm. Therefore, we believe that the incidence of low back pain in patients with a large degree of spinal canal diameter, < 1.4 cm. At the same time, the foreign researchers found that intermittent claudication, radioactive nerve pain, neurological morbidity and spinal canal diameter decreases significantly associated with [9]. Because of the considerable professional knowledge, proficiency and accuracy of the ultrasonic measurement of the spinal canal diameter, it is not widely used to measure the vertebral canal size at present.

3. Ultrasound Examination of Core Muscle Groups

3.1. The significance of the core muscle group in maintaining the stability of the lumbar

The lumbar spine itself does not have stability. If we want to maintain lumbar stability and exercise we need to rely on the stability of the lumbar core muscle group [10]. If the balance between injury and repair of the lumbar core muscle group is broken, even minor injuries can

easily lead to low back pain. Low back pain is often associated with fatigue and middle age, which may be related to the muscle, tendon, joint cartilage and other tissue damage in these populations [11]. Therefore, it is important to exercise the core muscles. Core muscle strength training can enhance the muscle strength of low back muscle, while improving lumbar muscle strength and its ratio [12].

3.2 .Cleft muscle and low back pain

The muscle is close to the muscles of the lumbar spine, its function is to ensure that the close connection between the vertebral body, and to coordinate the work of the L1-L5 vertebral body. It is flexible, and can be repeated to assume a variety of roles in the power of the waist [13]. Normal human's multiple split muscle is round or oval, and both sides are symmetrical. [14]: about 80% of patients with chronic low back pain will be in the muscle atrophy. And the long-term bed rest of adults, the way of the muscle atrophy and the way of the muscle atrophy of low back pain patients is very similar. MRI study showed that more than 2 months after male volunteers were lying in bed for months, their multiple muscle atrophy was significantly atrophy, and the loss of activity was [15]. In the normal state, the multi - cleft muscle protects and supports the low back through constant movement. But if the function of the multi - cleft muscle once appeared weakened, and then there will be low back pain.

3.3. Ultrasound imaging of the multi - cleft muscle

At present, the most commonly used imaging examination in the clinical evaluation of the CT, magnetic resonance imaging (MRI) and ultrasound imaging. Previous studies have compared the MRI, CT and RUSI in the detection of deep tissue and muscle morphology and function after that the musculoskeletal ultrasound has good reliability and validity (ICC=0.72-0.98) [17]. The first application of Hides[18] in patients with low back pain in patients with low back pain were studied by the use of the. The detection method for subjects prone position, then placed a pillow in the abdomen, hold in order to eliminate the lumbar lordosis. The results show that this method can measure the size and transverse area of the adult muscle. Then Hides[19-20] found that the symptoms of low back pain were significantly relieved with the improvement of the cross-sectional area of the multiple cleft. Therefore, rehabilitation physicians can achieve the goal of treating pain by observing the cross-sectional area of the muscle and the rehabilitation training and treatment plan.

3.4. Ultrasound imaging of abdominal muscle

The abdominal muscles including the rectus abdominis, external oblique, oblique and transverse abdominal muscle, the muscles responsible for trunk rotation, bending action. On the other hand, it is also involved in maintaining the stability of lumbar spine. American scholars have

investigated the abdominal muscles of patients with low back pain in the past ten years. It is found that exercise abdominal muscles can effectively delay the recurrence of low back pain [21]. The thickness and reliability of the abdominal muscles of healthy young people were measured by using the technique of ultrasonic imaging, and the results showed that the [22] can be accurately and effectively used in the training of the rehabilitation therapists. The rehabilitation of ultrasound technique can be accurate and effective measurement of abdominal external oblique, oblique and transverse abdominal muscle thickness. At present, there are many prospective studies on the study of muscle and bone ultrasound in abdominal muscle, which is lack of the corresponding clinical data support.

4. Ultrasound Examination of the Sacral Iliac Joint

The study showed that the symptoms of 10%-25% in patients with low back pain were derived from the [23] of the sacral joint. The abnormal and inflammatory changes in the biomechanics of the sacral joint are the potential risk factors for low back pain [24]. Evaluation of the value of Doppler's [25] in the diagnosis of Ankylosing (Spondylitis) in patients with early ankylosing spondylitis (AS). The study found that there was a relationship between the CRP, ESR and BASDI scores in the blood flow resistance index of the sacral iliac joint. The higher the patient's inflammation index, the higher the BASDI score, the lower the blood flow resistance index. The conclusions are as follows: the diagnosis of early ankylosing spondylitis can be used as an important auxiliary examination, at the same time, low resistance blood flow is an important clue to the active ankylosing spondylitis. Zhou [26] thinks that Doppler ultrasound can display the sacroiliac joint abnormal blood flow, which is valuable for the diagnosis of central type spine arthritis of sacroiliac arthritis.

5. Ultrasonic Examination of Lumbar Spondylolisthesis

Spondylolisthesis is due to congenital dysplasia, trauma, strain and so on, the upper and lower vertebral body part or all slip [27]. Lumbar spondylolisthesis may occur after the occurrence of low back pain, lower limb pain, numbness and other symptoms. Repeated radiological assessment is needed in the course of treatment. However, long-term accumulation of radiation dose is relatively high, which may cause other side effects, especially for children with growth and development of [28-29]. The safety and operability of ultrasound have obvious advantages in this field. The study showed that the error of the spinal dislocation of ultrasound measurement is only 1.3 mm, which is consistent with the degree of X - ray in the

measurement of lumbar spondylolisthesis, and its correlation is as high as $= 0.976$ ($P < 0.001$). In view of this, the accuracy of ultrasound diagnosis has already had the condition of clinical application. At home and abroad, there are few studies on the clinical application of ultrasound in lumbar spondylolisthesis, but the future may be in the specific application of the study.

6. Conclusions

Application of musculoskeletal ultrasound in low back pain has just started. But for X-ray, CT, and nuclear magnetic resonance imaging, ultrasound as a safe, inexpensive, reproducible technique has shown great potential in the diagnosis and treatment of musculoskeletal disorders. The development of ultrasound imaging has reached a new level, which makes it more and more problems to be solved in clinical practice. There is no doubt that musculoskeletal ultrasound will become an important equipment for rehabilitation, and musculoskeletal ultrasound evaluation and guidance technology will become the essential technology of rehabilitation physicians.

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