

Physical Therapy for Low Back Pain

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Abstract: Physical therapy consists of fixation, thermotherapy, traction, and physical training. The symptomatic therapy is effective for some low back pain, including pain due to metastasis by malignant tumors. Fixation with a corset or wide canvas band reduces muscle pain in the low back region as curative therapy, but reduces the pain caused by tumors or inflammation as symptomatic therapy. Thermotherapy is the most popular form of the 4 types of physical therapy used in medical institutions in Japan. Thermotherapy includes deep heat, such as produced by microwaves and superficial heat, such as produced by hot packs and paraffin baths. Traction other than pelvic traction for lumbar intervertebral disc hernia has recently been losing popularity, because of the prolonged hospital stays required. Physical training is expected to be the most effective method of reducing low back pain. Strengthening low back and abdominal muscles after muscle stretch exercises is effective in reducing low back pain because it has a “natural” corset-like effect that prevents pain.

Key words: Physical therapy; Fixation; Thermotherapy; Traction; Physical Training

Physical Therapy Contributes to Reducing Low Back Pain

Physical therapy, which consists of exercise therapy, such as fixation, thermotherapy, traction, and muscle strengthening, and guidance in regard to everyday activities, contributes to reduction of low back pain in either an auxiliary manner or as the fundamental modality of treatment, depending on the disease. Thus, although we recommend physical therapy, which

is less invasive than drug therapy or surgical therapy, as the treatment of the first choice for low back pain, it is important to determine whether its role is as auxiliary therapy or as the fundamental modality of treatment. A correct diagnosis of the disease responsible for the low back pain is also essential in order to make this distinction.

Five different types of physical therapy for low back pain, and the diseases for which they are indicated, are listed in Table 1. For example,

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Table 1 Physical Therapy for Low Back Pain

1. Fixation (corset, bleached cloth, etc.)	Acute muscular low back pain (sprained back) Vertebral body compression fractures, invasion of the lumbar spine by bacteria/tumors
2. Thermotherapy (hot pack, microwaves)	Chronic muscular low back pain, intervertebral disc degeneration, spondylosis deformans, ankylosing spinal hyperostosis, non-spondylolytic spondylolisthesis, lumbar spinal canal stenosis, kyphosis secondary to osteoporosis
3. Traction (continuous, intermittent indirect)	Intervertebral disc degeneration, lumbar spinal canal stenosis, and lumbar intervertebral disc hernia
4. Exercise therapy (muscle strengthening, Williams' exercises)	Chronic muscular low back pain, degenerative diseases of the lumbar spine
5. Guidance in everyday living	
a. Bone strengthening:	Low back pain secondary to osteoporosis
b. Muscle rest:	Acute and chronic muscular low back pain
c. Load reduction:	Degenerative diseases of the lumbar spine

methods designed to eliminate pain by fixing the lower back with a corset or wide canvas band in acute muscular low back pain (sprained back) are classified as fundamental therapy, that is, they are expected to lead to regeneration or healing of torn muscles. However, fixation for invasion of the lumbar spine by bacteria or a malignant tumor, as in tuberculous spondylitis or spinal metastasis by a malignant tumor, is only a means of relieving low back pain temporarily. Drug therapy or surgery of the underlying disease is important as curative therapy in both of these diseases, and to the extent that the curative therapy is ineffective, the low back pain fails to resolve. Fixation for vertebral compression fractures corresponds to fundamental therapy, since it is designed to promote bone healing and eliminate pain, but the existence of curative treatment methods that improve bone fragility must not be forgotten. For these reasons, in order to use physical therapy effectively in low back pain, it is important not to

overlook two important diseases that are only very rarely encountered and account for less than 1 in a 1000 low back pain patients: purulent/tuberculous spondylitis and spinal metastasis by malignant tumors.

Guidance in everyday life, which corresponds to physical therapy in the broad sense, is also important. We teach the importance of daily exercise to strengthen the bones in osteoporosis, and the importance of postures that allow rest without imposing a load on the muscles in acute and chronic muscular low back pain, and guide patients accordingly. In addition, as for lumbar spine degeneration, we guide a strategy to decrease load to lumbar spine, and avoid the progression of the degeneration. In addition, in degenerative diseases of the lumbar spine, we guide to reduce the load of the force on the lower back to prevent the progression of the diseases.

Fixation

Fixation of the lower back by means of bleached cloth, corsets, etc., reduces low back pain by 3 actions: (1) limiting the movement of painful muscles, intervertebral joints, intervertebral discs, and fractured vertebral bodies, (2) maintaining good posture so as to reduce the mechanical load on the lower back, and (3) reducing the mechanical load on the lower lumbar spine.

Not only does limiting movement eliminate pain in the muscles, bones, joints, and intervertebral discs that compose the lower back, but it can promote healing of the underlying disease. For example, acute muscular low back pain caused by muscle and fascia tears, vertebral body compression fractures manifested by bone collapse, intervertebral arthropathy manifested by mild inflammation in the joints, intervertebral disc hernia, in which a protruding disc compresses the spinal cord, etc., start to heal as a result of fixation. Methods in which the thorax and the pelvis are fixed rendering the lumbar spine rod-like is effective in limiting

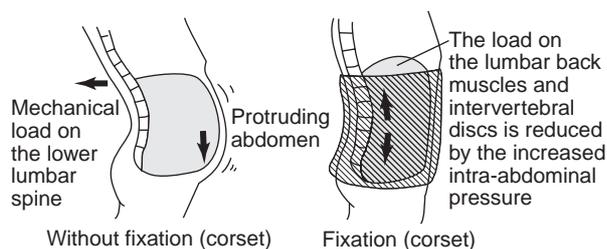


Fig. 1 Lumbar-pain-reducing effect of fixation (quoted from Iwakura, H., *et al.* eds.: *Diseases of the trunk and musculoskeletal system, and rehabilitation.* Ishiyaku Publishers, Inc., Tokyo, 1985; pp. 133–196.)

the movements of these tissues, and a slightly longer elastic corset than usual (Damen corset) or a Knight corset with a metal bar in its posterior portion are used for this purpose.

The Williams' flexion orthosis is available as a firm corset that has a corrective effect in lessening the anterior curvature of the lumbar spine by means of a metal frame. Although it is said to be suitable for sustaining good posture, in the author's experience the patient compliance rate is poor. By contrast, flexible corsets, which are short, easy-to-remove types sold in pharmacies, have a good compliance rate, and many patients have found them to be effective. The reason is that, as shown in Fig. 1, fixing the lower back and abdomen as though hoops had been slipped onto a barrel make it possible to correct the protrusion of the abdomen and raise intra-abdominal pressure, which reduces the external force on the posterior lumbar muscles and lumbar intervertebral discs.¹⁾

Based on the above, it can be concluded that long, firm corsets are useful as a method of fixation for low back pain when the aim is to achieve bone fusion after vertebral body compression fractures and to relieve intense pain caused by purulent or tuberculous spondylitis, metastases of malignant tumors. However, fixation with relatively short Damen corsets or bleached cloth is adequate for most other forms of low back pain in terms of efficacy, compliance, and comfort.

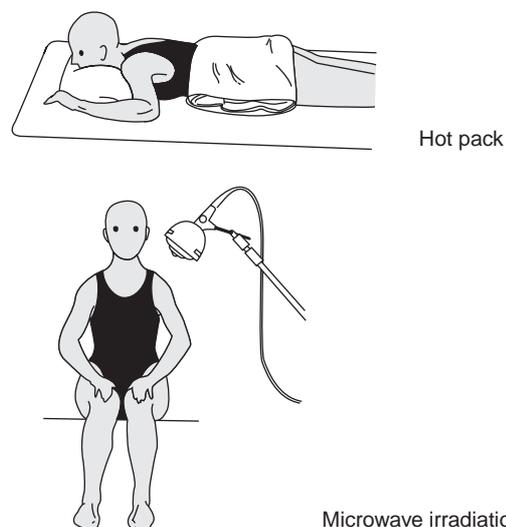


Fig. 2 Thermotherapy by hot pack and microwave therapy
The hot pack is designed to reduce pain by the action of heat on the surface (conduction heat), while microwave therapy is designed to relieve pain by the action of heat deep inside the body (deep heat).
(quoted from Yoshimura, S.: *The course of physical therapy in stroke patients.* Hayashi, Y. ed.: *Rehabilitation Manual. Journal of the Japan Medical Association (extra issue) 1994; 112(11): 19*)

Thermotherapy

Thermotherapy of low back pain is the most frequently used form of physical therapy performed in medical institutions. Thermotherapy is divided into methods that use surface heat and methods that use deep heat, and other forms of thermotherapy include hydrotherapy in the form of partial baths and whirlpool baths, and hot springs, which have a change-of-climate effect and mental-relaxation effect.

As shown in Fig. 2, there are 3 forms of thermotherapy that use surface heat, a form that uses conduction heat, including hot packs and paraffin baths, a form that uses radiant heat, including infrared rays, and a form that uses convection heat, including hydrotherapy and hot air baths. Methods that involve exposure to microwaves or ultrashort waves, on the other hand, are classified as deep-heat thermotherapy.²⁾ A therapeutic effect begins to occur after 3 to 5 minutes of exposure to their heat, and the maximal effect is obtained after 30

minutes. However, since burns occur when the temperature of the dermis and epidermis is raised to 42°C and heated for several hours, thermotherapy at no more than 45°C for about 30 minutes can be said to be in the safe range (but there are individual differences).

Not only does blood flow in local arterioles and capillaries increase when exposed to heat, but sympathetic vasodilatation occurs in distant areas as well. Local metabolism also accelerates; nerve sensitivity decreases, and the pain threshold rises. The sensitivity of muscle spindles, nerve endings that affect muscle tonus, decreases in response to heat, and muscle spasms are prevented. The extensibility of connective tissue increases, and joint contractures are relieved. The increase in muscle blood flow is also associated with the removal of substances related to fatigue and pain-inducing substances within the muscle. In this way heat has a rapid effect in relieving low back pain.

Thermotherapy is contraindicated for low back pain in the presence of acute inflammation, for example, in active tuberculous spondylitis or purulent spondylitis. Since heat increases the pain in malignant tumors and may increase the size of the tumors, it is also contraindicated in spinal metastasis of malignant tumors. Moreover, burns tend to occur in patients with impaired sensation, and heat exacerbates the swelling when edema is present. When artificial joints or metal inside the body is exposed to deep heat, the heat becomes concentrated and burns tend to occur, and thus deep heat is contraindicated when metal is present in the body.

Traction

Traction is frequently performed in diseases of the cervical spine and for fracture reduction and fixation. However, because of the efficacy of anti-inflammatory analgesics, blocking therapy and the development of surgical procedures that replace it, traction is being used less often to eliminate low back pain. The recent

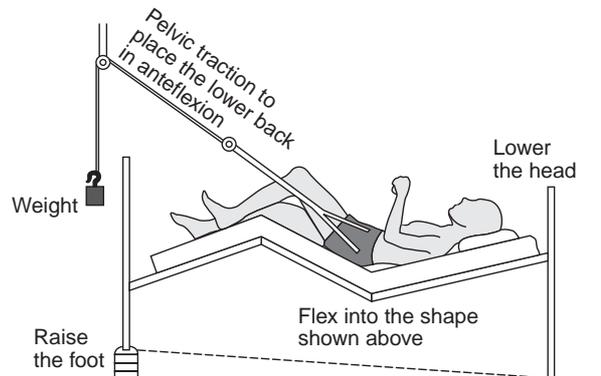


Fig. 3 Traction for lumbar intervertebral disc hernia

trend toward shorter stays in medical institutions can be cited as another reason why traction for low back pain has been replaced by other treatment modalities.

Traction exerts its greatest efficacy against low back pain when used to treat lumbar intervertebral disc hernia. As shown in Fig. 3, a pelvic traction band is usually wrapped around the pelvis with the patient resting in the supine position, and traction is applied by means of a 5–10 kg weight at the foot of the bed. This procedure is effective, because when the lumbar area—pelvis is flexed 20–30 degrees like a craft knife, it acts in a direction that reduces the protruding intervertebral disc back into position. Because of the strong traction toward the foot of the bed, the body imperceptibly slides in that direction, and the weight exerting the traction force may eventually touch the floor. To prevent that from happening, the head of the bed can be lowered slightly and the bottom raised by placing blocks under the legs at the foot of the bed and raising it 10 cm off the floor. When traction is applied in this manner, the symptoms improve within 3–7 days. Resolution of the low back pain is often observed in about 2 weeks, and the traction can be discontinued at that time.

The traction used for lumbar intervertebral disc hernias, called “pelvic traction”, used to be performed for lumbar spinal canal stenosis, which was diagnosed as sciatica, and was effec-

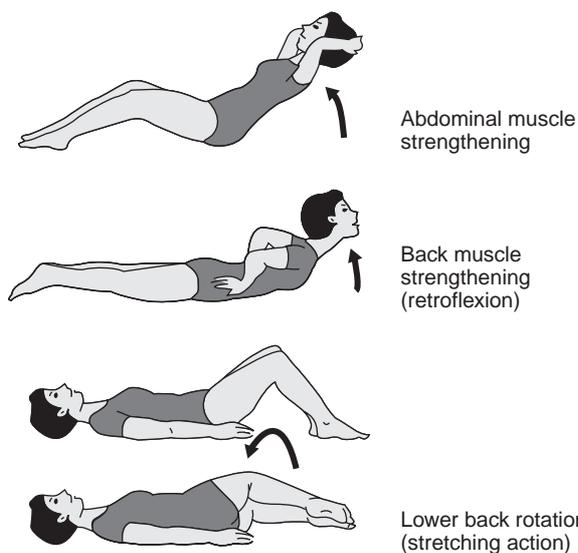


Fig. 4 Exercise therapy for chronic muscular low back pain (Hayashi, Y.: Stiff shoulder and low back pain. *The Journal of Therapy* 1991; 73(11): 2183)

tive. However, because its efficacy was unpredictable and temporary, the hospital stay was too long, etc., it is no longer performed for lumbar spinal canal stenosis, which is a degenerative disease, and blocking therapy or surgical therapy is performed instead. Traction seldom exacerbates symptoms, but because powerful force is exerted on the bones through the skin, it is necessary to check to be sure that no redness or foci of necrosis have developed in the skin. Moreover, when the weight is placed in a high position to prevent it from touching the floor, care must be taken to ensure that it does not fall and cause an accident.

Exercise Therapy (Muscle Strengthening)

Exercise therapy relieves low back pain in chronic muscular low back pain and degenerative diseases of the lumbar spine by strengthening the lumbar muscles and abdominal muscles. Lumbar muscles whose muscle strength has been increased by exercise are able to lifting the upper body, with the lower back acting as the pivot. The abdominal muscles act as a

“natural” corset, and as shown in Fig. 1, they contribute to raising the pressure in the abdominal cavity and reducing the load of the force on the lower back. Two simplified Williams’ exercises and stretch exercises performed before and after them appear to be useful for this purpose, and they are illustrated in Fig. 4.

Eliminating the movements of other muscles by slightly flexing the knees and slowly lifting the upper portion of the body by contracting the abdominal muscles alone is an effective means of strengthening the abdominal muscles. However, it is sometimes difficult to perform unless patients have regularly trained their abdominal muscles, and excessive repetitive abdominal strengthening exercises sometimes cause such intense pain the following day that the patient seems to have peritonitis. Because of this it is advisable to gradually strengthen the muscles by using techniques and numbers of repetitions tailored to each individual’s physical constitution. In regard to the lumbar muscles, there is a tendency to be kyphotic in osteoporosis and scoliosis is sometimes present in cases of intervertebral disc degeneration, making it difficult to bend the body back, and forcing the back into retroflexion may risk exacerbating the lower back pain.

Keeping these points in mind, lower back pain is often relieved by about 3–4 weeks after starting 20–30 repetitions of abdominal muscle and lower back muscle strengthening exercises a day. Before and after the training exercises it is useful to perform lower back rotation exercises in the same supine position by lowering the flexed knees to the right and left and stretching and moving the muscles and ligaments of the lower back and buttocks.

In the low back pain prevention exercise class in Tokyo that the author was involved in, practical training guidance centered on the exercises in Fig. 4 was provided for 10 weeks with the aim of establishing regular exercise habits at home. The result was improvement of the low back pain in 32 of the 50 participants (48 women, 2 men; mean age 53.8 years), and

measurements of several parameters in the patients who showed improvement revealed that the changes were significant.³⁾

Exercise therapy is the sole educational form of physical therapy for low back pain, and it demands an effort on the part of patients, but if patients can learn muscle strengthening and make it a regular habit, it is a “good medicine” that they can take with them wherever they go.

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