

The influence of the post-isometric relaxation technique of the iliopsoas muscle on the functional abbreviation of the lower limb.

Case study

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Hypothesis

1. Does the pir technique affect the elongation of a seemingly shortened leg?

2. What is the duration of the leg extension?

Introduction

Leg length discrepancy (LLD) is an effect often described in the literature as uneven length of the lower limbs. It covers about 40-70% of the population and can exceed 2 cm of inequality in nearly 0.1% [1]

Knutson et al. studied 573 people and found that only 10% of people have lower limbs of equal length [2]. The discrepancy in leg length has long been a source of controversy in the research and clinical environment. It disagrees on many aspects, such as its effect on various neuromusculoskeletal disorders and the evaluation of different measurement methods. [3]

LLD can be classified as an anatomical abbreviation of the lower limb when the difference is caused by deformities of structural origin that can be measured directly in the bones of the lower limbs, or of functional origin when the inequality is caused by postural disorders [4].

These two aspects have been linked to knee or hip osteoarthritis and other mechanical abnormalities in the event of incorrect load distribution [5,6].

In kinematics, gait asymmetries are observed, among other things; pelvic drooping and hip insertion in the stance phase) [7,8]

Some authors have found dysfunction of flexion in the sagittal plane of the hip, knee and ankle joint [7,9]. A reduction in load time, stride length and walking speed of a shorter limb were also observed [10].

The authors proved that LLD-induced kinetic asymmetries can initiate plantar tendonitis, low back and knee pain [11,12,13].

Two methods of measuring the abbreviation of the lower limb are used: the direct method, in which we make a measurement between; the anterior upper hip spine and the medial ankle in the supine position using a centimeter tape. [13] and an indirect method, consisting of LLD measurement by lifting to level the pelvis [14].

X-ray image is considered a priority for measuring the length of the lower extremities, but unfortunately exposes patients to ionizing radiation [15]. Measurements cannot assess dynamic changes in leg length because they are performed in a static position. Functional short-circuit of the lower limb

may result from adaptive shortening of soft tissues, from ligament flaccidity, from axial defects or from muscle contractures [16,17].

Blake and Ferguson[4]observed that the functional abbreviation of the lower limb could be caused by excessive asymmetric pronation in the foot. They confirm that the pronation of the feet is accompanied by a decrease in the longitudinal arch.

Fisk and Baigent [18] searched for causes in the hip joint and so, for example, in osteoarthritis of the hip joint as the cause of limb abbreviation and Gophton and Trueman [19] , they identified hip arthrosis as common problems in the longer limb. This situation was supported by both Friberg [20] and Rothenberg 21.

Friberg [20] suggests that increased pressure on the articular surface can then cause cartilage damage. Rothenberg [21] observed that sciatica is more common in the longer limb, and bursitis can occur on the side of the shorter limb.

Other authors have also noted an inequality in the length of the lower limbs associated with a number of knee problems. Holmes et al. [22] observed that 7 out of 61 cyclists with knee pain with iliotibial band syndrome also had a limb of unequal length of 6 to 9 mm documented by X-ray.

Subotnick [23] also proved that the iliotibial band It is more tense on a shorter leg.

Kujala et al. [24] they found that athletes with a lower limb length inequality greater than 5 mm had a statistically significant increase in knee injuries due to overload compared to the control group without lower limb length inequality.

Several authors suggest that treatment is not needed if the patient is asymptomatic,[25,26,27] but Gofton [28] believes that intervention in symptomless patients should be a prevention strategy to prevent future pathology.

Reid and Smith [29] proposed a measurement in terms of classifications of the length of the unequal lower limbs in which a discrepancy of 0 to 30 mm is taken into account as mild, from 30 to 60 mm as moderate and 60 mm or more of the length of the lower limb the discrepancy is considered serious.

Classification

None of us is symmetrical and there will often be some disproportion between one side and the other, and this can be considered physiological if it is within the normal range. Unfortunately, this is a relatively common defect, often considered insignificant, but it can lead to irreversible changes in the musculoskeletal system.

The spine and body posture depend on the alignment of the two parts of the pelvis and the sacrum. The position of the pelvis can be determined by the setting of individual bone points on the pelvis.

In the correct position of the pelvis, the bone points should be at the same level on both parts of the pelvis: Anterior upper iliac spines - equal on the same side
Posterior upper iliac spines - equal on the same side
Left and right iliac comb - equal on the same side

Symmetrical pelvic alignment, however, is rare. According to the author's statistics [37], more than 95% of patients have asymmetries of the pelvic alignment, which causes tilting of the base of the sacrum, provoking lateral curvature of the lumbar spine and compensatory lateral curvature of the remaining sections of the spine and an apparent change in the length of the lower limbs [37].

According to Ackermann, as a result of external force or sudden overload, the pelvic bone may be twisted in a clockwise or counterclockwise direction, which may lead to an apparent shortening or lengthening of the lower limb. Pelvic torsion leads to the pelvis being lifted upwards through too tense muscles and there is an intensification of the apparent abbreviation of the lower limb. In the standing position at full load, the pelvis tilts towards the shorter leg. The resulting muscle tension lifts - when the pelvis is relieved - this part of the pelvis again upwards [37]. Therefore, when lying down, you can measure the length of the limbs. While one part of the pelvis has become twisted, the other part of the pelvis is forced to move the opposite as compensation for this movement [36].

Twisting of the pelvic bones and the associated nerve irritation leads to muscle contracture, which leads to an apparent abbreviation of the leg [36]. Most often they react in the apparent abbreviation of the legs muscles – lumbar larger and smaller.

According to Ackermann, if the right leg has been apparently shortened, the lumbar spine compensates and bends towards the longer left leg. The manual examination of the legs was performed in the position of lying on the stomach, by a manually experienced therapist, grabbing the hock joints, holding the middle fingers of the thighs of the hands below the inner ankles. The upper part of the trunk is tilted back to be able to pull evenly by the legs. At the same time, the ew scoliosis of the lumbar spine is equalized and the actual abbreviation of the lower limb remains [36].

Anatomy:

The iliopsoas muscle shortened on one side causes a lateral bend of the lumbar spine and rotation in the opposite direction. It is related to the fact that it can increase the arc of scoliosis and rotation. Bilaterally tense iliopsoas m. causes deepening of lordosis. Its main function is the flexion and external rotation of the hip joint, deepens lumbar lordosis with fixed lower limbs, and with the flexion of the hip joints bends the lumbar spine [38].

Post-isometric relaxation technique

The technique of post-isometric muscle relaxation dates back to the 60s of the twentieth century. This technique relies on the physiological mechanism by which we can obtain a form of muscle relaxation and stretching. Its mechanism causes a reflex occurring in the muscles, which causes the opposite effect to stretching. In this way, the muscle tightens and contracts and thus has a protective effect against tearing. It is stated that the duration of muscle defense lasts about 30 seconds from the moment of stretching [30, 31].

The technique of post-isometric relaxation of the muscle begins with stretching the myofascial unit, to the first sensation of stretching but without pain, then the movement is stopped and resistance should be applied in the direction of limited movement. Then we perform muscle tension, it should be remembered that the movement must be in the form of isometric tension, the resistance should not be greater than 20% of the total muscle power, while the duration of the contraction should be from eight to ten seconds. It is necessary to remember that during muscle contraction there is no movement in the joint, which may be in a nearby area [32, 33].

The next phase after the tension of the myofascial unit is relaxation, which can be combined with exhalation. The relaxation time should last about 10 seconds and at this phase there is a passive stretching of the muscle to the sensation of the next barrier. One repetition: this is a cycle: muscle tension by the patient and relaxation along with increasing the range of motion. We perform two to 4 repetitions in 2-3 sets, which should be separated by 2 minute breaks [34, 35].

The technique of post-isometric muscle relaxation can also be used in the form of self-therapy.

Technique of execution:

In lying on the back, to set the starting position, you need to look for (spina iliaca anterior superior), set your thumbs on them and while maintaining the bend of the knees and hip degrees, start the flexion in the hip joint – increase them to look for the right level of spina iliaca anterior superior, if the (spina iliaca anterior superior) rises up during the hip bend, we leave this place and lower the leg down and from this moment we start the pir. Movement: the therapist resists the flexion in the hip and keeps up to 8 seconds in isometric tension, then we inhale and exhale. Then we repeat the exercise, looking for a new barrier



Pir m .hip-lumbar execution technique



Pir autotherapy m.iliopsoas

The patient was kneeling with a one-knee. The legs were set at the width of the hips, . Movement: Moving forward with the hip and knee of the leg in front. There should be a feeling of pulling around the thigh, groin , abdomen on the stretched side We try not to bend the trunk forward. We withstand the position for 8 seconds, relax, and then repeat the movement at least 3 times to each side.

Research material

A woman of 40 years, reporting symptoms: - fatigue pain of the right limb after prolonged walking / standing, - from time to time pain on the outside of the right thigh, (paraspinally), also the area of the iliotibial band, - pain in the sacroiliac joint after prolonged walking or running on the left side (longer limb), a feeling of jumping / instability of the knee on the medial side - during rotation of the lower leg and straightness, - point pains with longer sitting topography of points trigger m. quadrilateral ridge, . m.extensor of the back, - often neck pain (more often on the right side)

The following parameters are included for the study:

	Left	Right			
Relative length of the lower limbs	88cm	87cm			
Absolute length of the lower limbs	78,5cm	78cm			
Alignment of hip plates with board 1 cm	0	1cm board			
Test soleus muscle	-	+			
m.biceps muscle test	-	+			
Ober test	-	+			
Patrick's test	-	+			
Thomas test	-	-			
Two balance test	24kg	30kg			
Vertical projection from the occiput	1cm – deviation to the left	Lack			
skoliometr	cross bone o	l- peak 1 sin	th/l 1sin	Th- peak 4dex	th3 3dex
Inclinometer	Lordosis angle 37 degrees	Kyphosis angle 25 degrees			

Inclinometer assessment

The study began in a standing position, without shoes, hands were positioned along the trunk. The study began by applying the inclinometer to the sacrum, after which the inclinometer was reset. Then the device was applied to the thoracic-lumbar passage, and the value of lumbar. Again, without tearing the inclinometer from the back, the device was zeroed and set on the curvature of thoracic kyphosis in the vicinity of Th1 – Th3, where the value of thoracic kyphosis was read [39].

The therapy consisted of: - autotherapy of the hip-lumbar m. in the kneeling position of the single leg. 2x daily series in the morning and evening. - therapy with a therapist 1x – daily - pir

The study also used: Topographic points on the skin were determined using a washable marker designed for the skin, the following issues are specified:

Are the shoulders equal, at the same height?

Is the shoulder in protraction or retraction?

Is the shoulder blades at an equal height as far away from the spine?
Hip plates above?
Hip spines anterior, hip spines posterior hip spikes



Photo 1. Standing posture in front. Shoulder asymmetry, left shoulder higher, left shoulder more protruding, right shoulder blade lower, left shoulder protraction, spina iliaca anterior superior -right lower, forward.



Photo 2. Standing posture at the back asymmetry of the hip plates, left plate higher and rotated externally, kbtg left higher, kbtg right lower, asymmetry of knee folds, knee stextension left



Photo 3. Posture on the side (visible increased lordosis, contracture of the lumbar hips) th - flat)



Photo 4.Photos of feet at the back (visible increased load on the right foot on the side side, increased arch of the foot, increased supination of the right foot)



Photo 5. Standing posture at the back with a board of 1 cm (alignment of the posterior hip spines, alignment of the hip plates)



Photo 6. on the back without a board



Photo 7. after therapy from the front



Photo 8. after therapy from the back



Photo 9. after therapy from the side



Photo 10. after therapy with 1cm insert



Photo 11. after therapy foot

Results after therapy:

	Left	Right
Relative length of the lower limbs	88cm	88cm
Absolute length of the lower limbs	78cm	78cm
Two balance test	26	28
Vertical projection from the occiput	0,5cml	-
inclinometr	Angle of lumbar lordosis 34 degrees	Angle of thoracic kyphosis 25 degrees
skoliometr	L/S 0 th/11sin th4dex	

Conclusion

1. Unfortunately, the effect lasted up to two days after 6 weeks of therapy, after 2 days there was a return from before the therapy
2. The effect of hip-lumbar pir gave effects but unfortunately not permanent

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