

Screening for Lower Cross Syndrome in Asymptomatic Individuals- A Study Protocol

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Abstract

Background: lower cross syndrome results from muscle strength imbalance in the lower segment. It is characterized by specific pattern of muscle weakness and tightness that cross between the dorsal and ventral sides of the body. In lower-crossed syndrome, the patient typically has anterior pelvic turn, elevated lumbar lordosis (swayback), and weak abdominal muscles. Inaction may also have a detrimental effect on the mechanics of the body, such as immobilization, disuse or excessive postural discomfort, such as sitting at the workstation for long periods of time and poor posture. It also involves tightness of the iliopsoas, rectus femoris, fascia lata tensor, adductor group, gastrocnemius, and soleus. Pressure biofeedback device is used for the purpose of measuring and treating the transverse abdominis muscle. This study is needed because over time due to prolonged daily activities and lack of regular exercises in young people, this leads to muscle imbalance which leads to low back pain in this population. The goal of the study is to screen for lower cross syndrome in asymptomatic individual.

Aim and objective: To screen for lower cross syndrome in asymptomatic individual. **Materials and Methods:** Based on the inclusion and exclusion criteria, 300 individuals will be included in the study and the respective evaluation procedure for lower cross syndrome will be carried out.

Result: The expected results would include the data about whether lower cross syndrome would be detected in the asymptomatic individuals. Data will be analyzed using paired T-test.

Conclusion: based on the previous data of test and assessment we assume it will be beneficial in relieving the symptoms of lower cross syndrome.

Keywords: lower cross syndrome, Kinect azure, pressure biofeedback unit, Thomas test.

Introduction

Lower Crossed Syndrome (LCS) is a musculoskeletal condition characterized by unique patterns of muscle weakness (Abdominals and Gluteus Maximus) and tightness (iliopsoas and spinal extensors) that connect the dorsal and ventral sides of the body. This postural difference will lead to future Low back pain. This research therefore attempts to establish the screening of lower crossed syndrome in young people.

Lower cross syndrome is also known as pelvic cross syndrome or underkruz syndrome¹, resulting in

a disparity of muscle strength between deep abdominal musculature and gluteus medius, and gluteus maximus. This is a syndrome of postural distortion which affects the lower kinetic chain. The patient typically has anterior pelvic turn, elevated lumbar lordosis (swayback), and poor abdominal muscles in lower-crossed syndrome. These patients usually suffer from severe low back pain, piriformis syndrome and anterior pain in the knees. The lower cross syndrome involves oblique rectus abdominis, gluteus maximus, medium gluteus and hamstring.²

It also involves iliopsoas tightness, rectus femoris, tensor fascia lata, adductor group, gastrocnemius, and

soleus. It results in anterior pelvic movement, lumbar spine hyperlordosis, flexion hips and hyperextended knees. From a variety of scenarios such as chronic, repeated, running acts, low-cross syndrome can develop. Inaction may also negatively impact the body's mechanics, such as immobilization, disuse or constant postural pain, such as sitting for long periods of time and bad posture at the workstation. Lower cross syndrome is described in two distinct ways: one in the lower back and one in the hip. Rehabilitation of the lower cross syndrome is based on the Sherrington law of reciprocal inhibition which states that the opposite muscle relaxes when one muscle is shortened or tightened. So the pelvis, hip joint and lumbar spine will relax, with the Stretching of compressed muscles and muscle strength. Some muscles are overactive while others are inhibited as the muscles respond to protect the body from damage or pain.

As a result, joint stress is altered and muscle tiredness is increased. Postural or anti-gravity muscles are more readily activated for these defensive reactions. Meanwhile, muscles with predominantly dynamic or physical function appear to be impaired when physical stress occurs. When muscles react to prevent or reduce physical injury, normal patterns of movement are changed. Muscle strength affects performance of released motion. Additional effects of muscle imbalance include altered joint mechanics that cause unequal distribution of articular pressure and altered rotational centers that eventually contribute to joint instability and pain. The combination of strong and weak muscles induces changes in movement patterns resulting in changes in joint biomechanics leading to secondary degenerative changes. With a limited range of joint motion due to chronic tightness of the muscle, secondary associated joint hypermobility problems may occur.

Pressure biofeedback unit is used for the evaluation and treatment purpose of the transverse abdominis muscle.²

If the lordosis is deep and small, then the imbalance is mainly in the pelvic muscles; if the lordosis is shallow and extends into the thoracic region, then the imbalance predominates in the muscles of the trunk. Janda considered muscle imbalance to be an impaired relationship between muscles prone to tightness or

shortness, and muscles prone to inhibition. According to the source, our body primarily has two types of muscles, which are postural muscles such as iliopsoas, lumborum quadrates, erector spinae, back rotators, and phasic muscles such as abdominals, hip extensors, etc. He noted that static or postural muscles are predominantly tending to tighten. Individuals in the age group from late adolescence to 40 years are extremely involved in everyday life and are subject to different stresses.

In contrast to older people, the age-related changes in this age group are minimal. One of the most interesting hypotheses in physical medicine is that the fundamental mismatch between postural and phasic muscles in and around the pelvis perpetuates tension, strain and altered patterns of movement that account for the re-injury of these main structures.

Janda noticed that the hip flexors become shortened or tight due to prolonged static postures, such as sitting at a desk all day. The brain will therefore automatically start shutting down or inhibiting the muscles of the glutei that are on the opposite side. Now, due to the forward pelvic turn and hip flexion contracture, the imbalance pattern facilitates increased lumbar lordosis and over activation of hip flexors compensating for the weak abdominals.

Hip extension would be limited due to tightened psoas, and the presence of an inhibited antagonistic gluteus maximus would create a poor quality of hip extension because the contra-lateral lumbar erector spinae and ipsilateral hamstrings would have to become overactive and eventually tight to perform the necessary hip extension instead of the gluteus maximus. Low back pain is a common problem and lower crossed syndrome is one of the threatening combinations of lower back structures with biomechanical muscle dysfunction due to excessive stress. People with such postural imbalance sometimes complain of lower back pain and, if left unchecked, this postural imbalance may trigger a chronic lower back pain that becomes more difficult to correct at later stage.

Das S, Sarkar B, et al .This study showed that the prevalence of lower crossed syndrome was higher in females than in males of the same age group. It was also found that there is insignificant difference between males and females of the same age group in iliopsoas

(left sided) tightness. But there is a significant difference in length of spinal extensor, abdominal strength and maximum strength of bilateral gluteus, right iliopsoas length between males and females of the same age group, and females are more prevalent in developing weakness of these muscles. However in this study, the prevalence was not significant to the number of individuals screened.¹

There is need for this study because over the period of time due to prolonged daily activities and lack of regular exercises in young individuals, leads to muscle imbalance leading to low back pain in this population. Therefore the awareness regarding regular exercise and stretching would be possible by, screening individuals for lower cross syndrome flags in asymptomatic individuals for early detection, treatment, and prevention.

Objective: To screen for lower cross syndrome in asymptomatic individual and to prevent lower cross syndrome in the young individuals.

Methods

This research is being conducted in local communities in Wardha City, Maharashtra, India after ethical clearance is obtained from Institutional Ethics Committee, Datta Meghe Institute of Medical Sciences, Deemed to be University. Based on the inclusion and exclusion criteria, 300 individuals will be included in the study and the following evaluation procedure will be carried out.

Study Design: Observational study

Settings: Datta Meghe Institute of Medical Science, Sawangi Meghe, Wardha

Participants:

Inclusion criteria:

1. Asymptomatic individual,
2. Patients willing to participate

Exclusion criteria:

1. Chronic low back pain
2. Disc herniation,
3. Neurological deficits,

4. Respiratory conditions,

5. Patients who are not willing to participate or uncooperative.

VARIABLES:

Outcome measures:

There will be assessing of the following muscles:

1. Postural assessment- The posture will be evaluated with Kinect Azure which will provide detailed evaluation of posture in anterior, posterior and lateral view.³ Typically, Kinect data showed excellent validity and could be used to predict dynamic foot work. This approach has also been used for other anatomical measurements, including calculation of the curvature of the spinal cord, patient size, and lung function of the respiratory volume.

2. Thomas Test- This test is used to measure hip flexor muscle flexibility, which includes iliopsoas, rectus femoris, pectineus, gracilis, tensor fascia late and sartorius. The patient is normally supine, investigate excessive lordosis. Flex one hip, bring the knee to the chest to flatten the spine / support the pelvis. The patient keeps a flexed hip to the chest. If anterior tightness leg is present, the leg will lift off the bed. Intrarater reliability =0.52 interrater reliability =0.60, SEM =1 degree.⁴

3. Gluteus Maximus Strength Test: The patient's position is inclined to lie with one knee flexed up to 90 degrees. The patient lifts the thigh from the table while the examiner pushes the thigh raised towards the table. Compare bilateral muscle strength. The ICCS Ranged from 0.76-0.85 and from 0.75-0.83.⁵

4. Psoas Major Strength Test- The patient position is supine with one leg elevated, abducted and foot rotated externally 45 degrees. The patient elevates the leg and examiner resists it and stabilises the opposite ASIS. Compare the muscle strength bilaterally. It has a inter examiner reliability of cohane k unweighted score (κ - 0.67).⁶

5. Modified Schobers test: It measures the amount of flexion in the lumbar. The position of the patient is on his back while the examiner is standing. A mark is made on the vertebral column at the level of PSIS. Mark 5 cm below it and 10 cm above it, then ask

to touch the toes. Unless the rise in distance between the two fingers on the spine of the patient is less than 5 cm then this is indicative of restricting lumbar flexion or overly active erector spinae. The high values of Intraclass Correlation Coefficients (0.83 for flexion and 0.68 for extension) also indicated high reliability for between-days measurements.⁷

6. Modified Thomas test: this test is for rectus femoris muscle Patient posture is likely to lie with knees bent to 90 degrees, the examiner asks patients to resist while pushing against the flexed knee. Compare the strength of the muscles bilateral. it is having interrater reliability ($r = 0.91-0.93$; $ICC = 0.89-0.92$)⁸

7. Transverse Abdominal Muscle- The patient position is prone lying asks to pull in the stomach by increasing abdominal pressure stabilising the lumbar spine.

8. Active knee extension test: It is used to measure the length of the hamstring muscle and the extent of active knee extension in the hip flexion role. The patient lies supine with and is advised to move his leg to full hip flexion with arms raising his forearm to the chest; the patient is advised to vigorously flex the knee from the starting position to the full tolerable stretch in the hamstring muscle. Measure the angle with the goniometer. This test has excellent interrater reliability with interclass correlation coefficient (ICC) values of 0.87 and 0.81, standard error of measurement (SEM) = 3.5 and 3.8 degrees.⁹

9. Pressure biofeedback unit: A system used to test transversus abdominis. It is a simple instrument that records varying pressure in an air-filled pressure cell. This allows identification of body along with the spinal movements. This system functions as a stabiliser and can be used for activities focusing on joint protection and stabilization. This study found 0.47 [95 percent confidence interval (CI) 0.20 to 0.67] intra-class correlation coefficient (ICC) for inter-observer reliability, and 0.81 (95 percent CI 0.67 to 0.90) ICC for test-retest reliability.²

Study size: 300

Discussion

Muscle dysfunction is one of the most significant

risk factor of low back pain in the young population. Lower Crossed Syndrome (LCS) is a muscle imbalance that includes tightness of hip flexors, lower back muscles and abdominal weakness, gluteus maximus muscle; that alters the distribution of biomechanical force in lower back region and can lead to chronic low back pain. There is lack of literature which states the screening of lower cross syndrome in asymptomatic individuals. The present study will be conducted with the aim of screening the asymptomatic individuals suffering from lower cross syndrome.

In the pelvic cross syndrome originally suggested by Janda, the pelvis is more dorsal and this is associated with imbalanced trunk muscle coactivation with more dominant activity found in the extensors termed as posterior pelvic cross syndrome. Conversely, pelvis is more anterior in the other large category and this is associated with a predominant tendency for more flexor activity, known as anterior pelvic cross syndrome¹⁰.

Expected Results

Lower cross syndrome was detected in the young individuals but no study has been done on asymptomatic individuals. The result would include data about whether the measures taken were effective for screening lower cross syndrome. Once the study result is complete, data will be analysed using paired t-test and will be presented in the form of research paper.

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