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Tight Hamstring Syndrome Related Lumbar Disc Herniation and Its Rehabilitation Program to Two Case Reports

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Authors' contributions

This work was carried out in collaboration between all authors. Author EEK designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author OB managed the literature searches, analyses of the study performed the spectroscopy analysis and author FT managed the experimental process and author HRE identified the species of plant. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Tight hamstring syndrome (THS) is a symptom complex which has a varied pathogenesis. The syndrome usually occurs in childhood and adolescent period. It is characterized by tightness of lumbar, ischial and crural muscles.

Case Report 1: 17 year old male was complaining of low back and right leg pain which spread to the back right leg for last two month. He walking with limited forward flexion and right knee flexion. Stright leg raising test (SLRT) was leading to elevation of whole body like a board with painful and patient was suffering from pain when his legs was elevated to 30 degree. Popliteal angle of effected sign was 87 degrees. There was no weakness of lower extremity. MRI of lumbar spine showed L5-S1 right far lateral disc herniation. It was decided that patient's diagnosis was THS depending on lumbar discopathy. Medical treatment, conventional physical therapy (15 session) and Mulligan traction straight leg raise technique (TSLR) were applied (9 session). After the

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treatment his complaints were better than the baseline and the results of examination was improved.

Case Report 2: 19 year old male was was complaining of left leg pain which spread to the back left leg last four month. SLRT was leading to elevation of whole body like a board with painful and patient was suffering from pain when his legs was elevated to 40 degree. He was standing and walking with limited forward flexion and increased flexion at left knee. it was also decided that patient's diagnosis was THS depending on lumbar discopathy. Medical treatment, conventional physical therapy (15 session) and Mulligan TSLR technique were applied (9 session). After the therapy, his toe touching distance was 25 cm and SLRT was negative. Low back range of motion (ROM) was full.

Conclusion: As well as developing technologies and treatment approaches, we believe that early diagnosis of THS and its reason can prevent additional surgeries. Our cases which diagnosed THS related lumbar disc herniation improved with early intervention.

Keywords: Tight hamstring syndrome; lumbar discopathy; Mulligan technique.

1. INTRODUCTION

Tight hamstring syndrome (THS) is a symptom complex that has a varied pathogenesis [1]. The syndrome usually occurs in childhood and adolescence [2]. It is characterised by tightness of lumbar, ischial and crural muscles [3]. The mechanism that produces the hamstring spasm is not well understood, but hamstring tightness may certainly accompany any irritative lesion of spinal nerve roots [4]. Various intra and extraspinal diseases are considered to be involved [1,5]. The aspects are identical to those seen in cord-traction syndrome, the filum terminale syndrome or tight filum terminale [2]. The first description was made by Stork in 1935. Detailed definition was published by Güntz et al in 1958 [1]. The clinical symptom complex is induced by a fixed contraction of lumbar, ischiocrural and gluteal muscles, which fix the lumbar vertebral column and the hip joint typically in an extended position when the full extended leg is lifted up and frequently results in a typical shifting gait as well as a fixed scoliosis. The symptoms usually exist bilaterally and can still be experienced under anaesthesia. Subsequent reports emphasised the broadly diversified underlying diseases of THS [6,7].

Kayser at al. [1] published a multicenter retrospective study with 102 cases in 2006. Among these were lesion intervertebral disc disease, trauma, tumours, infection, aneurysmal bone disease, and congenital malformation.

Treatment is recommended according to diagnosis. Zhu et al. [7] stated that 10 patients whose diagnosis was THS dependent on lumbar discopathy had been surgically treated. Even six months after surgery four of the patients' hamstring tightness continued.

Mulligan has described the traction straight leg raise technique (TSLR), which is said to improve the range of the straight leg raise (SLR) in patients with low back pain. This procedure involves traction to the leg while lifting the limb through a painfree range of SLR. Indications for use are limited range of SLR together with low back pain with or without referred thigh pain. The TSLR technique has advantages over other treatment options, as it is a single painless intervention that is said to have immediate benefit. The SLR test is frequently used in the assessment of patients presenting with lumbar spine dysfunction and one of the few indicators that has been shown to identify the degree of impairment from low back pain. Furthermore, it has been suggested that improving the range of SLR has a beneficial effect in restoring normal movement and reducing the degree of impairment due to low back dysfunction [8]. A pilot study [9] provided evidence that the Mulligan TSLR technique improved SLR in patients with low back pain. Subsequently, in a study by Pratishtha et al, which involved 90 patients, the Mulligan TSLR stretch was shown to be more effective in improving hamstring muscle performance and flexibility [10].

Two cases with tight hamstring syndrome related lumbar disc herniation and their rehabilitation programs are presented in this manuscript.

2. METHODS

The demographic characteristics and pain history of two patients were established. Lumbar and lower extremity joints were evaluated by examination with plain radiographs,

computerised tomography (CT), and magnetic resonance imaging (MRI), in order to obtain differential diagnosis from inflammatory or infectious causes and tumours. Deep Tendon Reflexes and blood tests were evaluated. Toe touching distance was measured. Active knee extension test (popliteal angle) was used to evaluate hamstring tightness and was compared with the popliteal angle of the case's other low extremity. Range of SLR and popliteal angle was recorded with goniometers at first onset of discomfort reported by the patient. Measurements were repeated three weeks after the end of treatment.

In addition to medical and physical therapy, both patients were applied TSLR each session consisting of three replicates. This technique involves sustained traction applied to the limb with the knee extended. The patient is supine lying on a very low bed or on the floor and the practitioner stands facing the patient's affected side. The patient actively does the SLR and both the practitioner and the patient note the range. The practitioner now grasps the patient's lower leg proximal to the ankle joint and raises it off the bed to a position just short of the painful range. The practitioner flexes his knees and holds the clasped leg to his (practitioner's) chest. When the practitioner extends his knees this will effectively apply a longitudinal traction to the leg provided the bed is low enough and the practitioner is tall enough (Fig. 1). Sustain this traction and undertake a straight leg raise as far as it will go provided there is no pain. If there is pain, slightly rotate, abduct or adduct the hip while raising the leg. When pain free, SLR with traction is given three times [9]. Both photos of patients and clinical knowledge are used with permission.

Fig. 1. Illustration of TSLR application

3. CASE REPORT 1

A 17 year old male was admitted to the inpatient clinic of the department of physical medicine and rehabilitation complaining of low back and right leg pain, which had spread to the back of the right leg for the last two months. There was no night pain, complaints about upper extremities or previous trauma. However, he described heavy lifting two and half months ago. On examination, low back range of motion (ROM) was limited in flexion and last 20 degrees were painful, ROM in extension was limited and last 15 degrees were painful. Lumbar lordosis was decreased. There was no weakness of lower extremity muscles. Bilateral SLR test leading to elevation of the whole body like a board was painful and the patient was suffering from pain when his legs were elevated to 30 degrees (Fig. 2). He was standing and walking with decreased lumbar lordosis, limited forward flexion and increased flexion at the right knee (Fig. 3). Lower extremity joints, hip and sacroiliac joints were evaluated as normal. MRI of lumbar spine showed L5-S1 broad-based central disc protrusion (Figs. 4, 5).

Fig. 2. Case 1 with board sign in tight hamstring syndrome

The deep tendon reflexes were assessed as normal brisk response. Results of blood test were found to be within normal limits. Toe touching distance was 45 cm. According to the results of the examinations, it was decided that the patient's diagnosis was tight hamstring syndrome depending on lumbar discopathy. Popliteal angle was used to evaluate hamstring tightness and was compared with the popliteal angle of the case's other low extremity. Pre treatment, right popliteal angle was 87 degrees and left popliteal angle was 34.5 degrees.

Fig. 3. When standing he had decreased lumbar lordosis, limited forward flexion and increased flexion at right knee (case 1)

Medical treatment (nonsteroidal anti inflammatory and myorelaxant drugs), conventional physical therapy (ultrasound, hotpack and tens) was applied for 15 sessions (five days per week) and Mulligan TSLR was applied for 9 sessions (three days per week).

After the treatments, he was reevaluated. Toe-touching distance decrased from 45 cm to 32 cm. Along with the decrease in toe-touching test, lumbar lordosis increased to close to normal. Despite this, lumbar ROM was still limited in flexion and the last 10 degrees were painful but ROM in extension was full and painless, and his legs could be elevated to approximately 90 degree without elevation of the whole body like a board (Fig. 6). Forward flexion was increased and right knee flexion was decreased at standing and walking. Post treatment right popliteal angle was 62.5 degrees and left popliteal angle was 34.5. Right popliteal angle was reduced 24.5 degrees.

Eventually, after the treatment his complaints were better than the baseline and the results of examination were improved.

Fig. 4. Magnetic resonance imaging: T2 weighted sagittal view L5-S1 broad-based central disc protrusion (case 1)

Fig. 5. Magnetic resonance imaging: T2 weighted axial view L5-S1 broad-based central disc protrusion; right root compression is more obvious (case 1)

Fig. 6. His bilateral SLR without elevation of the whole body like a board after medical treatment, physical therapy and application of Mulligan TSLR (case 1)

4. CASE REPORT 2

A 19 year old male was admitted to the outpatient clinic of the department of physical medicine and rehabilitation. He complained of left leg pain, which had spread to the back left leg for the past four months. The patient did not define any previous trauma, night pain, complaints about upper extremities or heavy lifting. However, the patient was a licensed basketball player. On examination, lumbar ROM was limited in flexion and the last 10 degrees were painful; ROM in extension was not limited. Lumbar lordosis was almost normal. There was no weakness of the lower extremity muscles. Bilateral SLR test leading to elevation of the whole body like a board was painful and patient was suffering from pain when his legs were elevated to 40 degrees (Fig. 7). He was standing and walking with limited forward flexion and increased flexion at the left knee. Lower extremity joints, hip joints and sacroiliac joints ROM were evaluated as being within normal limits and these joints were evaluated with plain radiographs, CT, and MRI as normal. MRI of lumbar spine showed L5-S1 disc protrusion (Figs. 8, 9). Deep tendon reflexes were viewed as normal with a brisk response. The results of the blood test were found to be within normal limits. Toe touching distance was 39 cm at baseline. Pre treatment right popliteal angle was 22.5 degrees and left popliteal angle was 60.5 degrees.

According to all of the examination results, it was decided that the patient's diagnosis was tight hamstring syndrome depending on lumbar discopathy. Medical treatment was prescribed as 1 mg tetracosactide for four doses, nonsteroidal anti inflammatory and myorelaxant drugs. In

addition, bed rest was recommended. After the treatment period, the patient was re-evaluated. The patient's pain complaints were reduced, but his hamstring tightness continued. Therefore, conventional physical therapy (ultrasound, hotpack, and tens) was applied for 15 sessions (five times per week) and Mulligan TSLR technique was applied for 9 sessions (three days per week). After the therapy, his toe touching distance was 25 cm and SLR test was negative with no elevation of the whole body like a board (Fig. 10). Low back range of motion (ROM) was full and painless. Post treatment right popliteal angle was 22.5 degrees and left popliteal angle was 47.5 degrees. Left popliteal angle was reduced 13 degrees.

Fig. 7. Case 2 with board sign in tight hamstring syndrome

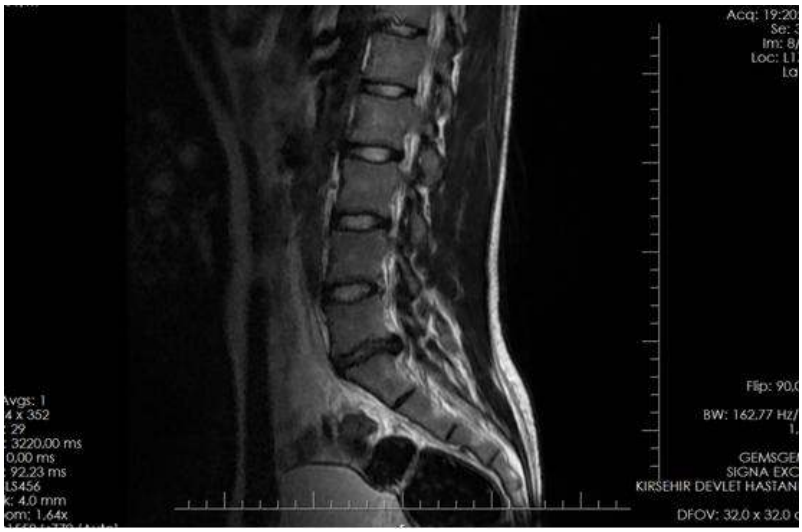

Fig. 8. Magnetic resonance imaging: T2 weighted sagittal view L5-S1 disc protrusion (case 2)

Fig. 9. Magnetic resonance imaging: T2 weighted axial view L5-S1 disc protrusion; Left S1 nerve root was significantly compressed (case 2)

Fig. 10. His bilateral SLR after medical treatment, physical therapy application and Mulligan TSLR (case 2)

5. DISCUSSION

There are several articles about THS and its rehabilitation, but most of them are case reports or very dated [3,4,7,11] so the terminology regarding this symptom complex is not yet standardised.

When the legs are raised with the patient in a supine position the entire trunk follows since the hips cannot be flexed passively due to the reflex spasm of the ischiocrural and lumbar extensor muscles.This unusual appearance is entitled "board symptom" in THS [4].

Hauberg et al. firstly drew a comparison with segmentally delimited, pain-reflecting muscle fixation. A fixed scoliosis and a typical waddling gait often exist [1].

MRI is safe and sensitive for studying young patients [12]. There is distinct nature of disc herniation in children so that the physical (mechanical) limitation is far more prominent than the focal findings such as reflex changes, sensory or motor deficits [13]. It is important to note that in paediatric patients with intervertebral disc disease SLR test is present in 100% of patients [13]. The SLR test is almost always restricted to some degree by any irritation of the lower lumbar nerve roots and is associated with pain in the lower part of the back and along the course of the sciatic nerve; however, in cases of tight hamstrings syndrome SLR test is greatly restricted without associated pain [1-3]. In the present study, two cases with THS were assessed at the baseline and after the treatment period. According to treatment results of these two cases toe-touching distance decreased and pain was relieved in both of them.

Gait abnormality is pathognomonic for this syndrome [3]. It is characterized that the decrease in the anterior inclination of the pelvis, limited forward flexion as well as flexed hips and knees. In the literature, it is shown that gait abnormality is associated with THS.

The muscle-skeletal system develops very quickly in adolescents. Jozwiak et al. [14] suggested that, during this growth spurt, the alternately relative shortening of the hamstrings and quadriceps stimulates each other's lengthening growth by the traction they produce across the knee joint. In that case, long-term irritation of the sciatic and results of hamstring spasm can disrupt the balance of growth. Similarly Zou et al. [7] described "It is possible that the long duration of sciatic nerve tension caused the hamstring spasm to become a structural tightness." Their patient group had a much longer history so that they needed osteotomy after discectomy operations.

Atalay et al. [3] observed that recovery of spinal mobility and range of SLR was slow even after surgery but their case had suffered from pain and tightness for seven months when he was admitted to the clinic. Similarly, Bulos stated that in one patient recovery was still incomplete six months after the operation [15]. However, our cases' diagnosis that it was tight hamstring depending on lumbar discopathy were diagnosed earlier than those in previous reports.

In these two cases, we applied medical treatment, conventional physical therapy (ultrasound, hotpack, and tens) and Mulligan TSLR technique [16]. Mulligan described TSLR, which is said to improve the range of SLR in patients [8]. Hall et al. [9] demonstrated a significant increase in range of SLR of 11 degrees after only one application of TSLR technique in subjects with low back pain. Dixon and Keating stated that improvement in range of SLR must be greater than six degrees in order to state that a real change in SLR range has occurred [17]. Furthermore, in a single-case study design, it has been shown that improvement in range of SLR as a primary goal of treatment had a significant effect on reducing chronic pain [18]. Habertsma and Goeken [19] indicated hamstring stretches did not make tight hamstrings less stiff but rather influenced the

stretch tolerance of the muscles. The TSLR technique induced changes to hamstring muscle stretch tolerance and, therefore, greater range of hip flexion reduced the mechanical stress of SLR on the painful lumbar structures. Hall et al. [20] measured electromyographic and pain responses during the SLR test in normal and neural mechano-sensitised subjects. They interpreted early-onset muscle activity as a protective mechanism for the sensitised neural tissues. It is possible that the increased range of SLR found in our study may be a result of inhibiting pain and muscle activity, pain inhibition as well as changes to motor function. Various receptors exert an inhibitory influence on lower limb alpha-motoneuron activity. Golgi tendon organs around the knee, hip and spine probably initiate various segmental reflex pathways during traction of the limb. Likewise, Golgi tendon organs are activated during large amplitude stretching movements such as SLR [9,10,21,22].

Although there is no study about popliteal angle evaluation with tight hamstring after applying TSLR, only one study evaluated popliteal angle in an asymptomatic male after applying TSLR. That study supports our case report. In the study they proved that Mulligan TSLR shows a significant improvement in knee ROM when applied to tight hamstring for a prolonged period of time (three weeks) [23]. We also applied Mulligan TSLR for three weeks (three sessions per week).

6. CONCLUSION

As well as developing technologies and treatment approaches, we believe that early diagnosis of THS and its causes can prevent additional surgery. Our cases that were diagnosed with THS related lumbar disc herniation improved with early intervention.

CONSENT

Both patients have confirmed to use images and medical information in an article.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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