

AUSTRALIAN COLLEGE OF NATURAL MEDICINE
BACHELOR OF HEALTH SCIENCE MUSCULOSKELETAL THERAPY

Musculoskeletal Therapy of the Lower Extremity

Case Study Number 01 – Severs Disease

Alicia Larissa Jackson 220800

CASE STUDY # 1 SEVERS DISEASE	2
Step 1: History and Initial Observations.....	2
Step 2: Develop a Differential Diagnosis	2
Step 3: Select Appropriate Algorithm and Blocks.....	4
Step 4: Develop a Primary Diagnosis.....	4
Step 5: Ask Additional Questions	5
Step 6: Physical Examination	5
Step 7: Make a Working Diagnosis	6
Step 8: Develop a Treatment Plan	7
Step 9: Implement the Treatment Plan	9
Step 10: Confirm a Diagnosis	9
BIBLIOGRAPHY.....	10

CASE STUDY # 1 SEVERS DISEASE

Step 1: History and Initial Observations

History:

Chief Complaint:

The patient, Mei Mei, is a 9 year old female. Mei Mei is a slim, extremely active child who has just made her local gymnastic team. She is also an avid runner and is on the school athletics team. Since Mei Mei started gymnastics, she has begun to experience pain in the back and sides of both of her heels. Her mother has noticed that she has started to limp and her coach has also reported that Mei Mei's pain is worse when she points her toes before take off.

Previous History:

Mei Mei has a very healthy and active lifestyle. There is nothing wrong with her other than the pain in her heels. There is no history of previous injuries to the area or any other significant history findings.

Contributing Factors:

Pain is aggravated when the patient is active, during athletics and gymnastics. Running and jumping are found to increase the pain significantly and any techniques 'enpointe' are excruciating to sustain. The running surfaces that Mei Mei plays sports on are hard dirt or concrete. Mei Mei is finding that days on which she is playing sport, the pain is worse.

Relieving Factors:

The pain is relieved when Mei Mei takes time off from sports and during non-weight bearing. Mei Mei's mother has been applying ice to her heel which has been helping to relieve the pain for a short time. Mei Mei's mother has been giving her neurofen on the nights that the pain is relatively severe.

Lifestyle Factors:

Mei Mei is an extremely active young girl, she is small framed and very healthy. Sports take up most of her time and are her main hobby.

Initial Observations:

General:

Mei Mei is small framed; she has well defined muscles and tends to walk with a slight limp/antalgic gait on both sides. She also has tight gastrocnemius and Soleus muscles.

Regional:

Mei Mei has mild swelling of the calcaneus and some calcaneal enlargement bilaterally, however the tightness on the right is slightly worse than the left. There is a slight lump at the back of both of the heels.

Step 2: Develop a Differential Diagnosis

Possible Conditions:

- ≈ Sever's Disease
- ≈ Achilles Tendon Pathology
- ≈ Calcaneus Fractures (stress fracture)
- ≈ Tarsal Coalition
- ≈ Non-neoplastic Conditions Simulating Bone Tumors
- ≈ Osteomyelitis

Anatomical Structures Involved:

Muscles:

- | | |
|---------------------------------------|------------------------------|
| ≈ Tibialis anterior and posterior | ≈ Peroneus longus and brevis |
| ≈ Extensor hallucis longus and brevis | ≈ Intrinsic foot muscles |
| ≈ Extensor digitorum longus | ≈ Gastrocnemius |
| ≈ Flexor hallucis longus and brevis | ≈ Hamstrings |
| ≈ Plantaris | ≈ Soleus |

Bones:

- | | |
|-----------------------------|---------------|
| ≈ Tibia (medial malleoli) | ≈ Tarsals |
| ≈ Fibula (lateral malleoli) | ≈ Metatarsals |
| ≈ Patella | ≈ Phalanges |
| ≈ Calcaneus | ≈ Talus |

Ligaments:

- | | |
|---------------------------------------|----------------------------|
| ≈ Anterior talofibular ligament | ≈ Long plantar ligament |
| ≈ Posterior talofibular ligament | ≈ Calcaneocuboid ligament |
| ≈ Deltoid ligaments | ≈ Calcaneofibular ligament |
| ≈ Calcaneonavicular (Spring) ligament | |

Fascia:

- ≈ Planter fascia (aponeurosis)
- ≈ Anterior and posterior lower limb fascia

Mechanisms of Injury:

- ≈ direct or microtrauma to the growth centre of the posterior calcaneus
- ≈ hard playing surfaces
- ≈ shoes - poorly padded
- ≈ cleats
- ≈ poor support
- ≈ excessive foot pronation
- ≈ tight Achilles tendon

Most Likely Diagnosis:

The most likely diagnosis is Sever's disease with associated hypertonicity of the Gastrocnemius and Soleus muscles, resulting in inflammation and swelling of the calcaneal attachment causing significant pain and disability.

Step 3: Select Appropriate Algorithm and Blocks

There is no specific algorithm leading to the diagnosis of this condition however the algorithm for non traumatic or insidious onset of foot pain can be used to rule out other possible conditions. (Souza p 397)

Step 4: Develop a Primary Diagnosis

Sever's disease is defined as "a traction apophysitis of the attachment of the Achilles' tendon to the calcaneus" (Brukner, P, Khan, K, 2001). It is classified as a child and adolescent non-articular osteochondrosis, and is the second most common osteochondrosis seen in the younger athlete after Osgood-Schlatter disease.

Symptoms include a gradual onset of heel pain and tenderness in a growing, active child that is bilateral in 60% of cases. Pain is aggravated by walking, the child may have a limp, and symptoms are worse after activity and in the morning. Pain is often relieved by rest and avoidance of sporting activities. There is localised tenderness and swelling at the site of insertion of the Achilles' tendon, pain on deep palpation of the Achilles, and pain whilst performing active toe raises. Forced dorsi-flexion of the ankle also proves uncomfortable and is relieved with passive equinus positioning. In long-standing cases, the child may have calcaneal enlargement. There is an increased incidence in children involved in running and jumping sports, and the condition is more common in males 10 to 12 years of age, although in females occurs at a younger age, around 8 to 10 years of age.

During adolescence, rapid growth phases cause bone to lengthen before muscle and tendon are able to stretch correspondingly; and before the musculotendinous complex is able to develop the necessary strength and coordination to control newly lengthened bone. Tendon attachment sites, the apophyses, are cartilaginous plates that provide a relatively weak cartilaginous attachment, predisposing to the development of avulsion injuries. (Brukner, P, Khan, K, 2001 Pg. 652) The calcaneal apophysis in the heel develops as an independent centre of ossification, although it can occasionally be multiple, appears in boys aged 9-10 years with fusion by 17, and in girls at slightly younger ages. During puberty, the apophyseal line appears to be weakened further because of increased fragile calcified cartilage and micro-fractures are believed to occur because of shear stress leading to the normal progression of fracture healing. Sever's disease is believed to be caused by decreased resistance to shear stress at the bone-growth plate interface, and the anatomy of the calcaneal apophysis lends to significant shear stress because of its vertical orientation and the direction of pull from the strong gastroc-soleus muscle group. (<http://www.emedicine.com/orthoped/topic622.htm>)

Management of Sever's disease consists of activity modification, stretching, strengthening and reduction of inflammation so that the child may become pain free. Limitation of activity, particularly running and jumping is necessary, although patients with symptoms that are not severe enough to warrant limiting sports activities or if the patient and parents are unwilling to miss a critical portion of the sport season, wearing a half-inch inner-shoe heel lift (at all times during ambulation), a monitored stretching program focusing on gastrocnemius, soleus and hamstrings, strengthening of the ankle plantar-flexors, pre-sport and post-sport icing, and judicious use of anti-inflammatory agents normally reduces the symptoms and allows continued participation. If symptoms worsen, activity modification must be included. Advice may be given to the

patient that the condition will always settle, approximately within six to twelve months, occasionally with symptoms persisting up to two years. In order to prevent the recurrence of the child's condition, the parents, coaches and trainers of the child are instructed on an exercise and stretching program that they are encouraged to perform throughout their training; and be aware of their symptoms in order to initiate early protective measures or seek medical attention before the condition becomes acute.

Step 5: Ask Additional Questions

1. Have you seen a doctor about the pain?
2. How long has this condition been present for?
3. Have you sought any treatment for this condition?
4. Are you taking any other medications?
5. Is there any other pain in the foot or the toes?
6. Is the pain triggered by any other movements?
7. Does squeezing the heel increase the pain?
8. Is the inflammation increased with activity?
9. Does the pain occur during or after the activity?
10. Is the pain relieved with the ice massage?
11. Have you been stretching before and after sports, if so, what stretches?
12. Have there been has you coach mentioned anything that you should be doing.

Step 6: Physical Examination

Inspection:

General:

≈ Asymmetries, bony landmarks, fascial tautness, shadowing, obvious anomalies.

Regional:

≈ Joint orientation, bony landmarks, shadowing, fascial tautness, muscle bulk or atrophy, tissue texture, edema, redness, calluses, structural alignment and assessment of shoes to view lines of force.

Palpation:

- ≈ Near touch
- ≈ Skin and superficial fascia
- ≈ Muscles
- ≈ Joints

Tests Performed:

- ≈ Gait analysis and postural analysis of the lower limbs
- ≈ Active range of motion at the Hip, knee, ankle and foot
- ≈ Passive range of motion at the Hip, knee, ankle and foot
- ≈ Active resisted range of motion at the Hip, knee, ankle and foot
- ≈ Joint play at the Hip, knee, ankle, tarsals and metatarsals

Special tests:

- ≈ Leg-Heel alignment Test
- ≈ Hoffa's Test For calcaneal fracture
- ≈ Morton's neuroma test
- ≈ Tinel's sign at the ankle (anterior tibial branch of deep peroneal nerve and posterior tibial nerve)
- ≈ Feiss Line test (determines the degree of a flat or pronated foot)
- ≈ Kleiger test for deltoid ligament tear
- ≈ Anterior drawer test for ankle instability
- ≈ Talar tilt for ankle instability

Potential Risks of Selected Tests

There may be a risk of passively taking the injured area past the bind with PROM, as it is not limited by the patient's pain as with AFROM, and care must be taken when applying overpressure to the affected joint. Active resisted muscle strength testing can also be provocative of pain and could aggravate a muscle strain if performed vigorously. Some special orthopaedic tests can be provocative, so any test which aims to reproduce the patient's symptoms has the associated risk of making the symptoms worse.

Test Sequence:

- ≈ Active – AROM
- ≈ Passive – PROM
- ≈ Active resisted – ARROM
- ≈ Joint Play
- ≈ Special Tests

Step 7: Make a Working Diagnosis

Findings

Inspection/Postural Analysis:

General:

- ≈ Patient is of average height and weight for her age and appears fit and healthy with good muscle tone
- ≈ Patient has an antalgic gait, walking with discomfort on both feet. The patient is avoiding rising up onto the toes (plantar flexion) during the toe off phase of walking.
- ≈ The patient has a painful facial expression when walking
- ≈ The patient is wearing her joggers so they can be examined.

Regional:

- ≈ Slightly pronated feet bilaterally
- ≈ Visibly noticeable muscle tone on lateral and posterior aspect of lower leg
- ≈ Slight oedema/puffiness around the posterior aspect of the calcaneus
- ≈ Feet are callused from frequent wearing of sports shoes
- ≈ Some redness over the posterior aspect of the calcaneus

Palpation:

- ≈ Fascial restrictions over the lateral and posterior aspect of the lower leg and the posterior aspect of the thigh. The plantar fascia is lengthened due to pronation, and taut.
- ≈ There is tenderness on palpation of both calcaneal bones and their attachments
- ≈ Heat is palpated over the posterior aspect of both calcaneal bones
- ≈ Peroneus longus and brevis, soleus, gastrocnemius and the hamstrings were hypertonic and tender on palpation.
- ≈ The above muscles had trigger points within the hypertonic bands.

Muscle tests:

- ≈ Gait analysis and postural analysis – The patient has an antalgic gait with limping on both feet. There is decreased plantar flexion of the feet during the toe off phase of walking with both feet. Both feet pronate when weight bearing.
- ≈ Active range of motion at ankle was decreased and painful in both dorsi and plantar flexion movements and worse when weight bearing.
- ≈ Passive range of motion at the ankle resulted in pain and restriction with dorsi flexion particularly with the knee extended. Passive hip flexion with the knee extended was also restricted.
- ≈ Active resisted strength testing showed pain at the calcaneus with resisted plantar flexion of the foot.
- ≈ Joint play at the calcaneus was restricted into varus. The tarsals were slightly hypermobile.

Special Tests:

- ≈ Leg-Heel alignment Test = Bilateral hind foot valgus
- ≈ Hoffa's Test For calcaneal fracture = -ve
- ≈ Morton's neuroma test = -ve
- ≈ Tinel's sign at the ankle (anterior tibial branch of deep peroneal nerve & posterior tibial nerve) = -ve
- ≈ Feiss Line test (determines the degree of a flat or pronated foot) = 2nd degree flat foot
- ≈ Kleiger test for deltoid ligament tear = -ve
- ≈ Anterior drawer test for ankle instability = +ve (very slight excess movement of the talus)
- ≈ Talar tilt for ankle instability = +ve (very slight excess movement of talus)

Working diagnosis

From the information and the assessment conducted, it was concluded that the patient suffers from bilateral Sever's disease predisposed by excessive pronation and hypertonic gastrocnemius and Soleus muscles, resulting in bilateral pain and reduced Dorsiflexion, maintained by repetitive microtrauma from extreme levels of high impact exercise.

Step 8: Develop a Treatment Plan

Aims of treatment

- ≈ Decrease the pain and sympathetic nervous system firing
- ≈ Improve range of motion

- ≈ Increase pain free ranges
- ≈ Allow for return to pain free exercise
- ≈ Reduce hypertonicity and muscle spasm
- ≈ Educate the patient and her coach towards an appropriate strengthening and stretching program
- ≈ Referral to a podiatrist for correction of foot biomechanics via the use of orthotics
- ≈ Decrease local swelling and irritation

Treatment plan

Length:

- ≈ 60 minute session
- ≈ 2 sessions a week for 4 weeks, then once a week for another 4 weeks.
- ≈ Review after week 6-8 and cease, continue or refer as appropriate.

Treatment components

- ≈ Positioning – prone, side lying and supine
- ≈ Pre-treatment heat packs applied to the lower leg, avoiding the inflamed Achilles attachment
- ≈ begin with the patient received gentle effleurage and petrissage over both of the lower limbs to help relax the patient and prepare the area for more vigorous techniques.
- ≈ Myofascial release over the lateral and posterior lower leg, anterior, posterior and lateral thigh region
- ≈ Deep Myofascial stripping, pin and stretch and active engagement techniques through the peroneals, gastrocnemius and Soleus. The upper leg would benefit from the same treatment to the ITB
- ≈ Cupping (moving) to the ITB to increase local circulation and reduce fascial restrictions, may also be applied statically to the superior heads of the gastrocnemius.
- ≈ NMT, including trigger point release to the peroneals, Soleus, gastrocnemius, tibialis posterior, TFL, hamstrings, quadriceps, Gluteus medius
- ≈ Positional release techniques should be applied to above trigger points/muscles that elicit a pain response of 7 or above.
- ≈ Myofascial dry needle therapy to the Achilles tendon and the musculotendinous junction, Gluteus medius, Gastrocnemius and Soleus
- ≈ Met and PNF to the hypertonic gastrocnemius, soleus, peroneals, hamstrings and quadriceps
- ≈ Golgi tendon organ release to the Gastrocnemius
- ≈ Cross fiber frictions to the Achilles tendon and musculotendinous junction after the acute phase has passed and follow with ice application
- ≈ Mobilisation of the calcaneus into a varus position

Rehabilitation/home exercises

- ≈ Application of ice to the region both before and after training on hard surfaces
- ≈ Cease training to rest the injured area, this may help the condition to self resolve
- ≈ Core stabilisation would be covered by her intensive gymnastics training regime, therefore, additional exercises are not necessary

- ≈ Range of motion exercises to improve and maintain range of motion of the ankle
- ≈ Referral to a podiatrist to orthotics and other foot biomechanical changes, as well as advice on appropriate foot wear
- ≈ Self stretches to the gastrocnemius, soleus, peroneals, tibialis posterior, hamstring and quadriceps
- ≈ Strengthening of tibialis anterior, vastus medialis oblique, toe gripping exercises to strengthen the plantar surface of the foot.

Step 9: Implement the Treatment Plan

- ≈ The working diagnosis and treatment plan were explained to the patient and informed consent was obtained.
- ≈ An approximate time frame for the patient to feel relief from the condition was given along with advice on how to avoid aggravating the condition. The patient was also told that the condition may take a couple of months to improve, but is a self resolving condition.
- ≈ Mei Mei was given an exercise program which involved the stretches and strengthening exercise for the lower limb.
- ≈ The patient was advised on hydrotherapy treatments and self massage to encourage relaxation and pain reduction.
- ≈ Self stretches for the shortened structures were given to the patient
- ≈ Educate Mei Mei's parents and coach about the condition and how to recognize that a flare-up of the condition is about to occur. This will also be beneficial as a strengthening and stretching program can also be shown to the coach for use in the warm-up and cool down phase of the training.

Step 10: Confirm a Diagnosis

The diagnosis of Sever's disease was confirmed when symptoms were significantly reduced following the treatments that the patient received.

- ≈ After 2 weeks the patient found a significant decrease in pain.
- ≈ The treatments showed a decrease in the inflammation and the severity of the pain. There was less pain with Dorsiflexion and the patient's limp has decreased slightly. Mei Mei is now able to stand on her toes without pain.
- ≈ The patient has been performing her exercises and stretches, this has notably improved her posture and lower limb biomechanics.
- ≈ Mei Mei has been to the podiatrist, where she was given orthotics to correct her foot biomechanics
- ≈ Results were evaluated after every treatment session.
- ≈ The patient will continue to have monthly assessments and treatments as required until there is 100% improvement on initial pain for 1 month or more.
- ≈ Continue with stretching program and the exercises.

BIBLIOGRAPHY

Brukner, P., Khan, K. 2001, *Clinical Sports Medicine*, Second edition, McGraw-Hill Australia Pty Limited.

Fritz, S. 2004, *Essential Sciences for Therapeutic Massage*, second edition, Mosby, St. Louis, Missouri.

Hertling, D. and Kessler, R.M., 1996 *Management of Common Musculoskeletal Disorders, Physical Therapy Principles and Management, 3rd ed.* Lippincott Williams and Williams.

Kendall, F., McCreary, E., Provance, P., Rodgers, M. & Romani, W. 2005, *Muscles Testing and Function with Posture and Pain*, 5th Edition. Lippincott Williams & Wilkins, Philadelphia.

Magee, D. 2002, *Orthopaedic Physical Assessment*, 4th Edition, Elsevier, Philadelphia, Pennsylvania.

Souza, Thomas A. 2005, *Differential Diagnosis and Management for the Chiropractor, Protocols and Algorithms*, 3rd edition. Canada: Jones and Bartlett International.

Rattray, F., Ludwig, L. 2005, *Clinical Massage Therapy – Understanding, Assessing and treating over 70 Conditions*, 11th edition Talus Incorporated, Canada