

Case Study: Lower Limb Biomechanics



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Using orthotic therapy can be rewarding for both the patient and the practitioner, personally I really enjoy the deductive process that is required in the assessment procedure. In this issue I would like to present a case which I treated just recently and how the appropriate treatment and orthotics were prescribed to successfully treat the cause of the patients pain and discomfort.

Case Study: Presenting Condition

A 35 year old female patient weighing 65kg attended my clinic complaining of the following:-

- Painful heels in both feet (medial) when getting out of bed in the morning or after sitting for some considerable time.
- Pain on the medial side of both knees - mainly when walking up and down stairs.
- Pain in the groin area (both sides) usually after about 10 minutes of walking or standing.
- Lower back pain in the lumbar region – the pain being greater on the right side when she stands for more than 5 minutes in one spot. After 15 minutes of walking the pain becomes constant.

A good idea is to take the information from the assessment (see Figure 1), and draw a 'stick diagram' (using the measurements from the assessment)

as a visual aid in the explanation to the patient (see Figure 2).

NAS ASSESSMENT	R	L
RCSP:	X	X
NCSP:	0	0
Leg Length:	-	-
FFT:	-	-
M.P.:	High external	High external
Hip ROM:		
Int:	60°	60°
Ext:	20°	20°

X = amount of pronation

Figure 1: Assessment measurements

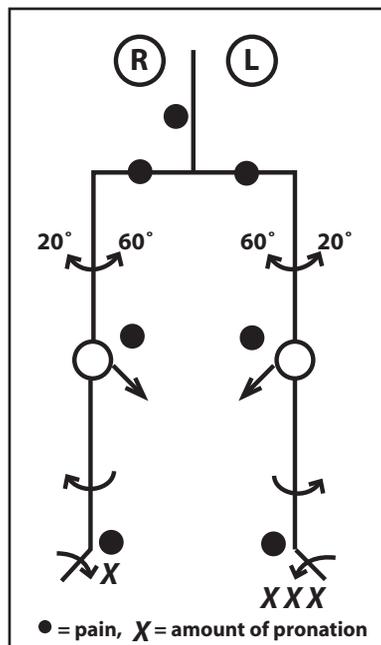


Figure 2: Explanatory 'stick diagram'

Assessment indicates:

- More pronation on the left,
- Knees are squinting,
- External tibial torsion (high),
- Hip range of motion (ROM) is

compensating to correct the external tibial torsion.

The explanation to the patient was as follows:

- Painful heels in both feet would indicate that the feet are excessively pronating, causing the medial plantar fascial attachment to be placed under strain, causing tearing of the fascia attachment and inflammation will occur. Pain will be experienced mainly in the morning or after a period of inactivity. During rest the fascia relaxes and shortens back to its original position. Upon standing, the pronation factor causes the feet to suddenly elongate and the fascia to pull at the plantar fascial calcaneal attachment, resulting in the pain that felt upon standing.

- Pain on the medial side of the knees is associated with excessive STJ (Subtalar Joint) pronation which causes the tibia to internally rotate with the pronation. As this occurs it causes a slight genu valgum affect on the knee with the result that medial collateral ligament strain can be experienced.

- Often compensatory actions will be experienced as the body seeks to counterbalance for the internal knee movement, by way of tightening the ITB's, which may result in the patient's patella tracking laterally. If this occurs then it will weaken the vastus medialis oblique muscles (VMO's).

- Another factor is the patient's external tibial torsion (genetically inherited) and appears to compensate with tight iliopsoas and hip adductors – which is why they have a limited external hip range of motion of 20° in both, and 60° internal hip range of motion as a compensation for external

tibial torsion.

- As the soft tissue compensation occurs, resultant rotational strain on the knees occurs with increased medial forces on both feet, thus causing excessive pronation and the squinting knee position.
- The groin pain is, I believe, associated with the iliopsoas muscles which attach from the L1 to L5 area to the lesser trochanter and is shortening to compensate for external tibial torsion. As it shortens the pelvis is tilted anteriorly (forward) and may cause pain in the groin area, increasing the likelihood of a sway back (lordosis), with a further compensation in the thoracic as kyphosis develops, together with bad posture, because of the change in the body's centre of gravity. This places the head over the metatarsal heads rather than the midtarsal area of the foot and this constant position can contribute to spondylolysis of the L5 / S1.

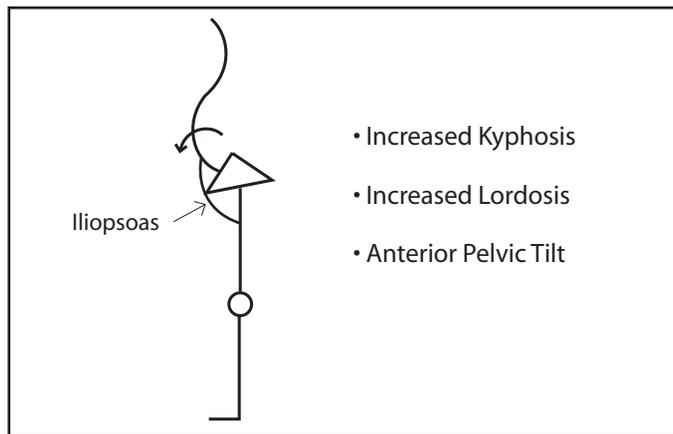


Figure 3: Compensatory effects of tibial torsion on the back, pelvis and hips.

The assessment indicated no short leg, however, the patient is experiencing hip problem in the right side. Note that the LEFT foot is pronating excessively more than the RIGHT causing a functional leg length discrepancy (LLD), shortening the leg and causing the RIGHT side SIJ (Sacro Iliac Joint) jamming as it has become the longer leg.

Rx

If the assessment had indicated a structural shorter right leg then it may have been presumed that the left is excessively pronating to level the structure with the shorter leg. In this case the back pain is usually aligned with the longer leg left side rather than right.

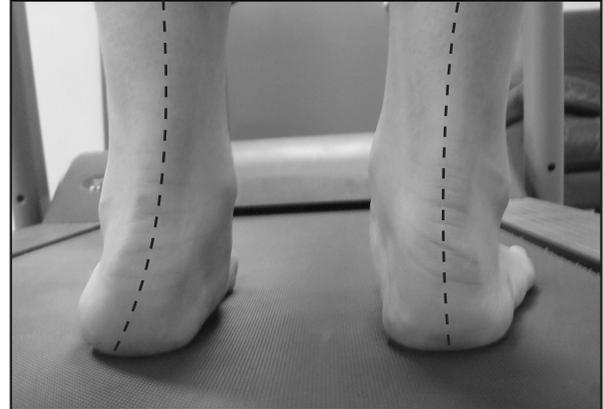


Figure 4: Patient's RCSP

The patient pronates on both feet and so will need to be prescribed an ICB Blue MID density orthotic commensurate with her weight (65kg). The orthotics were heat moulded to the patient in STJ neutral. Her progress was monitored to ensure that the orthotic density was maintaining her corrected position.

If the medial knee pain had not subsided I would have remeasured the RCSP (Resting Calcaneal Stance Position) and NCSP (Neutral Calcaneal Stance Position) to ensure that the 5° rearfoot varus was adequate and if required increased the rearfoot control.

The patient presented with external tibial torsion which could have been treated with orthotic 'gait plates', if she was under the age of 16 years (whilst her bones were still growing). However, in this case all we can do is to work around the structural abnormality. Therefore she was prescribed a regime of muscle stretches to reduce the pressure on the lower back caused by the tight iliopsoas and this may have to be monitored by other allied health colleagues.