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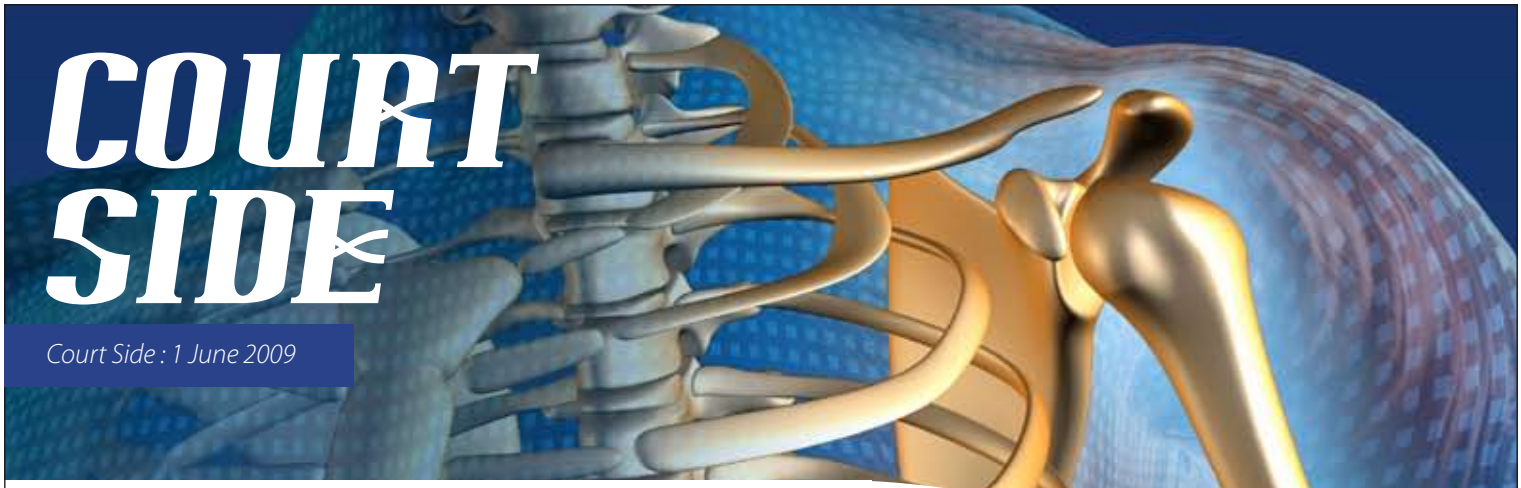
A Back2Sports Sports Injury Management Newsletter



Anterior Knee Pain in Runners:
Predicting, Preventing and Managing

Knee pain is the most common running injury, occurring in approximately 55% of recreational runners. Of this number, 65% will have severe symptoms requiring them to seek medical attention or contemplate cessation of running[1]. Anterior Knee Pain (AKP), otherwise known as Patellar Femoral Pain, is one of the most common condition resulting in knee pain; about 25% of all knee injuries[2]. Preventing AKP is possible through identifying a few etiological factors that pre-disposes one to AKP and making changes where possible.

Etiological Factors

Of all the many etiological factors linked to AKP, studies have shown that a combination the following 5 factors have the highest reliability in predicting AKP[1,2]:

1. *Lack of pronation of the rear foot on heel strike - Increases the strain that the knee undergoes due to the lack of absorption of the ground reaction force. This is distinct from the overpronation of the mid-foot which also leads to AKP.*

2. Foot type (pes cavus) – *Athletes with pes cavus or high arch foot type have a smaller surface area of contact thus increasing the ground reaction force.*

3. Lack of strength and/or endurance of quadriceps - *correlates with an increased impact of the knee during a run.*

4. High Q angle – *more pronounced in females due to their wider pelvises. This greater Q angle increases the tension of the ITB. This in turn results in an increase in the internal rotation (turning in) of the hip, further increasing tension through the ITB. As the ITB has attachments to the lateral retinaculum, a tight ITB will pull on the patellar laterally resulting in a laterally shifted and tilted patellar. This alters the pressures under the surface of the patella, causing a premature wear of the cartilage and increasing the risk of degeneration and pain.*

5. Training methods – *training on hard surfaces and premature change of footwear had been found to increase risk of AKP.*

Management of AKP

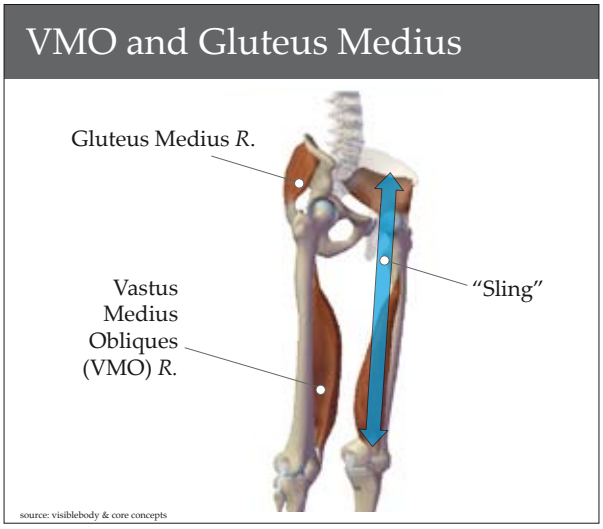
Commonly, physiotherapists manage AKP symptomatically with the use of electro-physical agents (EPA) like Ultrasound, Interferential Current (IFC) or Short Wave Diathermy (SWD) to reduce the pain and swelling, if any. Exercises are directed to the quadriceps, hamstrings and calves to improve the strength and flexibility of the knee.

However, in recent years, research has shifted the direction of AKP rehabilitation from symptomatic management to solving the primary faults leading to AKP. These primary faults can be divided into muscular, structural and training[3].

Management of Muscular Faults

Weakness in Gluteus Medius (GM) and Vastus Medialis Obliques (VMO) muscles are the main muscular causes of AKP[1,3]. The primary function of Gluteus Medius is to externally rotate the hip while the VMO aids in knee extension with a secondary role in the stabilization of the patellar. These two muscles works as a sling to aid in stabilizing the hip (figure 1). Weakness, or rather the lack of motor control of the GM would lead to an internal rotation of the hip. This would, in turn, cause a tension of the ITB, which would pull the patellar laterally, affecting the length-tension relationship of the VMO. The VMO would be lengthen, affecting not only the activation timing but also the strength. This causes a mismatch in the force working to center the patellar within the femoral groove, leading to a possible degeneration of the cartilage behind the patellar, which might then cause pain[5].

Studies have shown a strong correlation with over-pronation of the foot leading to AKP. It is believed that over-pronation of the foot will lead to the knee turning inwards, causing the ITB to be under tension, increasing the risk of mal-tracking of the patellar[5]. Tight calf muscles, especially the soleus, have been linked to over-pronation of the foot, which would cause the knee to turn inwards. Again, note that this is distinct issue from the lack of pronation of the rear foot on heel strike.



To correct the muscular faults, a good rehabilitation program should incorporate both release of the tight structures and strengthening of the weak muscles. This would include specific stretches for the quads, hamstring, calf muscles and ITB if they are shortened and strengthening exercises for the gluteus medius and VMO. Gluteus Medius can be trained through using the clam exercise and gradually progressed to weight bearing functional positions. Similarly, the motor control and strength of the VMO can be achieved through close kinetic, functional exercises like wall squats, single leg squats, step ups and eccentric step downs. Strengthening of the intrinsic muscles of the foot by doing toe curls has also been recommended to help prevent over-pronation of the foot.

Management of Structural Faults

The most common structural fault leading to AKP is the high-arch foot type. While both high arch feet and runners who tend to over-pronate on weight-bearing are at risk, research found that athletes with a high arch foot are at greater risk of developing AKP compared to flat or pronated feet. This has been attributed to the fact that a rigid foot with a high arch has an increased load per surface area on impact[1]. The use of proper footwear or foot orthotics to improve shock absorption is the best way to manage this fault. If the lack of rear foot pronation on heel strike is due to stiffness in the rear foot, mobilization of the talo-calcaneal joint can be done to release the stiffness.

Patellar tilt, another structural fault, can be managed with stretches of the ITB and taping. However, there are still contradicting conclusions from research on their efficacy in correcting this fault.

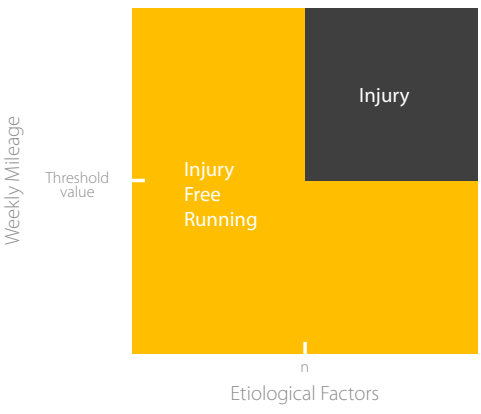
For the other structural faults like an increased Q angle and available full range of movement of knee, there is unfortunately, little to be done [1,2].

Management of Training Faults

Pre-matured discarding of running shoes and weekly mileage are the two most common training faults.

Research has found that the optimal mileage on 1 pair of foot wear should be about 800–1000km. However, most runners with knee pain tend to discard their shoes after about 500-600km, due to discomfort[1,3]. This point is counter-intuitive as most think that once the shoe starts to wear out, one would need to change to ensure proper support[1, 2]. However, further research revealed that frequent change of shoes increases the risk of AKP as the foot would need to get re-accustomed to the support of the shoe.

There has also been a co-relation between the mileage an athlete can run pain-free and the number of etiological factors that may cause AKP. This is an inverse relationship; athletes who have more predisposing etiological factors should lower their weekly mileage (refer to figure 2)[2].



Other training fault corrections include:

- changing to softer running surfaces like stadium running track surface or grass, instead of crowned, hard surfaces like the road or cemented pavements.
- Plus slow, progressive increment of running distance and speed are as important in preventing AKP as proper running techniques.

Conclusion

In summary, knee pain in runners, though is common, is preventable through the identification of the 5 predicting etiological factors and taking the following precautions:

1. Lack of pronation of the rear foot on heel strike - *Mobilisation of the talocalcaneal joint*
2. Foot type (pes cavus) - *Foot Orthotics / Proper footwear*
3. Lack of strength and/or endurance of quadriceps - *Strengthening exercises for quadriceps like wall squats and single leg squats (high repetitions)*
4. Increased Q angle - *ITB stretches*
5. Improper Training methods - *Slow, steady progression of training and runs on softer surfaces*

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