

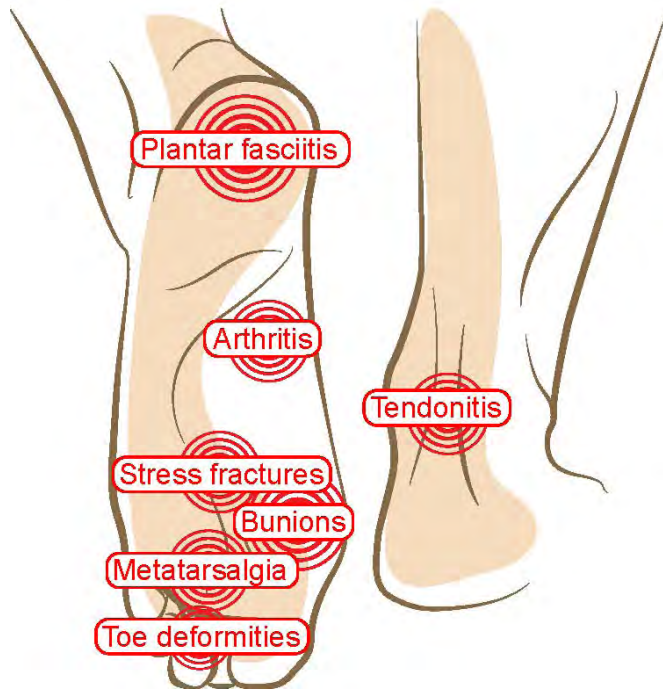
WHAT, WHY & HOW of common foot disorders.

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in association with Aetrex



7. Should everyone wear orthotics?



Incidence of foot pain

Twenty four percent (24%) of the population have foot and/or ankle pain. That makes it 1 in 4 adults. Let us look at why foot pain is a common problem. Let us look at the past, many thousands of years ago, a time when we did not have shoes and walked barefoot. A time when we did not have roads, cities or hard floored buildings. A time when we walked on soft surfaces such as grass, soil, and sand. Our foot was designed by nature to walk on soft ground. When walking on soft ground the earth moulds to the shape of the foot. Imagine walking on a sandy beach and creating foot

prints on the sand. As gravity pulls us toward the ground, the pressure of our weight is evenly distributed across the plane of our feet and there is a wide area of contact. This is not the case when we walk on hard surfaces such as a tiled floor. On a tiled floor or on a hard surface the area of contact between the feet and the ground is less. A similar situation occurs when we wear shoes. This is because the inside of the shoe is also flat and is not contoured like an orthotic.



What can walking on flat and hard surfaces do to our feet?

Our feet are flexible and have a tendency to turn inwards when we walk or stand. This movement when our feet turn in is called overpronation. Overpronation causes the arches to flatten and the ankles to collapse in.

Most of us can cope with walking on flat surfaces as our muscles and ligaments are strong. But 1 in 4 cannot and will have pain. Problems with incorrect foot position can also have a domino effect on the ankles, knees, hips, and even the back resulting in pain or discomfort in areas distant to the feet.

How can orthotics help?

Orthotics lift the arch, cushion the sole, and evenly redistribute the pressure under the feet. Science tells us that pressure is force divided by area i.e $\text{Pressure} = \text{Force} / \text{Area}$. This means that if we increase the area that our foot comes into contact with, the pressure (and therefore the pain) can be reduced. When we walk on hard surfaces like a tiled floor, the area of contact is less. The smaller area of contact increases the pressure through the parts of the foot that are in contact with the floor as the weight of our body remains the same. However, as we walk on soft ground the ground gives way slightly and there is a greater area of contact. The ground giving way and moulding to the shape of our feet is clearly seen when we walk on a sandy beach. Majority of foot pain can be managed effectively by providing the feet with a proper contoured surface to rest on. This is how orthotics provide our feet a comfortable platform to walk and run on.

With orthotics, you can wear your favourite shoe.

Studies have shown that one of the factors that deter individuals from orthopedic shoes is the 'attractiveness' of the footwear. However,

orthotics can be placed inside your shoe and will allow you to wear your favourite footwear and feel great while you do it! Your footwear may however need to be slightly roomier to accommodate the orthotics.

Is scanning your foot important?

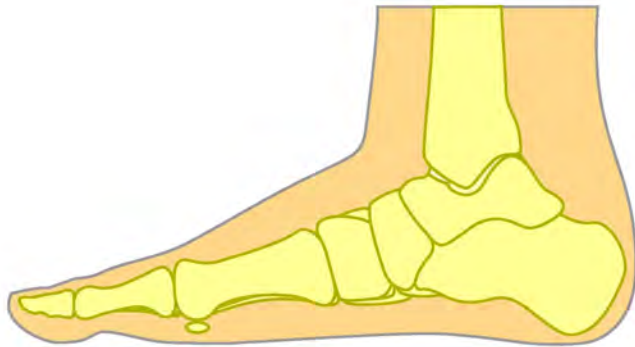
A good way to see how foot scanning can help with pain is to compare this to fitting tires for your car. When tires are fitted, we balance them and align them. Balancing and aligning the tire makes the tire last longer. The vehicle also becomes more fuel efficient. Tires are expensive to replace and hence we are diligent in balancing and aligning them. However, it seems that since our feet came to us for free, we are not so diligent in balancing and aligning them. If balancing and aligning car tires improves efficiency and decreases wear of the tire, it then stands to reason that balancing and aligning the feet may produce similar results. The art of scanning the feet is called pedobarography.

Do our feet or our car tires travel a greater distance in their lifetime?

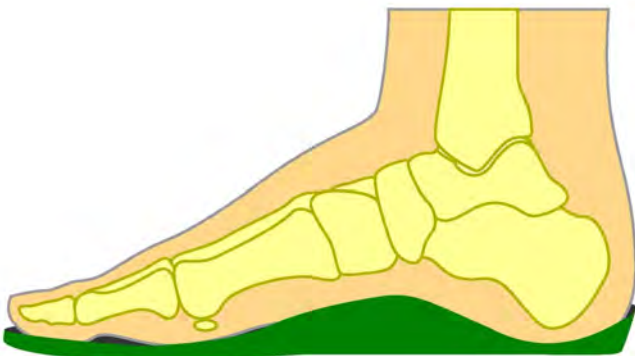
An average car tire travels 20,000 miles. Our feet on the other hand, cover approximately 110,000 miles in a lifetime, which is the equivalent of travelling 4 times around the globe! It is easy to neglect our feet which can cause problems and ultimately foot pain down the line. Scanning the feet can identify the type of orthotic required. The orthotics will cradle our foot and provide the support and comfort it requires.



Side view of foot showing well formed arch



Collapsed arch



Arches restored with supportive orthotics

Aetrex Technology has a variety of foot scanners that provide a pedobarograph. Aetrex's Albert is able to identify arch type and define high-pressure points. Following the scan, it provides an image showing the pressure reading across both the feet. In addition, the Albert Operating System provides suggestions regarding the orthotics that may be best suited for the foot type.

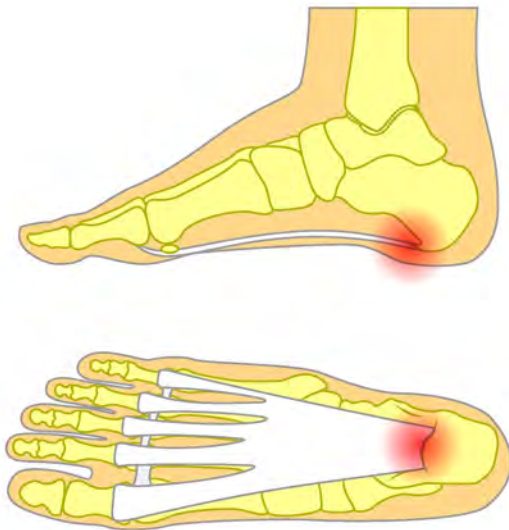
Summary

If we take great care and invest in having a high quality tyre for our cars then it stands to reason that we need a high quality surface for our feet to walk on. We have no control of the outside environment. However we do have control of the inside of our shoes. If using an orthotic is like walking on a sandy beach then it is important we have that contoured surface inside our shoe. Wearing an orthotic is like creating nature inside our shoes. It is like taking a slice of sand from the beach and inserting into our shoes to walk everywhere. Having a high quality surface for our feet to tread by using orthotics is going to give us more pain-free mileage from our feet. This is the reason why I recommend an orthotic should be used by everyone.

1. Plantar Fasciitis

What is it?

Plantar fasciitis is the most common cause of heel pain. The plantar fascia is a piece of tissue connecting each of the toes with part of the heel bone. This stabilizes the arch of the foot and helps control movement. Plantar fasciitis occurs when this tissue is inflamed. Pain is usually felt in the heel and the arch of the foot in one or both feet. The pain is usually worst during the first steps of the day or following rest. Pain can also arise following walking, running or standing for a long time.



Why does this occur?

Plantar fasciitis results from long-term pressure and repetitive strain on the foot from either lifestyle, exercise or old age. This repetitive strain leads to microtrauma, which

leads to a repair response. The repetitive injury and repair causes chronic inflammation. There is often not a singular clear cause. People at greater risk of plantar fasciitis are those that have tight calf muscles, high-arched feet or flat feet. It is also more common in overweight people, and in people who frequently perform high-impact activities like running, dancing or jumping.

How can it be treated?

Daily stretching of the plantar fascia and calf muscles can be helpful. Orthotics support the plantar fascia and decrease the stress. Ice can be applied to the area of pain for 10-20 minutes at a time, up to three times per day. Steroid injections into the plantar fascia is also recommended, but unfortunately steroid injections can damage the fat pad covering the heel. The fat pad then becomes thinner and the condition can become more severe.

Orthotics?

Orthotics cradle the foot and decreases the repeated stress on the plantar fascia. This helps to decrease inflammation and the pain associated with plantar fasciitis.

Medication

If there is a definite trigger for the pain, like high-impact exercise, this can be decreased to reduce the pain. Over-the-counter anti-inflammatory medications like ibuprofen may provide some relief in the short-term.

2. Metatarsalgia

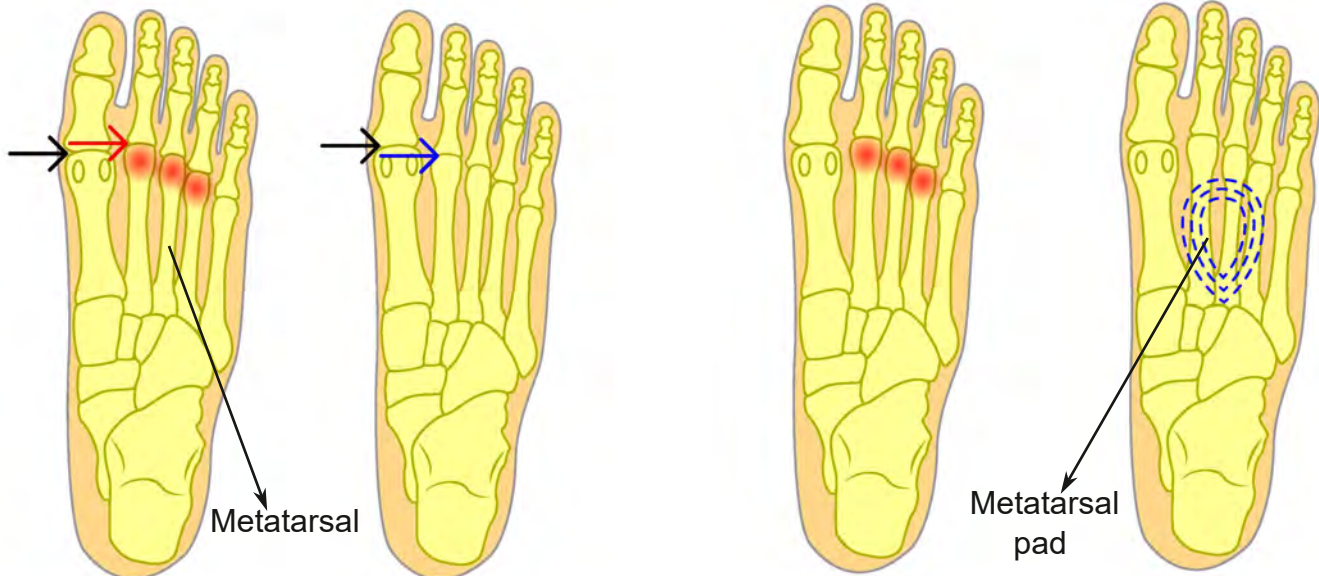
What is it?

The condition is defined as pain in the ball of the foot (the forefoot), directly beneath the metatarsal heads. The metatarsal heads are the joints that connect the foot to the toes. They support weight and, as such, they can be a target for pain and inflammation due to the pressure they are often under when we walk, run and stand. Estimates of its prevalence of foot pain in the metatarsal region range from 5% to 36%. The severity of the condition is affected by the variation in pressure applied to the forefoot. These differences in pressure are increased by factors including the shape of the feet (length of the metatarsals and high arch), tightness of the calf muscles, unsupportive

footwear, partaking in excessive physical exercise and age,.

Why does this occur?

Based on how it is caused there are three types of metatarsalgia, primary, secondary and iatrogenic. Primary metatarsalgia is due to anatomical variations. The 1st metatarsal may be shorter and allow greater forces to be transferred via the 2nd, 3rd and 4th metatarsals. The 2nd 3rd and 4th metatarsals are thinner and cannot take excessive strain. Tightness of the calf muscles (the gastrocnemius) and a high arch can also cause primary metatarsalgia. Secondary metatarsalgia is caused by conditions that increase the pressure on the metatarsal joints indirectly. This occurs in conditions like



Rheumatoid Arthritis (RA) where the plantar pad (the thick flesh under the heads of the metatarsal) moves away, reducing the amount of soft tissue to cushion the bones. Due to the decrease in the amount of the soft tissue coverage of the heads of the metatarsals it becomes painful when one bears weight. The third category is called iatrogenic or due to previous medical intervention. For example, surgery to correct bunions may shorten the first metatarsal causing increased weight and pressure on the other metatarsals.

How can it be treated?

Stretching

Stretches which increase the flexibility of the calf muscle (gastrocnemius) are recommended.

Orthotics

Metatarsal pads, which provide support behind the ball-of-the-foot, have been found to relieve the pressure on the metatarsals by up to 60%.

Surgery

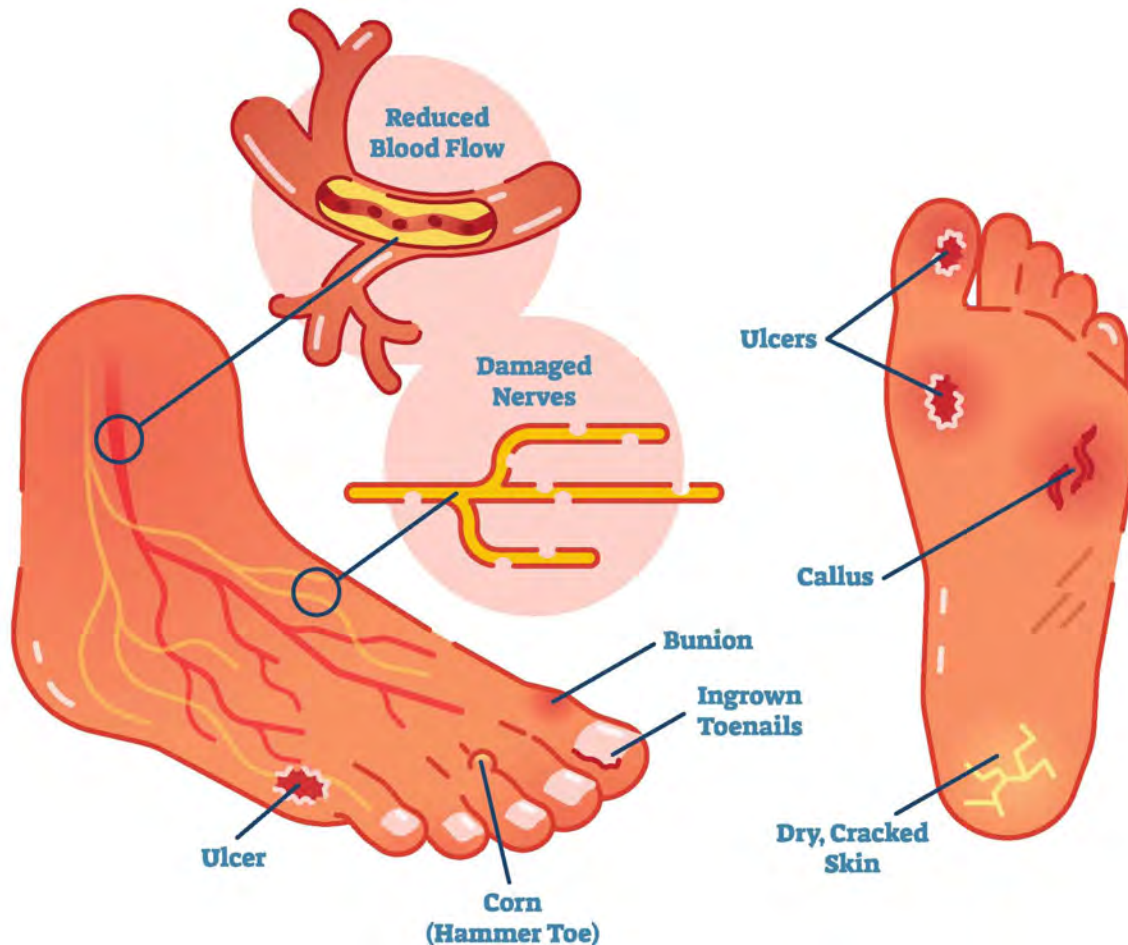
In severe cases surgery may be required. Various surgical procedures have been described including release of the tight calf muscle, shortening of the 2nd, 3rd and 4th metatarsals, excision of the neuroma etc..

4. Diabetes and feet

What is it?

Diabetes occurs when the body is not able to control glucose levels. Our bodies are made up of billions of cells. The cells require fuel or energy. Glucose is one of the fuels used by the body. Insulin is needed to move the glucose from outside the cell to inside the cell. This is something similar to the pump in a fuel forecourt. Though there is fuel in the fuel

forecourt, a pump is needed to pump the fuel into the car. A lack of insulin or an inability of the insulin to transport the glucose into the cell causes diabetes. In diabetes there is a lot of glucose in the blood but it is unable to enter into the cell due to a lack of insulin. There are two types of diabetes. Type 1 diabetes is an autoimmune disease, where the body's immune system destroys the insulin-producing pancreatic beta-cells. Type 2 diabetes occurs



when insulin becomes ineffective or inadequate. Lifestyle conditions like obesity and inactivity cause Type 2 diabetes. The high sugar levels can cause damage to the nerves, kidney and eyes. The heart can also be affected and people with diabetes have an increased risk of angina and heart attacks. The incidence of diabetes is increasing worldwide. According to estimates from 2019, 463 million people worldwide were reported to be living with this condition.

Why does this occur?

Unfortunately diabetes affects the feet and can cause serious problems. Initially the small nerves in the feet are affected and it causes numbness or a lack of sensation. The lack of sensation allows damage to the skin to go unnoticed. In addition there is a decreased ability to heal which allows the damage to become an ulcer. An ulcer may initially only be on the surface, but it may become deep and involve the tendons and bones. A very deep ulcer with infection in the bone may require amputation. The statistics are quite grim. 1 in 6 diabetics will develop an ulcer. 1 in 6 who have an ulcer will ultimately undergo a leg amputation. 50% of the patients with an amputation will die within 5 years.

How can it be treated?

The main issue is to treat the diabetes and keep the sugar levels under control. The second issue is to avoid developing an ulcer.

Orthotics

Normally when standing on a flat surface like the inside of a shoe the main weight bearing occurs only through the ball of the feet and the heel. Orthotics which are contoured to the feet allow the body weight to be distributed over a wider surface area and not just through the heel and the ball. This relieves the pressure on the parts of the foot which are more prone to ulcerations. Research has shown that orthotics both reduce the occurrence and also the recurrence of ulcers. Orthotics have also been found to reduce the threat of amputation from 54% to 6%. However once an ulcer develops specialist treatment is required.

6. Sports injuries

Medial tibial stress syndrome, Stress fractures and Patellofemoral pain syndrome

What is it?

Medial tibial stress syndrome causes pain in the lower part of the leg along the inner border of the larger bone (tibia).

Stress fractures are minor fractures that occur within the substance of the bone. This occurs mainly in the lower part of the shinbone (tibia), metatarsals, navicular, fibula and femur.

Patellofemoral pain syndrome is pain that occurs around the knee and is more frequently



Overpronation

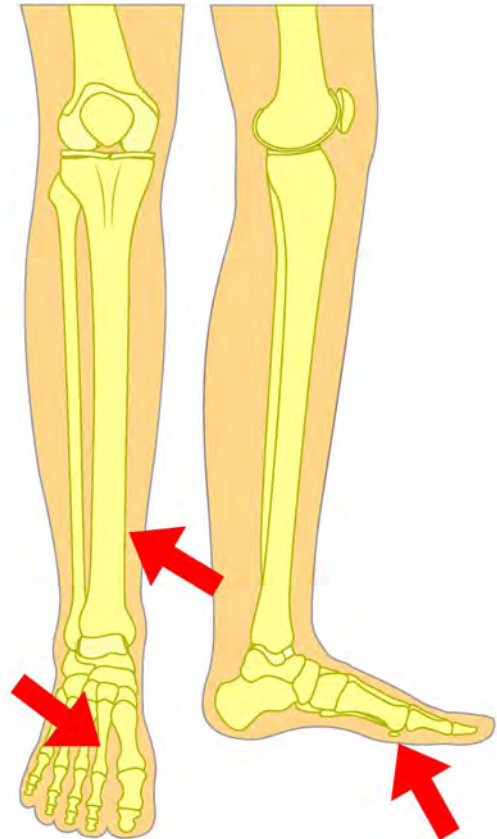


Overpronation corrected with Orthotics

seen in female athletes and runners.

Why does this occur?

Medial tibial stress syndrome is caused by repeated activity of the lower leg muscles that arise from the back of the main lower leg bone (Tibia). These muscles help with walking, running and maintenance of the arch. Excessive and repetitive use of these muscles pulls the fibers of these muscles at its



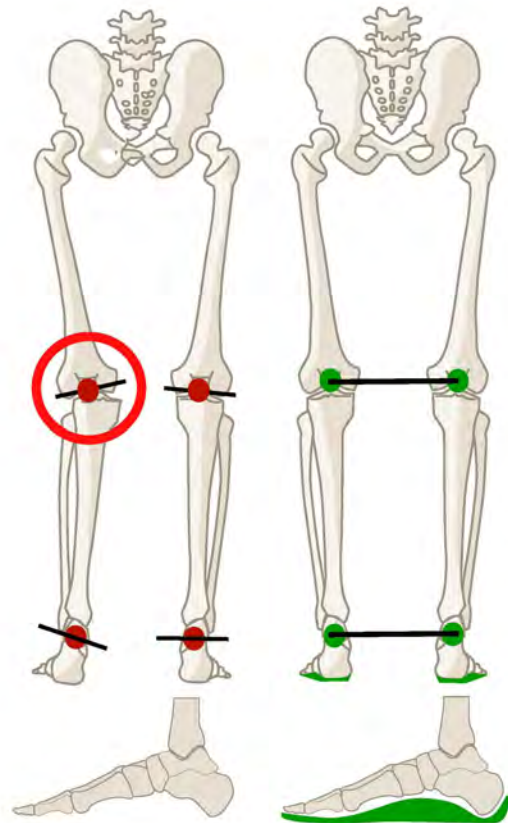
Common sites of stress fractures



With pronation there is rolling in of the tibia (lower leg) and femur (thigh). The pull of the muscle rolls the knee cap outwards. This causes pain in the knee in runners.

attachment to the bone.

Stress fractures occur when the body is not able to keep up with the repetitive damage and repair the numerous minor fractures. Bone consists of flexible collagen fibres that are hardened with calcium. This is similar to reinforced concrete which has steel cables and cement. The collagen takes the place of the



Orthotics prevent the overpronation and thereby decreases the rubbing of the knee cap (patella) onto the front of the femur (thigh bone)

steel cables and the calcium takes the place of the cement. If a bone is subjected to a very large load like a 100 kg weight falling onto it, it is likely to break completely. That would be a fracture. However if the bone is subjected to repetitive small loads only a few fibres may break. The body immediately tries to heal up the few fibres that have broken. Unfortunately at times the repetitive stress may break more fibres than what the body can repair. This is a stress fracture.

Patellofemoral pain syndrome occurs when the knee cap repeatedly rubs against the lower end of the femur. The femur, the tibia and the knee cap together form the knee joint. Many factors may cause patello femoral pain syndrome but pronation of the foot is mainly implicated. Pronation of the foot, causes

internal rotation of the tibia and internal rotation of the femur. This occurs because all these bones are attached to one another and form a part of the same chain. The forces on one is transferred to the other like falling dominoes. But as the femur and tibia roll inwards the quadriceps muscle in front of the thigh pulls the kneecap outwards. The repetitive friction as the knee cap is pulled outwards while the knee joint rolls inwards causes patellofemoral pain syndrome. How can it be treated?

Severe pain from any of the above conditions requires restriction or even stopping of the repetitive activity that is causing the symptoms, pain killers, ice, therapy and splints. Once healed, there can be a slow return to activity. Stretching and strengthening exercises may be required. Treatment from a qualified health professional is recommended as there may be other underlying issues.

The clever plan would be to avoid these conditions. Wearing orthotics decreases the pronation and collapse of the arch. Decreasing the collapse of the arch decreases the load onto the muscle that is pulling up the arch thereby preventing or decreasing the chance of developing medial tibial stress syndrome. Similarly preventing pronation decreases the inward rotation of the tibia and the femur which will decrease the repetitive stress between the kneecap and the lower end of the femur and help with preventing patellofemoral syndrome. Orthotics cradle the foot and allow for shock absorption which decreases the chances of developing stress fractures.

REARFOOT OPTIONS:



Cupped

Cushions and stabilizes rearfoot. Recommended for medium and high arch feet.



Posted

Controls over-pronation and balances rearfoot. Recommended for flat or low arch feet.

FOREFOOT OPTIONS:



Neutral

Without metatarsal support for those not suffering from ball-of-foot discomfort.



Supported

Metatarsal support comforts ball-of-foot & redistributes weight from metatarsal area.

Each series have 4 options. There are two rearfoot options, Cupped and Posted. Cupped are for normal or high arch feet whilst posted is for flat or low arch feet.



As a Consultant Orthopaedic Surgeon, I trained to operate on patients with arthritis, deformities, fractures, disc prolapses and other musculoskeletal conditions. Surgery is essential in many situations but may not be needed in others. Over the course of my career, I noticed an increased dependence on surgery when the benefit did not meet the patient's expectations. In addition, surgery could cause complications. Having surgery is an irreversible decision. Hence, alternative options need to be considered before deciding to have a surgical procedure. There are many other less-invasive, risk-free interventions that can have similar or better outcomes than surgery. In

order to help patients pursue a healthy life and avoid or even delay surgery, I became invested in providing alternative treatments, which do not involve going under the knife. In this quest I came across Aetrex and its products. I fell in love with its products because it provided value for money solutions to resolve common foot problems. I am not suggesting that all foot problems can be addressed by these Orthotics but a majority of them can. It is important that this non operative option is attempted before surgery is considered. I now am part of this wonderful company and conduct research for them. I hope the advice provided in this book will provide pain free extra miles from your feet.

DISCLAIMER – PLEASE READ THIS PRIOR TO USING THIS BOOK

Please note that the content of this book is for information only and is not a substitute for professional medical advice, diagnosis, or treatment. It is strongly recommended that you consult with your doctor or other qualified health provider for any health issues you may have with your feet. If you follow the advice in this book, you agree that you do so at your own risk and are voluntarily doing so.

Please also note that I or a company that I am involved with obtains financial remuneration from Aetrex for the services I provide to Aetrex Inc.

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