Assessment and Treatment of the Sinew Channels for Pes Planus (Foot Over-Pronation) and Its Relationship to Leg, Ankle and Foot Injuries

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Sinew Channel Evolution
Originally described in Chapter 13 of the Ling Shu - 2nd century BC (Nguyen, V. 2005), (Deadman, P. 2007). Tom Myers – Anatomy Trains 2002 (Myers, T 2014)

Myofascial planes are part of a continuous network that consists of the muscle and its fascial layers (Myers, 2014). These are the epimysium, perimysium and endomysium that surround and invest the muscle, muscle fascicles and muscle fibers respectively.

Myofascial planes are continuous sequences of connective tissue that join muscle, tendon, fascia and in many cases, the periosteum. Where one tendon attaches to the bone, the next tendon seamlessly begins without a separation along the myofascial plane.

Myofascial planes, sometimes referred to as "myofascial meridians" (Myers, T. 2014), (Wilke, J. 2015) are a viable explanation of the sinew channels (jingjin). Myofascial planes can be seen as a modern-day evolution of the *Lingshu* description of the jingjin.

The Urinary Bladder sinew channel consists of a continuous myofascial plane from the foot to the head. It generally follows the pathway of the primary channel, but has several branches that integrate other myofascial tissues and channels. For example, one of these branches is on the lateral leg that connects the peroneus longus/brevis myofascia with the biceps femoris (Callison & Lau 2016). This is clinically relevant when treating injuries involving the low back, hip, knee, leg, ankle and foot.

For decades, muscles have been thought of according to their role in eccentric, concentric and synergist actions and defined by their origins and insertions on bony attachments. Thinking more systemically and in light of recent research, force transmission is more about myofascial groups than that of individual muscles. No representation of individual muscles has been found within the sensory or motor cortex of the brain (Williams, 1995). The sequences of muscle contractions together with fascial plane movements during motion are far more complex than we have previously assumed (Fukunaga, 2012).

The nervous system seems to be around six times more proprioceptively interested in what goes on in the fascial matrix than it does in detecting changes in the muscle itself (Van der Wal, J. 2009). About 80% of all peripheral nerve afferent fibers come from the myofascial tissue. The body wide connective tissue network is certainly our most important organ for proprioception (Schleip, R. 2003).

Myofascial planes create a continuous line of pull which communicates mechanical and proprioceptive information along myofascial sequences to help coordinate complex movement. (Stecco, 2004). Research shows that adjacent myofascial planes have fascial expansions, which link and communicate proprioceptive information with other functionally related myofascial structures. (Schleip, 2013).

The mapping of the *jingjin* and its relationship with acupuncture channel correspondences (i.e., internal/external, six divisions and midday/midnight) are seemingly linked with the myofascial sequences. This lecture will explore the *jingjin* related to integrity of the medial arch and how imbalances in these channels contribute to pes planus.

Functional Anatomy/Pes Planus (Foot Over-Pronation)
The medial longitudinal arch is the longest and highest of the arches, and it traverses the medial aspect of the foot along the Spleen and Kidney sinew channels, extending from the calcaneus through the first three metatarsals. It is most dynamic as a shock absorber during static support and movement. The navicular bone is the keystone of the medial arch and is found at the arch's high point, just above K 2 (*rangu*).

Heel strike: The mid-to-lateral heel lands with a supinated foot that is a rigid foot that is capable of handling the force from the ground below and the body weight above.
Mid-stance: The foot moves from supination in heel strike into pronation during mid-stance. Pronation is a flexible foot that absorbs the weight of the body at mid-stance. Normal pronation involves an elastic recoil as the fascia builds tension and similar to a trampoline, rebounds to create a spring.
Push-off: The foot springs out of pronation and into supination in order to push off from the first metatarsal.

From the heel strike to the push-off phase, the weight distribution is transferred along the lateral longitudinal arch, across the metatarsal joints to the first MTP joint and big toe. The medial longitudinal arch normally does not make contact with the ground.

From heel strike to mid-stance, the foot moves from supination in heel strike into normal pronation.
In pes planus, the foot over-pronates and cannot recover into supination for adequate push-off from the first MTP. In pes planus, the foot over-pronates and cannot recover into supination for adequate push-off from the first MTP.

One of the many reasons for pes planus associated with various musculoskeletal complaints is that the alignment of the lower extremity,up to the pelvic girdle can be altered, due to forces acting on the foot (Khamis, 2007). Pes planus can cause a multitude of injuries such as: low back strain, sacroiliac joint pain, trochanteric bursitis, knee pain, fibular head displacement, tibial stress syndromes, ankle sprain, tarsal tunnel syndrome, plantar fasciocis, Morton's neuroma to name a few.

It is true that many patients with over-pronated feet do not present with musculoskeletal complaints; however, in a clinical study of fifty people with musculoskeletal pain, 84% of the patients had excessive foot pronation. (Nigg, 2001).

Supination of the ankle/foot complex consists of adduction, inversion and plantarflexion.
Pronation consists of abduction, eversion and dorsiflexion.

The primary support of the medial arch comes from the biomechanical pull of the tibialis anterior and tibialis posterior. The position of these muscles gives them leverage to lift the medial longitudinal arch and pull the foot into inversion.

- Tibialis posterior: inversion and plantar flexion.
- Tibialis anterior: dorsiflexion, inversion and adduction.

The peroneus longus and brevis muscles provide a primary action of everting the foot which counteracts the tibialis posterior and tibialis anterior effect of lifting the medial arch.

- Peroneus longus and brevis: eversion and plantar flexion

Pes Planus: An Imbalance in the Myofascial Sling

Both the soleus and the gastrocnemius (triceps surae) form the Achilles tendon. There are separate fascicles of this tendon, and closer inspection shows the soleus having a medial attachment and the gastrocnemius having a lateral attachment onto the calcaneus (Szaro, 2009).

- Gastrocnemius and soleus: plantarflexion, eversion (gastroc), inversion (soleus).

The medial and lateral attachments of these muscles provide a counterbalance for the calcaneus. The calcaneus is a proximal foundation for the medial longitudinal arch. In pes planus, with calcaneal eversion, the soleus (primarily medial fibers) are lengthened and the gastrocnemius (primarily lateral fibers) are shortened. (Edama, 2016)

The triceps surae along with the Achilles tendon is continuous with the plantar fascia through the periosteum of the calcaneus that form different myofascial planes.

The medial arch is strongly supported by the plantar fascia. The plantar fascia is made up of three distinct structural components: medial, central and lateral. The central component is the thickest and strongest section and it is commonly referred to as the plantar aponeurosis.

During gait, when the foot impacts the ground during the mid-stance phase, the plantar fascia elongates. During push-off and into propulsion, the plantar fascia acts like a "spring" when the heel lifts from the ground by approximating the calcaneus and metatarsal heads.

The foot is like a suspension bridge. Both are tensegrity structures (tension provide integrity). Balanced tension from above and below provides a resilient structure. Loss in the balanced tension from above and the spring-like elastic recoil from an elongated plantar fascia substantially decreases the foot's ability to recover from the collapsing arch.

The Sinew Channels and Pes planus/ Integrating Functional Anatomy with the *Jingjin*
The *jingjin* were first described in Chapter 13 of the *Nei Jing Ling Shu.* These descriptions of channel topography are at times, vague and difficult to interpret, with very little information that has been added since that time. Our inclusions of adding particular tissues to the sinew channel categorization are based on the discovery of the myofascial planes, continued exploration of cadaver dissections, examination of functional movement patterns and finally, clinical corroboration our findings.

As we move into this section on the imbalances between the agonist and antagonist muscle groups and their respective sinew channels, we must remember that these localized tissues that act on the ankle and foot can be observed as being excess (*shi*) and deficient (*xu*). The myofascial tissues in the *jingjin* will be locked-long (*xu*) and failing to support the medial arch, while others will be locked-short (*shi*) and contributing to the collapse of medial arch.

The sinew channel imbalances can be seen beyond the leg. Frequently, the SP-ST sinew channels are collapsed down and the UB sinew channel is pulled up. The K sinew channel below the knee is lax and lengthened.

Pes planus will frequently exist with a collapse in other areas in the body. A common posture with pes planus presents with a drop in the front of the body (SP, K, LU channels) and the back of the body (UB channel) will be pulled up. When building a treatment protocol, it is important to consider supplementing SP, K, and LU qi.

The Spleen and Stomach Sinew Channels/ Lifting the Medial Arch
The Stomach Jingjin

- Main Branch
    - Dorsal interossei
    - Tibialis anterior
    - Extensor hallucis brevis
    - Extensor digitorum longus
    - Rectus femoris

    - Vastus lateralis
    - Rectus abdominis and anterior fascia, (external and internal obliques)
    - Sternalis
    - Sternocleidomastoid (sternal head)
    - Facial muscles

"The Zu Yangming (ST) Jing Jin begins at the extremity of the third toe, inserts in the ankle joint, climbs obliquely along the fibula and inserts in the lateral surface of the knee." Ling Shu, Ch. 13, translation by Nguyen Van Nghi

Two muscles in the Stomach sinew channel that are directly affected by pes planus are the tibialis anterior and dorsal interossei. From the ankle near ST 41, the tibialis anterior tendon crosses to the medial aspect of the foot to attach to the medial cuneiform and base of the first metatarsal, which provides this muscle with excellent leverage to lift the medial arch. In pes planus, this muscle is usually locked-long.
The dorsal interossei muscles are affected by foot over-pronation due to a collapse and approximation of the metatarsal bones. This results in these muscles becoming locked-short.

Spleen Jingjin

- Main Branch
    - Tibialis posterior
    - Flexor hallucis brevis
    - Adductor hallucis
    - Quadriceps femoris – Vastus medialis
    - Sartorius
    - Posterior fascia of rectus abdominis (internal obliques)
    - Diaphragm (anterior portion) connecting to the lumbar spine

"The Zu Taiyin (SP) Jing Jin begins on the medial side at the extremity of the great toe, and inserts on the medial malleolus" Ling Shu, Ch. 13, translation by Nguyen Van Nghi

Two muscles in the Spleen sinew channel that are directly affected by pes planus are the tibialis posterior and flexor hallucis brevis. The tibialis posterior tendon has several attachments on the foot to help lift and stabilize the medial arch. One primary attachment is on the medial cuneiform, which together with the tibialis anterior tendon, helps to lift the medial arch. In pes planus, this muscle is locked-long.

The normal function of the flexor hallucis brevis helps to maintain the tension of the medial longitudinal arch. Due to its proximal attachment to the tibialis posterior tendon, it assists the tibialis posterior in stabilizing the medial arch. In pes planus, this muscle is locked-long.

The Urinary Bladder and Kidney Sinew Channels/Counter Balance to the Medial Arch
UB Jingjin

- Abductor digiti minimi
- Plantar fascia, lateral band
- Gastrocnemius
- Peroneus longus and brevis
- Hamstrings – biceps femoris, semitendinosus
- Sacrotuberous ligament, multifidus triangle and sacral ligaments
- Gluteus maximus
- Thoracolumbar fascia

- Erector spinae and transversospinalis
- Cervical extensors
- Suboccipitals
- Galea aponeurotica (occipitalis and frontalis)
- Facial muscles
- Branches from the thoracolumbar fascia include: latissimus dorsi – pectoralis major (clavicular head) – SCM, platysma; and trapezius

The Zu Taiyang (UB) Jing Jin begins at the extremity of the little toe, inserts at the lateral malleolus, climbs and inserts in the knee, goes back down to the lateral malleolus and inserts at the heel, reascends the posterior aspect of the lower leg and reaches the popliteal fossa. Ling Shu, Ch. 13, translation by Nguyen Van Nghi

To review, the gastrocnemius has a primary lateral attachment on the calcaneus, and the line of pull tends to tilt the calcaneus into eversion. The gastrocnemius and the abductor digiti minimi are interconnected via the lateral band of the plantar fascia. In pes planus, the gastrocnemius (especially lateral fibers) and the abductor digiti minimi are locked-short. The peroneus longus and brevis have a strong pull upward with foot over-pronation with each weight-bearing step as the foot rolls into eversion.
In pes planus, the peroneus longus and brevis are locked-short.

Kidney Jingjin

- Abductor hallucis, plantar fascia
- Ligaments of the medial arch and plantar foot
- Soleus, flexor digitorum brevis, plantaris, popliteus
- Semimembranosus, adductor magnus, medial collateral ligament
- Deep lateral rotators, obturator internus, pelvic floor, levator ani, anterior sacral fascia
- Anterior longitudinal ligament (ALL) (and vertebral bodies and discs), psoas major
- Transverse abdominis, multifidus
- Longus colli, longus capitis, rectus capitis anterior

"The Zu Shaoyin (K) Jing Jin follows along the Zu Taiyin (SP) Jing Jin, reaches the area inferior to the medial malleolus, inserts at the heel where it merges with the Zu Taiyang (UB) Jing Jin, ascends and inserts in the medial tuberosity of the knee." Ling Shu, Ch. 13, translation by Nguyen Van Nghi

Two muscles in the Kidney sinew channel that are directly affected by pes planus are the soleus and abductor hallucis. These muscles are interconnected via the medial band of the plantar fascia. The soleus has a primary medial attachment on the calcaneus. With pes planus, the calcaneus is everted and the soleus is locked long (primarily medial fibers). The normal function of the abductor hallucis helps to maintain the tension of the medial longitudinal arch. In pes planus, the abductor hallucis is locked-long.

The Sinew Channels and Pes Planus - Assessment and Treatment

- Navicular Drop Test
- Flexor Hallucis Longus (FHL) Tension Test
- Helbing's Sign
- Foot Flare Sign (Foot Abduction)

One common cause of pes planus that has recently been proposed is called "Acquired Flatfoot Deformity" and is directly related to "dysfunction of the tibialis posterior tendon." This condition occurs in adults, especially women in the 40+ age group and is due to illness, unusual or prolonged stress, faulty biomechanics, ligament laxity or as part of the normal aging process. (Rabbito, 2011). Other known risk factors for acquired flatfoot deformity include obesity, hypertension and diabetes. (Kohls-Gatzoulis 2014).

- Most of the causes of "Acquired Flatfoot Deformity" are conditions that have Spleen and/or Kidney organ patterns of disharmony.
- Further investigation is needed, but could it be that these conditions and diseases have a propensity to not only cause tibialis posterior dysfunction but also affect all tissues and respective channels associated with the Spleen and Kidney organs. That is, will SP and K organ pathology be a contributor to the excess and deficient conditions found in the *jingluo* and *jingjin* in cases of acquired flatfoot deformity and/or pes planus?

The sinew channels lie alongside and are nourished by the primary channels. The primary channel's circulation of qi and blood expands to the muscles, tendons, ligaments and joints (Keown, D. 2016), (Low, R 1983), (Ni, Y 1996).

"The jing luo move the qi and blood internally and externally, regulate the yin and yang, moisten the tendons and bones, benefit the joints."

Ling Shu, Chapter 49

"The twelve regular meridians connect with the organs (zang fu) internally and with the joints, limbs and other superficial tissues of the body. When the ache is located in the organ, the meridian is ill and as a result becomes painful."

Miraculous Pivot, Chapter 13

Because the Spleen (*pi*) rules muscle tissue and influences the tissues involved within its channels, the *jing luo* and *jing jin*, it is conceivable for the practitioner to take a discerning examination on patients with pes planus and the proper function of the Spleen organ.

- Controls the ascending or raising of *qi*.
- Controls the muscles and the four limbs.

Because the Kidney (*shèn*) rules the bones, joints and ligaments* and influences the tissues involved within its channels, the practitioner should examine patients with pes planus for proper function of the Kidney organs.

- The Kidney rules the bones, joints and ligaments.
- Determines aging through the 7-8 year cycles.
- Governs growth and development.

Muscle	Jingjin/xu-shi	Locked long-short	Special Technique
Myofascial Sling			
Peroneus longus	UB *shi*	Locked-short	Reduce – Pull *qi* downward
Peroneus brevis	UB *shi*	Locked-short	Reduce – Pull *qi* downward
Tibialis posterior	SP *xu*	Locked-long	Reinforce
(SP6) Tibialis posterior tendon	SP *xu*		Reinforce – Pull *qi* upward
Tibialis anterior	ST *xu*	Locked-long	Reinforce
Tricep Surae			
Gastrocnemius	UB *shi*	Locked-short	Reduce
Soleus	K *xu*	Locked-long	Reinforce
Intrinsic Foot Muscles			
Abductor hallucis	K *xu*	Locked-long	Reinforce – Lift upward
Flexor hallucis brevis	SP *xu*	Locked-long	Reinforce – Lift upward
Abductor digiti minimi	UB *shi*	Locked-short	Reduce – Lengthen

Intrinsic Muscles: Lifting the Medial Arch Needle Technique
This needle technique is a modification of a lift-and-rotate (*nian zhuan*) method and is used to stimulate two intrinsic muscles and the surrounding fascia, which are directly affected by the collapse of the medial arch. The two muscles are abductor hallucis and flexor hallucis brevis. The motor points of each muscle, found on the Kidney and Spleen sinew channels, are needled to lift the collapsed tissue and increase proprioception.

Foot Abduction in Pes Planus: An Imbalance in the K and UB Jingjin
The K and UB *jingjin* help to balance the tension in the plantar fascia and help provide for intrinsic support of the medial arch and calcaneus. Common imbalances involve a locked-short lateral side and locked-long medial side, resulting in a medial tilt of the calcaneus or calcaneal eversion.

- Locked long (K): Medial band of the plantar fascia and the abductor hallucis. Treated by "Lifting the Medial Arch" needle technique.
- Locked short (UB): Abductor digiti minimi and lateral band of plantar fascia. Treatment to follow.

Intrinsic Muscles: Widening the Lateral Band Needle and Myofascial Techniques
This needle technique elongates the fibers of the lateral band of the plantar fascia and the abductor digiti minimi. Shortened fibers are lengthened and proprioception is increased. This a reducing needle technique that helps eliminate obstructions in the local UB *jingjin*. Widening the Lateral Band Needle Technique: One needle is inserted into the abductor digiti minimi motor point located at UB 64 and directed toward UB 63. The second needle is inserted from UB 63 and directed toward UB 64. Both needles have an oblique needle angle. The two needles are pulled in opposite directions to stimulate the abductor digiti minimi and lengthen the lateral band of the plantar fascia to increase proprioception.

This myofascial technique supplements the needle technique to widen the lateral band of the plantar fascia.

- With the knuckle of each index finger placed side by side, access the lateral band of the plantar fascial posterior to the base of the 5th metatarsal joint in the region of UB 63 (*jinmen*) by pressing in a medial direction until a dense resistance is felt.

- A lengthening stroke is applied by directing one knuckle towards UB 61 (*pucan*) and the other towards the base of the 5th metatarsal joint.

The Sinew Channels and Pes Planus – Assessment and Treatment of Plantar Fasciitis/Fasciocis
Foot over-pronation places increased tension and stress on the plantar fascia, which results in micro-tearing of the tissue where the plantar aponeurosis inserts onto the medial calcaneal tubercle (a common site of pain in plantar fasciitis).

- Heel pain at the medial fascial attachment on the calcaneus that is worse with activity.
- Pain may refer between the Spleen and Kidney sinews channels of the foot.
- Increased pain with the first steps out of bed in the morning or a period of inactivity.
- Pain upon palpation of the plantar aponeurosis tissue that attaches to the medial tubercle of the calcaneus.

Fasciosis is defined as a chronic degenerative condition of the fascia that is characterized histologically by fibroblastic proliferation, the absence of inflammatory cells and disorganized collagen with zones of avascularity (Khan, 2002).

Histological studies of plantar fasciosis have revealed a high prevalence of necrotic tissue located in the region where the plantar fascia inserts into the medial aspect of the calcaneus. The cause of the necrotic tissue is from an impingement of the medial plantar artery, which nourishes the tissues at this part of the heel. Pes planus lengthens the abductor hallucis muscle and can strangulate the artery, thus leading to necrotic tissue in the localized area and an inability of the plantar fascia to heel (Fink, 2012).

Plantar Fasciitis/Fasciocis Needle Technique
Using the classical needle technique *Pang Ci*, the practitioner inserts two 1.5-inch/40mm needles into two different points with the needles angled toward each other so that the tips converge at the plantar aponeurosis attachment site on the medial tubercle of the calcaneus. The needles should be at a 90˚ angle to each other.

Triceps Surae Motor Points
Treatment of the triceps surae motor points is especially important when treating pes planus induced plantar fasciitis/fasciocis. The treatment protocol can vary depending on how many needles the practitioner wants to use.

1. Treat the excess muscles: lateral and medial gastrocnemius with a reducing needle technique.
2. Treat the one or two motor points on the medial side of the soleus with a reinforcing needle technique.

Plantar Aponeurosis Myofascial Techniques
The supine patient holds their ankle in plantar flexion while the practitioner places both thumbs in the K 1 (*yongquan*) region. As the patient slowly dorsiflexes their ankle, the practitioner applies deep pressure with the thumbs moving proximally toward the calcaneus. This technique is repeated 5-7 times, each time alternating on different aspects of the bottom of the foot. This technique should be slow and deliberate and the practitioner should try to feel the fascial tissue beneath the thumbs. Apply sustained pressure to the fascia, ironing out any soft tissue adhesions that are felt as lumps or knots.

This second technique is a cross-fiber myofascial technique. The practitioner places firm pressure with their thumb on the thickened plantar aponeurosis at the medial tubercle of the calcaneus. The patient is asked to slowly invert and then evert their foot as the practitioner cross-fibers the plantar aponeurosis tissue. Continue this technique for 1-2 minutes.

Master Knot of Henry: Flexor Hallucis Tenosynovitis
The master knot of Henry is an anatomical location where the flexor hallucis longus and the flexor digitorum longus cross each other under the foot.
This location is approximately 1 *cun* distal from K 2 and inferior to the navicular-cuneiform joint.

Pes planus can cause fascial binding and adhesions in this location and alter the normal mechanics of these two tendons. The flexor hallucis longus in this mid-plantar region can become thickened, fibrotic and painful; this is frequently misdiagnosed as plantar fasciitis.

The Sinew Channels and Pes Planus - Assessment and Treatment of Morton's Neuroma
Morton's neuroma is an injury that consists of thickening of the fibrous tissue that surrounds the interdigital plantar nerves in the foot; it often affects the nerve found between the 3rd and 4th metatarsals, or, less often, the interdigital nerve between the 2nd and 3rd metatarsals.
Pes planus, and its secondary effect on the anterior transverse arches, is a common finding in cases of Morton's neuroma.

The anterior transverse arch is actually two arches consisting of the transverse arch at the cuboid/cuneiforms and at the level of the metatarsal heads. The normal function of the anterior transverse arch is to absorb loads during the support and push-off phase of the gait cycle.

When the medial longitudinal arch has fallen, the anterior transverse arches collapse secondarily and cause the middle metatarsal bones to drop inferiorly. This increases the stress on the ligaments that stabilize the metatarsal bones, and causes compression of the interdigital plantar nerve.

- Pain, tingling and/or numbness is often felt near the *bafeng* points between the 3rd and 4th or the 2nd and 3rd metatarsals. Occasionally the pain is felt more distally into the toes or proximally between the metatarsals.
- There may be swelling between the affected metatarsals and toes.
- Symptoms can occur sporadically or spontaneously.
- Patients commonly report feeling the sensation of a pebble in the shoe.
- Morton's Test

Morton's Neuroma*:* *Qi Ci* and *Bafeng* Needle Techniques
The location of the dorsal interossei MP is in very close proximity to the fibrous tissue build-up of Morton's neuroma. To locate the dorsal interossei motor points, the practitioner divides the length of the metatarsal bone in half. Using a modification of the *Qi Ci* needle technique, two 1.5-inch/40mm needles are inserted obliquely, 0.5-1 inch deep from the dorsal surface into each interossei head, so that the tips of the needles form an "X." The practitioner should needle these points with a reducing method, although care must be taken not to injure the plantar nerve.

To stimulate the bafeng points for the treatment of a Morton's neuroma, use a 1.5-inch/40mm needle to stimulate the extra point *bafeng* between the MTP joints of the affected toes. The needle should be inserted at a slightly oblique angle toward the plantar surface of the foot. The needle depth is 1-1.25 inches, directed toward the center of the two metatarsal bones. Separating the MTP joints with firm pressure facilitates needle insertion. This needle technique is often used together with the dorsal interossei needle technique discussed previously.

The Sinew Channels and Pes Planus – Therapeutic Exercises
Pes Planus Intrinsic Muscles Exercise: Inch Worm
The standing or seated patient places their relaxed foot onto the floor (A). Keeping the foot on the floor for the entire exercise, the patient lifts K1 (*yongquan*) upward to bring their toes toward their heel (B). The heel is then moved back so the foot is in normal position (C). Repeat 5-10x.
The patient will then perform the opposite maneuver by bringing their heel toward their toes by lifting K1 upward, then move the toes forward so the foot is in normal position. Repeat 5-10x.

Pes Planus Intrinsic Muscles Exercise: Foot Curls
After performing the inch worm, the patient abducts and everts the foot by turning their toes out and flattening SP4-K2 to the floor. They then adduct and invert the foot by turning the toes in and lifting SP4-K2 away from the floor. Emphasis should be on curling the medial arch up and making a 'C' shape with the medial foot while minimizing turn from the leg. Repeat 5-10x.

Pes Planus Extrinsic Muscle Exercise: Inverted Heel Raises
This is a good exercise for injuries where foot over-pronation is a contributing factor. It is best prescribed when it can be performed with no pain. It is useful for ankle sprains, tenosynovitis injuries and plantar fasciitis. This exercise is contraindicated for patient with MTP joint injuries such as turf toe and sesamoiditis.

The patient is instructed to stand with their toes touching and their heels turned outward. It is best for the patient to be next to a wall or a chair to have something to hold to maintain balance.
The patient is instructed to slowly lift the heels as high as possible and then slowly lower them to the starting position. The patient should focus on keeping the heels outward while in plantar flexion.

Pes Planus Extrinsic Exercise: Inverted Toe Raises
The patient is instructed to stand with their back to the wall and their heels 2-3 inches away from the wall. The feet are hip-width apart and pointed straight forward.
The patient extends both knees by contracting the quadriceps while simultaneously dorsiflexing and inverting both feet.

Motor Points

Peroneus longus
Motor Point: 1.5-2 *cun* directly below the head of the fibula.
Needle Technique: Perpendicular needle insertion 0.5-0.1 inch deep.
Peroneus brevis
Motor Point: 1 *cun* above GB 35 (*yangjiao*) on the posterior border of the fibula.
Needle Technique: Oblique needle insertion angled under the lateral border of the fibula, 0.5-0.75 inch deep.
Tibialis posterior
Motor Point: Deep to SP 8 (*diji*)
Needle Insertion: Oblique needle insertion starting at SP 8 to needle the underside of the tibia bone approximately 1-1.25 inches deep directed toward the center of the calf.
Caution: The posterior tibial artery and nerve are in close proximity to this point.
Tibialis anterior
Motor Point: Extra point *lanweixue*, 2 *cun* below ST 36 (*zusanli*).
Needle Technique: Perpendicular needle insertion 0.5-1 inch deep.

Gastrocnemius
Motor Points:
1) Medial head: 3-4 *cun* inferior to K 10 (*yingu*).
2) Lateral head: 2-3 *cun* inferior to UB 39 (*weiyang*).

Needle Technique: Perpendicular needle insertion 0.5-1 inch deep for both motor points.

Soleus
Motor Points:
1) On the posterior border of the fibula, 3 *cun* inferior to the head of the fibula.
2) 1 *cun* posterior from SP 8 (*diji*).
3) Halfway between SP 7 (*lougu*) and SP 8 (*diji*).

Needle Technique: Perpendicular needle insertion 0.5-0.1 inch deep for all motor points.

Abductor digiti minimi
Motor Point: The plantar surface of the fifth metatarsal head, 0.5-1 *cun* distal to UB 64 (*jinggu*).
Needle Technique: Perpendicular needle insertion 0.5-0.75 inch deep.

Abductor hallucis
Motor Point: K 2 (*rangu*).
Needle Technique: Perpendicular needle insertion 0.5-0.75 inch deep.

Flexor hallucis brevis
Motor Point: Halfway between SP 3 (*taibai*) and SP 4 (*gongsun*) on the plantar surface of the foot.
Needle Technique: Perpendicular needle insertion 0.5-0.75 inch deep.

Dorsal Interossei
Motor Points: The dorsal interossei consist of four muscles with one motor point located on each of the two heads as they arise from the adjacent sides of the metatarsal bones. These points are located approximately 0.5-0.75 *cun* proximal from LIV 2 (*xingjian*), ST 44 (*neiting*) and GB 43 (*xiaxi*).
Needle Technique: Oblique needle insertion 0.5 inch deep from the dorsal surface into each interossei head between each metatarsal bone so that the needles form a cross.

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