

PFA Offers New CEP Program via *Current Pedorthics* Magazine

Beginning with this issue of *Current Pedorthics* magazine, and for all of 2011, PFA will offer Continuing Education Points (CEPs), approved by the American Board for Certification in Orthotics, Prosthetics & Pedorthics (ABC) and the Board of Certification/Accreditation International (BOC), for specially designated articles in *Current Pedorthics*.

To take advantage of the program, visit www.pedorthics.org and click on the Continuing Education Opportunities tab to purchase the 10-question quiz associated with the designated article. CEP quizzes cost \$25 for members and \$35 for nonmembers. The quizzes are worth 1.0 Scientific or Business CEP, depending on the content.

This article is the first CEP-eligible article in *Current Pedorthics*. Look for additional CEP-eligible articles in future issues of the magazine. Successful completion of the quiz will result in 1.0 CEP reported directly to ABC and BOC at the end of each quarter.

If you have any questions, contact Lauren Kemp, PFA education coordinator, at (800) 673-8447 or e-mail info@pedorthics.org.

TAPING THE ARCH OF THE FOOT HAS LONG BEEN A TREATMENT OPTION FOR VARIOUS PAIN SYNDROMES OF THE FOOT AND ANKLE. PLANTAR FASCIITIS HAS BEEN ONE OF THE MORE COMMON FOOT CONDITIONS MANAGED WITH ARCH TAPING AS IT WAS ORIGINALLY INTRODUCED BY DR. RALPH DYE IN THE 1940S.

A variety of articles have consistently referenced the “low-Dye” arch taping technique and attributed its success to its effectiveness in controlling excessive foot pronation. Few research articles have attempted to substantiate this hypothesis and to date, little evidence supports the “pronation-control” theory of why arch taping has been helpful in managing these cases.

Some research suggests the plantar fascia experiences increased strain (elongation) of approximately 6 to 12 percent, particularly during mid-stance through terminal stance of gait. Tensile stress associated with this strain has been estimated to peak around 1 - 1.5 times body weight during terminal stance and seems related to the windlass effect of the plantar fascia (1, 2).

A definition of windlass includes the following: “Any of numerous hauling or lifting machines consisting essentially of a horizontal cylinder turned by a crank or a motor so that a line attached to the load is wound around the cylinder.” (www.answers.com/topic/windlass)

In this definition the *cylinder* represents the convex shape of the metatarsal head, the *crank* represents the proximal phalanx and the *line* represents the plantar fascia. **Figure 1** identifies the anatomical example of the windlass mechanism within the foot.

As the proximal phalanx dorsiflexes during terminal stance, the plantar fascia wraps around the metatarsal head and produces tensile force within the plantar fascia. This is displayed in **Figure 2**.

ARCH TAPING

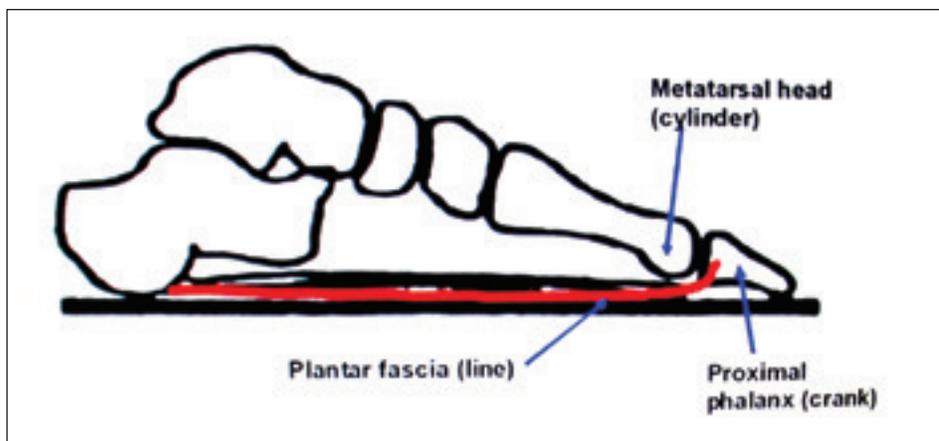


Figure 1: Windlass mechanism model for the foot.

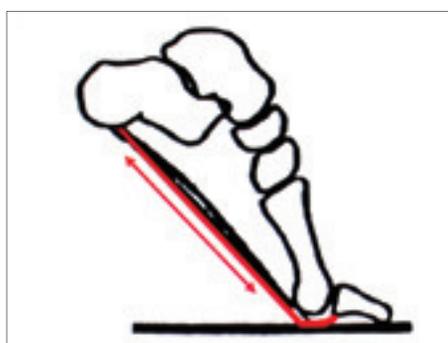


Figure 2: Terminal stance plantar fascia windlass effect.

Since plantar fasciitis seems to develop from repetitive and excessive tensile forces during stance, it might seem reasonable to more directly control or minimize these tensile forces. The rationale of the taping technique referenced in this article is based on the same concept of a windlass effect but acting through the tape. The emphasis of this taping technique suggests that the direction and placement of the tape is important in order to reduce the strain on the plantar fascia.

The tape used was multi-purpose polyethylene coated cloth tape (47mm, Tyco, Norwood, Mass.) with natural rubber based adhesive. A key element for tape application is to closely follow the anatomical alignment of the plantar fascia as much as possible. This includes aligning the longitudinal tape strip in the same direction as the plantar fascia with emphasis to cover the convex surfaces of the metatarsal heads as indicated in **Figure 3**.

Extending the tape over the convex shaped metatarsal heads ensures that the tape can function with its own windlass effect as it is anchored under the metatarsal heads from weight bearing pressure and as the tape wraps around the posterior heel (3,4). Previous descriptions in the literature of the low-Dye technique concentrated on tape strips applied from medial to lateral metatarsals and not extending over the metatarsal heads.

Figures 4 and 5 show the plantar and sagittal views of the completed tape procedure. (See references by Hunt *et al.*

(3,4) for a full description of the taping procedure.)

With plantar fasciitis, the main damaging force seems to occur with increased tension during weight bearing as the arch collapses during the first part of stance and also during terminal stance when the heel is off the ground.

Controlling excessive pronation during the first part of stance has been a focus of many of the articles describing arch taping as a viable treatment option. However, pronation control options would appear less effective as the heel leaves the ground during terminal stance. Here is when it might seem appropriate to consider a possible windlass effect produced by the tape. The combination of the tape controlling elongation of the foot during the first part of stance and the windlass effect of the tape during terminal stance may have a net result of reducing tension within the plantar fascia. **Figure 6** graphically demonstrates the possible effects of arch taping for the treatment of plantar fasciitis.

The hypothesis for the effectiveness of this taping technique is based on the



Figure 3: Longitudinal tape strip wrapping around heel and extending to cover metatarsal heads.



Figure 4: Plantar view.



Figure 5: Sagittal view.

premise that a windlass effect occurs within the tape. If a windlass effect occurs, then pressure would increase under the tape on the posterior calcaneus. To investigate this hypothesis the authors conducted clinical trials to measure posterior calcaneal pressure during a walking gait of eight normal subjects between ages of eight and 25. Miniature pressure sensors were used to measure the pressure at the tape and posterior calcaneus interface (Tactilus® Free Form Sensor System, Sensor Products LLC, Madison, N.J.).

Findings indicated that peak posterior heel pressure significantly increased to

35.3 psi at approximately 70 percent into stance phase compared to a non-taped condition. These results seem to support the hypothesis that a windlass effect does occur in this taping technique and may explain the positive clinical outcomes for plantar fasciitis.

The emphasis on mechanical control for this taping technique is unique in that its focus is to control elongation of the foot and plantar fascia rather than directly control pronation. The windlass effect acting through the tape seems a plausible explanation for the positive clinical outcomes based on the pressure studies during gait.

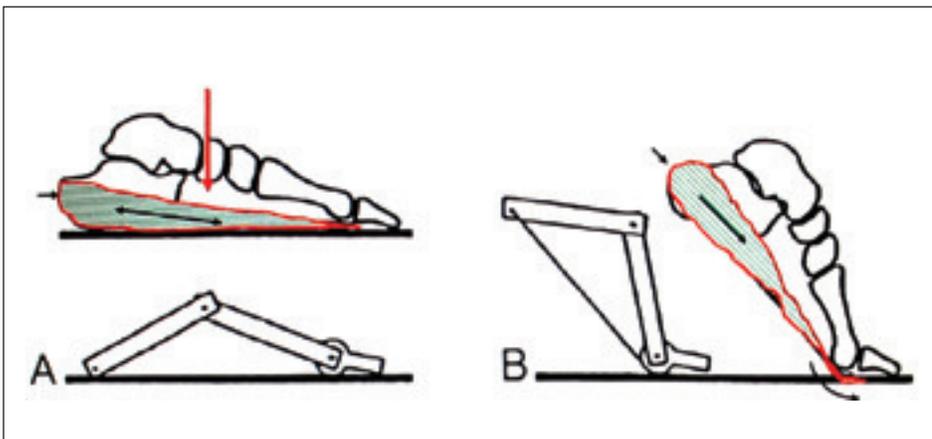


Figure 6: Force mechanisms within tape during gait. A, Increased tension within tape as arch tends to collapse. B, Tension in tape increases during terminal stance due to windlass effect of tape. Result is increased compressive force against posterior heel.

References

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