Field Evaluation and Management of Non-Battle Related Knee and Ankle Injuries by the ATP in the Austere Environment — Part Three

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Editor's Note: Part Three consists of ankle injury evaluation and taping.
Part Two (taping procedures for the various knee injuries) was published in the *JSOM* Spring 09, Vol 9 Ed 2.
Part One (evaluation of knee injuries) was published in the *JSOM* Winter 09, Vol 9 Ed 1.

Ankle

The most commonly injured ankle ligament is the anterior talo-fibular ligament (ATFL) located at the anterolateral aspect of the ankle (Figure 58).

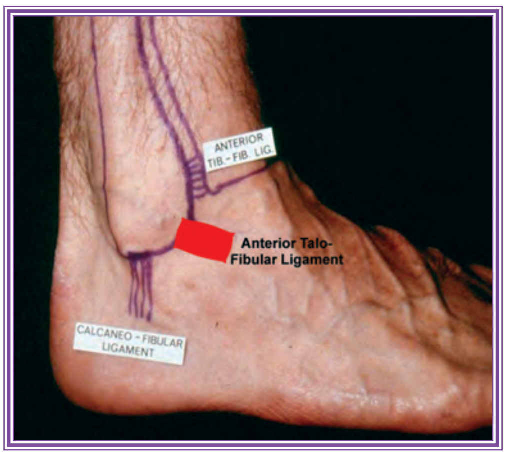

Figure 58: *Anterior talo-fibular ligament location at the anterolateral aspect of the ankle.*

With respect to ankle sprains and injury to the ATFL, the typical mechanism of injury involves a forced motion that is best described as a plantarflexion – inversion deforming force (Figure 59).

This injury is often accompanied by a history of a pop; the patient often states that they rolled their ankle; there is pain and swelling with the most intense area of symptoms located at the anterolateral aspect of the ankle.

Figure 59: *Plantarflexion and inversion of the ankle leads to abnormal stretching and tearing of the anterior talo-fibular ligament (ATFL).*

When intact, the ATFL goes from the distal aspect of the fibula to the talus. In this position, it acts as a checkrein to prevent abnormal posterior subluxation of the tibia relative to the talus (Figure 60).

Figure 60: *Intact AFTL prevents subluxation of the tibia and fibular complex relative to the talus.*

In testing for stability of the ATFL, which is a major stabilizer of the ankle, an anterior drawer test is performed. This is done much like the anterior drawer test of the knee. The knee is flexed to 90 degrees and the foot is stabilized (Figure 61). By applying an anteriorly directed force to the calcaneus, or by stabilizing the foot, and then applying a posteriorly directed force to the tibia, the stability of the lateral ankle ligaments are tested.

Figure 61: *Anterior drawer test of the ankle. With a posteriorly directed force applied to the tibia, and with the foot stabilized, there is no subluxation of the tibia and fibula posterior on the talus.*

If the ATFL is torn, the tibia and fibula will sublux posteriorly (Figure 62 and 63). It should be noted that this test should always be performed with the knee flexed. With the knee extended, there is false stability when doing the test.

Figure 62: *Torn ATFL with posterior tibia and fibular subluxation on the talus after applying a posteriorly directed force.*

Figure 63: *Torn ATFL with posterior tibia and fibula subluxation. Although xray stress views are shown for teaching purposes, the posterior "clunk" as the bones sublux is readily felt and may be visualized in most patients.*

The treatment for an ankle sprain is to prevent the deforming forces of plantarflexion and inversion. This is performed by taping the ankle followed by administration of non-steroidal anti-inflammatory medication. Further evaluation upon return to base is absolutely required. Most likely the mission can be completed.

Ankle Taping

Just as with the knee, the taping at the ankle begins with applying anchoring strips. The anchoring strips are usually overlapped by approximately 30-50%. This taping method is demonstrated using two colors of tape so that the overlap and position of the tape may be better appreciated. As with taping the knee, the skin should be clean and dry. If possible, shave the hair prior to tape application. However, tape should NOT be applied over open wounds.

Start by placing the ankle in the neutral position, perpendicular to the lower leg (Figure 64).

Figure 64: *Start with the ankle perpendicular to the foreleg and everted if possible.*

The circumferential anchoring strips are applied with approximately a 30%-50% overlap (Figure 65). Strips are applied at the metatarsal phalangeal region distally as well as approximately half way up the foreleg.

Figure 65: *Proximal and distal anchoring strips.*

Following the basic anchoring strips, U-shaped strips are applied. When applying these strips, start proximally and medially. As the tape is applied, the hindfoot is pulled into eversion, to decrease the stress on the damaged ATFL region. This allows for stability of the ankle with respect to inversion and eversion (Figure 66 and 67).

Figure 66: *Pull tape strips from medial to lateral to evert the hindfoot.*

Figure 67: *Second hindfoot anchoring strip applied.*

After two of these strips have been applied, U-shaped strips are applied beginning at the medial aspect of the foot and then continuing posterior to the ankle, ending at the distal lateral aspect of the foot. This aids in stability of forefoot adduction and aids in stability of inversion (Figure 68 and 69).

Figure 68: *Initial horizontal foot/ankle anchoring strip.*

Figure 69: *Second horizontal foot/ankle anchoring strip.*

After completion of these two strips, the anchoring strips (or heel lock taping) to specifically resist inversion are applied. The tape is started at the medial aspect of the ankle (Figure 70).

Figure 70: *Start at the proximal medial ankle with the heel lock tape strip.*

Pull the tape across the plantar aspect of the heel (Figure 71),

Figure 71: *Plantar application of the heel lock.*

As the tape is pulled proximally and laterally across the lateral border of the heel and ankle, the heel and ankle should be everted to further increase the efficiency of the heel lock tape strip and thereby decrease any stress on the injured ATFL region (Figure 72).

Figure 72: *Pull the ankle into eversion as the tape is applied to the lateral border of the heel and ankle.*

Finally, continue to pull the heel into eversion as the tape is pulled to the medial side of the foreleg (Figure 73).

Figure 73: *Completed application of the heel lock tape strip.*

The heel lock tape strip essentially pulls the ankle into a position of eversion which takes the stress off the damaged ligaments. Once the first heel lock strip is applied, three or four more are then placed (Figure 74-76).

Figure 74: *Completion of second heel lock strip.*

Figure 75: *Starting the third heel lock strip.*

Figure 76: *Completion of four heel lock strips.*

Once these strips have been applied, additional circumferential strips are applied (Figure 77).

Figure 77: *Circumferential anchoring strips applied to the foreleg and foot.*

In doing so, all the skin is closed and covered with tape with the exception of the open area at the heel. This is done because ankle injuries are associated with a lot of swelling. If there are any breaks in the tape and if skin is allowed to "peek" through the tape, this area will develop a very painful tape blister, which in the austere environment runs the risk of becoming infected (Figure 78).

Figure 78: *Complete taping with the heel left open.*

This type of taping results in excellent stability of the ankle joint. Obviously, the patient cannot return to totally normal activities although he should remain functional.

To appreciate the amount of stability that taping provides, look at the amount of inversion possible in the untaped ankle (Figure 79) as opposed to the taped ankle (Figure 80).

Figure 79: *Significant inversion of untaped ankle.*

Figure 80: *Minimal inversion of taped ankle as determined by inability to invert ankle/foot and raise the1st MTP joint off of the floor.*

General Principles and Guidelines

In trying to anticipate return to activity, ideally there is no swelling or effusion, the patient has full range of motion and approximately 90% of normal strength. However, the treating ATP must be aware that as swelling decreases, the pain decreases and the motion increases. This gives a very false sense of healing. In fact, the symptoms will often disappear approximately four weeks prior to completion of healing. Obviously, this sets up the situation whereby the patient is relatively asymptomatic, the healing is immature and not complete, and a premature return to activity leads to an extremely high re-injury rate.

In general, successful treatment of non-battlefield related knee and ankle injuries, in the austere situation, so that the patient may remain functional, requires several things:

- The ATP must understand the anatomy involved.
- He must know the questions to ask to identify the mechanism of injury.
- The ATP must understand the taping principles.
- He must recognize that the taping is designed to support the injured tissue and decrease the stress load on the injury. To determine the type of taping and to apply it successfully, it is obviously necessary to have a high prob ability of a working diagnosis.
- He must know the possible diagnoses affecting a joint given a set of physical findings and a mechanism of injury
- Most importantly, a minimum of six weeks of healing is required, regardless of what the patient says or how the patient feels.
- The absence of pain does not equal healing
- All of the injuries discussed here are significant injuries that absolutely require further medical evaluation upon return to base.

Reference

Perrin, David. (2005). Taping and Bracing, Human Kinetics.

This completes our three-part series.

JF Rick Hammesfahr, M.D. graduated from Colgate University in 1973 and the College of Medicine and Dentistry of New Jersey in 1977. He was Chief Resident in Orthopaedics at Emory University from 1980-1982. In addition to receiving numerous surgical awards, he has been on the speaking faculty of numerous medical and orthopaedic meetings serving as the co-director of several courses on knee surgery. His publications have focused on tactical medicine, arthroscopy, calcaneal fractures, abductor paralysis, wound healing, running injuries, meniscal repair, septic knees, and sports medicine. He has written two book chapters, one book, published 22 articles, serves on the editoral review board of multiple medical journals, is a chief editor of the "Ranger Medic Handbook," and has presented over 120 CME lectures and talks on orthopedics and sports injuries.

Dr Hammesfahr has served as president of the largest regional orthopaedic association, the Southern Orthopaedic Association. Currently, he is the Director of the Center for Orthopaedics and Sports Medicine and serves as the Chairman of the USSOCOM Curriculum and Examination Board.