Dynamic Chiropractic

ORTHOTICS & ORTHOPEADICS

Orthotic Support on the Gridiron

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With the spring sports season underway, we who work with athletes want them to be able to practice and play in an environment that is as injury-free as possible. This includes general measures such as the ritual of pre-participation physical examinations. After a thorough history and sport-specific examination are conducted, recommendations are made toward the goal of increasing the possibility of safe athletic participation, maximizing individual performance.

These recommendations include activities directed toward overcoming, improving and/or eliminating the deficits recorded during the pre-participation examination. These activities often are directed at improving flexibility, strength, aerobic or anaerobic endurance, and power.

As many as 1.5 million young men participate in football in the United States, and an estimated 1.3 million football-related injuries are sustained annually. With spring comes the beginning of preseason training and preparation. Fifty-one percent of injuries occur during training. Contact sessions are 4.7 times more likely to produce injuries. Lower-extremity injuries account for 50% of all injuries, with knee injuries accounting for up to 36%. Upper-extremity injuries account for 30%. Sprains and strains account for 40% of injuries, contusions 25%, fractures 10%, concussions 5%, and dislocations 15%. Foot and ankle injuries are reported to account for 12% of lower-extremity injuries. Low back injuries account for another 5% of injuries.[1]

Considering the high incidence of lower-extremity injuries in football, the question begs to be asked, "What else can we do to decrease the volume of injuries seen in our athletes?" Over time, there have been many approaches to reducing lower-extremity injuries. One such approach has been the suggested mandating of routine knee-bracing as a prophylactic measure to prevent knee injury. The conclusion, after a thorough review of literature on this topic, does not support the use of routine bracing and leaves the decision to wear a brace up to the individual athlete.[1] A measure that has been demonstrated to decrease injury rates is to have the athletes wear shorter cleats. Increasing preseason conditioning also has been found to decrease the injury rates in football players.

Custom-made orthotics have been reported to be effective in reducing pain, improving mobility and providing considerable protection against abnormal loading of the knee's medial compartment.[14] This innovative strategy, directed at reducing lower-extremity injuries in athletes, has been researched by numerous authors. Support demonstrating favorable results in the use of custom-made foot orthotics on lower-extremity injuries continues to accumulate.

Custom-made orthotics frequently are prescribed in the conservative management of overuse running injuries. Numerous studies have reported significant decreases in maximum rear-foot eversion angle, maximum rear-foot eversion velocity impact peak, maximum vertical loading and tibial internal rotation. When these factors are high, they are related to causes of overuse injuries and have been shown to be decreased with the use of custom orthotics.[2]

The tibialis posterior muscle is an essential stabilizer of the foot during standing and walking.[13] The tibialis posterior tendon provides dynamic support along the plantar aspect of the foot and arch.[6] When this muscle is deficient, a decrease in the longitudinal arch height often occurs.[7] During gait, eccentric activity of the tibialis posterior tendon, which is initiated at heel strike, permits controlled foot pronation and assists with shock absorption during limb-loading.[8]

During terminal stance, a second peak in tibialis posterior activity contributes to the transverse tarsal joints locking as body weight progresses forward over a stable foot, as the heel rises from the ground.[8] Custom-made orthotic intervention has been demonstrated to promote normalized function of the tibialis posterior muscle, which is regarded as the major contributor to ankle inversion and acts to eccentrically limit pronation. Orthotic intervention assists in reducing ankle inversion and probably assists the posterior tibialis muscle in controlling subtalar joint pronation.[3] This is an important factor, as it is believed that normalized subtalar joint pronation is an essential protective mechanism that facilitates the lessening of impact forces during running. These conclusions regarding the influence of orthotic use on runner biomechanics easily can be extrapolated to easing and preventing lower-extremity injuries in football players.

Orthotics have been found to be a successful intervention in patellofemoral pain[4] in athletes who demonstrate excessive pronation, excessive internal rotation of the lower extremity during weight-bearing, and increased quadriceps angle (Q angle). All factors were reduced, with an associated reduction in patellofemoral contact pressures and altered patellofemoral contact pressure mapping. Wearing custom-made orthotics has been demonstrated to influence the knee to assume an abducted attitude prior to heel strike. It has been suggested that this normalizes the knee in a healthier manner for those suffering from patellofemoral problems.

One of the more common injuries in women athletes is to the anterior cruciate ligament (ACL). A number of studies have reported a significantly higher incidence of knee injuries in general, and ACL injuries in particular, than their male counterparts.[5] There have been numerous intrinsic and extrinsic factors implicated as contributing factors to this phenomenon.

One possible gender-related cause is an increased genu valgum, related to a woman's normally wider pelvis. Orthotics have been shown to exert a positive influence in terms of decreasing pain and increasing function. A reduction in the excessive valgus knee reduces forces in the laterally directed soft tissues from the patellar tendon, the quadriceps tendon and the iliotibial band, and contributes to reduced patellofemoral contact pressures.[4]

A growing number of studies examine proprioceptive responses of the lower extremity and postural sway as it relates to injury and stability of the ankle joint.[9] The emphasis of these investigations is related to the importance of proprioception in return to functional activity after injury and implication in the role of athletic performance, especially the relationship of postural sway as a predisposing factor to ankle injuries.[10] The mechanism for this protocol is the concept that if the forces required to correct an unstable placement of the foot are delayed due to fatigue, then the ankle joint is at risk for injury, and differences found might be the result of proprioceptive deficits.

In one study, individuals with "pathological" sway amplitudes were predisposed to injury in the following season.[8] Orthotics have been shown to successfully modify selected aspects of lower extremity mechanics, as well as improve balance in individuals with acute ankle sprains. They have been shown to increase structural support, improve joint congruency, and improve proprioceptive

and kinesthetic awareness.

These results suggest that with fatigue, the ability of the lower leg to control sway becomes compromised, and orthotics provide much-needed additional support. This stability improves alignment, which improves stability of the ankle. Improved alignment has been associated with mechanoreceptor function and neural feedback.

The benefits suggested by the literature have been tested by a recent study by Jensen, Austin, Mandell, et al.[11] Their study investigated the effectiveness of custom orthotics at reducing injuries among members of a college football team. The results included a significant decrease in lower-body injuries - from 148 in 2004 to 126 in 2005. Significant drops were noted, especially in knee and lumbar spine injuries, with smaller drops in foot, ankle and toe injuries.

As the football season officially gets underway with spring training across the country, doctors should consider having the feet of their athletes evaluated thoroughly. Perform the pre-participation physical examinations and, when necessary and appropriate, place these athletes in custom-made orthotics.

References

1. Saal, J. Common American football injuries. *Sports Medicine,* 1991:12(2):132-47.
2. MacLean, C., McClay Davis, I., Hamill, J. Influence of a custom foot orthotic intervention on lower extremity dynamics in healthy runners. *Clinical Biomechanics,* 2006;21:623-30.
3. Kulig, K., Burnfield, J.M., Reischl, S., Requejo, S.M., Blanco, C.E., Thordarson, D.B. Effect of foot orthosis on tibialis posterior activation in persons with pes planus. *Med Science Sports Exercise,* 2004:24-28.
4. Foxworth, J., Gross, M. The role of foot orthoses as an intervention for patellofemoral pain. *Journal of Orthopedic and Sports Physical Therapy,* 2003;33:661-9.
5. Lamb, M.M., Moeller, J.L. Anterior cruciate ligament injuries in female athletes: why are women more susceptible? *The Physician and Sports Medicine,* 1997;25(4).
6. Klein, P. S, Martin and M Rooze. Moment arm length variations of selected muscles acting on the talocural and subtalar joints during movement: an in vitro study. *J of Biomech,* 1996;29:21-30.
7. Funk DA, Cass JR and Johnson KA. Acquired flat foot deformity secondary to posterior tibial tendon pathology. *J. Bone and joint Surg. Am,* 1986;68:95-102.
8. Troop H, Ekstrand J Gillquest J. Stabilometry in functional instability of the ankle and its value in predicting injury. *Med Sci Sports Exercise,* 1984;16:64-6.
9. David T. Effect of orthotics on postural sway after fatigue of the plantar flexors and dorsiflexors. *Journal of Athletic Training,* 2000;5(1):26-30.
10. Perry J. *Gait Analysis: Normal and Pathological Function.* Thorofare, NJ: Charles B. Slack, 1992: 69-80.
11. Jensen B, Austin W, Wilder NJ, Ungar BA, Zhang J, Nosco DL, Mandell M. Effectiveness of custom orthotics at reducing injuries in a college football team. *Journal of Chiropractic Education,* 2007;21(1):109.
12. Marks R, Penton L. Are foot orthoses efficacious for treating painful medical compartment knee osteoarthritis? A literature review. *Int J Clinical Practice,* Jan 2004;58(1):49-57.
13. Burnfield KK, Reischl S, Requelo SM, Blanco CE, Thorarson DB. Effect of foot orthoses on tibialis posterior activation in persons with pes planus. *Med Science Sports Exercise,* Jan 2005;37(1):24-9.
14. Marks R, Penton L. Are foot orthotics efficacious for treating painful medial compartment knee osteoarthritis? A review of the literature. *Int J Clin Pract,* Jan 2004;58(1):49-57.