EFFECT OF ANKLE TAPING ON STANDING BALANCE IN THE INDIVIDUALS WITH FUNCTIONAL ANKLE INSTABILITY

Yi-Wen Chang[1], Hong-Wen Wu[2], Wei Hung[1] and Yen-Chen Chiu[1]

Department of Exercise & Health Science[1], Department of Physical Education[2], National Taiwan College of Physical Education, Taichung, Taiwan[2]

KEYWORDS: ankle sprain, centre of pressure, sports injury.

INTRODUCTION: Ankle sprain is one of the most common sport injuries in athletes. Based on the epidemiologic investigation (Bahr, 1997), the injury rate of ankle sprain could be 54% in volleyball players, indicating that more than half of the volleyball players has been suffering ankle sprain. The rate of recurrent ankle sprain could be as high as 79% in the volleyball players with ankle sprain. Also, ankle sprain is a common sports injury that can cause significant and chronic disability. Functional instability of the ankle has been defined as a tendency for the foot to give away after an ankle sprain. Such instability is a relatively widespread concern following the acute ankle sprain, persisting as a chronic condition long after the apparent signs and symptoms of the original insult have resolved.
Ankle taping has become one of the major interventions in athletic training and is often used for rehabilitation and/or prevention of ankle sprains. Orthotic devices have been shown to effectively modify selected aspects of lower extremity mechanics and improve foot stability during the stance phase of running (Guskiewicz, 1996). Ankle function and muscle coordination after the ankle sprain have been documented (Fu, 2005). However, very little study has been done focusing on the effect of ankle taping on balance control in the individuals with recurrent ankle sprains. Therefore, the purpose of this study was to investigate the effect of ankle taping on the balance ability in the individual with functional ankle instability.

METHOD: Fifteen subjects (10 males and 5 females) participated in this study. Their average age was 21.1±0.96 years. Their average body mass was 65.07±11.41 kg. Their average height was 172.4±8.97 cm. The criteria for subject inclusion were (1) unilateral ankle sprain, (2) at least twice of ankle sprain with first or second degrees in the past three years and (3) no injury within six recent months. Subjects with surgery history in lower extremity or any other neuromuscular deficit would be excluded in this study. They had no pain or uncomfortable symptom in the testing day.
Center of pressure (COP) length was measured with a balance plate (DigiMax posturomed). Subjects were asked to perform one-leg standing in 20 sec. Subjects were asked to perform static standing with slightly knee bended on a balance plate. Arm position was not limited so as to maintain their standing balance as stable as possible. Data were measured in the following testing conditions: 2 sides (healthy and injured), 2 standing surfaces (stable and unstable), 2 visions (eyes-open and eyes-closed) and 2 tapes (taping and no-taping). The healthy and injured ankles were taped by an experienced athletic trainer (1.5" Johnson & Johnson non-elastic white tape). Five-cm displacement in medial-lateral direction was allowed in unstable surface. One trial was performed by each subject in each condition. Vision impaired condition was included in this study because we attempted to see if the standing stability without visual feedback could be enhanced by ankle taping. The COP length of 20-sec data collection was analyzed. Paired t-test was used to compare the difference between taping and no-taping ankles.

RESULTS: COP lengths in different testing conditions are shown in Table 1. For the COP data in anterior-posterior (AP) direction, taping had significantly greater COP lengths than no-taping in the injured ankle in stable and unstable surfaces ($p<0.05$). However, in healthy ankle, taping had significantly lesser COP lengths than no-taping in unstable surface ($p<0.05$). Eyes-open and eyes-closed conditions showed the same findings in AP direction.

The findings in medial-lateral (ML) direction were almost the same with in AP direction, excluding the injured ankle in unstable surface and eyes-closed condition.

Table 1. COP lengths (mm) in different testing conditions

			AP			ML		
Vision	Surface	Side	Taping	No-taping	p	Taping	No-taping	p
Open	Stable	Healthy	29.1	28.6	.721	22.2	21.2	.589
		Injured	35.1	26.2	.015*	26.7	19.9	.002*
	Unstable	Healthy	413.1	847.3	.012*	995.0	1768.6	.015*
		Injured	732.8	340.3	.000*	1968.9	984.1	.004*
Closed	Stable	Healthy	52.5	55.4	.591	38.1	39.6	.662
		Injured	68.9	41.2	.022*	45.7	29.4	.013*
	Unstable	Healthy	539.9	818.6	.008*	974.5	1287.8	.040*
		Injured	856.0	542.7	.014*	1277.7	1037.6	.199

DISCUSSION: Understanding the mechanisms of ankle sprain and balance control is very important in prevention of ankle sprain. Robbins et al. (1995) indicated that ankle taping partially modified impaired proprioception caused by exercise in healthy people. Abian-Vicen et al. (2008) reported that the use of ankle taping had no effect on the jump performance of healthy young subjects. This study demonstrated how the ankle taping influenced on the standing balance in the subjects with functional ankle instability. Based on our findings, ankle taping had no positive influence on standing balance in the ankle with recurrent sprains since tapings showed substantially greater COP lengths than no-tapings almost in all testing conditions for injured ankles. It was implied that taping might deteriorate the ability of balance control in chronic injured ankle. However, taping showed considerably lesser COP lengths than no-taping in healthy ankle in unstable surface. Ankle taping could improve standing stability in healthy stable ankle, especially in unstable surface.

CONCLUSION: This study identified the effect of ankle taping on the standing balance in individuals with recurrent ankle sprains. Ankle taping did not help maintaining better standing balance in the unstable ankle while it could substantially reduce the postural sway in stable ankle in unstable surface. The biomechanical findings of this study would be helpful in athletic training. The athletes could have better performance in sports following the effective prevention of ankle sprain.

REFERENCES:

Abian-Vicen, J., Alegre L.M., Fernandez-Rodriguez J.M., Lara, A.J., Meana, M. & Aguado, X. (2008). Ankle taping does not impair performance in jump or balance tests. *Journal of Sports Science and Medicine*, 7, 350-356.

Bahr, R. & Bahr, I.A. (1997) Incidence of acute volleyball injuries: a prospective cohort study of injury mechanisms and risk factors. *Scandinavian Journal of Medicine & Science in Sports*, 7,166-171.

Fu, A.S., & Hui-Chan C.W.Y. (2005) Ankle joint proprioception and postural control in basketball players with bilateral ankle sprains. *American Journal of Sports Medicine*, 33, 1174-1182.

Guskiewicz, K.M., & Perrin, D.H. (1996) Effect of orthotics on postural sway following inversion ankle sprain. *Journal of Orthopaedic & Sports Physical Therapy,* 23, 326-331.

Robins, S., Waked E. & Rappel, R. (1995). Ankle taping improves proprioception before and after exercise in young men. *British Journal of Sports Medicine*, 29, 242-247.

Acknowledgement

The study was partly supported by the grant of National Science Council (NSC97-2410-H-028-003-), Taiwan.