

ANTI-PRONATION FOOT TAPING ALTERS MUSCLE ACTIVATION PATTERNS OF VASTUS MEDIALIS, VASTUS LATERALIS AND GLUTEUS MEDIUS DURING TREADMILL RUNNING

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^{1,2}Luke Kelly, ¹Sebastien Racinais, ^{1,2}Craig Tanner, ¹Justin Grantham, ^{1,2}Hakim Chalabi

¹Aspetar- Qatar Orthopedic & Sports Medicine Hospital,

²National Sports Medicine Program,

email: luke.kelly@aspetar.com, web: www.aspetar.com

INTRODUCTION

Anti-pronation (AP) taping has been shown to change foot posture and function[1]. As yet no studies have examined the effect of anti-pronation taping on upper leg muscle activation whilst running. Our hypothesis was that the activation of Gluteus Medius (GM), Vastus Medialis (VM) and Vastus Lateralis (VL) can be significantly effected by the application of AP taping.

METHODS

Single Blind, counterbalanced, repeated measures study. 13 Healthy recreational runners (Age 31.7 ± 5 yr, height 181.7 ± 5 cm, weight 81.6 ± 6 kg). Augmented Low Dye Taping (ALD) [1] was the method of anti-pronation taping used. The placebo taping method consisted of 4 base straps across the plantar aspect of the heel. They were anchored with strips of tape on the medial and lateral aspect of the heel.

Each participant completed 3 sets of 6 min running on a treadmill at a speed of $10 \text{ km}\cdot\text{h}^{-1}$ with 3 different taping conditions (ALD, Placebo, No tape) applied in counterbalanced order. Average muscle electrical activity, estimated by the root mean square (RMS), time to peak activity and in-shoe plantar pressure were recorded over an average of 20 gait cycles, after 5 minutes of treadmill running. For each condition, participants wore standardized running shoes (Adidas Response Cushion). Plantar pressure was recorded with Pedar X in-shoe pressure analysis (Novel GMBH, Munich, Germany).

Statistical analysis was ANOVA for repeated measures.

RESULTS AND DISCUSSION

Peak Plantar Pressure displayed significant increase in peak plantar pressure in the lateral mid-foot in ALD versus both no taping ($P < 0.001$) and placebo ($P < 0.001$, fig 1).

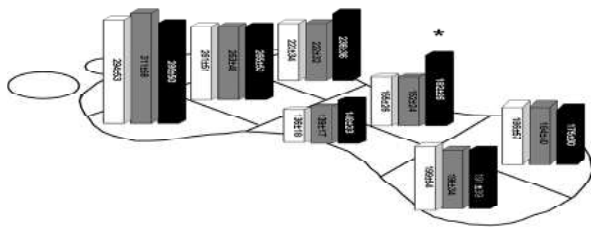


Fig 1-Plantar Pressure (KPa) during treadmill running for 7 foot regions with no (□), placebo (■) and Augmented Low Dye -ALD- (■) taping. * ALD significantly higher than the two other conditions, $P < 0.001$.

RMS activity of VM was dependent of the condition ($P < 0.05$). Post hoc analysis showed that ALD significantly decreased RMS activity in comparison of both No taping and Placebo ($P < 0.05$, fig 2). No difference was observed between No taping and Placebo. A significant effect of ALD taping on time to peak contraction after heel contact was observed, for GM and VL ($P < 0.05$). Post hoc analysis showed a significant increase in time to peak contraction with ALD as compared to No taping ($P < 0.05$). The use of a placebo partially blunts this effect for both GM and VL, but a trend is still present in the two muscles ($P=0.065$ for placebo vs. ALD for both GM and VL, fig 3).

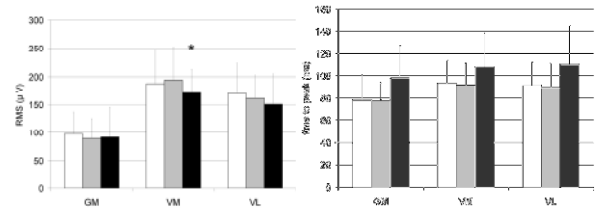


Fig 2- Average muscle electrical activity (RMS – μV). No (□), placebo (■) and Augmented Low Dye -ALD- (■) taping.

Fig 3- Time to peak EMG activity measured from heel strike No (□), placebo (■) and Augmented Low Dye -ALD- (■) taping.

This study is the first to examine the simultaneous effects of ALD taping on EMG activity of upper leg muscles and plantar foot pressures during running. Our results suggest that 1) ALD taping significantly decreases average muscle activity of VM, 2) causes a delay in onset of activity in GM and VL, and 3) causes an increase in lateral midfoot plantar pressure during shod treadmill running. These results align well with Nigg's theory [2] of muscle tuning. Forces acting on the foot during stance phase act as an input signal to produce a muscle reaction, optimal foot function will reduce muscle activity.

CONCLUSIONS

ALD taping significantly changes foot posture, and as a result causes changes in muscle activation patterns of GM, VM and VL.

REFERENCES

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- Nigg B. The Role of Impact Forces and Foot Pronation: A New Paradigm *Clin J Sport Med* **11**:2–9, 2001

