EVALUATION OF PATELLAR TENDON MECHANICAL PROPERTIES AND THE PREFERRED LANDING LEG IN ELITE JUMPING ATHELTES

Amitabh Gupta*†, Garry Allison‡, Jill Cook††, and Craig Purdam†

[*]La Trobe University, Melbourne, Victoria, Australia
[†]Australian Institute of Sport, Canberra, Australia
[‡]Curtin University, Perth, Western Australia, Australia
[††]Deakin University, Melbourne, Victoria, Australia

KEY WORDS: patellar tendon, mechanics, landing leg

INTRODUCTION: The purpose of this investigation was to evaluate patellar tendon (PT) mechanical properties in healthy, elite jumping athletes and the association with their preferred landing leg.

METHOD: Elite athletes (N=38) free of musculoskeletal pain were recruited from the Australian Institute of Sport, Australia. Subjects included 11 male volleyballers (MVB) (mean (SD) age (years), height (m) and weight (kg)) (17.5 (0.1), 2 (0.1) and 91.6 (8.9)), 13 male basketballers (MBB) (17.2 (1), 2 (0.1) and 87 (13)) and 14 female basketballers (FBB) (17 (0.8), 1.8 (0.1) and 78.1 (10.6)). Diagnostic ultrasound (US) (12MHz transducer, Nemio, Toshiba, Japan) was used to record the PT cross-sectional area. Ramped maximal voluntary isometric knee extension contraction (MVIC) at 90° knee flexion was performed (KinCom dynamometer, Chattanooga, USA). Knee torque and PT length, from inferior pole of the patella to the tibial tuberosity (Image J software http://rsb.info.nih.gov/ij/download.html), were determined at rest and 10% MVIC increments. PT force was calculated as knee extension torque divided by PT moment arm length, measured utilising a custom-made caliper (ICC = 0.7). PT mechanical properties (strain, stress, stiffness and elastic modulus) were calculated at 10% increments from 0 to 100% MVIC effort. T-tests were performed for inter-side and group comparisons. Sporting groups were stratified by landing leg as either left preferred landing leg (LPLL) or right preferred landing leg (RPLL).

RESULTS: In MVB the left and right PT are less stiff for the LPLL group compared to the left and right PT of the RPLL group ($p \leq 0.02$) only at sub-maximal efforts in MVB (Table 1).

Table 1 Male volleyball – Patellar tendon stiffness (MN/m) (Mean (SD))

	Left preferred landing leg (n=7)	Right preferred landing leg (n=4)
Left (40-60% MVIC) ($p < 0.02$)	0.83 (0.15)	1.16 (0.23)
Right (20-60% MVIC) ($p < 0.02$)	0.68 (0.10)	1.09 (0.37)

PT strain, stress, stiffness and elastic modulus were no different betweens sides for MVB, MBB or FBB, or between LPLL and RPLL groups in MBB (n=11 for LPLL and n=2 for RPLL) or FBB (n=8 for LPLL and n=6 for RPLL).

DISCUSSION: In volleyball, where there is a greater prevalence of jumper's knee than basketball (Lian Ø.B. et al, 2005), exposure to a sport-specific PT loading strategy may contribute to differences in PT mechanical properties based on the preferred landing leg.

CONCLUSION: This preliminary investigation may demonstrate sport-specific PT loading strategy observed as a difference in PT stiffness based on the preferred landing leg.

REFERENCES:

Lian Ø.B., Engebretsen L. and Bahr R. (2005). Prevalence of jumper's knee among elite athletes from different sports: a cross-sectional study. American Journal of Sports Medicine, 33, 561-7