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The H-Taping Method for Prophylactic or Temporary Fixation of Partial A2 Pulley Tears During Rock Climbing: A Biomechanical Study

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INTRODUCTION

- Closed digital annular pulley tears are common in the rock climbing community. Partial or complete tears of the A2 pulley occur due to forceful contraction of the tendon mostly occurring when the fingers are in a crimp grip position. (Fig. 1) The most common method of prophylactic and temporary fixation of the A2 pulley is circumferential taping, but this method has been shown to be ineffective against pulley tears⁴.

PURPOSE

- We present a biomechanical study investigating an alternative taping method proposed by Schoff et al⁵. This method, known as “H-Taping”, allows for simultaneous protection of the A1-A3 pulleys. We investigate this taping method for prophylactic and temporary treatment of A2 pulley tears.

METHODS

- Fourteen matched pairs of fresh-frozen cadaveric hands with forearms were used in this study (range 50-98 y/o; mean 73 y/o):
  - Four fingers (index [IF], long [LF], ring [RF], small [SF]) from each hand were tested individually
  - IF: Compared intact vs. partially torn (50%) A2 pulleys, untaped with Digital Image Correlation (DIC) to measure bowstringing
  - LF: Compared intact vs. torn A2, taped
  - RF: Compared intact A2 pulleys, taped vs. untaped
  - SF: Compared torn A2 pulleys, taped vs. untaped

- The flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) tendons for each finger were identified and sutured together for loading
- The “H-tape” was applied and normalized to cover 75% of the proximal and middle phalanx of each taped finger (Fig. 2)

- The finger was placed in a custom tensile testing fixture designed to position the hand in a rock climbing crimp grip; metacarpophalangeal joint flexed 60 degrees, proximal interphalangeal joint flexed 90 degrees, and distal interphalangeal joint hyperextended (Fig. 3)
- Tendons were loaded at 30 mm/min until failure occurred

RESULTS

- Adding tape to an intact (RF analyses) or torn (SF analyses) pulley does not allow for a greater applied force to the tendon (p=0.69 and 0.39, respectively) or an increase in force at the fingertip (p=0.12 and 0.92, respectively)
- The average amount of bowstringing measured by DIC was 3.78 mm for the intact pulley and 4.21 mm for the torn pulley. There was no significant difference in the amount of bowstringing between the torn and intact pulleys (p=.23; Fig. 5)

CONCLUSIONS

- H-taping does not allow for increased applied force to the tendon and does not increase the force at the fingertip in specimens with an intact A2 pulley
- H-taping of a torn pulley does not increase the allowable applied force to the tendon or increase the force at the fingertip to the level of an intact A2 pulley

CLINICAL RELEVANCE

- The results do not support H-taping as a prophylactic or temporary fixation measure against A2 pulley injury

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REFERENCES