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Practice Forum

Pulley injuries in rock climbers: Hand therapy clinical application

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New techniques using either taping and/or a custom fabricated pulley ring are recommended by these authors to treat pulley injuries in rock climbers. Either technique provides support to the injured pulley and allows rock climbers to continue their meaningful activity while the pulley heals. — KRISTIN VALDES, OTD, OT, CHT, Practice Forum Editor

Introduction

In the past, the frequency of treating rock climbers in the hand therapy clinic may in part have been determined by geographical location. However, the sport of rock climbing is increasing in popularity¹ and will be included in the 2020 Olympic Games.² This may cause an influx in the number of pulley injuries treated by hand therapists as these are the most common injuries sustained by rock climbers, occurring as 15.4% of all climbing injuries.³

Pulley injuries in rock climbers and traditional hand therapy pulley injury treatment

Rock climbers often assume what is termed a crimp position (Fig. 1), a position of extreme flexion at the proximal interphalangeal (PIP) joint and hyperextension at the distal interphalangeal joint, to achieve greater strength in grip. This position applies approximately 287 Newtons (N) of force on the A2 pulley and 226 N at the A4 pulley.⁴ The A4 ruptures more often in climbers because the actual strength of the A2 pulley has been found to be greater than that of the A4.⁵ Flexion of the digit causes most stress to the distal end of the A2 pulley and the proximal aspect of the A4 pulley, as the A3 pulley does little in the way of supporting the tendon.^{6,7}

Hand therapists are tasked with providing protection for the A2 and A4 pulleys for either conservative or postsurgical management. Our classic circumferential pulley ring may not be the best option for pulley protection especially in high-demand climbers. A recent cohort study⁸ examined outcomes following pulley reconstruction with the use of a thermoplastic ring over the pulley for 90 days postoperatively. Only 18 of 30 participants had a return to near

normal status related to flexor bowstringing.⁸ A biomechanical study found that it is minimally effective to apply tape circumferentially at the proximal phalanx and at the distal proximal



Fig. 1. Crimp position.

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Fig. 2. Leukotape cut for H-tape application.

phalanx (just proximal to the PIP joint) for A2 pulley injuries as the tape did little to absorb flexor tendon force on the pulley or decrease bowstringing.⁹ In addition, studies on treatment outcomes for rock climbers who used conventional circumferential

taping and thermoplastic rings to treat pulley injuries find increased tendon-phalanx distance (or bowstringing) via ultrasound.^{10, 11}

Alternative methods for pulley protection

H-tape

Schoffl et al¹² proposed the H-tape method for pulley protection. This method of taping considers the point at which the tendon has the greatest distance from the bone during flexion (the PIP joint), which is also where deflection of flexor tendon force is most important. In a research study using ultrasound on rock climbers with pulley injuries, the H-tape method was found to significantly decrease tendon-phalanx distance, whereas other tape applications did not change this measurement.¹²

Schoffl et al¹² recommend a 10 cm by 1.5 cm piece of Leukotape. The tape should be cut in half through the length from both ends but leaving a 1-cm bridge uncut in the middle (Fig. 2). The tape should first be applied to the distal end of the proximal phalanx at the bridge of the tape and then the proximal straps should be wrapped around the proximal phalanx. The PIP joint should be flexed and then the remaining 2 distal straps secured around the proximal middle phalanx (Fig. 3).¹²

Pulley-protection orthosis

In 2016, Schneeberger and Schweizer¹³ developed and tested a novel design of what they termed a pulley-protection orthosis. Their design is like the conventional pulley ring, but it has cutouts on the sides of the orthosis to allow firm fixation with inelastic tape without compression of the digital nerves and blood supply (Fig. 4).¹³ The orthosis can be applied to provide force to the flexor tendon to keep close distance to the bone allowing the pulley to heal at an effective length.¹³ In a cohort study of 47 rock climbers

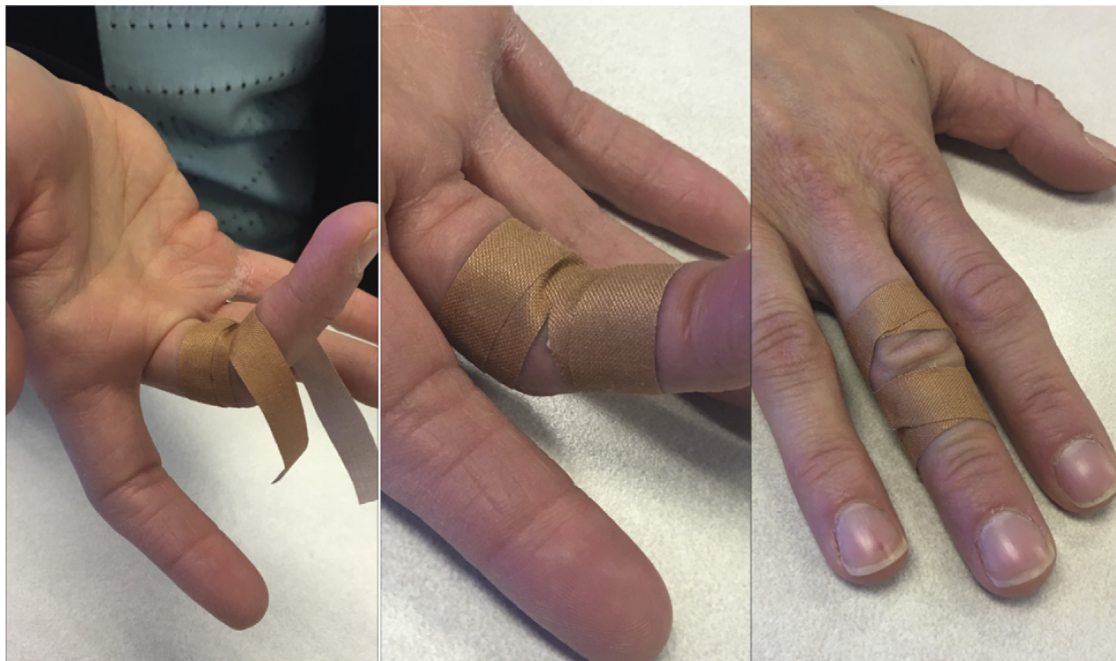


Fig. 3. Application of the H-tape.

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