

# Vertical addiction

Julian Saunders looks at common injuries sustained by rock climbers.

The fact climbers have arms resembling sculpted titanium rods is a good indication of the stresses they endure. Hanging onto a cliff — not infrequently risking a perfectly good set of ankles — is a great way to generate strength. It is also a great way to self-combust. Eye popping, tendon ripping, and at times, bone-fracturing feats of power, are, for some climbers, just party tricks. Fear is the catalyst of physiologic mayhem. The flip-side, though, is where pain becomes background noise only — and every contractile tissue available moves you upward only an inch at a time. Tap into this dark well of strength enough and you learn to do it without the adrenalin; naively resetting the many cerebral and physiological hand brakes until they are barely a hindrance. The strange thing is climbers are always surprised when something snaps.

Finger injuries are perhaps the most common injury afflicting climbers. Of these, the vast majority involve damage to what is referred to as the pulley apparatus (Figure 1. *overleaf* Shows the three pulleys predominately involved in finge injuries). This is a series of five slips of tissue, known as pulleys, and are coded A1-A5. They are distributed along the length of the finger, A1 being just inside the palm and A5 distal to the distal interphalangeal (DIP) joint. They hold the tendon close to the bone and allow flexion of your fingers without the tendons 'bowstringing'. Pulleys are extremely strong in species designed to climb, such as monkeys. Rock climbers, though, live in a world of denial.

Although pulleys are much stronger in climbers than sedentary individuals, the stress placed on this apparatus is continually approaching the maximum possible load. Hence, they regularly tear or snap. I have seen a few cases where A2, A3 and A4 have snapped simultaneously. Diagnosis requires a keen sense

of palpation and a good history. A noise like a snapping twig at the time of injury, along with on palpation bowstringing, will indicate pulley rupture. Visual bowstringing will indicate multiple ruptures. A2 and A3 may go simultaneously or in isolation, whereas an A4 tear is typically accompanied by an A3 rupture. A1 and A5 are rarely damaged. Injury is most common in the ring and middle fingers, and is accompanied by tenderness over the pulley, often most acutely on the little finger side. Simultaneous active-resisted flexion of the metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints, and hyper-extension of the DIP joint (know as a 'crimp' position) will most likely aggravate the pain and be accompanied by weakness. 'Open' hand position, where the MCP joints remain in neutral and the PIPs and DIPs are minimally flexed, is usually painless.

The pathomechanics of this injury have had little research. The sequence of tissue failure under load has been observed in cadaveric studies — they show that pulleys will almost always fail before the flexor tendons.

Depending on the severity of the injury, treatment involves rest initially (1-6 weeks), and then manual therapy to increase blood flow, reduce scar tissue, and regain range of motion. Changed training habits, such as reducing the amount of crimping (a very small hold that accepts only the finger tips), will allow a much earlier return to climbing, and will also decrease the chronic load the pulleys are placed under in the future. Ruptured pulleys rarely heal, but the finger can still regain much of its functional strength.

Accessory motions of the MCP, PIP and DIP joints play a crucial role in the even distribution of loading along each pulley. This should be assessed in all fingers and treated where appropriate.



### Golfer's elbow

Although this condition will usually start as medial epicondylitis, it can quickly progress to medial epicondylitis. As a general rule, tendinopathy of more than a few weeks is likely to be morphing into tendinosis.

Climbers are prone to this condition for a couple of reasons. Firstly, it places great strain on the forearm flexors. I have seen climbers doing one-arm chin-ups using only the distal phalanx of one finger. Secondly, climbers are not very good at not climbing, i.e., precipitating conditions, such as tendonitis or an acute tear — which will rarely be given a chance to heal, and subsequently progresses to tendinosis.

Medial epicondylitis usually presents as pain over the common flexor tendon. It can be acutely painful if the patient knocks the medial epicondyle on a hard surface. It is most painful when warming up, and after finishing climbing. Active resisted ulna deviation with wrist flexion is often, but not always, painful. Typically, climbers have the condition for between four and six months prior to seeking treatment.

There have been a few different approaches in the past to treating this injury. Due to the non-inflammatory nature of tendinosis, pharmacological interventions, such as cortisone, are relatively ineffective. Exercise intervention, however, is very effective. Eccentric exercises can be employed to strengthen the common flexor tendon: a standard protocol involves 3 sets of 10 repetitions, twice per day (morning and night). The weight of the dumbbell should be fairly high. Most climbers can easily lower 8 kilograms weights, with the more advanced using up to 13 kilograms. The patient should be quite fatigued by the end of each set. The elbow should be held between 90 and 145 degrees, with the forearm being supported on a flat



## Vertical addiction – *continued*

surface. Angle will depend on the position of most aggravation.

Ice the common flexor tendon after the evening exercises: five minutes on, five minutes off – three times.

There are marked biomechanical differences in how the forearm muscles respond when crimping and open-handing holds. Crimping involves much greater anterior wrist stabilisation, i.e., contraction of flexor carpi ulnaris (FCU) and flexor carpi radialis (FCR). FCU is usually the culprit in medial tendinopathy. As such, I normally recommend that the patient stops crimping for at least a month. This will wreak havoc on their climbing ability, but it is better than not climbing at all.

Pronator teres is usually involved in about 40 per cent of cases. Eccentric exercises for this muscle are easily incorporated into the program. Holding a dumbbell with weight on the top end only, allow it to fall into external rotation, not exceeding 90 degrees if the elbow is also at 90 degrees. If the arm is at more than 130 degrees, this will not be possible anyway. These exercises will initially aggravate the

condition. After the tissue has adapted and there is no pain, increase the weight. Most climbers take about three months to recover whilst they continue training and climbing as normal. Very few have a recurrence if they continue the exercises more casually after the condition has been resolved.

Assessing the shoulder, thoracic spine and cervical spine for normal range of motion (ROM) and function is paramount. Any inability of the shoulder to accommodate load will be, at least in part, transferred to the elbow.

### Wrist

The wrist can be a diagnostic nightmare for most manual therapists, as it can contain myriad injuries. It requires a vast array of special tests, which are rarely pathognomonic, even when used in combination.

The most common injury amongst climbers is a distraction tear to the triangular fibrocartilaginous complex or its ligamentous anchors. Typically injured by compression (diving onto an outstretched hand in baseball, for instance), this disc, and the ligaments

attaching to it, can also be torn when a distraction force is applied to the volar forearm or wrist.

Injury typically occurs while pulling on a large hold with the full surface of the hand, i.e., the wrist is flexed between 40 and 60 degrees. Only very rarely will a tear occur from a single exertion. As a general rule, it will happen during a session where the climber is repeatedly placing the wrist under duress in this position.

Ulna deviation with the wrist slightly flexed will often reproduce the patient's symptoms. Extension through flexion in ulna deviation may produce pain and a palpatory 'click'.

Pressing with a thumb between the ulna and the mid carpals is usually painful. These patients often have laxity in the distal radio-ulna joint, and ulna carpal instability and sag.

This kind of injury can be tricky, so a multi-pronged approach is the best option. After initial rest (one to four weeks depending on severity), gentle mobilisation of the carpals is a good start. Subsequent strengthening of FCU — it partially attaches to the triangular fibrocartilage complex (TFCC) — will also help enormously.



PHOTOGRAPHY: ROSS TAYLOR

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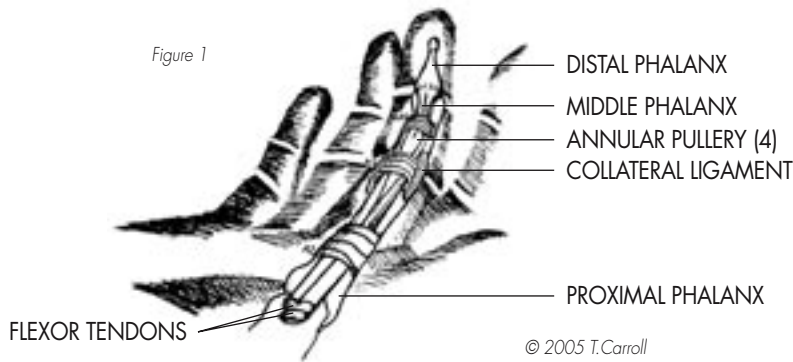
PHOTOGRAPHY: ROSS TAYLOR

Strapping the wrist around the proximal carpal row, and radius and ulna to reduce translation through, and traction of, the TFCC will assist healing. Depending on severity, and with close monitoring, this taping may allow the patient to return to climbing. Crimping will almost always be painless, but comes with the potential of a plethora of other injuries.

### Shoulder

Primarily designed for extensive motion, the shoulder has a fairly good capacity for power. With the large forces used in climbing, however, the delicate control required to avoid injury is easily marred by the slightest changes in motor control. The primary injury to the shoulder is most often reduced ROM due to hypertonicity of infraspinatus and teres minor. This precipitates a secondary injury, either a more serious rotator cuff pathology (most commonly supraspinatus and rarely subscapularis) or damage to the labrum, which is also very common amongst climbers. The arms of a climber spend most of their time in the most unstable glenohumeral position, external rotation and abduction above the head. Although dislocation is infrequent, subluxation is not. A labral lesion often results. Almost all of these will repair or stabilise.

Shoulders respond very well to simply



regaining ROM. Labral pathologies also require motor control re-education to prevent the humeral head from encroaching the anterior labrum when the arm is above the head.

The shoulder is a complex and time consuming joint. A comprehensive assessment crosses into so many other areas. Certainly, all the muscles controlling both the scapula and the glenohumeral articulation need to be assessed. Similarly, cervical, thoracic and rib motion need to be screened as well.

### Conclusion

Rock climbing as a sport produces many injuries. If it is not impact damage from falling (one patient broke both ankles), then it is acute

strains from trying too hard, or chronic strains from trying too much. Climbers are, however, exceptionally good at following instructions, as long as you don't tell them to stop. With some knowledge of climbing, most injuries can be managed with only a short absolute rest period. One handed climbing for instance is great for training balance and coordination.

*Julian Saunders, an osteopath, was a professional climber for many years and has climbed extensively throughout Australia and overseas. His clientele of predominantly rock climbers (coming from all over Australia) and circus performers provide hours of fun. He has degrees in Medical Science (exercise physiology), Applied Science (Clinical Science), and a Masters degree in the pathomechanics of finger injuries.*

