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ORIGINAL RESEARCH

Descriptive Epidemiology, Medical Evaluation, and Outcomes of Rock Climbing Injuries

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Objective.—To gather epidemiologic data on injury type, treatment, and recovery from rock climbing injuries.

Methods.—Design: retrospective cross-sectional study. Setting: web-based survey. Participants: rock climbers who sustained a climbing-related injury during the prior 24 months. Criteria for inclusion: aged ≥18 years; participation in rock climbing at least 4 times per year in the United States. Interventions: none. Main outcome measures: percentage of injured climbers seeking medical care, providers seen, subspecialty referral, development of chronic problems, factors affecting return to climbing, injuries by climbing type, body region, and injury type.

Results.—Data were collected over a 60-day period using the Research Electronic Data Capture (REDCap) survey system. Seven hundred and eight surveys were collected from 553 male and 155 female climbers. Thirteen hundred ninety seven injuries were reported, and 975 injuries were suitable for analysis. The most common provider initially seen was a primary care provider. Subspecialty referral was commonly obtained. Injury patterns differed by climbing type. The percentage of respondents that returned to climbing before their injury was fully healed was 51.1%, and 44.9% of respondents developed chronic problems related to their climbing injury. Twenty-eight percent of respondents were unable to return to their previous level of climbing performance. Several factors were associated with delayed recovery from climbing injury.

Conclusions.—A significant number of climbers sought healthcare after injury. A majority of climbers who sought treatment were referred to subspecialist providers. About one-half of climbers were symptomatic when they returned to climbing and developed chronic problems after injury. Factors associated with slower return to climbing included increasing age, smoking, fractures, and surgery.

Keywords: rock climbing, sports injuries, treatment, recovery, epidemiology

Introduction

Rock climbing continues to increase in popularity. Among outdoor sports, only water sports, adventure racing, and triathlons have seen more new participants in recent years.[1] The growth in the number of indoor climbing facilities has greatly increased accessibility in areas of the country with limited outdoor climbing opportunities. Current sports participation data from 2012 indicate that there are over 6 million rock climbing participants in the United States.[1] This figure represents 2.4% of the general population over the age of 6, with the highest participation rates among those aged 6 to 24.[1] There is high regional variability in climbing participation. Recent data from Utah, where indoor and outdoor climbing is readily accessible, indicate that 13.3% of adults participated in rock climbing at least once during the prior 12 months.[2] As climbing grows in popularity, so does the need to better understand climbing-related injuries and treatment.

There are 4 general categories of technical rock climbing that were included in this study. The first is indoor or gym climbing. With this type of climbing, participants ascend on built walls using artificial holds on engineered routes using both lead climbing and top roping

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techniques. The "deck" or floor is generally well-padded, and the anchors in the wall are very stable and reliable. These engineered routes are graded by the Yosemite Decimal Rating System and range in difficulty from easy (grades 5.4–5.5) to exceptionally challenging (grades 5.14–5.15).[3] Indoor routes tend to be more overhanging and may involve more dynamic movements. The second type of climbing is traditional or "trad" climbing, and occurs outdoors. With traditional climbing, a climber or a group of climbers will place all the safety gear required to protect from a fall. Safety gear, commonly referred to as "protection," or "pro" is placed in the rock wall as the climber advances up a cliff face, and is usually removed once passage of the group is complete. The third type of climbing is outdoor sport climbing. Participants rely on permanent anchors that have previously been bolted or otherwise fixed to the rock. Since there is not a need to "place protection," this form of climbing tends to focus more on strength and gymnastic ability, often requiring the performance of difficult maneuvers. The fourth form of climbing is bouldering. This is performed without safety gear, and is generally limited to very short climbs. A portable pad referred to as a "crash pad" is usually placed on the ground at the bottom of the climb to provide cushion in the event of a fall. This form of climbing generally occurs on large outdoor boulders, but can also occur on artificial indoor boulders and short climbing walls. Bouldering generally involves difficult maneuvers that require short bursts of significant strength, endurance, and flexibility.

Several prior epidemiologic studies have been performed attempting to evaluate both the body regions and types of injuries sustained by climbers. Experts believe that an injury risk for rock climbing is lower than that for playing football or horse riding.[4] Yet, climbing-related injuries may be unusual, and physicians need to be aware of orthopedic injuries specifically sustained by climbers. Research has shown that strain and overuse injuries are the most frequent injuries sustained by climbers, and these are more likely to affect the upper extremities.[5–7] Traumatic, fall-related injuries are less common, and are more likely to affect the lower extremities.[5,7] In one of the larger epidemiologic studies, Gerdes et al reported on 2472 injuries among 1887 climbers.[6] This study found that upper limb injuries accounted for 57.6% of all injuries reported. Injuries involving the fingers represented 27.5% of the injuries in this study. Strain/Sprain and chronic overuse injuries of the fingers were reported as the most common types of injuries. The percentage of reported injuries in this study that affected the lower limb was 27.6%, with the ankle being the most common site of injury (12.6%). Lacerations and fractures were more common in the lower limb than the upper limb. Backe et al conducted a similar mail-based survey that was sent out to 560 members of a Swedish climbing club.[5] Three hundred fifty-five respondents reported 194 chronic injuries and 14 traumatic injuries. Hand, finger, and wrist injuries represented 42% of all overuse injuries. The number of traumatic injuries in this study was small, but also most frequently involved the lower limb. The injury incidence reported in this study was 4.2 injuries per 1000 climbing hours. Investigators in Germany have reported lower injury incidences.[8,9] Another study also indicated an extremely low rate of climbing-related injuries, as it was reported that there were 55 significant injuries from more than 1 million visits to 56 climbing walls in England, Scotland, and Wales.[10] Jones et al administered an in-person survey at both indoor and outdoor climbing locations in the United Kingdom.[7] Fifty percent of those surveyed had sustained at least 1 injury during the 12 prior months. Overuse (33%) and strain type injuries (28%) were the most common, with only 10% of all injures being traumatic or fall-related in this study. Logan and colleagues found that a greater climbing intensity was associated with a higher risk of hand and wrist injuries.[11] Addiss et al looked at climbing-related injuries in the US National Parks over a 2-year period.[12] They reported that there were 127 injuries, with 36 of them (28%) being fatal, and that 75% of all climbing-related injuries were due to falls.

Despite the growing data on the epidemiology of rock climbing-related injuries, little is known about the medical evaluation and treatment of these injuries. The article by Jones[7] reported that 38% of climbers sought medical evaluation for their injuries. Other studies have reported on climbing injuries presenting to the emergency department (ED) and other acute care settings.[13,14] However, there is a paucity of research on the types of medical professionals seen by climbers, and the role of imaging studies. The nature of injuries sustained in different types of climbing has also not been well reported. Furthermore, the factors associated with delayed recovery from climbing injury and the development of chronic problems have not been previously established. The exception would be finger pulley and flexor tendon injuries, for which the mechanisms of injury, diagnosis, and treatment have been well described.[15,16] The aims of this study were to expand upon existing data regarding the types of injuries sustained by type of climbing activity, to describe patterns of medical evaluations, and to identify factors associated with injury and recovery.

Methods

The survey study was approved by the University of Utah Institutional Review Board (IRB 00063354).