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BRIEF REPORT

Injury Trends in Rock Climbers: Evaluation of a Case Series of 911 Injuries Between 2009 and 2012

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Objective.—Rock climbing is a widely performed sport. This prospective single-institution study evaluated the demographics of climbing-related injuries to improve our comprehension of current injury characteristics.

Methods.—During a 4-year period, 836 patients with a total of 911 independent climbing injuries were prospectively evaluated using a standard questionnaire and examination protocol.

Results.—Of all injuries, 833 were on the upper extremities, 58 on the lower. Seventeen injuries were Union International des Associations d'Alpinisme (UIAA) grade 1 injuries, 881 were grade 2, and 13 were grade 3. No higher UIAA graded injuries occurred. Overall, 380 were acute injuries (359 were seen in clinic, 21 were seen through the emergency department), and 531 were overstrain injuries (all seen in clinic). Finger injuries accounted for 52% of all injuries, the shoulder being the second most frequent location. Pulley injuries were the most frequent finger injuries. Of 20 injured young climbers under the age of 15 years, 14 had an epiphyseal fracture (all epiphyseal fractures: mean age 14 years, range 12 to 15 years). Male climbers were significantly older ($P < .05$), had more climbing years ($P < .05$), and were climbing at a higher climbing level ($P < .01$). Older, more experienced climbers had significantly more overstrain injuries than acute injuries ($P < .05$).

Conclusions.—When comparing this study with our previous study from 1998 to 2001, there are some notable differences. Although pulley injuries are still the most common climbing injury, there are now more A4 pulley injuries than A2. Shoulder injuries are becoming more common, as are epiphyseal fractures among young climbers. It is important to understand current patterns of climbing injuries so that health providers can target interventions appropriately.

Key words: rock climbing, finger injuries, sport climbing, pulley injury, mountaineering, sports injuries

Introduction

Rock climbing is a widely performed sport, and over the past 20 years much research has been done to analyze the injuries, injury distribution, and injury risk involved. Most overstrain injuries are found on the upper extremities and are caused by performing a hard move.[1] Most acute trauma, however, involves the lower extremities and is caused by a fall.[1] A wide variety of studies have focused on upper limb injuries or on the various rock climbing subdisciplines: outdoor sport climbing and rock climbing, indoor climbing, and competition climbing.[1,2] Severe injuries during well-bolted sport climbing, indoor, or competition climbing are rare, but do happen.[1,2] Injuries from outdoor alpine climbing are more frequent and more serious.[1,2] One specific problem with some of these studies is that most are performed retrospectively with a bias (eg, patient selection bias), and the injury collection, grading, and anatomical presentation is inconsistent.[3] Acknowledging this fact, the Medical Commission of the International Mountaineering Association (UIAA MedCom) proposed a coherent injury score and further guidelines for injury analysis.[3]

In a previous study from 1998 to 2001, we prospectively clinically examined 604 climbing injuries and published an injury analysis and distribution.[4,5] In addition, we and many others gave lectures to trainers, parents, and doctors, and wrote articles and books to

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increase the awareness of climbing-specific injuries in an effort to reduce their frequency. As the sport becomes more professionalized, injury patterns are changing and require continued follow-up. Follow-up allows us to assess the effectiveness of preventive measures and to identify the changing injury patterns—for example, the number of epiphyseal injuries among young climbers.[6] To reevaluate injury demographics, distribution, and severity in our clientele, we conducted a prospective clinical follow-up study.

Methods

During a 4-year period from January 1, 2009, to December 31, 2012, we prospectively evaluated patients with climbing injuries. All athletes were seen in our hospital and evaluated with a standard questionnaire and examination protocol. The evaluation included two kinds of patients: patients making elective visits to our outpatients sports medicine clinic (which is part of our department of trauma and orthopedic surgery), and patients who came to our hospital, Klinikum Bamberg (a 24-hour level 1 trauma center within Germany's largest climbing area, the Frankenjura, in which V.S and D.P. are consultants to the orthopedic and trauma surgery department). The trauma surgical resident in charge of the emergency department kept us informed about any climbing patients and presented case information such as body weight and height, as well as information about how long the patient had been climbing and the climbing level.

The UIAA metric scale[3] was used to evaluate the climbing level. It was graded according to the hardest redpoint route (climbing without artificial aid and without rest) within the last 2 years. Acute injuries were defined as a single trauma with a sudden onset that led to an injury. Chronic injuries were defined as overstrain injuries with no specific acute trauma. For injury distribution, the Orchard Sports Injury Classification System 10 (OSICS 10) was used in accordance with the UIAA MedCom recommendations.[3] Injuries were graded using the UIAA MedCom score.[3] Pulley injuries were diagnosed using a 13 MHz linear transducer (Sonosite, Bothell, WA) with forced flexion, following our previous recommendations. If an exact diagnosis could not be obtained, an additional magnetic resonance imaging scan was performed with the hand in a crimp position. Pulley injuries were graded and treated according to the score of Schöffl et al.[4] When possible, the results of the prior 2003 study were included in the table of the results.[4,5] The Internal Ethical Commission of our institution accepted the study; external Institutional Review Board approval was not sought.

Statistical analysis was performed using Microsoft Excel for data collection and SPSS (SPSS Inc, Chicago, IL) for analysis. The statistical analysis was performed by an independent statistician. All measured values are reported as means and standard deviations. The Kolgomorov-Smirnov test was used to check for normal distribution. Homogeneity of variance was investigated using the Levene F test. Normally distributed variable differences within and between groups were assessed with paired and unpaired *t* tests. All tests were 2-tailed,

Table 1. Patient injury distribution and grading 2009 to 2012 compared with 1998 to 2001

Patients (n = 836)	*2009–2012 (n = 911)*	*1998–2001 (n = 604)*
Age, years	34.1 ± 11.1 (11–77)	28.3 ± 12.4 (13–52)
Climbing level[a]	8.8 ± 1.2 (5.0–11.3)	8.6 ± 1.1 (5.3–11.0)
Climbing years	13.3 ± 10.1 (0.3–64)	7.3 ± 5.8 (2–35)
Injury distribution		
Upper extremity	833 (91.4)	405 (67.1)
Lower extremity	58 (6.4)	77 (12.7)
Other	20 (2.2)	122 (20.2)
Injury grading		
UIAA 1	17 (1.9)	4 (0.6)
UIAA 2	881 (96.7)	584 (96.7)
UIAA 3	13 (1.4)	9 (1.5)
UIAA 4	None	7 (1.2)
UIAA 5-6	None	None
Injury type		
Acute	380 (41.7)	308 (51)
Overstrain	531 (58.3)	296 (49)

Values are mean ± SD (range) or *n* (%).

[a] Union International des Associations d'Alpinisme (UIAA) metric.