

Injury Trends in Rock Climbers – Evaluation of a Case Series of 911 Injuries Between 2009-2012

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Abstract

This prospective single-institution study evaluated the demographics of climbing-related injuries to improve our comprehension of current injury characteristics. During a four-year period, 836 patients with a total of 911 independent climbing injuries were evaluated using a standard questionnaire and examination protocol. 833 injuries were on the upper extremities, 58 on the lower. Seventeen injuries were UIAA grade 1, 881 grade 2, and 13 grade 3. No higher UIAA graded injuries occurred. Three hundred and eighty were acute injuries, 531 were overstrain injuries. Finger injuries accounted for 52 % of all injuries, the shoulder being the second most frequent location. Pulley injuries were the most frequent finger injuries. Seventy percent of injured young climbers under the age of 15 had an epiphyseal fracture. Older, more experienced climbers had significantly more overstrain injuries than acute injuries ($p < 0.05$). When comparing this study with our previous study from 1998-2001 there are notable differences. While 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 in young climbers. It is important to understand current patterns of climbing injuries so that health providers can target interventions appropriately.

Keywords: Climbing injuries, pulley injuries, shoulder injuries, epiphyseal fracture

Tendances à certaines lésions chez les varappeurs-Évaluation de différents cas sur 911 lésions entre 2009 et 2012.

Résumé

Cette étude monocentrique prospective a évalué les données démographiques des lésions qui ont été mentionnées dans le monde de l'escalade afin d'améliorer notre façon de comprendre les caractéristiques des lésions actuelles. 836 patients ayant subi 911 différentes lésions dues à l'escalade ont été évalués sur une période de quatre années. Pour ce faire, nous avons utilisé un questionnaire standard et un protocole d'examen. 833 lésions se trouvaient au niveau des extrémités supérieures, 58 sur les extrémités inférieures. 17 lésions étaient de niveau 1 UIAA, 881 de niveau 2 et 13 de niveau 3. Il n'y avait pas de niveau plus élevé. 380 lésions étaient graves/aigües, 531 étaient dues à une surcharge. Dans 52% des cas, il s'agissait des doigts, puis, en seconde position, des épaules. Dans les doigts, c'étaient surtout des lésions de poulie. Il s'agissait, dans 70% des cas de fractures épiphysaires chez de jeunes grimpeurs de moins de 15 ans. Les grimpeurs plus âgés ayant plus d'expérience montraient plus de lésions de surcharge de de lésions aigües. ($p < 0.05$). Si l'on compare cette étude avec notre précédente étude de 1998-2001, on remarque une différence importante: les poulies restent la lésion la plus fréquente mais maintenant, il y a plus de lésions de la poulie A4 que de la poulie A2. Les lésions de l'épaule sont plus fréquentes que les fractures épiphysaires chez les jeunes grimpeurs. Il est important de comprendre les schémas actuels des lésions chez les grimpeurs afin que les prestataires de soins de santé puissent intervenir de façon appropriée et ciblée.

Mots clés: lésions dues à la grimpe, lésions des poulies, lésions de l'épaule, fracture épiphysaire

Introduction

Rock climbing is a widely performed sport and over the last 20 years much research has been done to analyze injuries, injury distribution, and injury risk involved (Schöffl, Morrison, Schwarz, Schöffl & Küpper, 2010; Schöffl, Morrison, Schöffl, & Küpper, 2012). Most of the existing studies are performed retrospectively and injury collection, grading, and anatomical presentation are often inconsistent. Acknowledging this, the Medical Commission of the International Mountaineering Association (UIAA) proposed a coherent injury score and further guidelines for injury analysis (Schöffl, Morrison, Hefti, Ullrich, & Küpper, 2011). To evaluate injury demographics, distribution, and severity and to assess the effectiveness of preventive measures and to identify changing injury patterns we conducted a prospective clinical follow-up study and compare our findings to earlier studies (Schöffl, Hochholzer, Winkelmann, & Strecker, 2003).

Methods

During a 4-year period (1.1.2009-31.12.2012) we prospectively evaluated any patients presenting climbing-related injuries either in elective visits to our outpatient sports medicine clinic or acute cases who came to our hospital, a 24-hour level 1 trauma center within Germany's largest climbing area, the Frankenjura. All athletes were evaluated with a standard questionnaire and examination protocol. We recorded case information such as body weight and height, as well as information such as the patients' climbing level (Measured via the UIAA metric scale and graded according to the hardest redpoint route (climbing without artificial aid and without rest) climbed within the last two years. Acute injuries were defined as a single trauma with a sudden onset, which led to an injury. Chronic injuries were defined as overstrain injuries with no specific acute trauma. For injury distribution, the OSICS 10 (Orchard Sports Injury Classification System) was used in accordance to the UIAA MedCom (Medical Commission) recommendations. Injuries were graded using the UIAA MedCom score (Schöffl et al., 2011). Pulley injuries were diagnosed using a 13 MHz linear transducer (Sonosite®, Bothell, USA) with forced flexion following our previous recommendations. If an exact diagnosis could not be gathered, an additional MRI with the hand in a crimp position was performed. Pulley injuries were graded and treated according to the score of Schöffl, Hochholzer, Winkelmann, Roloff, & Strecker, 2004. The internal ethical commission of our institution accepted the study, external IRB approval was not sought. Statistical analysis was performed using SPSS ® (SPSS Inc., Chicago, IL). Normally distributed variable differences within and between groups were assessed with paired and unpaired t-tests. All tests were 2-tailed and a 5% probability level was considered significant. Cross table analysis with Pearson's Chi-squared test was performed for group analysis. The four most frequent OSICS locations (P = hand, finger, thumb, S = shoulder, clavicle, E = elbow, W = wrist) were further analysed.

Results

From 2009 to 2012 we treated 836 patients (630 (75%) male, 206 (25%) female) (see table 1) with a total of 911 independent climbing injuries. Sixty-three patients had two diagnoses, 11 three and one five different diagnoses. Three hundred and eighty were acute injuries, 531 were overstrain injuries. For the injury distribution see table 2 and 3. The ten most frequent injuries are shown in table 4. Pulley injuries were the most frequent injuries, followed by tenosynovitis of the finger flexor tendons and capsulitis of the finger joints. Six of the 10 most

frequent injury locations were on the hand and fingers. Out of 140 pulley injuries 103 were diagnosed through ultrasound examination. In 37 cases an additional MRI was performed. Overall, finger injuries accounted for 52% (n=474) of all injuries. The most frequent finger injury was a pulley injury with 140 cases. For a comparison of the pulley injuries distribution see table 5. More than 20 different diagnoses of finger injuries were present (table 6). Older, more experienced climbers had significantly more overstrain injuries than acute injuries ($p < 0.05$). There was no significant association between a climber's redpoint level and the development of overstrain or acute injury. Climbing level, years of climbing, height, weight, gender and age did not significantly influence the UIAA score. Acute injuries had a significantly higher UIAA score than overstrain injuries.

Discussion

In our present study we are trying to understand the dynamics of injuries in rock climbing. It is important to note that the cohort of climbers in this study is diverse. Most of our patients were climbing in the Frankenjura, Germany's largest sports climbing area. While most injuries were related to bolted sports climbing, we also saw patients from other climbing areas (e.g. trad climbing areas in the US or the UK, the Alps). Analyzing our patients we found more male climbers injured than females, which differs from other findings (e.g. Jones, Asghar, & Llewellyn, 2008; Josephsen et al., 2007). We believe that the gender difference is mainly a consequence of the higher number of male than female climbers within our region. The statistical analysis in our present study shows, that climbers with a higher age and more climbing years had significantly more overstrain injuries than acute injuries. Climbing frequency and difficulty were also associated with the incidence of overuse injuries by (Jebson & Steyers, 1997; Jones et al., 2008). Most (91.4%) of the injuries in our current study were on the upper extremity, consistent with extant research (Schöffl et al., 2003). In alpine terrain longer falls are frequent, resulting in a higher number of lower limb injuries (Schöffl et al., 2012). But as said above, most of our injured climbers come from a bolted sport climbing area, thus making upper limb injuries more likely due to performing hard moves. The injury severity in our present study was mostly low, none being higher than UIAA grade 3. This also represents the specifics of the local climbing area. However, it is still surprising that we didn't have any higher-grade injuries in our four years of research. Our hospital is one out of three level 1 trauma centers covering the Frankenjura. From press reports, we know that there were higher-grade injuries and fatalities in the respective time frame. These polytraumatic patients are distributed to various trauma centers through one regional control center. It dispatches in accordance to, e.g., current operative availability, flight time, NACA score, geographic region. Thus the number of polytraumatic patients is biased, as there is always the possibility that, whenever there was a polytraumatic climber, we may have already been busy with one or two other polytraumatic patients. However, the low injury severity in our study is consistent with various previous studies in the literature who show an overall low injury severity for sport climbing and bouldering (Jones et al., 2008; Josephsen et al., 2007; Schöffl et al., 2012). When comparing our present study with prior findings (Schöffl et al., 2003), we found that nowadays, pulley injuries are more common to the A4 instead of the A2 pulley. This reflects a tendency we have seen over the last years and may be explained by the biomechanics of grip techniques used. A higher occurrence of shoulder injuries might be attributed to the general rise of this injury in rock climbers as well as the fact that the authors specialize in sports medicine shoulder surgery, resulting in a sample bias (Schöffl et al., 2012). Moreover, we saw an increase in epiphyseal fractures, which was already also described by Bayer, Schöffl, Lenhart, & Herold, 2013. The increase becomes especially

apparent looking at adolescent climbers only: 14 out of 20 (70%) injured young climbers up to an age of 14 had an epiphyseal fracture, making an epiphyseal fracture by far the most common climbing injury in young climbers. These numbers are alarming and need to be acknowledged. Precautions need to be instigated and prophylaxis increased.

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