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Who Gets Injured When: An Overview on Chronic Injuries in Sport Climbing

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Abstract

Climbing as a young sport is growing fast. The fastest growing part of the sport is due to indoor walls for training attracting youngsters. With hard training from young ages it is vital to be able to pinpoint training regimes to avoid injuries in athletes. This reviews purpose is to search the literature to investigate what group of climbers are most prone to injury and which injuries are the most common.

Method: A semi structured literature search was conducted in PubMed on September 11 2013.

Result: The search gave 1244 titles. All titles were carefully searched for the possible finding of descriptions of climbing related chronic injuries. This led to the reading of 96 and then to a final inclusion of 44 papers. We found descriptions of 45 chronic injuries the 17 papers.

Discussion: Due to methodological differences, lack of reporting strategies and not using control groups in the included papers it is not possible to conclude on which groups of climbers are more prone to injuries or to which state the injuries are most prevalent amongst climbers.

Keywords: Chronic injuries; Sport climbing

Introduction

Described as a young sport, Rock Climbing is considered to have originated during the early 1970s. Climbing is a rapidly growing sport, International Federation of Sports Climbing (IFSC) states a current figure consisting of 25 million people of all ages climb regularly in an international perspective. During the last decade (2001 to 2012), global numbers of both climbers and climbing venues have increased by approximately 50%. Both senior and junior World Championships, a World-Cup and a number of international events are held by the IFSC. Parallel to international competitions, many national federations offer national and regional competitions resulting in an activity widespread among youth and adult climbers (IFSC homepage)

Beside its competitive dimension, Sport Climbing presents a number of opportunities for climbers at both professional and leisure levels to practice the sport in an outdoor setting. World-class athletes share the outdoor space with recreational climbers in several rock-climbing styles; these are termed lead climbing and bouldering. Climbing routes are graded according to difficulty in various subjective open-ended scales. One of the most used scales is the French currently ranging from 4-9b+. It is also common to report whether a climbing route is done On-sight (without previous knowledge of the holds on the route) or if it is red pointed (after working the climbing sequences over time).

Lead climbing consists of paths in which injury risk is minimised by removing loose rock, use of ropes and preplaced protection. Generally climbing paths, termed routes, span between 10 and 40 or more meters of rock or artificial structures of varying inclination

Bouldering consists of short paths, termed problems, of climbing in which the protective gear is limited to portable mats. The nature of protection limits therefore the nature of these paths to a few meters depending on the climbers own appreciation of risk [1,2]. In general bouldering consists of climbing actions consisting of technically and physically highly demanding nature [3].

The main discriminating feature between lead climbing and Bouldering is the relative intensity of movement. Being shorter paths, boulder problems tend to concentrate all the difficulty of the effort in a few actions. In consequence the Rate of Force Development (RDF) and Maximum Voluntary Contractions (MVC) are mayor discriminatory qualities between lead and boulder specialists. According to Franchini [3], the most intense physical demands correspond to bouldering and thereby possibly leading to divergent methodologies in specific training for lead and bouldering.

Chronic injuries have probably been prevalent amongst climbers for as long as there have been climbers. Climbing was for many decades not considered to be a sport alongside other sports. Climbers considered themselves to be somewhat different than other athletes. This notion is still somewhat prevalent among many climbers and there are still a lot of climbers who take pride in not following a training regime, they "just climb". With the increasing amount of climbers, training facilities and specialization of the sport it is reasonable to expect a rise in climbing-related chronic injuries.

Chronic injuries are suspected to be more common in elite athletes than with the recreational climber. The evidence on which injuries and to what extent they occur in different levels in climbing performance is limited. This overview is the first to summon up current evidence and research in chronic climbing injuries.

Methods

A semi structured literature search was conducted on September 11, 2013. The search included 6 different terms of "climbing injuries"

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and "chronic injuries in climbing". The search was limited to the PubMed database. The initial search included all languages. Inclusion of papers was made after careful reading of the title or abstract. All papers with a hint in the title and/or abstract of possible findings of described chronic injury in climbing were read in full text. There were not made any discriminations regarding documentation on how the included papers had conducted their investigation to make sure that what was described as a climbing injury actually was a climbing injury and not just an injured climber. All chronic injuries described in the full text articles were extracted (Table 1).

Result

Of the 1244 titles searched for possible injuries 96 abstracts were read leading to inclusion of 44 articles. We found distinct descriptions

Paper\	Method	Subjects	Injuries
AJ Logan, N Makwana, G Mason, J Dias. Acute injuries in the hand and Wrist Br J of Sports Med 2004; 38: 545-548	Qustionnaire. Sent to members of the national climbing federation (RR 51%)	545 Subjects, Age 23-93, average 50, Climbing level:British M-E6	Fingerjoints 33% (non spesific 25%, A2 puley ruptur 8%), lacerations 15%
AJ Logan, N Makwana, G Mason, J Dias. Can rock climbing lead to Dupuytren´s disease? Br J of Sports Med 2005; 39: 639-644	Qustionnaire. Sent to members of the national climbing federation (RR 51%)	545 Subjects, Age 23-93, average 50.Climbing level: British M-E6	Dupuytren´s disease (19.5%)
Jones G, Asghar A, Llewellyn DJ. The epidemiology of rock climbing injuries Br J Sports med 2008; 42: 773-778	Qustionnaire. Handed out to potential respondents on climbing facilities indoors and outdoors	201 Subjects, Age 35.2 (SD10.7) Climbing level: Years of climbing 13.9(SD11.8)	Acute/Chronic 33% chronic injuries; Fingers 35%, shoulders 20%, elbow 17% Wrist 7%, forearm >5% other locations 15%
Hochholzer T, Schøffl VR Epiphyseal fractures of the finger middle joints in young sport climbers. Wilderness and environmental medicine 2005; 16: 139-142	Observational. Single diagnose description	24 Subjects, Age 14.5 (SD0.9). Climbing level 7a (6a-8a)	Epiphyseale fractures
Schøffl V, Hochholzer T, Schoffl I.Extensor hood syndrome-osteophytic irritation of digital extensor tendons in rock climbers. Wildernes and environmental medicin 2010; 21: 253-256	Observational. Single diagnose description	13 Subjects, Age 33.8 (17-55). Climbing level: German 10.2, years of climbing 19 (5-30)	Extensor hood syndrome
El.Sheik Y, Wong I, Farrokhayar F, Thoma A. Diagnoses of Finger flexor pulley injury in rock climbers: a systematic review. Can J Plast Surg 2006; 14(4): 227-231	Litterature search	29 artikler om flexorseneskader	Review of finger flexor injuries
Wright DM, Royle TJ, Marshall T Indoor rock climbing:who gets injured?	Semisupervised qustionnaire. Handed out to the audience of a climbing world cup in 1999	Subjects 295. Climbing level: French 4-7b	Chronic injuries 44%, 19% had more than one site of injurie. Fingers most common 32%
Roseborrough A, Lebec M Differences in static scapular position between rock climbers and a non-rock climber population. NA J O Sport PH T 2007; 2(1): 44-50	Observational. Single diagnose	Subjects 61 (21 climbers, 40 healthy controlls). Age 25.8 (SD6.8)	Larger ratio of Glenohumeral/Scapular thracic rotation among climbers than healthy controlls
Schweizer A Sport climbing from a medical point of view. Swiss med wkly 2012; 142: w13688	Review. No method mentioned		64%-80% of injuries are finger flexor injuries, A2-A4 ruptures, secondary osteoarthrosis in fingers and hip, carpaltunnelsyndrom, tendosynovitis, gangliocyst of A1 and A2. Epitrochleitis, biceps tendinitt(SLAP), outlet impingement, rupture of RC, acromioclavicular degeneration, rare glenohumoral degeneration, rupture of the meniscus in the knee, collatteral ligamental laxation and rupture in the knee, maybe footproblems, low back pain, unspesific neck pain.
Bayer T, Schweizer A Stress fracture of the hook of the hamate as a result of intensive climbing. J Hand Surg Eur 2009 34; 276	Observational. Case report	1 subject. Age 31. Climbing level: "high level"	Stressfracture of the hook of hamate
Förster R, Penka G, Bösl T, Schöffl VR Climbers back- form and mobility of the thoracolumbar spine leading to postural adaptions in male high ability rock climbers. Int J Sports med 2009; 30: 53-59	Observational. Single diagnose description	Subjects 80. Age 31.2 (SD6.75). Climbing level: At least french 7c 3 years in row	Climbers back

Peters P Nerve compression syndromes in sport climbers. Int J Sports Med 2001; 22: 611-617	Clinical examination of climbers with painfull arms	Subjects 83. Age 32.4 (19-48). Climbing level: French 6a-8a	25.3% nervecompression syndromes (16.9% upper extremity, 8.4% under extremity). Carpal tunel syndrom 4, Ulnar nerve compression in the canal de Guyon 2, supinator syndrom 1, Pronatorsyndrom 1, unspesific hand pain 6, forfoos "neuritis" 5, compretion of the superfisial nerve of the "dorsum of the foot" 2
Pieber K, Angelmaier L, Csapo R, Herceg M Acute injuries and overuse syndromes in sport climbing and bouldering in Austria: a descriptive epidemiological study. Wien Klin Wochenschr 2012; 124: 357-362	Qustionnaire. Published on websites and climbing walls	Subjects 193. Age 30.4 (SD8.1). Climbing level: Climbing Intensity Score 1671.4 (SD1916.4)	Ligamental ruptures of the fingers 30.7%, Epicondylitis of the elbow 13.1%, chronic arthropaties of the fingers 7.5%, Rotaorcuff lesiones, SLAP, Bankart, bursitis and og subluksations of the shoulders 6.4%, back pain (incl 2 fractures) 5.3%
Rohrbough JT, Mudge MK, Schilling RC Overuse injuries in the elite rock climber. Med sci sports exerc 2000; 32(8): 1369-1372	Questionnaire and clinical testing of athletes in a national competition in USA 1995	Subjects 42. Age 25 (13-40). Climbing level: French 8a (7b-8b+)	Colateral ligament injury in fingers 40.5%, shoulderpain 33.3%, bowstring 26.2%, flexor tendon pain 26.2%, A2 pulley pain 23.8%, nodoles of the tendon 23.8%, medial epicondylitis 21.4%, lateral epicondylitis 9.5%, painfull muscle joint connection 7.1%, "wrist undercling injury 7.1%, carpal tunel syndrom 7.1%
Thompson RN, Hanratty B, Corry IS "heel hook" rock – climbing maneuver: a specific pattern of knee injury Clin J Sport Med 2011; 21: 365-368	Single case report	Subjets 1. Age 24. Climbing level: "experienced"	Rupture of anterolateral bundle, partial rupture of posteromedial bundle of PCL
Schweizer A Lumbrical tears in rock climbers. J Hand surg 2003; 23B(2): 187-189	Casedescription	Subjects 3. Age 25-29. Climbing level: French 7b+-8b+	Rupture of musculi lumbricalis (4 lumbrical)
Buda R, Di Caprio F, Bedetti L, Mosca M, Giannini S Foot overuse diseases in rock climbing an epidemiologic study J Of am pod med asc; 2013 103(2): 113-120	Clincal testing of athletes	Subjects 144. Age 31.7 (16-60). Climbing level: 4-8 (Scale unknown)	86% chronic injuries in the foot. Nails 65.3%, ancle sprains (27.8%), retrocalcaneal bursitis 19.4%, achilles tendinitis 12.5%, metatarsalgia 12.5%, plantar fasitis 5.6%

Table 1: Description of included papers with methodology, subjects and diagnoses.

Level of experience	Sport climbing, average red point level. French grades	Bouldering, average level. Fontanebleau grades
Recreational	4-6b	4-5+
Intermediate	6b+-7a+	6A-6C+
Experienced	7b-8a+	7A-7C
Elite	8b-8c+	7C+-8A+
International Elite	9a>	8B>

Table 2: Proposal of corresponding levels of experience between sport climbing and bouldering.

of either chronic injuries in 17 of the articles included in the original selection. After grouping the described injuries and removing repeated injury-types described more than once, the resulting list was composed of 45 chronic injuries (Nine in the fingers, seven in the hand and wrist, four in the fore arm, eight in the upper arm or shoulder, three in the knees, one in the hip, two in the back, one in the neck, nine in the ankle and foot) (Table 1).

One of the papers was specifically aiming on elite climbers whereas all included subjects were taking part in a national competition. Of the two reviews only one described the method used. In two of the included papers a differentiation was made in terms of how often an injury did appear due to the level of difficulty climbed. One of the included papers used a control group to rule out injuries common among the normal non-climbing population. In two of the papers included it was reported preferred climbing style. Subjects reported in the included papers ranged from 13-93 years of age, one of the studies had not mentioned the age of included subjects. Climbing abilities ranged from British moderate (French sport grade one) to French 8b+. It was not stated in any of the included papers whether the current grade climbed is on-sight, red point, or the highest grade ever climbed by the athlete during the climbing career. Of the included papers, five described the athletes by years climbed, five papers used grades climbed and one of the papers have an inclusion criterion of "three years or more climbing at least French 7c in a row". In two of the papers included, neither years climbed nor grades were mentioned. Both these papers were case reports and the climbers were described as "high level" or "experienced".

Discussion

The research on chronic injuries in climbing is relatively new and availability of studies is still limited. The methodology is varying in terms of how to identify injuries. Methods described in the included papers differ, from self-assessed questionnaires to clinical examination. A survey using questionnaires are depending on the respondents memory and their perception on what is a reportable injury. Climbers seem to have a tendency to not seek medical aid are a highly relevant problem regarding accuracy of diagnosis. Whereas a clinical examination gives a fairly accurate diagnosis. In some of the included papers no information on used methods is available, in addition one of the previous reviews [4], had no information on methodology regarding inclusion criteria of injuries or prevalence regarding described injuries.

It is, due to methodology, questionable whether all of the described injuries are climbing related injuries. As an example, low back pain (LBP) was included as a diagnose in two of the included papers giving two different conclusions [4]. This is regarding LBP as a climbing specific injury. Whereas [5] reports trunk pain (including LBP) to be prevalent in 5-3% of the climbers which is considerably less frequent than in the non-climbing population [6]. Pieber et al. [5], made a comparison of different ages among the respondents and reported that younger climbers seem to be more prone to injury than older climbers, unregarding of injury site and how the injury did occur, whereas Jones,

Asghar and Llewelyn [7] reports that older and more skilled climbers are more prone to overuse injuries. Roseburrough and Lebec [8] found, when using a non-climbing control group that the position of the scapula differs between climbers and non-climbers. While Forster, Penka, Bosl and Schoffl [9] reported that "climbers back" is a diagnose with increasing prevalence due to increasing climbing abilities using a control group of recreational climbers. Also other reported injuries vary in terms of how often they are reported to occur. Injuries in finger joints are suggested to be apparent in 33% of climbers (Logan Makwana, Mason and Dias) [10], +/-10% (Jones, Ashgar, Llewellyn) [7], 32% (Wright, Royle, Marshall) [11]. Schweizer [4] claims that finger injuries are the most common injury amongst climbers with a prevalence of 64-80% and Rohrbough (Rohrbough, Mudge, Schilling) [12] claim to find finger injuries in 40.5% of the elite climber. Buda [13] claims that 86% of all climbers have an injury of the foot due to climbing. While foot injuries barely are mentioned in the other papers. Jones, Ashgar, Llewellyn [7] have a 15% unmentioned sites of injuries that give room for foot problems and Schweizer [4] state that climbers"may have foot problems". Peters [14] finds nerve compressions in the foot amongst 8.4% of the climbers investigated. Agreements of prevalence are not better concerning shoulder injuries; Rohrbough, Mudge and Schilling [12] found shoulder pain in 33.3% of elite athletes, Jones et al. [7] reported chronic injuries in the shoulder amongst 20% of respondents and Pieber et al. [5] reports of 6.4% of the climbers having shoulder injuries originated from 5 different diagnosis.

The participants in the included papers range from 13-93 years of age. Although we do know that injury patterns in physical activity and sport differ due to age. Still it the included papers do not report included subjects in different categories of age.

The level of climbing is not always mentioned and sometimes reported as years climbing instead of level of difficulty. Two of the papers included [9] made distinctions between different levels of performance amongst the climbers included. Two of the papers included [15] reporting the climbers abilities either as "high level" or "experienced". One paper (Pieber et al.) [5] Based on their reporting of the climbers abilities using the climbing intensity score (CIS) proposed by Logan et al. [10].

When information on the style of climbing reported is missing or when the time span of the performance reported is missing it is difficult to compare results from different studies. Time of practice alone does not include any reference to intensity or density of climbing performed by the athlete. Even a distinction of style combined with years climbed does not give any relevant data to compare different studies.

Since the population in the studies differ in all aspects of age and abilities it is not surprising that the reported injuries also differ in prevalence and occurrence. Pieber et al. [5] made a comparison of different ages among the respondents and reported that younger climbers seem to be more prone to injury than older climbers, unregarding of injury site and how the injury did occur. Roseburrough [8], found, when using a non-climbing control group, that the position of the scapula differs between climbers and non-climbers. While Forster [9] reported "climbers back" as a diagnose with increasing prevalence due to increasing climbing abilities using a control group of recreational climbers.

An international consensus based on either the CIS proposal of Logan et al. [10] or based on what levels of grade climbed in a certain style is regarded as different levels of performance; easy, moderate, high and elite (Table 2). To our knowledge such distinctions of performance with international consensus do not exist to date.

If a consensus on what is to be considered as an elite climber is reached we also need a consensus, or at least information in the papers, on common practice of reporting of level of difficulty. Reporting studies with a higher degree of sub group dividing will make it more complicated to ensure enough respondents to give a correct picture on the pattern of injuries in climbing. On the other hand not reporting with sub grouped data makes it very difficult to interconnect and compare data from various sources and papers. Such comparing of results would over time give a clearer picture of what is relevant diagnosis and pattern of injury amongst climbers of various abilities and ages.

Conclusion

It seems to be a potential for further development in reporting incidence and prevalence of non-acute climbing injuries. This review reveals considerable inconsistencies in current literature regarding methodological approaches, on reporting strategies, presentation of demographic data and divisions of climbers according experience, level of skill and frequency of practice. These methodological inconsistencies and lack of accurate stratification of subgroups in climbing populations, poses large difficulties when it comes to collected data. These disparities render thus, a somehow large body of evidence which is difficult to scrutinize, leading to impossibility to give an accurate answer to the initial question. Who gets injured and when?

It is our belief that a consensus around stratification in the climbing population would markedly increase quality and user-friendliness of injury reporting endeavours. We suggest that facts taken into account in the future systematically include consensus about skill-level (grade scale or CIS), frequency of sports practice, age and climbing style (lead respectively bouldering). This parameters would then render a clearer picture of who gets injured and when, through making comparisons and combining of studies easier to scrutinize. It will undoubtly make it easier to ensure that relevant information on preventive training strategies is addressed to the right groups at the right time.

References

1. Watts PB (2004) Physiology of difficult rock climbing. Review article. Eur J Appl Physiol 91: 361-372.
2. Sheel AW (2004) Physiology of sport rock climbing. Review article. Br J Sports Med 38: 355-359.
3. Franchini MJ (2013) Differences in climbing-specific strength between and lead rock climbers. Strength Cond Res 27: 310-314.
4. Schweizer A (2012) Sport climbing from a medical point of view. Swiss med wkly 142: w13688.
5. Pieber K, Angelmaier L, Csapo R, Herceg M (2012) Acute injuries and overuse syndromes in sport climbing and bouldering in Austria: a descriptive epidemiological study. Wien Klin Wochenschr 124: 357-362.
6. Ihlbæk C, Brage S, Natvig B, Bruusgaard D (2010) Prevalence of muskeloskeletal pain in Norway. Tidsskr nor legeforen 130: 2365-8.
7. Jones G, Asghar A, Llewellyn DJ (2008) The epidemiology of rock climbing injuries 442: 773-778.
8. Roseborrough A, Lebec M (2007) Differences in static scapular position between rock climbers and a non-rock climber population. NA J O Sport PH T 2: 44-50.
9. Forster R, Penka G, Bosl T, Schoffl (2009) VR Climbers back- form and mobility of the thoracolumbar spine leading to postural adaptions in male high ability rock climbers. Int J Sports med 30: 53-59.
10. AJ Logan, N Makwana, G Mason, J Dias (2004) Acute injuries in the hand and Wrist Br J of Sports Med 38: 545-548.
11. Wright DM, Royle TJ, Marshall T (2001) Indoor rock climbing:who gets injured? BrJSports Med 35:181-185.

12. Rohr bough JT, Mudge MK, Schilling RC (2001) Overuse injuries in the elite rock climber. Med sci sports exerc 32: 1369-1372.

13. Buda R, Di Caprio F, Bedetti L, Mosca M, Giannini S (2013) Foot overuse diseases in rock climbing an epidemiologic study J of Am Pod Med Asc 103: 113-120.

14. Peters P (2001) Nerve compression syndromes in sport climbers. Int J Sports Med 22: 611-617.

15. Thompson RN, Hanratty B, Corry IS (2011) "Heel hook" rock - climbing maneuver: a specific pattern of knee injury Clin J Sport Med 21: 365-368.