Effect of hand rehabilitation in overuse injuries of hand in professional rock climbers

Rasika Panse, Ujwal Yeole, Sapna Domal and Pournima Pawar

Abstract

Background: Rock climbing places extreme forces on the upper extremity. The various grip techniques transmit extremely high forces through the tissue of the digits, hand and forearm resulting in a variety of acute and chronic injuries. Climbers present a stronger imbalance, it is probable that they have more difficulties in controlling and protecting their joints and are, therefore more exposed to joints instability, joint surface over-use and/or ligament tear. For this type of injuries hand rehab can be given which can improve their strength and prevent injuries.

Aim: Effect of hand rehabilitation in overuse injuries of hand in professional rock climbers.

Objectives: Effect of hand rehabilitation on overall hand function on overuse injuries of hand in professional rock climbers.

Material and methodology: Total number of 60 professional rock climbers between age 18-35 years of both genders with at least 1 year of experience were selected by simple random sampling. Michigan hand outcome questionnaire was used to assess using aneroid sphygmomanometer was used pre and post intervention. Intervention is based on strengthening exercises of finger flexors and extensors, intrinsic and numerical muscles for thrice a week until 3 week for 30 minutes.

Results: After comparing pre and post intervention data using student paired t test results showed that there was significant improvement in hand function (p<0.000), work (p<0.000), adls (p<0.000), reduction of pain (p<0.000) and hand grip strength (p<0.000).Conclusion: There is significant improvement in overall hand function and hand grip strength in professional rock climbers.

Keywords: Rock climbers, overuse injuries, hand function, strengthening

1. Introduction

Rock climbing is often a physically and mentally demanding sport, often tests the climber's strength, endurance, agility and balance along with mental control. Climbing is the activity of using ones hand, feet or any other part of body to ascend a steep object [1]. Rock climbers rely predominantly on digital and upper extremity strength and tactile ability to ascend shallow ledges and rock faces, using any of four gripping techniques i.e. open grip, cling grip, pocket grip, pinch grip depending on the terrain [1]. All four of the grip techniques transmit extremely high forces through the tissue of the digits, hand and forearm resulting in a variety of acute and chronic injuries. Fingertip injuries are most common hand injuries among rock climbers. Fingertip injuries have maceration and splitting of the skin of finger pads due to prolonged pressure and abrasion [1]. When a climber pushes and twists his or her fingers until they are wedged into a crack, torque forces on the finger joints can be very high. This type of climbing is associated with joint dislocations and digital avulsion amputations following a sudden slip or fall [2, 3]. Among these most serious injuries are flexor tendon strain, pulley strain and rupture [2, 3]. The most commonly affected site was the proximal inter phalangeal joint, or proximal phalax of the middle and ring fingers, with pain or injury reported at this site in 69% [4]. The incidence of hand and wrist injuries can be closely correlated with the duration and frequency of climbing and with the climbing techniques used [3]. For this type of injuries hand rehab can be given which can improve their strength and prevent injuries. Consequent to the stronger enhancement of finger flexors, climbers exhibited higher imbalance between flexors and extensors around both the wrist and MCP joints [17]. Climbers present a stronger imbalance, it is probable that they have more difficulties in controlling and protecting their joints and are, therefore more exposed to joints instability, joint surface over-use and/or ligament tear [17].
In professional rock climbers gripping techniques may result in soft tissue injuries, flexor tendon injuries etc, this can affect their rock climbing activities. So there is a need of hand rehab for the affected rock climbers. Therefore there is important to examine the effect of hand rehabilitation in professional rock climbers.

2. Material and Methodology

2.1 Methodology

Study Design: Pre-Post Experimental study. Study Setting: Trekking camps in and around Pune. Total number of 60 professional rock climbers between age 18-35 years of both genders with at least 1 year of experience were selected by simple random sampling. Michigan hand outcome questionnaire was used pre and post intervention.

2.2 Exclusive Criteria

- Thesubjectsnot willing to participate
- Any recent surgery or fracture of upper limb

Any known medically diagnosed neurological disorder and cardiovascular disorder

2.3 Outcome Measure

- Michigan Hand Outcome questionnaire [8]

2.4 Procedure

Ethical clearance was taken from institutional ethical committee of Tilak Maharashtra Vidyapeeth, department of physiotherapy. Various trekking camp was approached and permission was taken to conduct the study. Sample were selected according to the inclusion and exclusion criteria. They were explained about the aim and objectives of the study and a consent form was taken. Random sample collection was done by chit method. Data collection form were used for demographic identification. Michigan Hand Outcome questionnaire was used for ore and post intervention. Intervention is based on strengthening exercises which is to flexors and extensors intrinsic and numerical muscles. Intervention protocol as follows. Rehab was given for thrice a week until 3 week. In professional rock climbers gripping techniques may result in soft tissue injuries, flexor tendon injuries etc, this can affect their rock climbing activities. So there is a need of hand rehab for the affected rock climbers. Therefore there is important to examine the effect of hand rehabilitation in professional rock climbers.

2.5 Statistical Analysis

Data was collected and tabulated and analyze using primer of biostatistics software. MS Excel sheet 2007 was used. Mean and standard of deviation of all variables were analyzed. Data was compared using student paired t test with 95% of confidence. Mean Age was 22.62±2.975. Total number of 35 males and 15 female rock climbers participated in study of which 12 had right side dominance and 38 with left side dominance. After comparing pre and post intervention data using student paired t test results showed that there was significant improvement in hand function (p<0.000), work (p<0.000), adls (p<0.000) and reduction of pain (p<0.000)

3. Results and Discussion

3.1 Tables and Figures

Table 1: Represents Age, year of experience, gender and hand dominance of rock climbers

<table>
<thead>
<tr>
<th>Results</th>
<th>Mean±SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>22.62±2.975</td>
<td>0.000</td>
</tr>
<tr>
<td>Year of Experience</td>
<td>6.63±4.516</td>
<td>0.000</td>
</tr>
<tr>
<td>Gender</td>
<td>Male=35, Female=15</td>
<td>0.000</td>
</tr>
<tr>
<td>Dominance</td>
<td>Right=12, Left=38</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 2: Represents pre and post intervention values of Michigan hand outcome questionnaire

<table>
<thead>
<tr>
<th>Michigan hand outcome questionnaire</th>
<th>Pre</th>
<th>Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall hand function</td>
<td>65.6±12.9</td>
<td>88.5±6.566</td>
<td>0.000</td>
</tr>
<tr>
<td>Adls</td>
<td>80.38±9.736</td>
<td>93.96±5.59</td>
<td>0.000</td>
</tr>
<tr>
<td>Pain</td>
<td>45.3±16.14</td>
<td>18.94±12.4</td>
<td>0.000</td>
</tr>
<tr>
<td>Work</td>
<td>69.69±15.73</td>
<td>91.66±12.94</td>
<td>0.000</td>
</tr>
<tr>
<td>Anesthetics</td>
<td>97.7±7.098</td>
<td>99.8±1.414</td>
<td>0.028</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>69.27±10.42</td>
<td>90.88±6.96</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Fig 1: Pre and post intervention values of Michigan hand outcome questionnaire

3.2 Discussion

A total 60 samples were selected by random sample collection using Chit method. The sample collected between the age group of 18-35 with mean age 22. Out of which 15 subjects were female and 35 were male. In that 12 subjects were having right hand dominance and 38 having left hand dominance. Experience of each player into the game was summarized to a mean of 6.53. Out of 60 samples 10 dropped out from the study, 3 samples opted for tendon repair and remaining 7 subjects discontinued the follow up.

After comparing the pre and post intervention using paired t test for overall hand function (p value=0.000), adls (p value=0.000), pain (p value=0.000), work (p value=0.000), anesthetics (p value=0.0028), and satisfaction (p value=0.000)

The pre and post intervention using paired t test for right hand strength (p value=0.000) and left hand strength (p value=0.000)

Marwan A. Wehbe et al concluded a study after tendon gliding exercises the differential tendon gliding occur even though range of motion is limited thus improving cartilage nutrition and joint motion [7].

Anandhi have proved that after functional task training or resistance training of hand improved wrist flexor and extensor
4. Conclusion
There is significant improvement in overall hand function, adls, work, pain, anesthetics and satisfaction and grip strength in professional rock climbers.

5. Limitations and Future Scope of Study
Small sample size was collected. The study duration was very short. Functional exercises for hand can be added in protocol can be taken

6. References