Effects of Gua Sha therapy on weightlifting training: a randomized trial

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Abstract

OBJECTIVE: To evaluate the effect of Gua Sha therapy on weightlifting training.

METHODS: The sample size was calculated by conducting a pilot study. A total of 44 male weightlifters were randomly assigned to either the Gua Sha group (n = 15), sham scraping group (n = 14), or control group (n = 14). The participants in the Gua Sha group and sham scraping group received 16 sessions of Gua Sha therapy during normal weightlifting training for 8 weeks. No treatment was applied to participants in the control group. The effectiveness of Gua Sha therapy was evaluated by measuring weightlifting ability, the rating of perceived exertion (RPE) of snatch and clean and jerk (85% of 1 repetition maximum), and creatinine kinase (CK), blood urea nitrogen (BUN), and immunoglobulin A levels.

RESULTS: Gua Sha therapy treatment significantly increased weightlifting ability in participants in the Gua Sha group (P < 0.01). The RPE values of snatch and clean and jerk were significantly lower in the Gua Sha group and sham scraping groups compared with the control group (P < 0.05). CK levels were lower and immunoglobulin A levels were significantly higher in the Gua Sha group compared with sham scraping group and control group (both P < 0.05). BUN levels tended to be reduced only in the Gua Sha group. A close correlation between CK levels and the RPE was found in the Gua Sha group.

CONCLUSION: Gua Sha therapy can facilitate weightlifting ability, reduce the RPE, and inhibit muscle injury by promoting recovery from fatigue caused by normal weightlifting training. Gua Sha therapy could be an effective treatment to complement normal weightlifting training.

Keywords: Gua Sha therapy; Weightlifting; Creatine kinase; Blood urea nitrogen; Immunoglobulin A; Perceived exertion

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INTRODUCTION

Weightlifting, defined as a physical activity in which people lift weights, is a strength-based sport. Unsuitable training volume and/or intensity of exercise can result in a decrease in performance and muscle strain. Recovery from this condition often requires many weeks or months. The best means by which to quickly recover from routine weightlifting training and prevent muscle strain poses a continual challenge to weightlifters. Some recovery methods are commonly used to reduce fatigue due to training, such as massage, muscle stretching, proper hydration, and water therapy. Gua Sha is a traditional Chinese therapy that is popular in Southeast Asia in which the skin above stressed muscle tissue is scraped repeatedly by a blunt spoon-like tool. Previous studies have reported that Gua Sha can reduce muscular pain and chronic fatigue syndrome, as well as modulate the balance between parasympathetic and sympathetic activities. Our previous pilot and previous experiments also showed that Gua Sha therapy enhanced weightlifting ability. Relevant biochemical and psychological indicators can be monitored during normal weightlifting training. Creatine kinase (CK) levels match the intensity of weightlifting training as the training intensity is enhanced. Blood urea nitrogen (BUN) is a marker of metabolism during the training process. BUN levels may be used to monitor a person’s general health as a part of a comprehensive metabolic panel or basic metabolic panel. Immunoglobulin A (IgA) circulates in the peripheral blood and is abundant in various bodily secretions. IgA can bind to infectious agents before they have a chance to attach to and infect host cells. The rating of perceived exertion (RPE) scale is an index for evaluating perceived exertion in exercise testing, training, and rehabilitation, and has been validated against objective markers of exercise intensity.

Gua Sha therapy facilitates health in patients, players, and healthy people because it can increase the function of the bench press. A recent study showed that scraping therapy improved muscle strength in university students, and was beneficial for healthy people as a method of recovery from fatigue. Gua Sha therapy not only increases surface microperfusion, but also produces an immune anti-inflammatory effect, enhances liver antioxidant levels, prolongs endurance time, and increases the amount of white blood cells and neutrophils. Although our pilot study showed that Gua Sha therapy was a potential recovery therapy for weightlifters, the small sample size and brief term of treatment limited the effects of the study. We hypothesized that Gua Sha therapy improves weightlifting performance. Therefore, in the current study, we conducted a randomized, controlled trial to investigate the effect of Gua Sha therapy on weightlifting training.

MATERIALS AND METHODS

Participants

This clinical trial was reviewed by the Khon Kaen University Ethics Committee for Human Research based on the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines (Reference No. HE561103). This clinical investigative trial was registered in China (Registration No. ChiCTR-15006302). This 8-week prospective, parallel group, randomized, controlled clinical trial was conducted cooperatively by a research team that included two Gua Sha therapists, a nurse, two assistants, and a research methodologist. All procedures were conducted according to the principles listed in the Declaration of Helsinki. All participants were recruited from the National Center of Weightlifting Training, and signed a consent form before initiation of study procedures. This study was conducted for 8 weeks during the normal weightlifting training period at the National Center of Weightlifting Training. Stratified random allocation was performed by a seconded assistant based on athletic levels (master level, first level, second level, third level, and young level) in a double-blinded manner to achieve approximate equality of strength and skill. The nurse was blinded to assess based on the materials from the results of the experiment. Participants who met the inclusion criteria were randomly assigned to the Gua Sha group, the sham scraping group, and the control group. The same number subjects layered into the same weight level. The trial procedure was as follows: weightlifting skill evaluation, RPE measurement and a blood test before the intervention, Gua Sha therapy for 8 weeks (2 sessions per week), and then weightlifting skill evaluation, RPE measurement, and a blood test after the intervention.

Inclusion criteria

All participants met the following inclusion criteria: (a) male weightlifting students, (b) age of 16 to 22 years, (c) receiving weightlifting training for more than 3 years, (d) no injury in the last 6 months, (e) no smoking during this study, (f) no alcohol drinking during this study, (g) no history of hormone therapy, and (h) no health problems.

Exclusion criteria

Subjects who had any of the following problems were excluded: (a) ongoing joint or muscle dysfunction, (b) failure to refrain from tobacco or alcohol during this study, (c) treatment for any psychological problem, (d) injury or any health problem during this study, and (e) failure to agree to sign the consent form.

Sample size

To calculate the sample size, we first conducted a pilot study in which five participants who had undergone normal weightlifting training were recruited and re-
received Gua Sha therapy for 7 weeks. The RPE scale was used to evaluate the effectiveness of Gua Sha therapy in the pilot study. The mean pre-test RPE scale ($\mu$) was $18.2 \pm 0.6$ and the mean post-test RPE scale ($\mu$) was $16.5 \pm 0.6$. The effect size ($\mu$ - $\mu$) was 1.71, which was considered as the lowest level of change to indicate experimental significance. A significance level of $< 0.05$ ($Z_{a/2} = 1.96$) and power of the test at 90% ($Z_B (0.1) = 1.28$) were used for the calculation as follows: The standard deviation of average pre-test RPE was 1.44 during the preliminary study, as while, the post-test was 1.22.

All potential subjects, who were from the National Center of Weightlifting Training, received a physical examination to exclude those with health problems or injuries. A total of 45 male weightlifters were recruited. The titles of athletes in China include international masters of sports (1++), masters of sports (1+), first grade (1), second grade (2), third grade (3), and young athletes (4). The subjects were informed verbally and in writing before signing the consent form to participate in this experiment. Each of the consent forms was then signed by the subjects and their coaches. The investigator was not involved in this process.

Normal weightlifting training
Normal weightlifting training was defined as subjects who received weightlifting training from Monday to Saturday afternoon for approximately 2 to 3 h. The intensity of training was 40% to 95% of 1 repetition maximum (RM), including some sets of training, such as warm up, main training sets (snatch, clean and jerk, squat, dead-lift, press, etc.), and relaxation. The instrument of training was the barbell, the intensity was 85% of 1RM, and volume (kg) was three sets of 3RM. Snatch and clean and jerk were evaluated by a lifting exercise protocol that consisted of three sets of 3RM snatch (85% of 1RM) on Wednesday, and three sets of 3RM clean and jerk (85% of 1RM) on Friday in the same week. This involved a number of warm up trials being performed using 40% (3 repetitions, 2 sets), 50% (3, 2), 60% (3, 2), 70% (3, 2), 80% (3, 2), and 85% (3, 3).

Interventions
Gua Sha intervention was performed in the head, neck, back, and upper limbs. Gua Sha skill is characterized by a pressure of 0.5 to 1 kg based on the feeling of Gua Sha therapists applied in the up to down direction along meridians (Cutaneous Location of the Bladder Meridian of Foot-Taiyang, Heart Meridian of Hand-shaoyin, and Pericardium Meridian of Hand-jueyin) for 20 min during two sessions per week. There was a total of 16 sessions in 8 weeks. The intervention was completely tolerated with little pain. Treatment resulted in a crimson-red to purple color in the skin, with locations of emphasis in node and muscle attachment points. Sham scraping was characterized by a pressure < 0.5 kg applied up to down along meridians with out a pale red color in the skin for 10 min during 2 sessions per week. Interventions were performed in the rehabilitation treatment room during a warm season (27 ± 1D, approximately 50% humidity), without direct sunlight, without infrared radiation, and without indoor-outdoor ventilation. The Buffalo Horn scraper was used to scrape with a skin lubricant (Jinlongkang, Beijing Jinlongkang Gua Sha Cupping Research Institute, Beijing, China) to decrease friction. The therapists were trained and certified by the Ministry of Human Resources and Social Security, the People’s Republic of China. The head, neck, and back were scraped in the direction within with a 60-degree angle between the scraper and skin. Sessions were held between 8:30 and 11:30 AM on Thursday and Sunday. The control group only received normal weightlifting training as in the other groups.

Weightlifting ability
Weightlifting ability was evaluated by measuring the maximum values of the snatch and clean and jerk. This ability was measured 1 week before initiation of the trial and 1 week after the last treatment.

RPE measurement
The RPE measure, which was developed by Foster, was used to rate intensity of the entire workout. Using a 20-cm line ranging from 6 to 20 cm, the participants were asked to mark a point on the line. Six patients indicated no exertion at all and 20 indicated the maximal exertion ever experienced. The subject was shown the perceived exertion scale 30 min following weightlifting training and was asked “How was your workout?” The RPE was recorded 30 minutes post-exercise to prevent the influence of particularly difficult or easy elements near the end of the 85% (3 reps, 3 sets).

Serum biochemical indices
The serum biochemical indices CK, BUN, and IgA were measured before and after this study in the hospital. Venous blood was collected 1 d before the trial and 1 d after the last treatment at the clinic of the weightlifting training center in the morning before breakfast.

Data analysis
Data are presented as mean ± standard deviation. Correlation and one-way analysis of variance followed by the $q$ test were performed with SPSS 17.0 software (SPSS Inc., SPSS Statistics for Windows, Version 17.0, Chicago, IL, USA). A $P$ value <0.05 was considered statistically significant.

RESULTS
Baseline characteristics
The baseline features were as follows: the mean age was (21.3 ± 2.1) years, mean weight was (76.4 ± 22.3) kg, mean height was (171.3 ± 7.1) cm, and mean body

577 August 15, 2019 | Volume 39 | Issue 4 |
mass index was 24.4 ± 3.7. The mean duration of the training experiences was (5.6 ± 0.7) years and the mean athletic level was 2.0 ± 0.5.

Forty-five participants were randomly allocated to the Gua Sha group (n = 15), sham scraping group (n = 15) and control (n = 15) groups, and 44 participants completed the trial. The reasons for exclusion were violation of the inclusion criteria and no desire to participate. A total of 15 participants in the Gua Sha group received Gua Sha therapy for 8 weeks. One participant in the sham scraping group was excluded because of an injury incurred during study. Therefore, 44 participants were finally included in the analysis. Variables in each group are shown in Table 1 separately. We found no significant differences in athletic level or training years between the Gua Sha, sham scraping, and control groups at baseline.

**Effect of Gua Sha therapy on weightlifting ability**

After receiving scraping treatment for 8 weeks, mean snatch values were significantly higher in the Gua Sha group (5.6% ± 0.8%, P < 0.05) and sham scraping group (2.4% ± 0.6%, P < 0.01) compared with the control group (0.9% ± 2.0%). Furthermore, the mean snatch value was also significantly higher in the Gua Sha group than in the sham scraping group (P < 0.05). The mean clean and jerk value in the Gua Sha group (5.9% ± 1.4%) was also significantly higher compared with those in the sham scraping group (2.3% ± 0.5%, P < 0.05) and the control group (1.5% ± 0.9%, P < 0.01). Additionally, the mean clean and jerk value in the sham scraping group was significantly higher compared with that in the control group (P < 0.05).

**Effect of Gua Sha therapy on the RPE**

Before Gua Sha therapy, there were no significant differences in the mean RPE values of snatch in the Gua Sha group (17.29 ± 0.19), sham scraping (17.14 ± 0.21), and control (17.21 ± 0.19) groups. After 16 sessions of Gua Sha therapy, the mean RPE values of snatch in the Gua Sha, sham scraping, and control groups were 14.21 ± 0.24, 16.07 ± 0.25, and 16.71 ± 0.19, respectively. A significant decrease of RPE value was found in Gua Sha group (3.07 ± 0.30), relative to sham scraping group (1.07 ± 0.32, P < 0.05), and control group (0.50 ± 0.25, P < 0.05), but no significant difference was found between the sham scraping and control groups.

The mean RPE values of clean and jerk (85% of 1RM) before Gua Sha therapy in the Gua Sha group, sham scraping group, and control group were 18.36 ± 0.27, 18.43 ± 0.23, and 18.43 ± 0.20, respectively, with no significant difference among the three groups. After Gua Sha therapy for 8 weeks, the mean RPE values of clean and jerk in the Gua Sha group, sham scraping group, and control group were 16.14 ± 0.35, 17.29 ± 0.24, and 18.14 ± 0.21, separately, with a significant decrease in Gua Sha group (2.2 ± 0.3), relative to sham scraping group (1.1 ± 0.4, P < 0.05) or control group (0.3 ± 0.3, P < 0.01), whereas the disease in RPE value of cleaning and jerk in sham scraping group was significantly different from that in control group (P < 0.05).

**Effect of Gua Sha therapy on CK levels**

There were no significant differences in mean CK levels before Gua Sha therapy among the groups [Gua Sha group: 405 ± 24 U/L; sham scraping group: (391 ± 31) U/L; control group: (414 ± 27) U/L]. After Gua Sha therapy for 8 weeks, the mean CK level was significantly lower [(335 ± 26) U/L] compared with that before therapy in the Gua Sha group (P < 0.05). However, CK levels in the sham scraping and control groups [(369 ± 10) and (406 ± 38) U/L, respectively] were not significantly changed after Gua Sha therapy compared with before therapy. The mean difference in CK levels between before and after therapy was significantly lower in the Gua Sha group than in the sham scraping group (21 ± 27) U/L and control group (8 ± 35) U/L (both P < 0.05). However, there was no significant difference in the mean difference in CK levels between the sham scraping and control groups during normal weightlifting training.

**Effect of Gua Sha therapy on BUN levels**

There were no significant differences in mean BUN levels before Gua Sha therapy among the groups [Gua Sha group: (4.96 ± 0.29) mmol/L; sham scraping group: (5.08 ± 0.23) mmol/L; control group: (4.67 ± 0.23) mmol/L]. Gua Sha therapy for 8 weeks did not induce significant changes in BUN levels among the

<table>
<thead>
<tr>
<th>Athletics level of weightlifter</th>
<th>Gua Sha group</th>
<th>Sham scraping group</th>
<th>Control group</th>
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Table 1 Number of subjects in this study at each athletic level (n)
three groups [Gua Sha group: (4.73 ± 0.23) mmol/L; sham scraping group: (5.26 ± 0.22) mmol/L; control group: (4.82 ± 0.16) mmol/L].

**Effect of Gua Sha therapy on IgA levels**

There were no significant differences in mean IgA levels before Gua Sha therapy among the three groups [Gua Sha group: (1.64 ± 0.15) g/L; sham scraping group: (1.58 ± 0.13) g/L; control group: (1.64 ± 0.09) g/L]. After Gua Sha therapy for 8 weeks, mean changes in IgA levels in the Gua Sha, sham scraping, and control groups were (2.01 ± 0.16), (1.73 ± 0.14), and (1.65 ± 0.10) g/L, respectively. Only the Gua Sha group showed a significant increase in IgA levels after treatment ($P < 0.05$).

**Correlation between CK levels and the RPE of normal weightlifting after Gua Sha therapy**

There was a significant correlation between the RPE values of snatch and clean and jerk and CK levels in the Gua Sha group ($P < 0.001$, $r = 0.903$, Figure 1).

![Figure 1](image)

**DISCUSSION**

In this study, we found that Gua Sha therapy enhanced weightlifting performance, reduced the RPE of normal weightlifting training, decreased CK levels, and increased IgA levels in weightlifters. We also found that the RPE values of snatch and clean and jerk were correlated with CK levels after Gua Sha therapy. Previous studies have shown that the skill of weightlifting is associated with CK levels after Gua Sha therapy. Previous studies have shown that CK decreased due to Gua Sha therapy stimulates a change in conduction velocity due to different fibers having different conduction velocities, and facilitates parasympathetic nervous activity and modulates the balance between parasympathetic and sympathetic activity by changes in heart rate variability parameters. Therefore, a reduction in RPE values may have resulted from the increasing function and skills of subjects due to Gua Sha intervention. The weightlifters felt a lower degree of difficulty with the same intensity. Notably, RPE values remained stable in the control group, which is in contrast to previous reports. Future experiments with more participants and follow-up studies are required.

CK is a marker of muscle damage due to weightlifting training, Exercise-induced fatigue is closely associated with CK and BUN levels because these markers can effectively reflect the change in exercise load and degree of fatigue. Weightlifting training leads to muscle damage with different intensities. Previous studies have shown that CK levels are increased after exercise, whereas pain is also increased. Our previous pilot study indicated that a 5-kg increase in the weightlifting skill was obtained within 2 months if Gua Sha therapy was applied during normal weightlifting training. Additionally, some associated skills, such as dead-lift and back squat, were also improved by treatment. In the current study, not only RPE values of snatch, but also values of clean and jerk, were significantly increased in weightlifters who received Gua Sha therapy for 8 weeks during normal weightlifting training compared with before therapy. These results suggest that Gua Sha therapy improves weightlifting ability. The RPE, which is a measurable subjective perception referring to the amount of effort, is a personal feeling of expending while performing training. The RPE may reflect the intensity of exercise because combined psychological and physiological changes during severe training might provide important indicators for monitoring of training. Because the RPE scale indirectly shows changes in lactate levels, maximal oxygen consumption, and heart rate induced by exercise, it can be used to assess post-exercise recovery. RPE analysis can quantify and predict exercise intensity. A combination of the RPE and biomarker levels could be used to evaluate the effect of acupoint sticking therapy on exercise-induced fatigue. Acupuncture therapy can reduce CK levels in prevention of sport fatigue.

The present study showed that RPE values of snatch and those of clean and jerk (85% of 1RM) were significantly lower in the SG group compared with the SS and control groups. Furthermore, sham scraping significantly reduced RPE values, which is inconsistent with our pilot study. We speculate that, in this study, the reduction in RPE values may have been due to a difference in recruited subjects. Previous studies have thoroughly shown that Gua Sha therapy produces effects related to the physiological state in humans or rats. Gua Sha therapy stimulates a change in conduction velocity due to different fibers having different conduction velocities, and facilitates parasympathetic nervous activity and modulates the balance between parasympathetic and sympathetic activity by changes in heart rate variability parameters. Therefore, a reduction in RPE values may have resulted from the increasing function and skills of subjects due to Gua Sha intervention. The weightlifters felt a lower degree of difficulty with the same intensity. Notably, RPE values remained stable in the control group, which is in contrast to previous reports. Future experiments with more participants and follow-up studies are required.

BUN can be used as an index for assessing the degree of fatigue on body function. Our pilot study showed...
that BUN levels became higher with an increase in training volume for approximately 3 weeks, and then they decreased as the body adapted to the training. In the current study, the finding that BUN levels remained stable after Gua Sha therapy suggested that Gua Sha therapy helped the participants recover from normal weightlifting training by adapting to the workload more easily. IgA is a predominant immunoglobulin in mucosal fluids, and it can inhibit attachment and replication of pathogens and neutralize viruses and toxins. Tissue damage leads to activation of the immune system. Our study showed that the IgA levels were significantly increased after Gua Sha therapy during normal weightlifting training. This finding suggests that Gua Sha therapy activates the immune system by stimulating the skin, and thus enhances immune function, as well as skin secretion. Serum CK is believed to leak into the plasma from skeletal muscle fibers when they are damaged because of repeated and intense contractions. Serum CK levels are widely used as an index of skeletal muscle fiber damage in sport and exercise. Although the validity of CK as a marker of exercise-induced muscle injury has been questioned, CK is used reliably and commonly as such a marker. In this study, we found that the decrease in RPE values paralleled an inhibition of CK levels in weightlifters following Gua Sha intervention. This finding suggests an effect of Gua Sha on the output ability of normal weightlifting training. This correlation suggests that RPE might be a useful index for evaluating the intensity and volume of normal weightlifting training because it is more convenient, as well as cheaper, than a CK assay.

In conclusion, Gua Sha therapy may facilitate weightlifting ability, reduce the RPE, and inhibit muscle injury by promoting recovery from fatigue caused by normal weightlifting training. Therefore, Gua Sha therapy could be beneficial for weightlifting training.

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