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Gua Sha therapy for chronic low back pain: A randomized controlled trial

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ABSTRACT

Objective: To test the efficacy of Gua Sha therapy in patients with chronic low back pain.
Methods: 50 patients with chronic low back pain (78% female, 49.7 ± 10.0 years) were randomized to two Gua Sha treatments (n = 25) or waitlist control (n = 25). Primary outcome was current pain intensity (100-mm visual analog scale); secondary outcome measures included function (Oswestry Disability Index), pain on movement (Pain on Movement Questionnaire), perceived change in health status, pressure pain threshold, mechanical detection threshold, and vibration detection threshold.
Results: After treatment, patients in the Gua Sha group reported lower pain intensity ($p < 0.001$) and better overall health status ($p = 0.002$) compared to the waitlist group. No further group differences were found. No serious adverse events occurred.
Conclusions: Gua Sha appears to be an acceptable, safe, and effective treatment for patients with chronic low back pain. Further rigorous studies are needed to confirm and extend these results.

1. Introduction

Chronic low back pain is a major public health problem in industrialized societies [1,2], with a global average lifetime prevalence of 40 [3]. In Germany, almost one in four adults over 30 years reports chronic low back pain [4,5]. This is one of the major causes of work absenteeism and disability [5]. Given that an optimal clinical treatment has yet to be identified for this condition, patients often seek complementary and traditional therapy treatments [6–8].

One such approach is Gua Sha Therapy, an instrument-assisted "pressure-stroking" of a lubricated area of the body surface. 'Sha' literally means 'sediment' or 'sand' but in traditional medicine the term is applied to a syndrome or "toxin" in the body as well as its rash-like expression [9]. 'Gua' means 'to scrape or scratch', thus Gua Sha is a method to bring 'Sha' to the body's surface by means of scratching or scraping [9]. Gua Sha therapy uses a variety of instruments from slices of buffalo horn, specially made for this purpose, to round lipped metal lids (Fig. 1), to intentionally induce transitory therapeutic petechiae. These result from the extravasation of blood into the subcutis. They fade within 2–5 days [9]. Gua Sha therapy is generally well tolerated, with little or no discomfort. Gua Sha is widely used in Asia [10], as well as in communities of Asian immigrants worldwide [11]. It is known as a treatment in Chinese Medicine, and is also commonly used in Vietnam and Indonesia. It remains an important treatment technique for many acupuncturists and traditional East Asian medicine practitioners [9,12] for regional pain and for functional problems with impaired movement including low back pain [9]. Gua Sha has been shown to effectively treat chronic pain conditions such as neck pain [13,14], and perhaps migraine [15]. In a small pilot trial, Gua Sha also effectively reduced pain intensity and improved general health status in chronic low back pain [13]. However, that study included less than 20 patients with chronic low back pain.

This larger randomized trial was conducted to confirm the findings of the pilot study. The objective was to investigate whether Gua Sha induced stronger reductions in pain intensity and stronger improvements in general health status than an untreated control group. A secondary aim was to investigate the effects of Gua Sha on sensory measurements.

Abbreviations: IBM, International Business Machines Corporation; MDT, mechanical detection threshold; ODI, Oswestry Disability Index; POM, Pain on Movement Questionnaire; PPT, Pressure-pain threshold; SPSS, Statistical Package for the Social Sciences; VAS, Visual Analog Scale; VDT, vibration detection threshold

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Fig. 1. Instruments commonly used for Gua Sha treatment. In this study, the instruments on the right were used.

2. Methods

2.1. Design

This was an open-label randomized controlled trial with 2 parallel groups, conducted and reported in accordance with the CONSORT statement [16]. Patients were randomized to either: Gua Sha therapy or a waitlist control group and introduced to their assigned intervention after baseline assessment. Patients in the Gua Sha group were treated twice: 1) directly after randomization and 2) 7 days after randomization. Trial assessments were repeated 12 days after randomization. No changes were made to the methods after trial commencement.

2.2. Ethics, consent and permissions

The study was approved by the ethics committee of the local University Hospital (approval number: 08–3594) prior to patient recruitment, and retrospectively registered at ClinicalTrials.gov (Identifier: NCT03333213). All patients gave oral and written informed consent before being included.

2.3. Patients

Patients were recruited through website announcements and through our own database of study patients. A student assistant screened interested patients by phone by to assess their eligibility. Those who initially met the trial inclusion criteria were invited to undergo physical examination by the study physician who explored the patients' medical histories, current therapies and examined their physical health and neurological function. They also checked the patients' medical records such as laboratory findings or X-rays in order to rule out more serious pathologies. Patients satisfying the inclusion criteria and not meeting any exclusion criteria were provided detailed written and oral information before their written informed consent was obtained.

Eligible patients had to be between 18 and 75 years of age and had to have experienced non-specific low back pain at least once weekly for at least the previous 3 months. Their average back pain intensity had to be at least 40 mm on a 100 mm visual analog scale (VAS), with 0 mm denoting' no pain at all' and 100 mm denoting 'the worst pain imaginable'.

Patients were excluded if they suffered from specific low back pain due to trauma, disc protrusion, whiplash, congenital deformity of the spine, spinal stenosis, neoplasm, inflammatory rheumatic disease, or oncologic disease. Further exclusion criteria included dystonia, pregnancy, and invasive treatment of the spine or spinal surgery within the previous 4 weeks. Since Gua Sha therapy exposes the treated area of skin and tissues to pressure and friction, patients were excluded if they were taking oral steroids or anticoagulants or if they had hemophilia or a skin condition in the treatment area. In addition, patients who had started a new treatment for low back pain within the previous month, or were planning to start a new treatment within the next month, were excluded.

2.4. Randomisation

Patients were randomly assigned to study groups by non-stratified randomization. The random sequence was generated using the random number function of Microsoft® Excel software. The randomization list was kept on a password-secured computer and only the study coordinator had access to it. Sequentially numbered sealed opaque envelopes containing the patients' treatment assignments were prepared by the study coordinator who was not involved in patient recruitment, treatment or outcome assessment. After inclusion of a specific patient, the study physician opened the next lowest numbered envelope to reveal their treatment assignment.

2.5. Interventions

Gua Sha therapy. The study physician administered the Gua Sha treatments to seated patients. Patients' backs were first covered with Tumarol N Balsam (made by ROBUGEN GmbH; main ingredients: camphor, eucalyptus oil, menthol; dose: approx. 5–10 g per treatment). Then the study physician applied a round-edged instrument to patients' skin using pressured downward strokes. In this study we used the inside smooth edged lip of a standard metal cap, taken from a commercially available canning jar, as recommended by the standard Western Gua Sha textbook [9] (see Fig. 1); the cap was discarded after single use. The treatment usually started at the midline progressing from the non-painful to the painful side. Paravertebral strokes were applied from C7 to L5, followed by horizontal strokes between C7 and L5 with additional strokes along the dorsal surface of the gluteus maximus muscle. Finally, paravertebral strokes were applied to the neck from C1/2 to C7.

The strokes were repeated in one area until "Sha" (petechiae) became visible. At this point, the physician moved on to other body areas. Individual treatments lasted 15–20 min. The pressure applied was adjusted to patients' comfort so that pain was only minor and easily bearable. After treatment, patients were advised to rest briefly (5–10 min) before leaving. Patients were treated twice: once before and once after a 7-day interval.

Waitlist control group. Treatments in the control group were not regulated but patients were asked to continue their self-directed medical care. The patients were however asked to refrain from invasive treatments such as injections or acupuncture. Patients were asked not to change their treatment regimen during the course of the study; they were offered Gua Sha therapy once the trial was concluded.

2.6. Outcome measures

The primary outcome measure was current pain intensity; secondary outcome measures included functional disability; and mechanical, sensory and pain thresholds.

2.7. Questionnaires

Current pain intensity was measured on a 100-mm visual analog scale (VAS) ranging from 0 mm meaning 'no pain at all' to 100 mm meaning 'the worst pain imaginable'. To assess pain on movement, patients filled in a modified version of the Pain on Movement Questionnaire (POM), where they were asked to rate their pain intensity on a 100-mm VAS while flexing, extending, laterally flexing and laterally rotating their torso. An average pain-on-movement score was then calculated from all movement directions [17]. The original neck pain version of the POM has shown good validity and reliability [17]. The patients' functional low back-related disability was assessed using

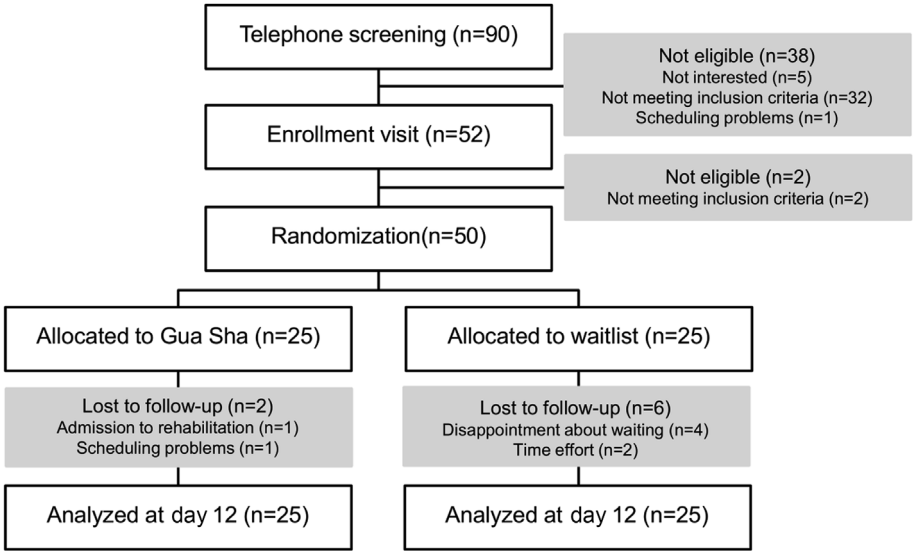

Fig. 2. Study flow chart.

the Oswestry Disability Index (ODI) [18], a 10-item instrument that determines how patients feel their low back pain affects their daily activities. Scores range from 0 to 100%, higher scores indicate higher impairment. Scores ranging from 0 to 10% indicate minimal disability, 21–40% moderate disability, 41–60% severe disability, 61–80% very severe disability, and 81–100% complete disability. After the intervention period, perceived change in health status was recorded on a 5-point Likert-type item ranging from 1 = "much better" to 5 = "much worse".

2.8. Sensory measurements

Pressure-pain threshold (PPT), mechanical detection threshold (MDT), and vibration detection threshold (VDT) were measured in accordance with the Quantitative Sensory Testing protocol [19,20] at 2 points:

(a) the site of maximal pain: the patient indicated the point where pain was strongest on a drawing of a human back. This point was later verified by physical examination and palpation by the study physician.
(b) in an adjacent region, 10 cm cranial to the painful area.

Thresholds determined at 2 control sites, the right hand and foot, served as measures of intra-observer reliability.

The PPT was measured using a digital algometer (Somedic AB, Horby, Sweden), the MDT was measured with a set of von Frey filaments (Somedic Sales AB, Horby, Sweden), and the VDT was determined using a Rydel-Seiffer tuning fork (64 Hz, 8/8 scale). A detailed description of sensory measurements can be found in previous publications [21–24].

Correlation coefficients (Pearson's r) between pre- and posttreatment scores at the control areas were calculated as a measure of intra-observer reliability. The following scores were found: PPT: r = 0.72 (hand) and r = 0.82 (foot); and MDT: r = 0.59 (hand) and r = 0.48 (foot); VDT r = 0.74 (hand) and r = 0.79 (foot).

2.9. Patients' expectations

All patients rated their expectations that the Gua Sha therapy would successfully improve their low back pain on a 100-mm VAS, with 0 mm indicating 'do not agree at all' and 100 mm indicating 'completely agree'.

2.10. Adverse events

All adverse events were recorded. Patients experiencing such events were asked to see the study physician to assess their import and initiate any necessary treatment.

2.11. Sample size calculation and statistical analysis

The sample size calculation was based on our pilot study of Gua Sha therapy for low back pain [13]. The study was powered to detect a group difference in pain intensity of 1.6 mm VAS with a standard deviation of 1.9 with 80% power and a 2-sided alpha of 0.05. Based on this calculation, a sample of 48 patients was required. To account for possible dropouts, we aimed at a sample of 50 patients.

All analyses were based on an intention-to-treat basis, including all patients being randomized, regardless of whether or not they gave a full set of data or adhered to the study protocol. Missing data were imputed by carrying the last observation forward.

Baseline data comparability was ensured using Student's t-tests for continuous data and chi-squared tests for categorical data. Continuous outcome data were analyzed using univariate analyses of covariance (ANCOVA), which modelled each post-treatment outcome as a function of the treatment group (classified factor), the patients' expectations (linear covariate) and its respective baseline value (linear covariate). This way, the analysis adjusted for baseline differences and differences in expectations. Differences in perceived change in overall health status were compared using chi-squared tests. All analyses were performed using SPSS software (version 20.0; IBM, Copenhagen).

3. Results

3.1. Patients

In 2009 and 2010, 90 patients were screened for eligibility, 38 of whom were ineligible (Fig. 2). Of the remaining 50 patients, 25 were randomized to Gua Sha therapy and 25 to the waitlist group. Two patients in the Gua Sha group and 6 patients in the waitlist group were lost to follow-up. In the Gua Sha group dropout was due to admission to a rehabilitation facility (n = 1) and scheduling problems (n = 1); in the waitlist group dropout was due to dissatisfaction with waiting for treatment (n = 4), and time effort (n = 2).

At baseline no significant between group differences were found for sociodemographic, clinical characteristics, nor treatment expectations

Table 1
Baseline characteristics for the study sample. If not otherwise denoted, means ± standard deviations are shown.

	Gua Sha Therapy (n = 25)	Waitlist (n = 25)	P
Age, years	52.2 ± 11.1	47.2 ± 10.9	0.114
Gender, n (female/male)	17/8	22/3	0.171
Pain duration, years	15.0 ± 13.5	12.3 ± 11.4	0.452
Treatment expectations, mm visual analog scale	72.4 ± 28.6	77.1 ± 24.2	0.540

Outcome Measures.

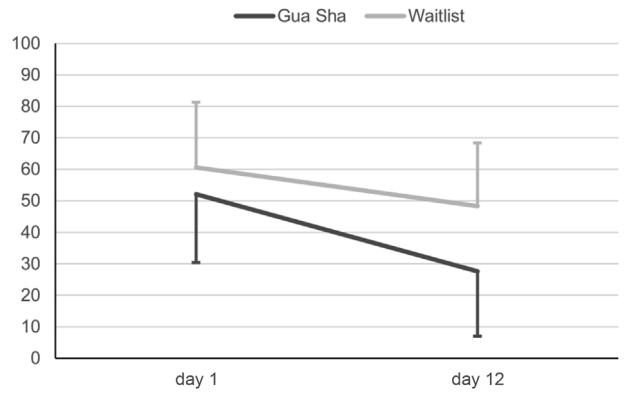

Fig. 3. Pain intensity (mean ± standard deviation) in the Gua Sha group and the waitlist group. Group differences were significant at week 12 ($p < 0.001$).

(Table 1).

For the primary outcome current pain intensity, a significant group difference favoring the Gua sha treatment was found after 12 days ($p < 0.001$; Fig. 3). In the Gua Sha group, the main pain intensity decreased from 52.1 ± 22.7 mm VAS to 27.6 ± 20.6 mm, while it decreased from 60.6 ± 20.7 mm VAS to 48.3 ± 20.1 mm VAS in the waitlist group.

No group differences were found for the other outcome measures (Table 2) except for change in health status ($p = 0.002$). Here, patients in the Gua Sha group more often reported improved health status after the study and less often reported decreased health status (Table 3).

3.2. Safety

In the Gua Sha group, 7 patients reported adverse events including transient increases in low back pain after treatment (n = 5), transient increases in leg pain (n = 1), hematomas for several days (n = 1), leg numbness (n = 1), increased knee pain (n = 1), muscle soreness (n = 1), and heartburn (n = 1). None of these adverse events were considered serious. No adverse events were reported in the control group.

Table 3
Perceived change in health status after the 12-day study period. Number and percentage of patients are shown.

	Gua Sha Therapy	Waitlist
Much better	7 (30.4%)	0 (0.0%)
A little better	10 (43.5%)	2 (12.5%)
Comparable	6 (26.1%)	13 (81.3%)
A little worse	0 (0.0%)	1 (6.3%)
Much worse	0 (0.0%)	0 (0.0%)

4. Discussion

The intervention was feasible, safe and well accepted by the patients. After two Gua Sha treatments, pain intensity was significantly reduced and the patients' general health status improved. The group difference for pain of about 20 mm on the 100 mm visual analog scale is clearly within the range of clinical importance [25]. No group differences were found for functional impairments nor for sensory measurements.

These findings are in line with those of our pilot study that found reduced pain intensity in patients with chronic neck pain and those with chronic low back pain after a single Gua Sha treatment, while pressure pain threshold increased only in chronic neck pain patients [13]. Pressure hyperalgesia is associated with both, chronic neck pain [26] and chronic low back pain [27,28]; it is most likely a consequence of chronic pain, rather than a cause [29,30]. Pressure pain thresholds are significantly higher in the lower back than in the neck [31], suggesting greater pressure sensitivity in the neck despite similar mechanisms at work. In line with our prior and current study, research on other manual therapies has also reported no effects for patients with back pain [32]. The lack of effects on other sensory measures, whose implications will be discussed below, is in line with studies of other traditional treatments for chronic spinal pain such as: wet cupping [23], dry cupping [21,24,33], cupping massage [34], and acupuncture-inspired needle stimulation pads [22]. The findings of this study are also in line with research on other manual therapies. For example a recent Cochrane Review found positive effects for massage therapy on pain intensity in chronic low back pain while effects on function were less clear [35]. The recent American College of Physicians Clinical Practice Guideline on low back pain found low to moderate evidence for the effectiveness of spinal manipulation, massage, and acupuncture in chronic low back pain [36]. The findings are also partly in line with a recent randomized crossover trial on Gua Sha for elderly patients with low back pain [37]. While the trial found no significant superiority of Gua Sha to thermotherapy, this might more be reflective of a lack of power than a lack of efficacy.

The mechanisms of action of Gua Sha are still under debate. It has

Table 2
Baseline and post-intervention scores for functional disability (Oswestry Disability Index, ODI) and sensory measurements. Means ± standard deviation are shown.

	Gua Sha Therapy		Waitlist		Estimated group difference (95% confidence interval)	P
	Day 1	Day 12	Day 1	Day 12		
ODI	42.8 ± 13.1	**39.5 ± 11.6**	44.6 ± 13.0	**44.4 ± 14.9**	**−1.8 (−5.8, 2.1)**	**0.357**
Sensory measurements						
Site of maximal pain						
Mechanical	1.5 ± 2.1	**0.8 ± 0.8**	0.8 ± 1.0	**1.1 ± 2.4**	**−0.5 (−1.1, 0.2)**	**0.168**
Pressure	2.4 ± 0.3	**2.5 ± 0.2**	2.5 ± 0.3	**2.5 ± 0.3**	**−0.0 (−0.1, 1)**	**0.663**
Vibration	5.5 ± 1.4	**5.0 ± 1.9**	6.0 ± 1.1	**5.5 ± 1.6**	**−0.0 (−0.7, 0.7)**	**0.915**
Adjacent region						
Mechanical	1.5 ± 2.7	**0.5 ± 0.5**	0.5 ± 0.5	**0.7 ± 0.7**	**0.3 (−0.0, 0.6)**	**0.055**
Pressure	2.5 ± 0.2	**2.5 ± 0.2**	2.5 ± 0.2	**2.5 ± 0.3**	**−0.0 (−0.1, 0.0)**	**0.431**
Vibration	5.9 ± 1.8	**5.7 ± 1.2**	6.1 ± 1.0	**5.9 ± 1.0**	**−0.1 (−0.6, 0.4)**	**0.690**

been demonstrated that Gua Sha treatment increases surface microperfusion in the treated areas by 400% [38] and that the resulting extravasated blood in the capillary bed is associated with an up-regulation of the heme oxygenase-1 (HO-1) gene expression [39,40]. In a mouse model, this immediate effect is sustained for at least five days [39]. An up-regulation of HO-1 has both cytoprotective [41] and anti-nociceptive effects [42], as well as anti-inflammatory and immunoregulatory properties [43]. Based on these findings, it can be argued that Gua Sha Therapy's effects on pain intensity in chronic low back pain may be due to an anti-nociceptive and anti-inflammatory effect via HO-1 gene up-regulation. It is also conceivable that Gua Sha therapy's ability to stretch underlying muscles and connective tissue may correct connective tissue changes hypothetically involved in the development and chronicity of chronic back pain [44,45]. In addition, therapeutic stimulation of the skin's mechanoreceptors and nociceptors has been previously discussed in the literature as a mechanism that inhibits pain signal conduction in the spinal cord [46,47] and perhaps mediates the effects of reflex therapies such as Gua Sha therapy [48]. However, the lack of any effect on sensory measurements in the current study does not support this proposed mechanism.

This study has a number of limitations: lack of long-term follow-up, the impossibility of blinding the patients and therapists to the patients' treatment allocations and the lack of other control conditions such as a placebo. Also for practical reasons, outcome assessors could not be blinded. Therefore, it cannot be ruled out that the observed effects are at least partly due to placebo effects. While the original POM has been validated in patients with chronic neck pain, the modified version for back pain has not been validated. Finally, it was originally planned to also assess physiotherapy or other therapy use outside the study treatment by using pain diaries. However, due to low compliance with the diaries, these data could not analyzed.

5. Conclusions

Gua Sha therapy appears to reduce pain intensity in a clinically relevant dimension and to improve overall health status in patients with chronic non-specific low back pain. Further rigorous studies are needed to confirm and extend these results.

Data availability

The data are available from Prof. Thomas Ostermann upon request.

Conflicts of interest

The authors declare that they have no conflicts of interests.

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