

Effects of Traditional Cupping Therapy in Patients With Carpal Tunnel Syndrome: A Randomized Controlled Trial

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Abstract: We investigated the effectiveness of cupping, a traditional method of treating musculoskeletal pain, in patients with carpal tunnel syndrome (CTS) in an open randomized trial. $n = 52$ outpatients (58.5 ± 8.0 years) with neurologically confirmed CTS were randomly assigned to either a verum ($n = 26$) or a control group ($n = 26$). Verum patients were treated with a single application of wet cupping, and control patients with a single local application of heat within the region overlying the trapezius muscle. Patients were followed up on day 7 after treatment. The primary outcome, severity of CTS symptoms (VAS), was reduced from 61.5 ± 20.5 to 24.6 ± 22.7 mm at day 7 in the cupping group and from 67.1 ± 20.2 to 51.7 ± 23.9 mm in the control group [group difference -24.5 mm (95%CI $-36.1; -2.9$, $P < .001$)]. Significant treatment effects were also found for the Levine CTS-score (-6 pts; 95%CI $-9; -2$, $P = .002$), neck pain (-12.6 mm; 95%CI $-18.8; -6.4$, $P < .001$), functional disability (DASH-Score) (-11.1 pts; 95%CI $-17.1; -5.1$, $P < .001$), and physical quality of life (.3; 95%CI $.0; .3$, $P = .048$). The treatment was safe and well tolerated. We conclude that cupping therapy may be effective in relieving the pain and other symptoms related to CTS. The efficacy of cupping in the long-term management of CTS and related mechanisms remains to be clarified.

Perspective: The results of a randomized trial on the clinical effects of traditional cupping therapy in patients with carpal tunnel syndrome are presented. Cupping of segmentally related shoulder zones appears to alleviate the symptoms of carpal tunnel syndrome.

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Key words: Carpal tunnel syndrome, complementary medicine, cupping, double crush syndrome, randomized trial, treatment.

Carpal tunnel syndrome (CTS) is a common disorder with an estimated prevalence of 2.7% (clinically and electrophysiologically confirmed) in the general population.¹ Women are more frequently affected than men.¹⁴ CTS causes significant morbidity² and has, in addition to its potentially debilitating physical aspects, a negative financial impact resulting from time lost from

work and increased medical expenses.⁴ Classic symptoms of CTS include numbness, tingling, burning, and pain in at least 2 of the 3 digits supplied by the median nerve (ie, thumb, index finger, and middle finger). These symptoms are highly prevalent (14.4%) in the general population.¹

CTS results from entrapment of the median nerve in the carpal tunnel of the wrist,³ pathologically the consequence of noninflammatory fibrosis of the subsynovial connective tissue surrounding the flexor tendons. Biochemical studies of surgical specimens suggest that a variety of regulatory molecules may induce the fibrous and vascular proliferation, possibly as a response to mechanical stress.⁵ But CTS is also related to systemic factors such as metabolic and endocrine disorders, obesity, and amyloid degeneration.^{6,14} Most cases of CTS have no readily

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identifiable cause (idiopathic CTS). Whether more proximal disorders, ie, cervical radiculopathies or musculoskeletal pain syndromes affecting referred, or segmentally related, zones, can predispose to injury at sites distal to their lesions and thus be involved in the pathogenesis of CTS as proposed by the double crush hypothesis^{13,30,35} remains controversial.

Standard treatment of CTS in the past has included wrist splints, oral anti-inflammatory agents, avoidance of occupational duties, locally injected corticosteroids, and surgery. However, symptomatic relief with conservative treatments has been less than satisfactory,^{23,26,28} and surgical decompression, often considered the definitive solution, yields good results in only 75% of cases.⁷ Since the standard treatments for CTS are not fully satisfactory, other conservative methods, including those from traditional and complementary medicine, need to be further evaluated.

Cupping of the skin and subcutaneous tissue is a traditional and widely used healing method in various countries and regions, eg, in China, India, Arabia, Central Europe, and parts of Africa.⁸ The cupping of defined zones of the shoulder triangle segmentally related to the median nerve to treat CPS has been practiced in European folk medicine and is supported by recent research. In a cross-sectional study, typical alterations of the connective tissue such as painful hardening of the subcutis, adhesion or swelling of subcutaneous tissue and fascia, and reduced microcirculation in the shoulder triangle, were found to be associated with the severity of CTS symptoms.²⁹ Since a preliminary clinical trial has shown that wet cupping of this region is superior to no treatment in relieving the symptoms of CTS at day 7 after treatment,²¹ we devised a randomized trial to assess the short-term effectiveness of wet cupping of referred zones of the shoulder by comparing it with that of a control treatment in patients with symptomatic CTS.

Methods

This study was designed as a randomized, controlled open trial. All study participants gave their informed consent. The study protocol was reviewed and approved by the Ethics Committee of the Medical Faculty, University of Duisburg-Essen, Germany. Patients were screened and recruited between July and November 2005. Treatments and follow-ups of the patients were completed by January 2006. All study procedures and the collection of data were carried out at the outpatient department of the Kliniken Essen-Mitte, an academic teaching hospital of the University of Duisburg-Essen, Germany.

Study Procedures

We recruited participants by means of a press release. Potential participants were screened for eligibility by telephone interview, and eligible candidates were scheduled for enrollment visits. A study physician performed

the candidates' physical examinations, and each candidate filled out a questionnaire. Thereafter, each participant was randomly assigned to either the wet cupping or the local thermal therapy group, and the respective treatment started. All measurements were repeated on day 7 after the allocated treatment.

Study Participants

Patients of both sexes were eligible if they were between 18 and 70 years old and suffered from manifest CTS as confirmed by neurological examination and electroneurography. Only patients who had connective tissue alterations in a predefined zone at the shoulder triangle overlying the trapezius muscle were included. Connective tissue was defined as altered if the consistency of the subcutis was hardened and folds of skin could not be lifted from the fascia without tissue resistance and some discomfort.

Patients were excluded if they were receiving anticoagulants or had hemophilia, anemia, polyneuropathy, or a coexisting serious illness. We also excluded patients if they were participating in another study, had undergone previous surgery for CTS, or had had intra-articular injections within the previous 3 months. Patients regularly taking NSAIDs or analgesics as rescue medication were not excluded if the mean weekly dosage and type of administration had not been altered during the preceding 3 months.

Randomization

Patients were randomly allocated to the 2 treatments by a nonstratified block-randomization with various block lengths and by preparing sealed, sequentially numbered opaque envelopes containing the treatment assignments. Randomization and the envelopes were prepared by the study biostatistician. When a patient fulfilled all enrollment criteria, the study physician opened the lowest-numbered envelope to reveal that patient's assignment.

Interventions

Cupping

There are 2 main types of cupping: dry and wet cupping. While dry cupping simply involves stimulation of the skin by suction, wet cupping includes some scarification of the skin before applying the cupping glasses. A partial vacuum can be produced by electromechanical or manual suction or by heat production within the cupping glass after it is applied to the skin. Mechanical suction was preferred in this study to avoid burning the skin. The protocol for performing cupping was as follows: The skin overlying the trapezius muscle was disinfected; scarification (puncturing) of the skin was carried out by repeatedly puncturing it superficially with sterile 20-gauge microlancets (number of incisions: 5 to 10); the vacuum cups (size 75 and 100 ccm) were applied and the air within the cup was rarefied by manual mechanical suction; the cupping glasses were removed after 5 to 10 minutes (or when they became partially

filled with capillary blood); and the treated area was then bandaged. Each patient was cupped only once at each of 2 locations. The area overlying the trapezius muscle with the poorest microcirculation by inspection and the area where subcutaneous adhesions were most pronounced and/or discomfort was greatest when the examiner lifted the skin and rubbed it between his fingers were chosen for cupping.

Control Treatment

The control group treatment consisted of applying heat by means of a heating pad (Zappsack, Fa COOC, Bönen, Germany) once for 15 minutes to the shoulder areas bilaterally with the patient in the supine position. A thermal treatment was selected as the control because in Germany, locally applied heat is frequently prescribed for and well accepted by patients with musculoskeletal pain. Patients with connective tissue alterations in the shoulder triangle frequently experience neck pain and commonly apply heat locally to relieve it.³¹ Evidence from randomized clinical trials (RCTs) documenting the efficacy of locally applied heat in chronic pain conditions is limited.^{9,34} However, local heat causes vasodilation, increases analgesia, and reduces muscle spasm, all of which would support its use in patients with chronic pain conditions.^{25,33}

Outcome Measures

The primary outcome measure was the change in total CTS symptom severity from day 0 to 7 as derived from the mean of the patients' 3 single 100-mm Visual Analog Scale (VAS) symptom scores (global pain, tingling, and numbness). Two additional 100-mm VAS scores were used to assess pain in the arm and hand with either movement or gripping. These were defined as secondary endpoints. All VAS scores were assessed daily and recorded in a diary by the participants for 7 days after randomization.

Other secondary outcomes included functional impairment as measured by the DASH questionnaire (Disabilities of the Arm, Shoulder and Hand) developed by the Upper Extremity Collaborative Group (UECG),¹⁷ the symptom severity score of CTS as measured by the questionnaire of Levine,²¹ the intensity of coexisting neck pain as derived from a 100-mm VAS and by the Northwick Park neck pain questionnaire,²⁰ and quality of life as assessed by the Medical Outcomes Study 36-Item Short-Form (SF-36).³² SF-36 scores were expressed as standard deviations from the mean of the normal German population. All questionnaires were filled in at baseline and 1 week after randomization.

Patients were asked to keep a diary from day 0 to 7, recording any adverse effects of their treatment and their use of oral rescue medication. To control for nonspecific effects of treatment, patients were asked to rate their expected outcomes on a 5-point Likert scale ranging from 4 (expecting considerable pain relief) to 0 (expecting no pain relief) immediately after they had been informed as to which treatment group they had been assigned. Trained, unblinded research assistants collected patient-reported data, and research personnel blinded to group allocation entered and monitored the data.

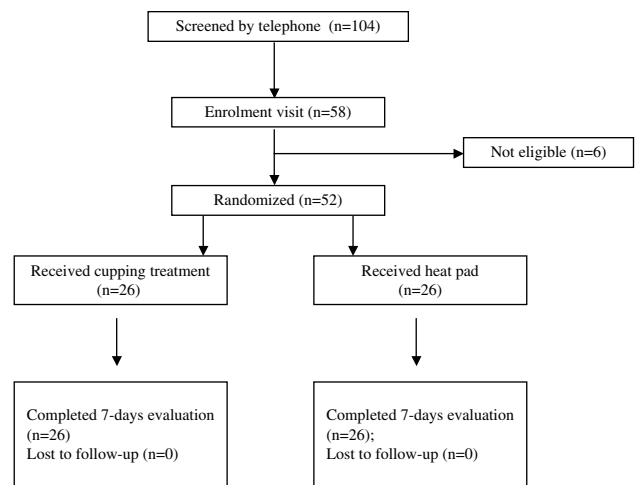


Figure 1. CONSORT trial flow-chart.

Sample Size Determination and Statistical Analysis

The study was powered to detect a change of 20 mm on the main outcome criterion between both treatment groups with 80% power on the basis of a standard deviation of 25 mm and a 2-sided significance level of $\alpha = 5\%$. This yielded a total of 52 patients.

All outcome criteria were analyzed by intention-to-treat with repeated measurement analyses of covariance (ANCOVA), which took time as the within-subject factor, group as a between-subject factor, and the respective baseline value as a linear covariate. Missing data were replaced by taking the last observation forward. Treatment effects were estimated within these models and reported as adjusted mean differences, including respective 95% confidence intervals (CI) and *P*-values from adequate 2-sided *t*-tests. Ancillary analyses were done to adjust for the effects of possibly confounding variables, namely outcome expectation. Here, we added these variables as covariates to the ANCOVA models and estimated the group differences in the presence of these covariates.

Of the individuals initially screened by phone, 58 were invited to be further assessed. Of these, the first 52 that fulfilled all study criteria and agreed to participate in the study were included, 26 being randomly assigned to the wet cupping group and 26 to the locally applied heat group. All patients had neurologically confirmed CTS for which they had previously received treatment. The most frequent treatment, a wrist splint, had been applied in 70% of the patients in each group. The right side of the body was affected in 61.5% of the cupping therapy group and in 57.7% of the control group. There were no dropouts (Fig 1). Baseline data were comparable between the study groups (Table 1).

Results

Outcome Measures

Cupping therapy was more beneficial than heat, according to the primary outcome measure, change in the total symptom score after day 7. The average (\pm SD)

Table 1. Baseline Characteristics of Study Patients

CHARACTERISTIC	CUPPING THERAPY (N = 26)	LOCAL THERMAL THERAPY (N = 26)
Age, years	57.2 ± 7.7	59.3 ± 8.3
Male/female	2/24	4/22
Mean duration of symptoms ± SD, months	49 ± 49	35 ± 24
Mean body mass index ± SD, kg/m ²	27.9 ± 5.5	28.7 ± 5.8
Mean weight ± SD, kg	76.1 ± 15.0	79.0 ± 16.4
Hypertension, n (%)	7 (44)	8 (50)
Mean CTS VAS sum score ± SD*, mm	184.4 ± 61.5	201.3 ± 60.6
Mean Levine questionnaire severity score ± SD, pts	3.1 ± 0.6	3.2 ± 0.8
Mean Levine questionnaire functional status score ± SD, pts	2.5 ± .8	2.6 ± .8
Mean pain at rest ± SD, mm	61.5 ± 24.9	58.6 ± 25.1
Mean SF-36 [†] physical quality of life score ± SD	-1.1 ± 0.8	-1.4 ± 1.2
Mean neck pain at rest ± SD, pts [‡]	49.0 ± 28.2	52.2 ± 27.1
Mean DASH [§] sum score ± SD, pts	36.3 ± 13.3	44.5 ± 19.0

*Symptom Severity score of the Levine carpal tunnel syndrome questionnaire.

[†]SF-36 = Short-form 36 health survey, population adjusted score.

[‡]Derived from Northwick Park neck pain questionnaire.

[§]DASH = Disabilities of the Arm, Shoulder, Hand Questionnaire.

symptom score was reduced from 61.5 ± 20.5 to 24.6 ± 22.7 mm at day 7 in the cupping group and from 67.1 ± 20.2 to 51.7 ± 23.9 mm in the control group (Fig 2), with a highly significant between-group difference of -24.5 mm [CI: -36.1; -12.9; *p* < .001 (repeated measurement ANCOVA)].

Comparably significant group differences favoring the cupping therapy were found with all 3 subscales of the sum score, the 2 additional CTS pain scales, and the Levine CTS questionnaire (Table 2). Disability in daily life as assessed by the DASH score was rapidly allayed with cupping therapy, resulting in a significant between-group difference (Table 3). In addition, neck pain, which was present in nearly all study participants at baseline, was significantly reduced by cupping as compared with heat (Table 3). Finally, the physical dimension of quality of life improved only for the cupping group at day 7 [mean group difference 0.3 (95% CI .0; 0.3); *P* = .048].

The use of oral analgesics was comparable in both groups throughout the study. On average, the participants used rescue medication on fewer than 5% of all patient study days with no significant differences between the groups.

Outcome Expectation

Baseline ratings of outcome expectation did not differ significantly between the 2 groups. Of the patients in the cupping group, 81% expected their assigned treatment to be efficacious, as did 84% of patients in the control

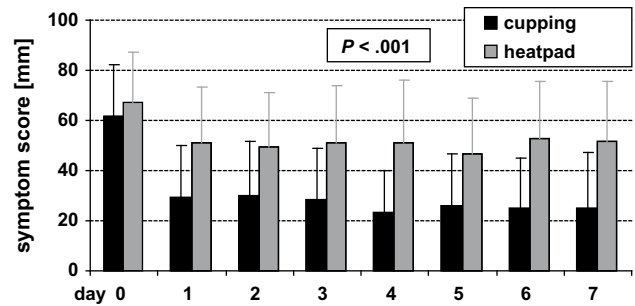


Figure 2. Total symptom score. Means ± SD of the total of 3 VAS symptom scores in the cupping and the thermal therapy groups during the course of the study. *P* values were calculated from repeated measurement ANCOVA.

group. Higher outcome expectation was not associated with study outcome (Fig 3), and statistical adjustment of the treatment effects for baseline outcome expectation did not affect the overall results. Thus, there was no indication that outcome was largely affected by the patients' expectations.

Safety

There were no serious adverse events in either study group. A regular minor adverse effect was a hematoma at the site of application of a cupping glass. All scarified wounds healed without complication. None of the patients rated the cupping procedure as painful, and all patients in both groups perceived their study treatment as very tolerable.

Discussion

Symptomatic CTS is highly prevalent in European populations.^{10,15} Since conservative options for treatment are limited,^{6,7} new therapeutic approaches need to be considered. It has recently been proposed that cupping, a traditional method of treatment, may be beneficial in symptomatic CTS when applied to referred connective-tissue zones at the shoulder-neck region.²² Cupping is used to treat pain syndromes in various different ethnomedical systems,⁸ and a recent randomized study suggested that cupping alleviates low back pain.¹² We designed the present study to further evaluate this uncommon method of treatment.

In this study, patients with CTS who were treated with wet cupping experienced a highly significant decrease in pain and other symptoms. Moreover, a single treatment improved functional ability and quality of life, and reduced associated neck pain for at least 1 week. The observed improvements are most likely attributable to the therapeutic intervention, confirming the results of the recent pilot study.²²

According to a recent CONSENSUS statement, pretreatment vs posttreatment changes of approximately 2 points (or 30 to 36%, using a NAS or VAS) show that subjects reported feeling "much better" or "meaningfully improved;" a decrease between 40 to 50% represents a "very much improved" status.¹¹ ≥ 4 points or ≥ 50% represents their feeling substantially ("very much")

Table 2. Severity of Carpal Tunnel Syndrome Symptoms Assessed With Visual Analog Scale Subscales and Levine Questionnaire in Study Groups With Group Differences for Change on Treatment

	<i>BASELINE</i>	<i>DAY 7</i>	<i>GROUP DIFFERENCE (95% CI)</i>	<i>P-VALUE</i>
Pain at rest				
Cupping therapy	61.5 ± 24.9	25.2 ± 25	-22.9 (-35.3; -10.5)	< .001
Thermal therapy	58.6 ± 25.1	47 ± 27.7		
Numbness				
Cupping therapy	61.1 ± 28	21.4 ± 24.6	-28.8 (-42.5; -15.1)	< .001
Thermal therapy	72.9 ± 22.6	54.4 ± 25.5		
Tingling				
Cupping therapy	61.3 ± 22.4	24.3 ± 23.7	-25.2 (-37.8; -12.6)	< .001
Thermal therapy	70 ± 20.5	52.9 ± 25		
Pain movement				
Cupping therapy	64 ± 23	29.2 ± 28.2	-32.4 (-45.5; -19.3)	< .001
Thermal therapy	60.1 ± 28.1	60.5 ± 28.8		
Pain with pressure				
Cupping therapy	41.1 ± 25.2	24.0 ± 26.1	-26.5 (-38.2; -14.7)	< .001
Thermal therapy	38.2 ± 25.9	49.3 ± 29.7		
Levine CTS Score				
Symptom severity				
Cupping therapy	3.1 ± .6	2.4 ± .8	-0.6 (-0.9; -0.2)	.002
Thermal therapy	3.2 ± .8	3.0 ± .7		
Functional status				
Cupping therapy	2.5 ± .8	1.9 ± .6	-0.6 (-0.8; -0.3)	< .001
Thermal therapy	2.6 ± .8	2.6 ± .8		

NOTE. Mean values ± SD and estimated group difference (95% CI).

improved.¹¹ In this trial, the mean pain score at rest decreased by 59%, and the mean symptoms score decreased by 60%. Both scores reflect substantial improvement. Moreover, the magnitude of the cupping intervention was 1.2 points, which is a large and clinically relevant effect.

At the outset, the symptom scores of the patients in the control group were slightly higher than those in the cupping group, which may bias the results. But with the exception of pain with motion, the baseline differences were not significant. Since the study was

randomized, these differences must have occurred by chance. Higher scores for numbness and tingling in the control group may reflect that this group had a poorer prognosis. Since the higher scores were offset by lower pain-at-rest scores, using the average score as a covariate in the analysis may not have adequately reflected prognosis. We therefore conducted an additional analysis in which the single scores (pain, tingling, and numbness) were used as covariates. This analysis resulted in even larger posttreatment group differences, thus corroborating our main results. Moreover, the results have been

Table 3. Dash Score and Neck Pain Assessed With Northwick Pain Questionnaire (NPQ) in Study Groups With Group Differences for Change on Treatment

	<i>BASELINE</i>	<i>DAY 7</i>	<i>GROUP DIFFERENCE MEAN (95% CI)</i>	<i>P-VALUE</i>
DASH score				
Cupping therapy	36.3 ± 13.3	23.7 ± 14.2	-11.1 (-17.1; -5.1)	< .001
Thermal therapy	44.5 ± 19	43.4 ± 19.9		
Neck pain				
NPQ sum score				
Cupping therapy	39.3 ± 11.7	22.6 ± 13.8	-12.6 (-18.8; -6.4)	< .001
Thermal therapy	44.2 ± 15.3	39.4 ± 16.6		
Neck pain at rest				
Cupping therapy	49 ± 48.2	21.4 ± 21.6	-24.4 (-35; -13.8)	< .001
Thermal therapy	52.2 ± 27.1	47.8 ± 23.4		
Neck pain with hand movement				
Cupping therapy	56.8 ± 28.8	25.9 ± 25.9	-26.2 (-38.2; -14.2)	< .001
Thermal therapy	64.9 ± 26.1	56.5 ± 24.6		

NOTE. Mean values ± SD and estimated group difference (95% CI).

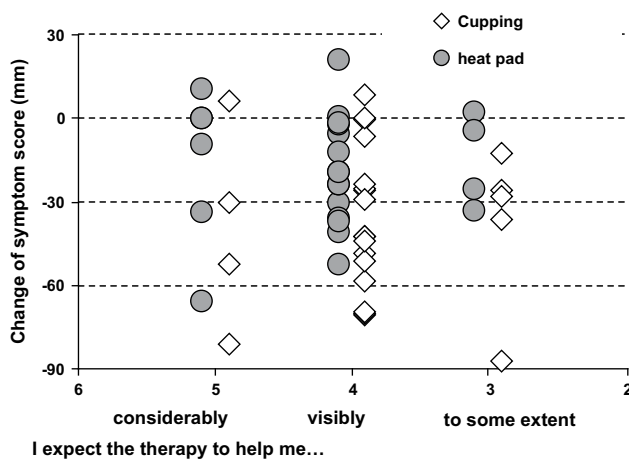


Figure 3. Change of overall symptom score (study day 7) and patients' expectations at baseline. Negative values indicate an improvement.

statistically adjusted for baseline differences; thus, the bias due to group differences at baseline can be regarded as negligible.

Various mechanisms have been considered to explain the observed effects. First, the cupping may have been effective due to its direct effect on the patients' cervicothoracic lesions, in accord with the double-crush hypothesis. This hypothesis was first proposed in 1973 by Upton and McComas,^{13,35} who observed that the majority of patients with CPS or an ulnar neuropathy also had electrophysiological evidence of cervicothoracic lesions. According to the double-crush hypothesis, proximal lesions (such as those of cervical radiculopathies or musculoskeletal pain syndromes in referred zones) may predispose patients to neural injury at distal sites; accordingly, nonsymptomatic impairment of axoplasmic flow along a nerve might eventually cause a symptomatic neuropathy.³⁰

Wet cupping applies negative local vacuum pressure to subcutaneous muscle and tissue, causes local bloodletting, and has lymph-flow modulating effects. In this trial it may have altered tissue perfusion and metabolism in the cervical and brachial plexus regions, and may have subsequently affected median nerve function. However, to date, neurophysiological trials to test the double-crush hypothesis have produced conflicting results.^{19,24} Therefore, it remains unclear whether cupping works via its effects on proximal nerve function.

Second, nociceptive activation contributes to chronic pain,²⁷ and wet cupping may alleviate pain by means of antinociceptive effects and by counterirritation. However, at present, it is unclear to what extent cupping induces such mechanisms.

Third, cupping therapy may simply have a powerful placebo effect. In fact, all invasive or nonpharmacological treatments may have relevant placebo effects. In a recent randomized trial, a sham device was more effective in relieving pain than a placebo pill.¹⁸ Therefore, the nonspecific and placebo effects of cupping therapy may result from the fact that it is an uncommon procedure. However, this is relevant only if placebos are

indeed effective in treating chronic pain syndromes, which remains unproven.¹⁶

This study is limited because it is an open trial. Placebo-like and unspecific treatment effects cannot be well controlled and precisely assessed. To date, it has not been possible to blind for complex procedures like wet cupping. Furthermore, since most German patients are familiar with cupping, they may be able to guess which treatment they received, thus compromising study results. For these reasons we first assessed the effectiveness of cupping in an open trial.

Since the effect of the cupping intervention in a population with chronic pain was large ($d = 1.2$), it seems unlikely that it can be fully explained by unspecific effects with nonblinding. Furthermore, we assessed outcome expectation in order to approximate the placebo effects. Scores did not indicate that the cupping group had higher expectations, and overall results did not change after adjustment for the confounding effect of outcome expectation. Therefore, although a relevant effect of cupping is very likely an unspecific one, our results indicate that this treatment may also have a specific effect. To better assess the nonspecific treatment effects of cupping, a sham cupping procedure should be developed for future trials.

This study is also limited by its brief duration. Yet, we did show that cupping of a referred zone for CTS results in relevant symptomatic relief. In clinical practice, cupping is conveniently and easily performed and thus suitable for repetitive treatments. Further studies are needed to assess the long-term value of cupping in the management of CTS.

The therapeutic effect of cupping may seem greater because of the control treatment to which it was compared. CTS is not usually treated by heat applied to the shoulder triangle. However, for the present study, locally applied heat was chosen over other established CTS treatments in order to compare 2 modalities of locodistant treatment. In addition, we chose locally applied heat because patients with neck pain—who comprised most of our patients—usually perceive intensive locally applied heat as pleasant and beneficial. The notion that local treatment within the shoulder triangle might result in the relief of CTS symptoms—the primary assumption of this study—was communicated to both study groups. The outcome expectation score in the control group suggests these participants expected their treatment to be effective. Future trials should also compare cupping for CTS with other standard treatments, eg, splinting and steroid injections.

Finally, the study is also limited by the sample size of the study population. Although the effects of treatment were consistent and the observed group differences were highly significant, the magnitude of the effects may be overestimated due to the small sample sizes.

Cupping therapy as applied in this study was safe and very well tolerated. A common minor adverse effect was a local hematoma, but wound healing after cupping was uncomplicated.

In conclusion, a single course of wet cupping of the shoulder triangle overlying the trapezius muscle

appears to be effective in relieving symptoms and pain for at least 1 week in patients with manifest CTS. The efficacy of this treatment and its related mechanisms

should be further studied in blinded, randomized trials of longer duration using other treatments as controls.

References

1. Atroshi I, Gummesson C, Johnsson R, Ornstein E, Ranstam J, Rosen I: Prevalence of carpal tunnel syndrome in a general population. *JAMA* 282:153-158, 1999
2. Atroshi I, Gummesson C, Johnsson R, Sprinchorn A: Symptoms, disability, and quality of life in patients with carpal tunnel syndrome. *J Hand Surg [Am]* 24:398-404, 1999
3. Bekkelund SI, Pierre-Jerome C: Does carpal canal stenosis predict outcome in women with carpal tunnel syndrome? *Acta Neurol Scand* 107:102-105, 2003
4. Bitar G, Alexandrides J, Missirian R, Sotereanos D, Nystrom A: Carpal tunnel release in the United States and Sweden: Reimbursement patterns, cost for treatment, and return to work. *Plast Reconstr Surg* 109:1574-1578, 2002
5. Bland JD: Carpal tunnel syndrome. *Curr Opin Neurol* 18: 581-585, 2005
6. Bland JD: Carpal tunnel syndrome. *BMJ* 335:343-346, 2007
7. Bland JD: Treatment of carpal tunnel syndrome. *Muscle Nerve* 36:167-171, 2007
8. Chirali IZ: *Traditional Chinese Medicine-Cupping Therapy*, London, Churchill Livingstone, 2000
9. Chou R, Huffman LH: Nonpharmacologic therapies for acute and chronic low back pain: A review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. *Ann Intern Med* 147:492-504, 2007
10. Dahaghin S, Bierma-Zeinstra SM, Ginai AZ, Pols HA, Hazes JM, Koes BW: Prevalence and pattern of radiographic hand osteoarthritis and association with pain and disability (the Rotterdam study). *Ann Rheum Dis* 64:682-687, 2005
11. Dworkin RH, Turk DC, Wyrwich KW, Beaton D, Cleland CS, Farrar JT, Haythornthwaite JA, Jensen MP, Kerns RD, Ader DN, Brandenburg N, Burke LB, Cella D, Chandler J, Cowan P, Dimitrova R, Dionne R, Hertz S, Jadad AR, Katz NP, Kehlet H, Kramer LD, Manning DC, McCormick C, McDermott MP, McQuay HJ, Patel S, Porter L, Quessy S, Rappaport BA, Rauschkolb C, Revicki DA, Rothman M, Schmader KE, Stacey BR, Stauffer JW, von Stein T, White RE, Witter J, Zavisic S: Interpreting the clinical importance of treatment outcomes in chronic pain clinical trials: IMMPACT recommendations. *J Pain* 9:105-121, 2008
12. Farhadi K, Schwebel DC, Saeb M, Choubasaz M, Mohammadi R, Ahmadi A: The effectiveness of wet-cupping for nonspecific low back pain in Iran: A randomized controlled trial. *Complementary Ther Med* 17:9-15, 2009
13. Flak M, Durmala J, Czernicki K, Dobosiewicz K: Double crush syndrome evaluation in the median nerve in clinical, radiological and electrophysiological examination. *Stud Health Technol Inform* 123:435-441, 2006
14. Geoghegan JM, Clark DI, Bainbridge LC, Smith C, Hubbard R: Risk factors in carpal tunnel syndrome. *J Hand Surg [Br]* 29:315-320, 2004
15. Haara MM, Heliövaara M, Kroger H, Arokoski JP, Manninen P, Karkkainen A, Knekt P, Impivaara O, Aromaa A: Osteoarthritis in the carpometacarpal joint of the thumb. Prevalence and associations with disability and mortality. *J Bone Joint Surg Am* 86-A:1452-1457, 2004
16. Hróbjartsson A, Gøtzsche PC: Is the placebo powerless? Update of a systematic review with 52 new randomized trials comparing placebo with no treatment. *J Intern Med* 256: 91-100, 2004
17. Hudak PL, Amadio PC, Bombardier C: Development of an upper extremity outcome measure: The DASH (disabilities of the arm, shoulder and hand) [corrected]. The Upper Extremity Collaborative Group (UECG). *Am J Ind Med* 29: 602-608, 1996
18. Kaptchuk TJ, Stason WB, Davis RB, Legedza AR, Schnyer RN, Kerr CE, Stone DA, Nam BH, Kirsch I, Goldman RH: Sham device v inert pill: Randomised controlled trial of two placebo treatments. *BMJ* 332:391-397, 2006
19. Kwon HK, Hwang M, Yoon DW: Frequency and severity of carpal tunnel syndrome according to level of cervical radiculopathy: Double crush syndrome? *Clin Neurophysiol* 117: 1256-1259, 2006
20. Leak AM, Cooper J, Dyer S, Williams KA, Turner-Stokes L, Frank AO: The Northwick Park Neck Pain Questionnaire, devised to measure neck pain and disability. *Br J Rheumatol* 33: 469-474, 1994
21. Levine DW, Simmons BP, Koris MJ, Daltroy LH, Hohl GG, Fossel AH, Katz JN: A self-administered questionnaire for the assessment of severity of symptoms and functional status in carpal tunnel syndrome. *J Bone Joint Surg Am* 75:1585-1592, 1993
22. Luedtke R, Albrecht U, Stange R, Uehleke B: Brachialgia paraesthetica nocturna can be relieved by "wet cupping"—results of a randomised pilot study. *Complement Ther Med* 14:247-253, 2006
23. Marshall S, Tardif G, Ashworth N: Local corticosteroid injection for carpal tunnel syndrome. *Cochrane Database Syst Rev*:CD001554, 2002
24. Morgan G, Wilbourn AJ: Cervical radiculopathy and coexisting distal entrapment neuropathies: Double-crush syndromes? *Neurology* 50:78-83, 1998
25. Nadler SF: Nonpharmacologic management of pain. *J Am Osteopath Assoc* 104(Suppl):6-12, 2004
26. O'Connor D, Marshall S, Massy-Westropp N: Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome. *Cochrane Database Syst Rev*: CD003219, 2003
27. Schaible HG, Ebersberger A, Von Banchet GS: Mechanisms of pain in arthritis. *Ann N Y Acad Sci* 966:343-354, 2002
28. Scholten RJ, Mink van der Molen A, Uitdehaag BM, Bouter LM, de Vet HC: Surgical treatment options for carpal tunnel syndrome. *Cochrane Database Syst Rev*: CD003905, 2007
29. Uehleke B, Ludtke R, Albrecht U, Stange R: [Associations between chronic irritation of tonsils, indurations of connective tissue areas and brachialgia paraesthetica nocturna]. *Forsch Komplement Med* (2006) 13:220-226, 2006

30. Upton AR, McComas AJ: The double crush in nerve entrapment syndromes. *Lancet* 2:359-362, 1973
31. Vos C, Verhagen A, Passchier J, Koes B: Management of acute neck pain in general practice: A prospective study. *Br J Gen Pract* 57:23-28, 2007
32. Ware JEJ, Sherbourne CD: The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 30:473-481, 1992
33. Weber D, Brown A: Physical agent modalities, in Braddom R (ed): *Physical medicine and rehabilitation*. Philadelphia, PA, WB Saunders, 2000, pp 440-458
34. Wright A, Sluka KA: Nonpharmacological treatments for musculoskeletal pain. *Clin J Pain* 17:33-46, 2001
35. Zahir KS, Zahir FS, Thomas JG, Dudrick SJ: The double-crush phenomenon—An unusual presentation and literature review. *Conn Med* 63:535-538, 1999