

H. Sprott · S. Franke · H. Kluge · G. Hein

**Pain treatment of fibromyalgia by acupuncture**

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**Abstract** The lack of objective parameters makes the measurement of pain and the efficacy of pain treatment in patients with chronic pain very difficult. We performed acupuncture therapy in fibromyalgia patients and established a combination of methods to objectify pain measurement before and after therapy. The parameters corresponded to patients' self-report. Twenty-nine fibromyalgia patients as defined by ACR-criteria (25 women, 4 men) with a mean age of  $48.2 \pm 2.0$  years and a mean disease duration of  $6.1 \pm 1.0$  years participated in the study. Pain levels and positive tender points were assessed using the visual analogue scale (VAS, i.e., range 0–100 mm) and dolorimetry. Serotonin and substance P levels in serum and the serotonin concentration in platelets were measured concomitantly. During acupuncture therapy no analgesic medication was allowed. The VAS scores decreased from  $64.0 \pm 3.4$  mm before therapy to  $34.5 \pm 4.3$  mm after therapy ( $P < 0.001$ ). Dolorimetry revealed a decreased number of tender points after therapy from  $16.0 \pm 0.6$  to  $11.8 \pm 1.0$ ,  $P < 0.01$ . Serotonin levels decreased from  $715.8 \pm 225.8 \mu\text{g}/10^{12}$  platelets to  $352.4 \pm 47.9 \mu\text{g}/10^{12}$  platelets ( $P < 0.01$ ), whereas the serum concentration increased from  $134.0 \pm 14.3$  ng/ml to  $171.2 \pm 14.6$  ng/ml ( $P < 0.01$ ). Substance P levels in serum increased from  $43.4 \pm 3.5$  pg/ml to  $66.9 \pm 8.8$  pg/ml ( $P < 0.01$ ). Acupuncture treatment of patients with fibromyalgia was associated with decreased pain levels and fewer positive tender points as measured by VAS and dolorimetry. This was accompanied by decreased serotonin concentration in platelets and an increase of serotonin and substance P levels in serum. These results suggest that acupuncture therapy is associated with changes in the con-

centrations of pain-modulating substances in serum. The preliminary results are objective parameters for acupuncture efficacy in patients with fibromyalgia.

**Key words** Fibromyalgia · Serotonin · Substance P · Pain · Acupuncture · Therapy

Sir,

Fibromyalgia is characterised by widespread pain [1]. In addition to the phenomenon of pain [1–4], researchers have shown pathological changes in pain-modulating substances in fibromyalgia patients [5–8]. Acupuncture therapy effectively reduces pain in fibromyalgia patients as previously shown [9]. The relationship between pain reduction and changes in pain-modulating substances in serum after acupuncture, however, is currently unknown.

The aims of this study are to examine whether pain reduction after acupuncture treatment is concomitantly related to changes in serotonin and substance P levels and to make the efficacy of acupuncture treatment more objective.

Twenty-nine fibromyalgia patients (25 women, 4 men) with a mean age of  $48.2 \pm 2.0$  years and mean duration of symptoms of  $6.1 \pm 1.0$  years were treated with acupuncture over 6 weeks (6 single treatments, once per week) according to an individually adapted therapy strategy following acupuncture rules [9]. The population did not show any alcohol or nicotine abuse in their history. No pain medication was allowed during the study. The following parameters were investigated to characterise the effect of the treatment:

- Patients reported their pain levels before and after acupuncture treatment using the 100 mm visual analogue scale (VAS) (0 mm = no pain; 100 mm = most intensive pain)
- Dolorimetry with a commercial dolorimeter (markasub, Basel, Switzerland) of 24 tender points as recommended by Lautenschläger et al. [10]

Dr. H. Sprott (✉) · S. Franke · G. Hein  
Department of Internal Medicine IV, Friedrich Schiller University,  
D-07740 Jena, Germany  
Tel.: +3641-939-157  
Fax: +3641-939-269,  
e-mail: ihs@rz.uni-jena.de

H. Kluge  
Department of Neurology, Friedrich Schiller University,  
Jena, Germany

**Table 1** All evaluated parameters before and after acupuncture treatment (means±SEM are given)

	Before therapy	After therapy	Significance
VAS (mm)	64.0±3.4	34.5±4.3	<i>P</i> <0.001
Tender points ( <i>n</i> )	16.0±0.6	11.8±1.0	<i>P</i> <0.01
Serotonin (µg/10 <sup>12</sup> platelets)	715.8±225.8	352.4±47.9	<i>P</i> <0.01
Serotonin in serum (ng/ml)	134.0±14.3	171.2±14.6	<i>P</i> <0.01
Substance P in serum (pg/ml)	43.4±3.5	66.9±8.8	<i>P</i> <0.01

- Measurement of platelet serotonin by fluorescent complex formation between serotonin and o-phthaldialdehyde [11]
- Measurement of serum serotonin by a commercial competitive ELISA (Amicyl-Test, IBL, Hamburg, Germany)
- Measurement of the serum substance P concentration in serum after purification of the specimens on C-18-RP-columns (Sep-Pak Plus C 18 columns, Millipore Waters, Eschborn, Germany) by an ELISA system (Cayman Chemical Company Ann Arbor MI, USA)

Statistical analyses were performed by SPSS for WINDOWS. Means and S.E.M. are reported. The Wilcoxon rank sum test was used.

All parameters measured before and after acupuncture therapy are shown in Table 1. As shown, there was a statistically significant decrease in the number of pathological tender points and in patients' VAS scores. There was also a significant decrease in platelet serotonin, an increase in the serum serotonin concentration, and a significant increase in the substance P level.

The significant pain reduction shown in the VAS and as assessed by dolorimetry suggest that acupuncture is a satisfactory adjuvant pain treatment in patients with fibromyalgia. The aim of the current study was to examine the concentrations of the so-called pain-modulating substances such as serotonin and substance P which are low in the serum of fibromyalgia patients [8] before and after acupuncture treatment. The results show that there is an increase to levels observed in healthy individuals [12] after acupuncture treatment. The platelet serotonin concentration decreases, corresponding to a double increase of the free serum serotonin based on a mean number of 2<sup>10</sup> platelets/ml plasma. This suggests that the normalisation of the

serum serotonin level is due to a mobilisation of platelet serotonin. These findings suggest that acupuncture is associated with a change in serotonin and substance P in serum in patients with fibromyalgia. In addition we observed reductions in the number of pathological tender points and decreased VAS scores corresponding to patients' own reports of pain reduction. There is a need for further randomised and controlled studies to confirm these preliminary results.

## References

1. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, Tugwell P, Campbell SM, Abeles M, Clark P, Fam AG, Farber SJ, Fiechtner JJ, Franklin CM, Gatter RA, Hamaty D, Lessard L, Lichtbroun AS, Masi AT, McCain GA, Reynolds WJ, Romano TJ, Russell IJ, Sheon RP (1990) The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the Multicenter Criteria Committee. *Arthritis Rheum* 33: 160–172
2. Müller W, Lautenschläger J (1990) Die generalisierte Tendomyopathie (GTM) I: Klinik, Verlauf und Differentialdiagnose. *Z Rheumatol* 49: 11–21
3. Müller W, Lautenschläger J (1990) Die generalisierte Tendomyopathie (GTM) II: Pathogenese und Therapie. *Z Rheumatol* 49: 22–29
4. Brückle W, Müller W (1991) Schmerzverlauf und -topographie bei generalisierten Tendomyopathien. *Z Rheumatol* 50 [Suppl 1]: 19–28
5. Russell IJ, Orr MD, Littman B, Vipraio GA, Alboukrek D, Michalek JE, Lopez Y, MacKillip F (1994) Elevated cerebrospinal fluid levels of substance P in patients with the fibromyalgia syndrome. *Arthritis Rheum* 37: 1593–1601
6. Sprott H, Kluge H, Franke S, Hein G (1995) Altered serotonin levels in patients with fibromyalgia. *J Musculoske Pain* 3 [Suppl 1]: 65
7. Sprott H, Franke S, Grohmann G, Kluge H, Hein G (1995) Pathologische Befunde bei Patienten mit generalisierter Tendomyopathie (Fibromyalgie). *Z Rheumatol* 54: 342
8. Stratz T, Schochat T, Farber L, Schweiger C, Müller W (1995) Are there subgroups in Fibromyalgia? *J Musculoske Pain* 3 [Suppl 1]: 15
9. Sprott H (1998) Efficiency of acupuncture in patients with fibromyalgia. *Clin Bull Myofascial Therapy* 3 (in press)
10. Lautenschläger J, Brückle W, Müller W (1991) Untersuchungen über druckschmerzhafteste Punkte bei Patienten mit generalisierter Tendomyopathie. In: Müller W (ed) *Generalisierte Tendomyopathie (Fibromyalgie)*. Steinkopff, Darmstadt, p 105
11. Bailly D, Vignau J, Lauth B, Racadat N, Benscart R, Servant D, Parquet PJ (1990) Platelet serotonin decrease in alcoholic patients. *Acta Psychiatr Scand* 81: 68–72
12. Stratz T, Schochat T, Hrycaj P, Schweiger C, Mennet P, Färber L, Müller W (1995) The blockade of 5-HT<sub>3</sub>-receptors in fibromyalgia – a new therapy concept? *J Musculoske Pain* 3 [Suppl 1]: 64