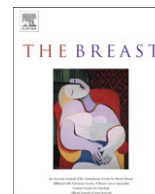


Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

The Breast

journal homepage: www.elsevier.com/brst

Original article

Acupuncture relieves menopausal discomfort in breast cancer patients: A prospective, double blinded, randomized study

Susanne Bokmand^{a,b,*}, Henrik Flyger^b^a Department of Breast Surgery, Vejle Hospital, Denmark^b Department of Breast Surgery, Herlev Hospital, Copenhagen University Hospital, Denmark

ARTICLE INFO

Article history:

Received 2 January 2012

Received in revised form

13 July 2012

Accepted 30 July 2012

Keywords:

Acupuncture

Hot flashes

Breast cancer

Plasma estradiol

ABSTRACT

Background: This study evaluates the effect of acupuncture on hot flashes and disturbed night sleep in patients treated for breast cancer. The effect of acupuncture was tested against a sham-acupuncture group and a no-treatment control group. Plasma estradiol was measured to rule out this as cause of effect. Side effects of the treatment were registered.

Methods: We randomized 94 women into the study: 31 had acupuncture, 29 had sham acupuncture and 34 had no treatment.

Findings: In the acupuncture group, 16 patients (52%) experienced a significant effect on hot flashes compared with seven patients (24%) in the sham group ($p < 0.05$). The effect came after the second acupuncture session and lasted for at least 12 weeks after last treatment. A statistically significant positive effect was seen on sleep in the acupuncture group compared with the sham-acupuncture and no-treatment groups. The effect was not correlated with increased levels of plasma estradiol. No side effects of acupuncture were registered.

Interpretation: We find that acupuncture significantly relieves hot flashes and sleep disturbances and is a good and safe treatment in women treated for breast cancer.

The project is registered at Clinical Trials.gov (no: NCT00425776).

© 2012 Elsevier Ltd. All rights reserved.

Introduction

Breast cancer patients have a higher incidence of bothersome hot flashes and sleep disturbances than other women do.^{1–4} The reasons for this high incidence of postmenopausal symptoms might be because most women with breast cancer are between 50 and 70 years, where the incidence of hot flashes is already high. Furthermore, prior to the breast cancer diagnosis, some women would have used hormone replacement therapy and would have subsequently withdrawn from this therapy. Adjuvant therapy often aggravates hot flashes, ultimately leading to poor quality of life.⁵ Consequently, there is a need for better rehabilitation, especially when the disease has been treated and is under control.

The exact pathophysiological background for the vasomotoric symptoms in postmenopausal women is unclear; nevertheless, it is undoubtedly multi-factorial and might include dysfunction of the thermoregulation center.^{6,7} The pathophysiology of acupuncture and

how it works is unknown. A hypothesis suggests that the hormone endorphin increases during acupuncture, thereby moderating the thermoregulatory mechanism in the hypothalamus.^{7,8} Calcitonin gene-related peptide level, a powerful vasodilator released during hot flashes, is shown to decrease during periods with acupuncture.⁶ Although several clinical trials have shown an effect of acupuncture on vasomotoric symptoms,^{6,8–13} others have not.^{14,15} Two reviews from 2009 conclude that the evidence is not sufficiently convincing to suggest acupuncture as an effective treatment of menopausal symptoms in patients with breast cancer and call for further studies to investigate the effects of acupuncture for treating hot flashes.^{16,17} Some studies suggest that acupuncture can increase plasma hormone levels.^{18–20} Accordingly, it is important to investigate whether there is an undesirable increase in plasma estradiol during and after acupuncture because of the possible increased risk of recurrence of cancer.²¹

In addition to the lack of evidence of the effect of acupuncture on hot flashes, there is also a lack of systematic, well-conducted research investigating the possible side effects of this treatment. The aim of the present study was to investigate the therapeutic effect of acupuncture on hot flashes and disturbed sleep in breast cancer patients, the possible side effects of this treatment, and the effect on plasma estradiol levels.

* Corresponding author. Department of Breast Surgery, Herlev Hospital, Copenhagen University Hospital, Herlev Ringvej 75, DK-2730 Herlev, Denmark. Tel.: +45 38682566.

E-mail address: sbok0003@heh.regionh.dk (S. Bokmand).

Material and methods

The study included 94 women, mean age 61 years (45–76 yr). The inclusion criterion was women treated for breast cancer with self-estimated troublesome hot flashes and disturbed night sleep. Exclusion criteria were treatment with hormone replacement therapy or known metastatic disease. Only the women's own perception of symptoms was registered. There were used no further selection criteria. The patients were recruited by advertisement at the breast center waiting room for mammography control and in the outpatient clinics. Inclusion was done by the investigator at the breast center where oral and written information was given, and before entering all the participants signed an informed consent. All patients were in the postoperative period from 6 months to 5 years. Two patients had chemotherapy but their treatment had ceased at the time of acupuncture. For all patients who had antihormone-treatment, it was given during the whole study period. The randomization was done by the acupuncturist. The participant personally drew a sealed envelope from a plastic bag and was randomly allocated to either of three groups. Group 1 included 31 patients who had acupuncture; Group 2 included 29 patients who had sham acupuncture; and Group 3 included 34 women with no treatment. Group 1 and 2 were both patient- and investigator blinded.

Two experienced acupuncturists gave either acupuncture in the selected acupuncture points or in the sham points. Group 1 had manual acupuncture in pre-determined bilateral points for 15–20 min once a week for five consecutive weeks. We used true points along the meridians for acupuncture. The points were Hc6, Ki3, Sp6 and Lr3. These points are located on the wrist, ankle and foot. We did not use any extra points as known from Chinese acupuncture. Group 2 had sham acupuncture in four pre-determined bilateral non-acupuncture points outside the meridians, but in the same region as the true points. It was given with the same needles as true acupuncture and inserted superficially in the skin. They were placed with 1 cm distance in the skin of the distal part of tibia in the frontal midline. One needle was given 1 cm cranially from the wrist line at the most ulnar point. The needles were in place for 15–20 min. Treatment was given once a week for five weeks like in the acupuncture group. Group 3: received no acupuncture. The acupuncture points were selected from the textbook *Practice of Acupuncture*.²² To our knowledge none of the participants had acupuncture before.

The set-up was tested in a pilot study including 25 women with a history of breast cancer and hot flashes. The study showed that 68% of the women more than halved the nuisance of their hot flashes and 76% had better sleep.

All participants in Group 1 and Group 2 kept a protocol-specific logbook where they rated the extent of their symptoms on a subjective visual analog scale (VAS) from zero to ten. Baseline score was based on a period of two weeks before entering the study. The logbook was filled in three days after each treatment, and six and twelve weeks after the final acupuncture treatment. Their sleep disturbances were rated "yes" or "no" at the same time points. The symptoms were not described in more detail and every patient was her own control. However, any side effects of the acupuncture, the use of adjuvant drugs and alternative medicine were registered at all time points. The participants in the no-treatment group kept a similar protocol-specific logbook filled in at the same time points they were not contacted during that period except for the day at the fifth week where they came for the last blood sample. All participants completed their logbooks. In this study axillary dissection was not a contradiction for acupuncture in the wrists. All the participants were offered acupuncture treatment after the study had ceased.

Plasma estradiol level was measured in blood samples taken just before the first treatment and 30 min after. It was measured again

five weeks later, 30 min after the final acupuncture treatment. Blood tests were also drawn from the control group at the allocation and five weeks later. Blood was drawn into Heparin Venous Blood Vacuum Collection Tubes. Plasma aliquots for estradiol testing were stored at -20°C until analysis was performed using a Roche Modular Immunochemistry[®], Electrochemical Luminescent Immuno Assay (ECLIA), Roche Diagnostics GMBH, Mannheim, Germany. The analysis was performed according to the manufacturers' instructions.

Approval for the study was obtained from an independent ethics committee on Biomedical Research Ethics, Denmark, (VF-20060112) and Clinical Trials.gov (no: NCT00425776).

Statistics: To detect a 50% decrease in symptoms in more than 50% of the women at a significance level of 5% and with a power of 80%, a total sample size of 93 participants with 31 in each group was needed. The three groups were compared in pairs in terms of each period.

The primary hypothesis was that more than 50% of the women receiving correct acupuncture would significantly halve their distress from hot flashes and night disturbances compared with the women receiving sham acupuncture and those with no treatment.

Comparison of groups was made using the Wilcoxon Rank Sum test and the relative differences were determined using the Kruskal–Wallis test.

Results

Table 1 shows the baseline characteristics of women entering the study. Biologically we have age and adjuvant medical treatment. The area of inclusion consists of Caucasians and no ethnical minorities were represented, no socio-economical data were collected, but the population is known to be very homogeneously.

A significant effect was found on hot flashes in the acupuncture group after the second acupuncture treatment (Fig. 1 and Table 2). The effect lasted for at least 12 weeks after the final acupuncture treatment, when registration was ended. In the sham-acupuncture group no significant effect was seen in comparison with the no-treatment group, but a visual trend of reduced symptoms was noted. A statistically significant positive effect on sleep was shown among those treated with acupuncture compared to those receiving sham acupuncture and no treatment (Table 3).

There was no increase in plasma estradiol level related to acupuncture in any group, as seen in Fig. 2. In three cases, a high level of plasma estradiol was detected. None was acupuncture-related: one case was explained by patient intake; the other two were pre-menopausal, one with too low a dose of antihormone and one with no adjuvant therapy.

During the project period 57 women were treated with adjuvant antihormone therapy (tamoxifen, letrozole or exemestane), two women received adjuvant docetaxel, and 35 women had no adjuvant therapy. Alternative medicine (melbrosia) during the whole

Table 1
Baseline characteristics of women entering the study.

| Treatment | Acupuncture <i>n</i> = 31 | Sham-acupuncture <i>n</i> = 29 | No treatment <i>n</i> = 34 |
|--|------------------------------|-----------------------------------|-------------------------------|
| Mean age years | 60 | 62 | 62 |
| Range | (46–75) | (43–72) | (45–75) |
| Antihormone treatment | 19 (61%) | 17 (58%) | 21 (61%) |
| Chemotherapy | 0 (0%) | 1 (3%) | 1 (3%) |
| Mean VAS score of nuisance of hot flashes before treatment | 7.0 | 7.4 | 6.4 |
| Number of women with disturbed sleep before treatment | 22 (71%) | 23 (79%) | 28 (82%) |

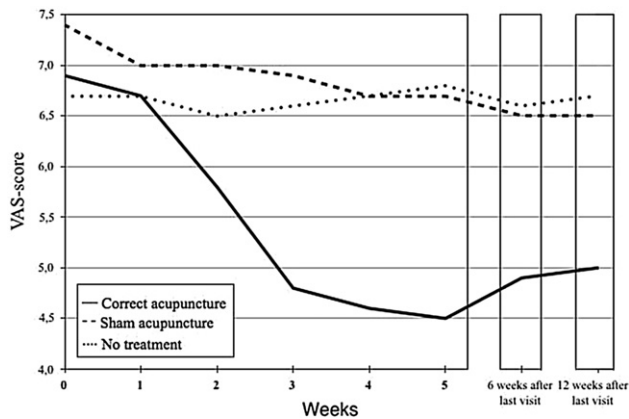


Fig. 1. VAS scores of hot flashes at baseline and during the study period in patients receiving acupuncture, sham-acupuncture and no-treatment.

period was used by two women: one in Group 2 and one in Group 3. During the test period six women used clonidine for hot flashes: four in Group 1, one in Group 2 and one in Group 3. Of the four patients in Group 1 who had both acupuncture and clonidine, only one reported effect of either of the treatments. The other three had no effect of neither clonidine nor acupuncture. One woman in Group 2 used venlafaxine together with clonidine and one in Group 3 used mirzapazine with clonidine. One participant in Group 3 started hormone replacement therapy to ease her menopausal complaints.

Side effects, mostly fatigue, pruritus and nausea, were reported by 14 (15%) participants. In the acupuncture group, four women had mild, temporary side effects, and one woman had side effects that were mild but long lasting: she complained of sensitivity to cold. In the sham-acupuncture group, five women had mild side effects and three had moderate complaints throughout the acupuncture period. Only one in the no-treatment group had mild, temporary side effects consisting of fatigue and tender joints.

Discussion

To our knowledge, this study is the only investigation of acupuncture including two control groups: a sham-acupuncture group and a no-treatment group, together with measurement of plasma estradiol level. We randomized 94 women with a previous history of breast cancer into a patient- and assessor-blinded clinical trial. The results showed a significant subjective improvement in the discomfort of hot flashes and better uninterrupted sleep in the group with genuine acupuncture compared with the sham-acupuncture and the no-treatment groups. This study is one of the few measuring plasma estradiol before and after treatment.^{18,19,22} Many

Table 2
Comparison of the nuisance of hot flashes in the groups before and after treatment.

| Treatment | Mean VAS-score in the three groups | | | | | |
|---|------------------------------------|-----------------|---------|-----------------|---------|--|
| | Group 1 | | Group 2 | | Group 3 | |
| | n = 31 | p-value 1 vs. 2 | n = 29 | p-value 2 vs. 3 | n = 34 | |
| Before 1 treatment | 6.9 | 0.3 | 7.4 | 0.7 | 6.7 | |
| 3 days after 1 treatment | 6.7 | 0.3 | 7.0 | 0.5 | 6.7 | |
| 3 days after 2 treatment | 5.8 | 0.009 | 7.0 | 0.5 | 6.5 | |
| 3 days after 3 treatment | 4.8 | 0.0002 | 6.9 | 0.7 | 6.6 | |
| 3 days after 4 treatment | 4.6 | 0.007 | 6.7 | 1 | 6.7 | |
| 3 days after 5 treatment | 4.5 | 0.0004 | 6.7 | 0.3 | 6.8 | |
| 6 weeks after the last treatment/visit | 4.9 | 0.004 | 6.5 | 0.7 | 6.6 | |
| 12 weeks after the last treatment/visit | 5.0 | 0.01 | 6.5 | 0.8 | 6.7 | |

Table 3
Comparison of sleep disturbance in the groups before and after treatment.

| Treatment | Group 1 | | p-value 1 vs. 2 | p-value 1 vs. 3 | Group 2 | | p-value 2 vs. 3 | Group 3 |
|---|---------|--------|-----------------|-----------------|---------|-----|-----------------|---------|
| | n = 31 | | | | n = 29 | | | n = 34 |
| Before 1 treatment | 22 | 0.5 | 0.2 | | 23 | 0.7 | | 28 |
| 3 days after 1 treatment | 21 | 0.5 | 0.1 | | 22 | 0.5 | | 28 |
| 3 days after 2 treatment | 20 | 0.2 | 0.1 | | 23 | 1 | | 27 |
| 3 days after 3 treatment | 12 | 0.009 | 0.002 | | 22 | 0.7 | | 26 |
| 3 days after 4 treatment | 11 | 0.0006 | 0.0001 | | 24 | 1 | | 28 |
| 3 days after 5 treatment | 12 | 0.03 | 0.001 | | 21 | 0.3 | | 27 |
| 6 weeks after the last treatment/visit | 13 | 0.003 | 0.01 | | 24 | 0.7 | | 26 |
| 12 weeks after the last treatment/visit | 13 | 0.03 | 0.009 | | 22 | 0.7 | | 27 |

women are now living longer after breast cancer treatment due to intensified adjuvant treatment. The majority of these women are treated with antihormone drugs with hot flashes and disturbed night-sleep being two of the most prominent side effects. Hormone treatment has been the only effective therapy, but the “HABIT” study showed an increased number of relapses among breast cancer patients receiving hormone replacement therapy; consequently, the treatment is no longer advisable.²¹ In our study no effect on plasma estradiol was found; however, earlier studies have suggested otherwise.^{18,19,22} Among Chinese patients with the traditional Chinese medicine diagnosis of kidney deficiency, Gong demonstrated that plasma estradiol could be manipulated using acupuncture.¹⁹ The difference in findings could be due to a different type of patients and a different acupuncture technique.

Very few sham controlled randomized trials have been undertaken; none with both a sham-acupuncture group and a no-treatment control group. No study was both assessor- and patient-blinded, while five studies were patient-blinded.^{12,14,22–24} Blinding is crucial to avoid overestimating treatment effect.¹⁵

The studies by both Deng et al. and Davies et al. found no difference between acupuncture and sham acupuncture, suggesting that either acupuncture is ineffective or sham acupuncture has a strong placebo effect.^{14,15} As a result, we found it necessary to have both a sham- and a no-treatment control group. In our study it was clear that the correctly administered acupuncture had a clinically relevant effect, whereas there was no effect in either control group, albeit there was a visually insignificant trend of effect in the sham-acupuncture group. This small reduction in symptoms might indicate that there is an effect of acupuncture needles merely by placing them in the region near the meridians.

Acupuncture points were chosen from a text book²² and tested in a pilot study including 25 women. In this unblinded, uncontrolled test, we saw a clear effect in 17 (68%) cases, indicating a possible positive effect of this approach. There seems to be no consensus in the selection of acupuncture points in the earlier studies.^{6,8–10,12–15,22–24} Some authors used western-inspired acupuncture,^{6,9–11,13,14,22–24} while others used traditional Chinese theory.^{8,12,15} The various methods could explain the different results.

Mild adverse events have been reported in previous studies.^{6,8,10,11,22,24} Accordingly, we registered side effects in this study and found only unspecific symptoms, which were most likely part of the disease or caused by adjuvant treatment with anti-estrogen or chemotherapy. Since no specific side effects of acupuncture are known, issues regarding side effects are unclear.

In the acupuncture group, four women were also taking clonidine; of these, three had no effect of either acupuncture or clonidine. These women could be particularly treatment-resistant cases, and for this, we have no explanation.

In conclusion: We find that acupuncture significantly relieves hot flashes and sleep disturbances in women treated for breast

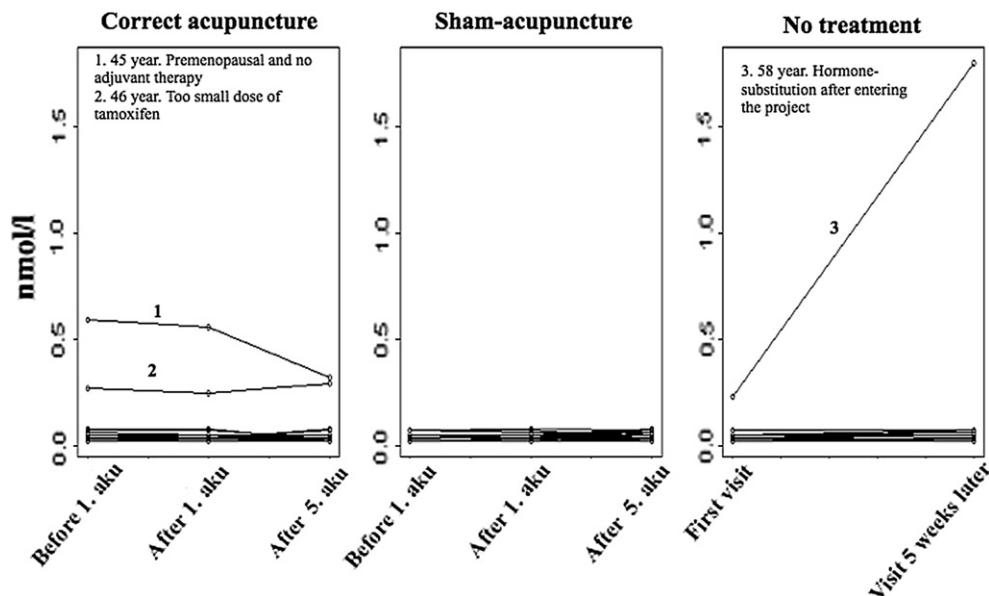


Fig. 2. Plasma estradiol level at baseline and during the treatment period with acupuncture, sham-acupuncture and no-treatment.

cancer. The effect was seen in the therapy period and at least 12 weeks after acupuncture treatment ceased. The effect was not correlated with increased levels of plasma estradiol. The current study showed no side effects of acupuncture. These results indicate that acupuncture can be used as an effective treatment of menopausal discomfort. Longer follow-up would be valuable to further substantiate the duration of the effect.

Role of the funding source

The study funds have no role in the study.

Conflict of interest statement

The authors have no conflicts or financial interest to declare with regard to the manuscript.

Acknowledgments

The authors were supported by funds from Vejle Hospital: "Udviklingsfonden" and "Forskningsrådet".

For statistical advice and calculations thanks go to statistician Henry Christensen, Professor Ivan Brandslund MD Vejle Hospital, Denmark, and Professor Werner Vach, Medical Statistics, the University of Southern Denmark, Denmark. Agnete Kaltoft and Ragnhild Lindholm, nurses and acupuncturists.

References

- Hammer M, Nedstrand E, Woyon Y. Few alternatives to estrogen replacement therapy for vegetative symptoms after menopause. *Lakartidningen* 2004 Apr 29;101(18):1612–6.
- Boeckhout AH, Beijnen JH, Schellens JH. Symptoms and treatment in cancer therapy-induced early menopause. *Oncologist* 2006 Jun;11(6):641–54.
- Harris PF. Prevalence and treatment of menopausal symptoms among breast cancer survivors. *J Pain Symptom Manage* 2002 Jun;23(6):501–9.
- Rozenberg S, Antoine C, Vandromme J, Carly B, Pastijn A, Neusy S, et al. Management of the menopause in breast cancer patients. *EJC Supplements* 2004;2(9):81–3.
- Hazel A. Hot flashes – A review of the literature on alternative and complementary treatment approaches. *Altern Med Rev* 2003;8(3):284–302.
- Filshie J, Bolton T, Browne D, Ashley S. Acupuncture and self-acupuncture for long term treatment of vasomotor symptoms in cancer patients. *Acupunct Med* 2005;23(4):171–80.

- Andrikoula M, Prelevic G. Menopausal hot flashes revisited. *Climacteric* 2009;12:3–15.
- Tukmachi E. Treatment of hot flashes in breast cancer patients with acupuncture. *Acupunct Med* 2000 Jun;18(1):22–7.
- Wyon Y, Wijma K, Nedstrand E, Hammar M. A comparison of acupuncture and oral estradiol treatment of vasomotor symptoms in postmenopausal women. *Climacteric* 2004 Jun;7(2):153–64.
- Cohen SM, Rousseau ME, Carey BL. Can acupuncture ease the symptoms of menopause? *Holist Nurs Pract* 2003 Nov–Dec;17(6):295–9.
- Nedstrand E, Wijma K, Woyon Y. Vasomotor symptoms decrease in women with breast cancer randomized to treatment with applied relaxation or electro-acupuncture: a preliminary study. *Climacteric* 2005 Sep;8(3):243–50.
- Hervik J, Mjaaland O. Acupuncture for the treatment of hot flashes in breast cancer patients, a randomized controlled trial. *Breast Cancer Res Treat* 2009 Jul;116(2):311–6.
- Nedstrand E, Woyon Y, Hammar M, Wijma K. Psychological well-being in women with breast cancer after treatment with applied relaxation or electro-acupuncture for vasomotor symptom. *J Psychosom Obstet Gynaecol* 2006 Dec;27(4):193–9.
- Deng G, Vickers A, Yeung S, D'Andrea GM, Xiao H, Sugarman S, et al. Randomized controlled trial of acupuncture for the treatment of hot flashes in breast cancer patients. *J Clin Oncol* 2007 Dec 10;25(35):5546–7.
- Avis NE, Legault C, Coeytaux RR, Pian-Smith M, Shifren JL, Chren W, et al. A randomized controlled pilot study of acupuncture treatment for menopausal hot flashes. *Menopause* 2008 Nov–Dec;15(6):1070–8.
- Myeong SL, Kun-Hyung K, Sun-Mi C, Edzard E. Acupuncture for treating hot flashes in cancer patients: a systemic review. *Breast Cancer Res Treat* 2009;115:497–503.
- Lee MS, Shin BC, Ernst E. Acupuncture for treating menopausal hot flashes: a systemic review. *Climacteric* 2009;12:16–25.
- Aso T, Motohashi T, Murata M, Nishimura T, Kakizaki K. The influence of acupuncture stimulation on plasma levels of LH, FSH, progesterone and estradiol in normally ovulating women. *AM J Chin Med (Gard City N Y)* 1976;4(4, winter):391–401.
- Gong D, Liang C, Lai X, Lai X. Effects of different acupuncture manipulation on plasma estradiol, testosterone and cortisol in patients with kidney deficiency. *Zhen Ci Yan Jiu* 1998;18(4):253–6.
- Liljegren A, Gunnarsson P, Landgren B, Rob  us N, Johansson H, Rotstein S. Reducing vasomotor symptoms with acupuncture in breast cancer patients treated with adjuvant tamoxifen: a randomized controlled trial. *Breast Cancer Res Treat* 2004;363(9407):453–5.
- Holmberg L, Anderson H. HABITS. Hormonal replacement therapy after breast cancer – is it safe? *The Lancet* 2004;363(9407):453–5.
- Hecker H, Steveling A, Peuker E, Kastner J. *Practice of acupuncture*. Thieme, ISBN 3-13-136821-7; 2005 (GTV).
- Davies FM. The effect of acupuncture treatment on incidence and severity of hot flashes experienced by women following treatment for breast cancer: a comparison of traditional and minimal acupuncture. *Eur J Cancer* 2001;37: 438.
- Frisk J, Carlhall S, Kallstrom AC, Lindh-  strand L, Malmstr  m A, Hammar M. Longterm follow-up of acupuncture and hormone therapy on hot flashes in women with breast cancer: a prospective, randomized, controlled multicenter trial. *Climacteric* 2008;11:166–74.