
CME review

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Acupuncture for allergic rhinitis: a systematic review

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Objective: To systematically evaluate the effectiveness of acupuncture for treating or preventing allergic rhinitis (AR).

Data Sources: We retrieved data from 17 electronic databases, nonelectronic searches of conference proceedings, our own files of articles, and bibliographies of located articles.

Study Selection: All randomized clinical trials (RCTs) of acupuncture for AR were considered for inclusion if they included placebo controls or were controlled against a comparator intervention.

Results: One hundred fifteen possibly relevant studies were identified and 12 RCTs met our inclusion criteria. The methodologic quality of the individual trials was variable. Our review includes 7 trials of high quality that met standards of methodologic rigor. All RCTs tested the effectiveness of acupuncture on AR symptoms and none on its curative value. Three RCTs failed to show superiority of acupuncture for treating or preventing symptoms for seasonal AR compared with placebo acupuncture. For perennial AR, 1 study reported favorable effects of acupuncture on a rhinitis symptoms score and 1 found positive results for a nasal symptoms score compared with placebo acupuncture ($n = 152$; standard mean difference, 0.45; 95% confidence interval, 0.13–0.78; $P = .006$; heterogeneity: $\chi^2 = 0.45$, $P = .50$, $I^2 = 0\%$). Two RCTs compared acupuncture with oral pharmacologic medications. Their results were in favor of acupuncture.

Conclusions: The evidence for the effectiveness of acupuncture for the symptomatic treatment or prevention of AR is mixed. The results for seasonal AR failed to show specific effects of acupuncture. For perennial AR, results provide suggestive evidence of the effectiveness of acupuncture.

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INTRODUCTION

Allergic rhinitis (AR) is 1 of the most common diseases worldwide, affecting 1% to 40% of the population, and an increasing prevalence has been reported in the last few decades.¹ AR is commonly divided into seasonal AR (SAR) and perennial AR (PAR), depending on the trigger of the condi-

tion (eg, pollen or house dust mites). The recent Allergic Rhinitis and its Impact on Asthma guideline proposes to replace these terms with *intermittent* and *persistent* AR, because this classification is applicable worldwide, whereas *seasonal* and *perennial* apply only to certain countries with seasonal variations.² Despite the advances in conventional medicine in the management of AR,³ patients may not feel that their symptoms are well controlled and many seek complementary and alternative medicine.⁴ A German survey found that SAR is the allergic condition most commonly treated with complementary and alternative medicine,⁵ and acupuncture seems to be used frequently.⁵

Acupuncture is an intervention used for treating pain and other conditions.⁶ Acupuncture has been claimed to influence

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specific and nonspecific cellular influx, activation of cell proliferation and regulation of subsequently involved cells that will result in a complex mechanism of transport, and further breakdown and clearance of all bioactive mediators.⁷ The anti-inflammatory actions of acupuncture are thought to be mediated via the reflexive central inhibition of the innate immune system.⁸ The rationale for using acupuncture to treat AR includes a modulation of cytokines and postulated anti-inflammation action. For AR, recent reviews reported contradictory results.^{4,9} One review claimed that acupuncture has no therapeutic effects,⁴ whereas another suggested that acupuncture can be an effective treatment.⁹ Both of these reviews were nonsystematic and therefore open to bias. Another systematic review¹⁰ included 7 randomized clinical trials (RCTs) and suggested that the evidence is insufficient. However, this review did not include all published trials and had other flaws, such as the inclusion of studies with inadequate controls. The aim of this systematic review is to critically evaluate the totality of the evidence from RCTs that tested the effectiveness of acupuncture for treating or preventing AR.

METHODS

Data Sources

Electronic databases were searched from their respective inceptions through September 2008 using the following databases: MEDLINE, AMED, British Nursing Index, CINAHL, EMBASE, PsycInfo, The Cochrane Library 2008 (Issue 4), 6 Korean medical databases (Korean Studies Information, DBPIA, Korea Institute of Science Technology Information, Research Information Center for Health Database, Korean Medline, and National Assembly Library), and 4 Chinese databases (China Academic Journal, Century Journal Project, China Doctor/Master Dissertation Full Text Database, and China Proceedings Conference Full Text Database). The search terms used were *acupuncture* AND (*allergy* OR [*allergic* AND *rhinitis*] OR *hay fever*). In addition, screening of reference lists of all located articles and reviews was performed, and our departmental files were hand searched. We also performed nonelectronic searches of conference proceedings, our own files of articles, 8 Korean traditional oriental medical journals (*Journal of Oriental Medicine*, *The Journal of Korean Acupuncture & Moxibustion Society*, *The Korean Journal of Meridian & Acupoint*, *Journal of Oriental Rehabilitation Medicine*, *Journal of Korean Institute of Herbal Acupuncture*, *The Journal of Korea Chuna Manual Medicine*, *Korean Journal of Oriental Physiology & Pathology*, and *The Journal of Korean Oriental Internal Medicine* [searched from their inception to September 2008]), and other relevant journals (*Focus on Alternative and Complementary Therapies*, up to September 2008).

Study Selection

RCTs that tested needle acupuncture with or without electrical stimulation as sole or adjunctive treatment, in patients of

either sex or any age diagnosed as having AR (SAR or PAR) and assessing clinically relevant outcomes, were included. The RCTs were included if acupuncture were tested against another group, such as a true placebo with no intervention, sham acupuncture, or another comparator treatment group or no treatment group. Acupuncture was defined as the insertion of needles into the skin and underlying tissues at particular sites for therapeutic or preventive purposes. Sham (or placebo) acupuncture was defined as acupuncture with or without penetration at the acupoints or nonacupoints. Trials that tested other forms of acupuncture (no needle insertion), such as laser acupuncture, transcutaneous electrical nerve stimulation, and moxibustion, were excluded. Trials with designs that did not allow an evaluation of effectiveness of acupuncture (eg, using treatments of unproven effectiveness in the control group or comparing 2 different forms of acupuncture) were excluded. Studies combining 2 different forms of acupuncture in the experimental group were also excluded. Trials published in the forms of dissertation and abstract were included. No language restrictions were imposed.

Data Extraction and Methodologic Quality Evaluation

Hard copies of all articles were obtained and read in full. All articles were read by 3 independent reviewers (M.S.L., M.H.P., B.C.S.), and data from the articles were validated and extracted according to predefined criteria. Allocation concealment was evaluated using the Cochrane classification. The quality of studies was evaluated by the Jadad scale, which was modified to take account of the fact that it is virtually impossible for an acupuncturist to be blinded to the treatment.¹¹ Points were awarded as follows: study described as randomized, 1 point; appropriate randomization method, 1 point; inappropriate randomization method, deduct 1 point; patient blinded to intervention (ie, control procedure was indistinguishable from real acupuncture), 1 point; evaluator blinded to intervention, 1 point; and description of withdrawals and dropouts, 1 point. The maximum number of points available was 5. Patient blinding was assumed where the control intervention was indistinguishable from acupuncture, even if the word *blinding* did not occur in the report. Points for evaluator blinding were only given if specified in the text. Discrepancies were resolved by discussion between 2 reviewers (M.S.L., M.H.P.) and, if needed, by seeking the opinion of a third reviewer (E.E.).

Data Synthesis

Standard mean difference and 95% confidence intervals (CIs) were also calculated for total symptom scores of AR using the Cochrane Collaboration's software (Review Manager [RevMan] Version 5.0 for Windows; The Nordic Cochrane Centre, Copenhagen, Denmark). The variance of the change was imputed using a correlation factor of 0.4 suggested by the Cochrane Collaboration. If appropriate, we then pooled data across studies using random-effects models if statistical heterogeneity did not exist. The τ^2 , χ^2 test, and Higgins I^2 test were used to evaluate heterogeneity.¹⁰

Outcome Evaluation

The overall result was classified as (1) positive when acupuncture was significantly more effective than the control in at least 1 of the AR-related outcome measures, (2) neutral when there was no significant difference between the acupuncture and the control, or (3) negative when acupuncture was significantly less effective than the control. $P < .05$ was considered statistically significant. Trials with 3, 4, or 5 points on the Jadad scale were considered high quality.

RESULTS

Study Description

The searches identified 116 potentially relevant articles, of which 12 met our inclusion criteria (Fig 1). Key data are summarized in Table 1¹²⁻²³ and Table 2. Three RCTs originated from China,^{17,21,22} 2 were conducted in the United Kingdom,^{12,14} 2 were from Australia,^{15,18} and 1 each was from Germany,²³ Austria,¹³ Sweden,¹⁶ Italy,¹⁹ and Korea.²⁰ Manual acupuncture was used in 11 trials,^{12-21,23} and electroacupuncture was used in 1 trial.²² Seven RCTs used penetrating sham acupuncture at nonacupoints,^{13-16,18-20} 1 RCT used sham acupuncture at acupoints,¹⁷ 2 studies used conventional pharmacologic drugs,^{21,22} 1 used no treatment,¹⁹ and 1 used routine care.²³ Nine of the included RCTs adopted a 2-armed parallel-group design,^{12-14,16-18,20,22,23} 2 had a 3-armed parallel group design,^{19,21} and 1 was a crossover trial.¹⁵

Ten RCTs tested acupuncture for treating AR,¹⁴⁻²³ and 2 RCTs tested acupuncture for preventing AR.^{12,13} In the 2 prevention trials, patients were classified as having SAR. Before the onset of the season in April, patients received acupuncture¹² or they received acupuncture after nasal allergen provocation.¹³ Symptoms were then evaluated during the following months. Five trials tested SAR,¹²⁻¹⁶ 6 trials tested PAR,¹⁷⁻²² and 1 trial did not specify the type of AR.²³ Seven trials allowed the concomitant use of pharmacologic medication for relief of symptoms of AR,¹²⁻¹⁸ whereas 1 trial did not.¹⁹ The other RCTs did not mention concomitant medications.²⁰⁻²³

Symptom reporting remains the most appropriate end point for the study of AR. Most of the included studies used subjective patient reports to evaluate improvements of AR symptoms. Five trials used diaries,^{12-14,17,18} and others used questionnaires.^{15,16,19,21-23} One RCT did not use subjective patients' reports.²⁰ It is so far the best-validated method.²⁴ The reliability of subjective assessments would be enhanced if it can be confirmed objectively.²⁵ However, using a less substantiated objective outcome alone may limit the validity of the results. Six RCTs measured the objective outcomes, including IgE and cytokines.^{16,17,19-22} Only 2 trials showed favorable effects of acupuncture.^{16,19}

Ten RCTs provided acupuncture on a regular basis, at least once weekly. The number of treatment sessions varied from 1 to 30. Two RCTs provided acupuncture only once.^{19,20} The rationale for the point selection was stated in 7 RCTs.^{12,15,17-21} The authors quoted classic literature or previous studies or

anecdotal use to justify the points used or the procedure for choosing acupoints. Two trials used individualized point selection on the basis of traditional Chinese medicine syndrome differentiation theory and showed positive effects of acupuncture on symptoms of AR.^{15,18} Needle stimulation causing a typical needle sensation has been claimed to be important for reaching maximum effects. This needle sensation (de-qi) was considered in 7 RCTs,^{14,16-18,20-22} whereas 1 trial reported use of the manipulation method only.¹⁵ In the present data set, we found no evidence that the presence or absence of de-qi exerted an important influence on the clinical outcomes.

Ethical approval was reported for only 5 trials.^{15-18,20} Eight RCTs^{12,14-18,20,21} evaluated adverse events of acupuncture and 4 studies^{13,19,22,23} did not.

Study Quality and Direction of Outcome

The concept of randomization is not different in acupuncture trials than in any other RCT, and patient blinding of acupuncture trials is possible through placebo or sham needles. We evaluated the methodologic quality of all RCTs using a modified Jadad scale, whereby a point is scored for subject blinding, assessor blinding, and handling of dropouts separately. The average methodologic quality of the trials was moderate. Three^{12,22,23} of 10 included trials scored only 1 of 5 possible points on that scale, whereas 2 RCTs^{19,21} scored 2 points. Of the 12 included RCTs, 7 described the methods of randomization^{13,14,16-18,20,22} and 2 described both patients and assessor blinding^{17,20} for a maximum of 4 or 5 points on the Jadad scale. Six trials described only patient blinding,^{13-16,18,19} whereas 4 studies^{12,21-23} could not make an attempt at either subject or assessor blinding. Sufficient details of dropouts and withdrawals were described in 7 trials.^{14-18,21,22} Only 3 trials reported details on allocation concealment.^{14,18,20} One trial was published as an abstract only.²³ Attrition rate (dropouts from trials) varied from 0% to 20%. Four trials used an intention-to-treat analysis.^{16-18,20}

Low-quality trials are more likely to overestimate the effect size.²⁶ In this review, 100% of the low-quality RCTs ($n = 5$)^{12,19,21-23} generated positive results compared with 43% of the high-quality trials ($n = 3$).^{15,17,18} Only 3 of the 12 included studies reported adequate allocation concealment.^{14,18,20} Sample size calculation was performed in 4 RCTs.^{14,17,19,20} One trial used uncertain statistics.¹²

Seasonal Allergic Rhinitis

Acupuncture vs sham acupuncture. Manual acupuncture was compared with sham acupuncture¹³⁻¹⁶ in 4 studies for symptom scores as a main outcome measure on visual analog scales¹⁶ and Likert scales.¹³⁻¹⁵ Only 1 found acupuncture to be superior for treating SAR,¹⁵ whereas 3 found no difference between acupuncture and sham acupuncture for either prevention¹³ or treatment.^{14,16} Two trials^{14,15} evaluated the effectiveness of acupuncture on the concurrent use of conventional antiallergic medication compared with sham acupuncture and found no significant intergroup differences.

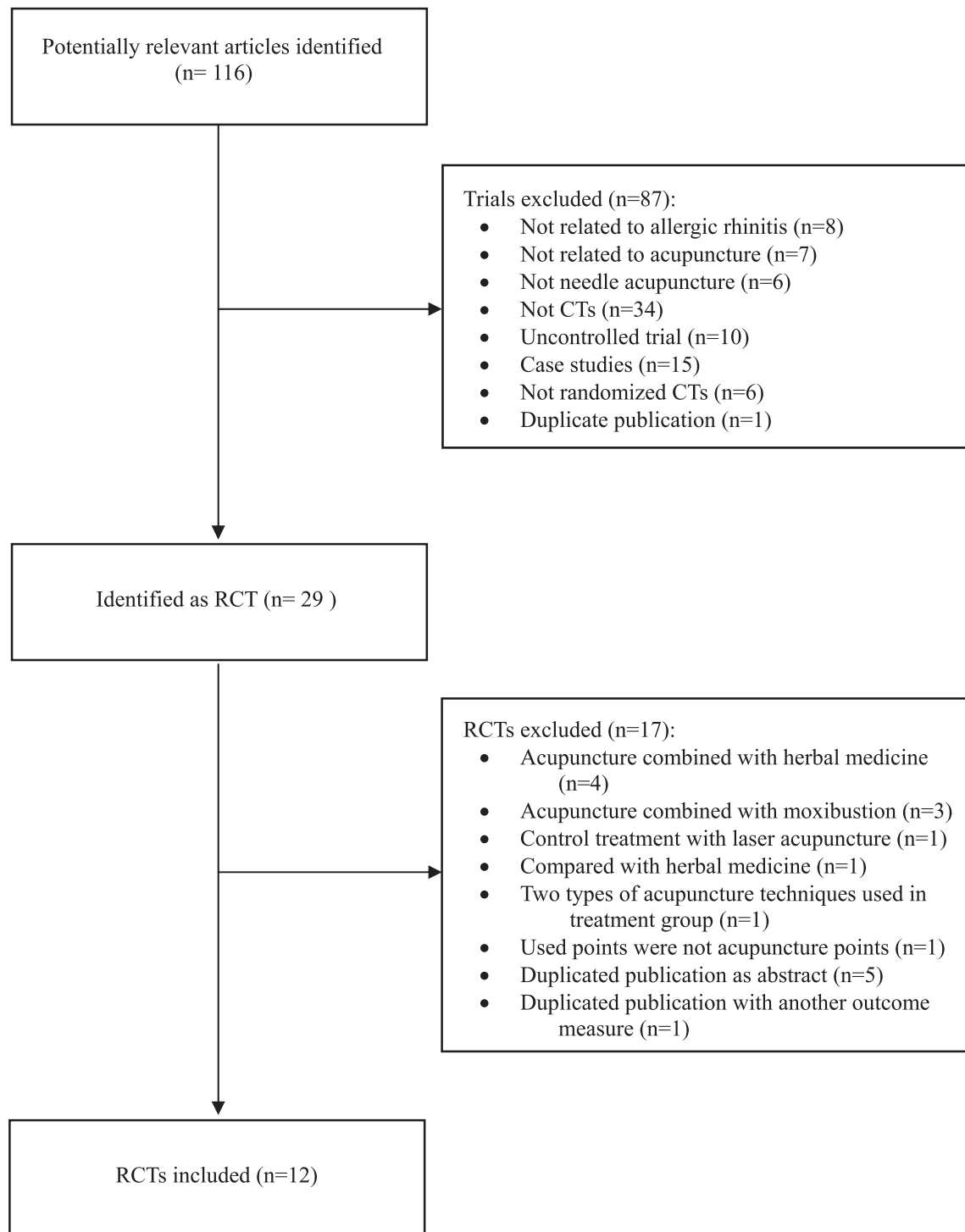


Figure 1. The study selection process. CT indicates controlled trial; RCT, randomized clinical trial.

Acupuncture vs drug therapy. The results of 1 trial suggested the effectiveness of acupuncture compared with conventional medication for symptom relief without providing statistical details.¹²

Perennial Allergic Rhinitis

Acupuncture vs sham acupuncture. Four trials^{17–20} evaluated the effectiveness of acupuncture on symptoms of PAR compared with sham acupuncture as main outcome measures on

Table 1. Key Data of RCTs of Acupuncture for Allergic Rhinitis

Source	Design, quality score (Jadad score), allocation concealment, sample size, and attrition rate	Diagnosis (duration), severity of symptoms, sex (M/F), and age	Experimental treatment (regimen)
Prevention			
Williamson ¹² (1994)	Parallel, open, 1 (1 + 0 + 0 + 0 + 0), NR, 31, 0%	SAR (≥ 3 y), moderate to severe symptoms requiring double or triple drug therapy for at least 2 months, (13/18), 18–40 y	AT (10 min, 1 session weekly for 3 weeks, n = 16)
Wolkenstein and Horak ¹³ (1998)	Parallel, PB, 3 (1 + 1 + 0 + 1 + 0), NR, 24, 25%	SAR (≥ 2 y), patient history, skin test, nasal provocation using pollen, pollen specific IgE, (14/10), 18–65 y	AT (30 min, once weekly for 9 weeks, n = 12)
Treatment			
Williamson et al ¹⁴ (1996)	Parallel, PB, 4 (1 + 1 + 1 + 1 + 0), adequate, 102, 18%	SAR (3–4 y), moderate to severe symptoms requiring continuous therapy for at least 1 month of year, (42/60), ≥ 16 y	AT (5 min, 3 or 4 times weekly for 10 weeks, n = 51)
Xue et al ¹⁵ (2002)	Crossover, PB, 3 (1 + 0 + 1 + 1 + 0), NR, 30, 13%	SAR (≥ 2 y), typical symptoms of SAR for at least the last 2 or 3 years, (14/16), 18–70 y	AT (25 min, 3 times weekly for 4 weeks, n = 30)
Magnusson et al ¹⁶ (2004)	Parallel, PB, 4 (1 + 1 + 1 + 1 + 0), NR, 40, 20%	SAR (NR), positive response to skin test, (12/20), 18–50 y	AT (30 min, 2 times weekly for 8 weeks, n = 20)
Ng et al ¹⁷ (2004)	Parallel, DB, 5 (1 + 1 + 1 + 1 + 1), NR, 72, 10%	PAR (4 wks) ≥ 4 wks of nasal symptoms and allergic disorders at ≥ 2 other sites; ≥ 1 positive result among total IgE (≥ 100 IU/mL), eosinophilia (>400 cells/ μ L) or positive skin test reaction, (47/25), 6–20 y	AT (20 min, 2 times weekly for 8 weeks, n = 35), 12 weeks of follow-up
Xue et al ¹⁸ (2007)	Parallel, PB, 4 (1 + 1 + 1 + 1 + 0), adequate, 80, 11%	PAR (16–70 y), total nasal symptom ≥ 6 , >2 -y PAR history, positive skin test reaction, (33/47), 16–70 y	AT (25 min, 2 times weekly for 8 weeks, n = 42), 12 weeks of follow-up
Petti et al ¹⁹ (2002)	Parallel, PB, 2 (1 + 0 + 0 + 0 + 1 + 0), NR, 90, 0%	PAR (2 y), documented PAR for at least 2 y; symptom score >10 (total score: 25), (37/53), 22–45 y	AT (20 min, once, n = 30), plus EA (ST36 and LI4, 90 Hz, 15 min)
Park et al ²⁰ (2005)	Parallel, DB, 4 (1 + 1 + 0 + 0 + 1 + 1), adequate, 101, 0%	PAR (NR), severe symptoms for 4 days weekly for 4 weeks for at least 2 y; nasal score ≥ 2 (total 4); positive skin test reaction, (61/40), 12–75 y	AT (15 min, once, n = 50)
Rao and Han ²¹ (2006)	Parallel, open, 2 (1 + 0 + 0 + 1 + 0 + 0), NR, 150, 5%	PAR (1–32 y), NR, (75/67), 13–66 y	AT (25 min, once daily for 4 weeks, n = 50)
Li et al ²² (2007)	Parallel, open, 1 (1 – 1 + 1 + 0 + 0), NR, 100, 0%	PAR (2–26 y), according to standard diagnoses of AR, (43/57), 5–68 y	EA (5–10 mA, 80–100 Hz, 30-min stimulation, once daily, for 10 sessions for a total of 3 courses, n = 50)
Brinkhaus et al ²³ (2005)	Parallel, open, 1 (1 + 0 + 0 + 0 + 0), NR, 981, NR	AR (NR), NR, (39; SD, 12)	AT (total 15 sessions during 3 months, n = 487), plus routine care (NR)

Abbreviations: AA, auricular acupuncture; AR, allergic rhinitis; AT, manual acupuncture; DB, double-blind (patient and assessor blind); EA, electroacupuncture; IFN, interferon γ ; IL, interleukin; NR, not reported; NS, not significant; PAR, perennial allergic rhinitis; PB, patient blind; quality score, Jadad score (randomization + randomization method + dropout or withdraw + patients' blind + assessor blind; maximum score, 5); RCT, randomized clinical trial; SAR, seasonal allergic rhinitis; SF-36, 36-Item Short-Form Health Survey; VAS, visual analog scale.

Table 1. Continued

Control treatment (regimen)	Main outcomes	Intergroup difference	Concomitant treatment
Prevention			
Conventional medication (NR), n = 15	Diary: (1) severity of symptoms (VAS); (2) symptoms improvement (verbal assessment); no objective outcome	(1) and (2) Changed in favor of AT but statistics uncertain	Conventional medication (NR)
Sham AT (nonacupoint, minimal insertion, NR manipulation, n = 12)	Diary: (1) nasal secretion; (2) symptom score (21 points); no objective outcome	(1) and (2) NS	Conventional medication (NR)
Treatment			
Sham AT (nonacupoint, minimal insertion, no manipulation, n = 51)	Diary: (1) symptom score (Likert, 10 points for each day); (2) medication use; no objective outcome	(1) and (2) NS	Conventional medication (NR)
Sham AT (nonacupoint, minimal insertion, no manipulation, n = 30)	Questionnaires: (1) severity of symptoms (5 points); (2) relief medication scale; no objective outcome	(1) $P = .012$, overall; $P = .003$, nasal; $P = .032$, nonnasal in favor of AT; (2) not performed	Western medication
Sham AT (nonacupoint, minimal insertion, no manipulation, n = 20)	Questionnaires: (1) symptom improvement during 12-month periods (VAS); objective outcomes; (2) skin test; (3) total IgE	(1) NS; (2) NS except mugwort ($P = .04$); (3) NS except mugwort	Antiallergic drugs
Sham AT (acupoint, minimal insertion, no manipulation n = 37)	Dairy plus questionnaires: (1) daily rhinitis score (4-point Likert score for 4 nasal symptoms); (2) symptom-free days (%); (3) daily relief medication score (VAS); (4) immediate improvement (VAS); objective outcomes; (5) IgE; (6) blood and nasal eosinophil	(1) NS at treatment period, $P = .03$ at the follow-up period in favor of AT; (2) $P = .001$ at treatment and follow-up period in favor of AT; (3) NS at both periods; (4) $P = .011$ in favor of AT; (5) and (6) NS	Antihistamine (chlorpheniramine mine)
Sham AT (nonacupoint, minimal insertion, no manipulation, n = 38)	Diary: (1) 7 days total nasal symptom score (5-point Likert scale); (2) medication use; no objective outcome	(1) $P < .01$ at both 8 weeks and 3 months of follow-up in favor of AT; (2) NS	PAR symptom relief medication
(A) Sham AT (nonacupoint, minimal insertion, manipulation, n = 30), none (B) No treatment (n = 30), none	Questionnaires: (1) symptoms score (6-point Likert scale for 6 items); objective outcomes; (2) cytokines (IL-2, IL-6, IL-10)	(1) $P < .01$, AT vs A or B in favor of AT; $P < .01$, A vs B in favor of A; (2) IL-2 and IL-10, $P < .01$, AT vs A or B in favor of AT, $P < .01$, A vs B in favor of A, IL-6, NS	None
Sham AT (nonacupoint, minimal insertion, no manipulation, n = 51)	No subjective outcome; objective outcomes; (1) total nasal volume; (2) total nasal minimum cross-sectional area	(1) and (2) NS	NR
(A) Medication (Saitezan, once daily, 10 mg, for 4 weeks, n = 50) (B) Auricular acupressure (n = 50) Cetirizine (10 mg 3 times per day, same duration with A, n = 50)	Questionnaires: (1) short-term response rate; (2) cumulative symptoms score; objective outcomes; (3) IgE; (4) IL-4; (5) IFN- γ Questionnaires: (1) total response rate; objective outcomes; (2) plasma vasoactive intestinal peptide; (3) substance P	(1) and (2) AT vs group A, $P < .01$ in favor of AT; (3)-(5) NS (1) $P < .05$ in favor of EA; (2) $P < .05$ in favor of EA; (3) NS	NR NR
Routine care (NR, n = 494)	Questionnaires: (1) Rhinitis-Specific Quality of Life Questionnaire; (2) general quality of life (SF-36); no objective outcome	(1) $P < .001$ in favor of AT; (2) $P < .001$ in both mental and physical component in favor of AT	NR

Table 2. Summary of Treatment Points and Other Information Related to Treatment

Source	Acupuncture method	Total No. of sessions	Acupoints	De-qi sensation
Williamson ¹² (1994)	Classic acupuncture (general practitioners)	3	Fixed points (2), bilateral LR3	Not considered
Wolkenstein and Horak ¹³ (1998)	Medical acupuncture (1 acupuncturist)	9	NR	NR
Williamson et al ¹⁴ (1996)	Classic acupuncture (more than 2 TCM acupuncturists)	30–40	Fixed points (6), bilateral BL2, LI20, LI4	Considered
Xue et al ¹⁵ (2002)	Classic acupuncture (1 acupuncturist)	12	Individualized points used; standard points (3): LI20, EX-HN3, GB20; possible additional points (individualized): lung qi deficiency: BL13, LU9; spleen qi deficiency: BL20, ST36; kidney qi deficiency: BL23, CV6	NR, manipulation used
Magnusson et al ¹⁶ (2004)	Classic acupuncture (1 acupuncturist)	16	Fixed points (9); bilateral LI4, LI20, LR3, LU7, ST36; EX-HN3	Considered
Ng et al ¹⁷ (2004)	Classic acupuncture (3 acupuncturists)	16	Fixed points (3); EX-HN3, EX-NH8, ST36	Considered
Xue et al ¹⁸ (2007)	Classic acupuncture (1 acupuncturist)	16	Individualized points used; standard points (3): LI20, EX-HN3, GB20; possible additional points (individualized): lung qi deficiency: LI4; spleen qi deficiency: ST36; kidney qi deficiency: CV6	Considered, manipulation used
Petti et al ¹⁹ (2002)	Classic acupuncture (1 acupuncturist)	1	Fixed points (4); manual acupuncture (EX-HN3, LI20), EA (LI4, ST36)	NR
Park et al ²⁰ (2005)	Classic acupuncture (1 acupuncturist)	1	Fixed points (5); bilateral: LI20, LI4; unilateral: GV23	Considered, manipulation used
Rao and Han ²¹ (2006)	NR	24	Fixed points (8); GB20, BL13, BL20, BL23, LI4, ST36, LI20, EX-2	Considered
Li et al ²² (2007)	NR	30	Fixed points (4); sphenopalatine ganglion area, LI20, EX-HN8, EX-HN3	Considered
Brinkhaus et al ²³ (2005)	Classic acupuncture (physicians)	15	NR	NR

Abbreviations: AT, manual acupuncture; BL, Bladder meridian; CV, conception vessel (or Ren meridian); EA, electroacupuncture; EX, Extra points; GB, Gall bladder meridian; GV, governor vessel (or Du meridian); ITT, intention-to-treat analysis; LI, large intestine meridian; LR, liver meridian; LU, lung meridian; NR, not reported; ST, stomach meridian; TCM, traditional Chinese medicine.

visual analog scales¹⁷ or Likert scales.^{17–19} One study reported favorable effects of acupuncture on mean rhinitis symptoms score during the follow-up period,¹⁷ and another found positive results for treating total nasal symptoms compared with sham acupuncture.¹⁸ The meta-analysis of these RCTs suggests acupuncture to be superior to sham acupuncture in symptoms-related AR ($n = 152$; standard mean difference, 0.45; 95% CI, 0.13–0.78; $P = .006$; heterogeneity: $\tau^2 = 0.00$, $\chi^2 = 0.45$, $P = .50$, $I^2 = 0\%$; Fig 2A). These 2 studies also evaluated medication use but failed to show superior effects of acupuncture.

A single acupuncture treatment did not improve total nasal volume compared with sham acupuncture,²⁰ whereas, in an-

other study, a single session of acupuncture improved symptoms compared with sham acupuncture and no treatment.¹⁹

Acupuncture vs drug therapy. Two RCTs^{21,22} compared acupuncture with oral drug medications and showed favorable effects for acupuncture regarding the responder rate and cumulative symptoms score. However, the meta-analysis shows that acupuncture on response rate was not statistically significantly superior to conventional drug therapy ($n = 193$; risk ratio, 1.08; 95% CI, 0.84–1.38; $P = .56$; Fig 2B), although marked heterogeneity was observed in this model ($\chi^2 = 8.91$, $P = .003$, $I^2 = 89\%$).

An additional RCT did not report the type of AR (author was contacted but no reply was received) and suggested that

Table 2. Continued

Rationales	Adverse events	Comments	Origin
Anecdotally used	Drowsiness (AT: 1)	Statistics were uncertain	United Kingdom
NR	NR		Austria
NR	Pain on insertion (AT: 9; placebo: 4); pain when needles were in situ (AT: 2; placebo: 2); bruising (AT: 9; placebo: 8)	Sample size calculation	United Kingdom
TCM theory	None	Sample size calculation; no washout period; sham group received treatment with short needle	Australia
NR	Pain (AT: 2 dropouts; placebo: 2 dropouts)	Previous experience of acupuncture: AT (4/14); sham control (3/17); ITT analysis	Sweden
TCM journals	Numbness (AT: 3; placebo: 2); headache (AT: 1); lightheadedness (AT: 2; placebo: 2); no severe adverse effects and no intergroup difference in occurrence	Sample size calculation; ITT analysis	China
TCM theory	Minor discomfort (AT: 11; placebo: 8); mild headache (AT: 1; placebo: 2); dizziness (AT: 1)	Sample size calculation; ITT analysis; sham group received treatment with short needle	Australia
Previous literature	NR	One time treatment	Italy
Classic text book	None	No subjective outcome and 1 time treatment; ITT analysis	Korea
TCM theory	Pain (AT: 3 dropouts; group A: headache, drowsiness (group B: 4 dropouts)		China
NR	NR	Inappropriate randomization method; the depth of acupuncture was different from personal states	China
NR	NR	Abstract only	German

acupuncture improved disease-specific and general quality of life compared with routine care alone.²³

DISCUSSION

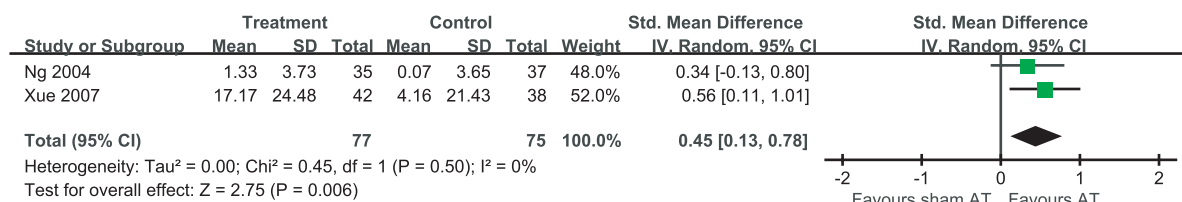
The totality of the evidence from RCTs of acupuncture for treating AR is mixed. The results for SAR fail to show specific effects of acupuncture. For PAR, the data suggest some effects for rhinitis or nasal symptoms compared with sham acupuncture or drug therapy. However, the number of trials and the total sample size are too small to draw any firm conclusion. Acupuncture provided no reduction in the use of medication when compared with sham acupuncture in both types of AR. Overall, our findings provide some suggestive evidence that acupuncture is beneficial for PAR.

Although most of the included trials used sham-control groups, none were flawless. Six RCTs of these trials^{13,15–19}

had small sample sizes ($n < 40$ for each group) and were thus prone to a type 2 error or exaggeration of the treatment effect.²⁷ Three RCTs^{12,19,20} included fewer than 10 sessions, which may be too little for obtaining a positive clinical outcome. Other trials seemed to have not been peer reviewed²³ or failed to include washout periods in crossover designs.¹⁵ Two trials provided acupuncture in a single session.^{19,20} One study included individuals who had received acupuncture treatment before entering the trial.¹⁶

Several sham acupuncture methods have been developed. These methods range from puncturing the skin outside acupoints, inserting needle on nonacupoints, or superficially puncturing the skin without stimulating. In the present systematic review, no evidence of the superiority of real acupuncture was found compared with sham acupuncture regardless of the acupuncture technique used. Nonpenetrating sham

(A) Total nasal symptoms of PAR (AT vs. sham AT)



(B) Response rate of PAR (AT vs. drug)

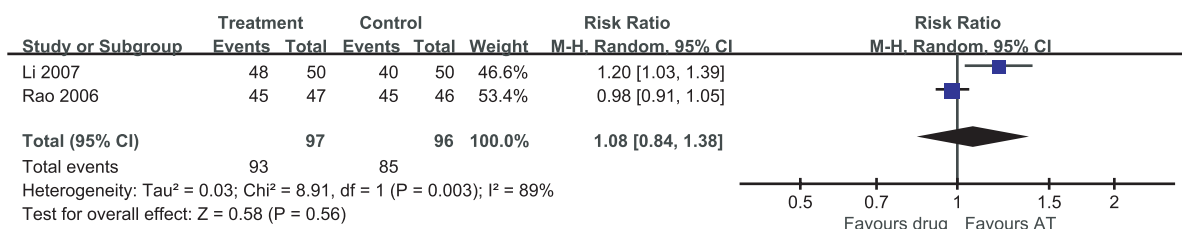


Figure 2. The effects of acupuncture. A, Total nasal symptoms of perennial allergic rhinitis (PAR), acupuncture vs sham acupuncture. B, Response rate of PAR, manual acupuncture (AT) vs pharmacologic drug. CI indicates confidence interval.

acupuncture was reported to be superior to placebo tablets for subjective pain outcomes.²⁸ This finding may suggest that the effects of needle acupuncture with or without electric stimulation could be nonspecific by nature. Three trials suggested positive effects of acupuncture on symptoms of AR compared with sham acupuncture in this review.^{15,17,18} However, these studies were too small to generate reliable findings. The success of blinding was evaluated in only 1 RCT.²⁰ To reliably account for the placebo effect, it is crucial that the placebo procedure is indistinguishable from the real treatment. Therefore, the success of the blinding procedures should always be evaluated and reported.

The results of this systematic review are consistent with several possible interpretations. Acupuncture might be ineffective, the studies inadequately designed, or the treatment not administered optimally in the existing studies. For instance, the number of treatment sessions could have been too small to generate a significant effect, treatment could have been suboptimal, or the protocol applied in the acupuncture group might not have been suitable for treating AR symptoms.

One could question the rationale for pooling data from only 2 trials. The main reasons for conducting meta-analyses is to increase power, improve precision, answer questions not posted by individual studies, settle controversies arising from conflicting results, and generate new hypotheses.²⁹ A meta-analysis can be performed by combining 2 or more trials. However, the use of statistics does not guarantee that the results are valid. In our case, conclusions have to remain tentative.

One argument for using acupuncture in the management of AR is that it might be safer than drug treatment. Eight

RCTs^{12,14–18,20,21} evaluated adverse events of acupuncture, and 4 studies^{13,19,22,23} did not. Two^{15,20} of them reported no adverse effects, and 6 studies^{12,14,16–18,21} reported mild adverse effects, such as pain, bruising, dizziness, numbness, and headache (approximately 9% of total participants). Relative to drug treatments these adverse effects may be infrequent or even negligible.^{30–33} Most adverse events were of mild severity and occurred with similar frequency among patients treated with real acupuncture and sham acupuncture. Two trials reported that the adverse effects of both real and sham acupuncture made study participants drop out^{16,21} because of pain, headache, or drowsiness. The authors reported that the occurrence was not significantly different compared with sham acupuncture.

One cost-effectiveness study of acupuncture for AR is available.³⁴ The mean estimated incremental health gain for acupuncture (16 sessions) above pharmacologic treatment was £18,250 per quality-adjusted life-year. The authors of that study³⁴ suggested that acupuncture is highly likely to be cost-effective, although there is little evidence for its effectiveness. The average outpatient payment of treating AR is approximately £284 for PAR and £237 for SAR per year per patient.³⁵ The mean cost for second-generation antihistamines is approximately £278 for PAR and £82 for SAR per year.³⁵ Therefore, total annual costs are approximately £564 for PAR and £334 for SAR. A frequency of up to 16 acupuncture sessions is required for treating AR.³⁴ Each session would cost approximately £24 (Cochrane 2002 cited in Roberts³⁴) to £43 (Netten and Cuttis 2002 cited in Vickers et al³⁶). This would amount to total direct costs of approximately £384 to £688. Thus, the direct costs for acupuncture might turn out not to be competitive, but reliable data are required.

Our review has a number of important limitations. Although strong efforts were made to retrieve all RCTs on the subject, we cannot be absolutely certain that our searches located all relevant RCTs. Another limitation of our review was not to seek the raw data from published trials and other unpublished sources known to experts in the field, both of which could be obtained by personal communication with those involved in such studies. Furthermore, selective publishing and reporting are other major causes for bias, which have to be considered. It is conceivable that several negative RCTs remained unpublished and thus distorted the overall picture.^{37–40} Such a publication bias cannot be ignored, and one might speculate that the conclusions could be less positive if more negative studies surfaced. Further limitations include the paucity and the often suboptimal quality of the primary data. Some of the RCTs included in the present review were not successful in minimizing bias. These facts limit the conclusiveness of this systematic review.

In conclusion, evidence of the effectiveness of acupuncture for the symptomatic treatment or prevention of AR is mixed. The results for SAR failed to show specific effects of acupuncture. For PAR, the results of our systematic review and meta-analysis provide suggestive evidence for effectiveness of acupuncture. However, the total number of RCTs included in the analysis and the total sample size were too small to draw firm conclusions about the effectiveness of this approach. Future RCTs should evaluate larger patient samples for longer treatment periods and include sham controls

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Objectives: After reading this article, participants should be able to demonstrate an increased understanding of their knowledge of allergy/asthma/immunology clinical treatment and how this new information can be applied to their own practices.

Participants: This program is designed for physicians who are involved in providing patient care and who wish to advance their current knowledge in the field of allergy/asthma/immunology.

Credits: ACAAI designates each Annals CME Review Article for a maximum of 2 category 1 credits toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity. The American College of Allergy, Asthma and Immunology is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.

CME Examination

1–7, Lee MS, Pittler MH, Shin B-C, et al. 2009;102:269–279.

CME Test Questions

1. Which condition or symptom is most widely treated with acupuncture?
 - a. pain
 - b. allergic rhinitis (AR)
 - c. asthma
 - d. insomnia
2. Which of the following statements is correct?
 - a. Acupuncture generates specific effects in seasonal AR.
 - b. Acupuncture generates promising effects in perennial AR.
 - c. Acupuncture generates effects in both seasonal and perennial AR.
 - d. Acupuncture does not generate effects in both seasonal and perennial AR.
3. Which of the following is not a common adverse event of acupuncture treatment?
 - a. pain
 - b. bruise
 - c. dizziness
 - d. vomiting
4. Which of the following acupoints is the most frequently used for treating AR?
 - a. LI4 (Hegu)
 - b. LI20 (Yingxiang)
 - c. GB20 (Fengchi)
 - d. ST36 (Zusanli)
5. According to prospective studies, the incidence of adverse events is:
 - a. 9%
 - b. 19%
 - c. 29%
 - d. 39%
6. Which meridian is the most frequently used for treating AR?
 - a. conception vessel (ren meridian)
 - b. governor vessel (du meridian)
 - c. bladder meridian
 - d. large intestine meridian
7. Which of the following criteria is not included in the modified Jadad scale?
 - a. randomization
 - b. patient blinded to intervention
 - c. practitioner blinded to intervention
 - d. description of withdrawals and dropouts

Answers on page 307.