Acupuncture as an Adjunctive Treatment for Angina Due to Coronary Artery Disease: A Meta-Analysis

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Source of support: Departmental sources

Background: In traditional Chinese medicine, acupuncture has been used to treat angina due to coronary artery disease (CAD). The aim of this systematic review of the literature and meta-analysis was to identify published randomized controlled trials (RCTs) that quantified the effectiveness of adjunctive acupuncture treatment in patients with angina due to CAD who were also treated with Western or Chinese medicine.

Material/Methods: A systematic review of the literature included a search of the PubMed, Embase, Cochrane library, and China National Knowledge Infrastructure (CNKI) databases, from their inception to September 2018. Published findings from RCTs were included that investigated the effectiveness of acupuncture as an adjunctive treatment for angina due to CAD in combination with Western or traditional Chinese medicine. The odds ratio (OR) and 95% confidence interval (CI) were calculated using the random-effects model to determine the outcomes of markedly and moderately effective rates for the use of acupuncture.

Results: Twenty-four published RCTs were identified that included 1,916 patients with CAD. Patients who received adjunctive acupuncture treatment had a significantly increased markedly effective rate. However, the moderately effective rate between adjunctive acupuncture combined with standard treatment for angina and standard treatment alone was not statistically significant. Sensitivity analysis showed that the pooled results for the markedly and moderately effective rates were robust. Subgroup analysis in most subsets supported the main findings.

Conclusions: Meta-analysis supported a positive treatment effect for the use of acupuncture when used as adjunctive therapy in patients with angina due to CAD.

MeSH Keywords: Acupuncture Therapy • Angina, Unstable • Coronary Artery Disease

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/913379

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Background

Although treatment strategies for patients with coronary artery disease (CAD) have shown marked improvements, CAD remains the most prevalent type of cardiovascular disease and the most common cause of mortality worldwide [1,2]. In India, the mortality rate for cardiovascular disease has been reported to be 235 in 100,000 people [3]. The clinical effects of CAD result from cardiac ischemia due to myocardial injury and necrosis. Angina can be the initial presenting symptom of CAD, and is associated with worse clinical outcome, irrespective of the presence of myocardial ischemia [4–6]. Therefore, early diagnosis of CAD and evaluation of the severity of this disease are important for preventing a serious adverse clinical outcome.

Medical treatment for the symptoms of CAD includes the use of β-blockers, and calcium antagonists, which are widely used in patients with angina and CAD [7,8]. Although these medical treatments result in a high rate of symptomatic relief, there remains a relatively high residual risk in patients with angina, which can cause severe clinical outcomes. In China, alternative therapies and traditional Chinese medicine, including acupuncture, have been used to treat the symptoms of CAD, and previously published studies have shown that acupuncture can be effective for relieving pain in patients with angina when combined with pharmacological treatment [9–12].

Although the mechanism of the therapeutic effects of acupuncture in patients with angina remains unclear, potential mechanisms may include effects on vascular endothelial function and cardiac function in myocardial ischemia, or effects on serum lipids, or inflammatory factors [13–15]. Therefore, the aim of this systematic review of the literature and meta-analysis was to identify published randomized controlled trials (RCTs) that quantified the effectiveness of adjunctive acupuncture treatment in patients with angina due to CAD who were also treated with Western or Chinese medicine.

Material and Methods

Data sources, search strategy, and selection criteria

This meta-analysis was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [16]. The meta-analysis included randomized control trials (RCTs) that were published in the English or Chinese language that studied acupuncture therapy for angina due to CAD. A systematic literature review was undertaken by searching electronic databases, including PubMed, Embase, the Cochrane library, and the China National Knowledge Infrastructure (CNKI), from their inception to September 2018. The search terms used were derived from the Medical Subject Headings (MeSH) terms from the National Library of Medicine (NLM) and included the following search terms: "acupuncture" AND "angina" AND "randomized controlled trials" AND "human". A manual search of the reference lists from the retrieved articles was also performed to identify any additional eligible published studies.

Two independent authors conducted the literature search and study selection process. Any disagreement was resolved by discussion until consensus was achieved. The inclusion criteria for the studies were based on the patient, intervention, control, outcome, and study design (PICOS) standards. Published studies were identified that included patients who were diagnosed with angina due to coronary artery disease (CAD); the intervention was simple acupuncture combined with standard treatment; the controls were patients treated with standard treatment alone; the study outcomes were reported markedly or moderately effective rates; the study design was randomized and controlled clinical studies. Studies that investigated the effectiveness of electro-acupuncture, hot needles, and moxibustion (heat therapy by burning plant material on the skin) were excluded. Observational studies and non-controlled clinical studies were excluded due to the possibility of the inclusion of uncontrolled confounders.

Data collection and quality assessment

Two authors collected the data from the identified publications and used a standard form containing pre-specified outcome data. The corresponding authors were contacted to obtain additional outcome data if these were not reported. Data obtained include the first author's surname, publication year, sample size, mean patient age, the percentage of male subjects, the duration of disease, standard treatment, and the duration of treatment. The Jadad scale (Oxford quality scoring system) was used to evaluate the methodological quality of the RCTs used in the meta-analysis [17], and scores ranged from 0–5, based on randomization, concealment of treatment, blinding, intention-to-treat analysis, and outcome evaluation. Two coauthors evaluated study quality, and an additional author adjudicated inconsistencies by referring to the original publication.

Statistical analysis

The evaluated outcomes were assigned into dichotomous categories in each RCT, and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated by event numbers and sample size in each group in individual trials before data pooling. The overall ORs for acupuncture combined with standard treatment compared with standard treatment alone on the markedly and moderately effective rates were calculated using a fixed-effect model and a random-effects model [18,19]. The pooled results

using the random-effects model were presented due to the assumption that the true underlying effect varied among the included RCTs [19]. Heterogeneity across the RCTs was investigated by using I^2 statistics (0–100%) and Q statistics, a form of chi-squared (χ^2) test. A value for I^2 >50.0% or P-value <0.10 for the Q statistic was considered to represent significant heterogeneity [20,21]. Sensitivity analysis for a markedly and moderately effective rate was conducted to evaluate the impact of each trial on the overall analysis [22]. Univariate meta-regression analysis was conducted for the markedly and the moderately effective rates based on publication year, sample size, mean age, the percentage of male subjects, disease duration, standard treatment, the duration of treatment, and the Jadad scale (Oxford quality scoring system) [23]. Also, subgroup analysis based on the above factors were also performed to evaluate the therapeutic effects of acupuncture in specific subpopulations. Publication bias for the markedly and moderately effective rates was calculated using funnel plots, and the results of Egger's test [24], and Begg's test [25]. All statistical analysis was conducted using STATA version 10.0 (Stata Corporation, College Station, TX, USA). A P-value <0.05 was considered to be statistically significant.

Results

Literature search

The initial search of the electronic databases initially identified 412 potentially relevant published studies, and 49 publications were retrieved after reviewing the titles and abstracts of the articles. Following the review of the full text, a total of 24 published randomized controlled trial (RCTs) that met the inclusion criteria were included in this meta-analysis [26–49]. Manual searches of the reference lists from the retrieved studies did not identify any additional eligible published RCTs. Figure 1 shows the flowchart of the protocol used for the literature search and study selection.

Characteristics of the identified published RCTs

In total, 24 RCTs involving 1,916 patients with angina due to coronary artery disease (CAD) were included in the meta-analysis. The studies included were published between 1999 and 2018, and sample size ranged from 40–200. The mean age of patients ranged from 45.9–65.1 years. Percentage of male subjects in the included studies ranged from 23.5–82.3%, mean duration of disease ranged from 1.7–10.4 years and treatment duration ranged from 10 days to 2 months. There were 18 RCTs that used Western medicine as the standard treatment for angina, and the remaining six RCTs used traditional Chinese medicine as standard treatment. Also, 20 of the included trials reported randomization and outcomes with a
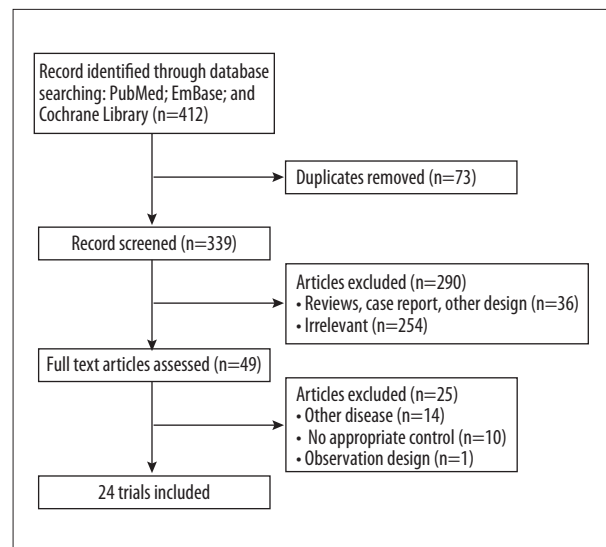
Figure 1. Flowchart of the literature search and publication selection process.

Jadad score of 2, whereas the remaining four RCTs had a Jadad score of 1. The characteristics of the studies and the patients are shown in Table 1.
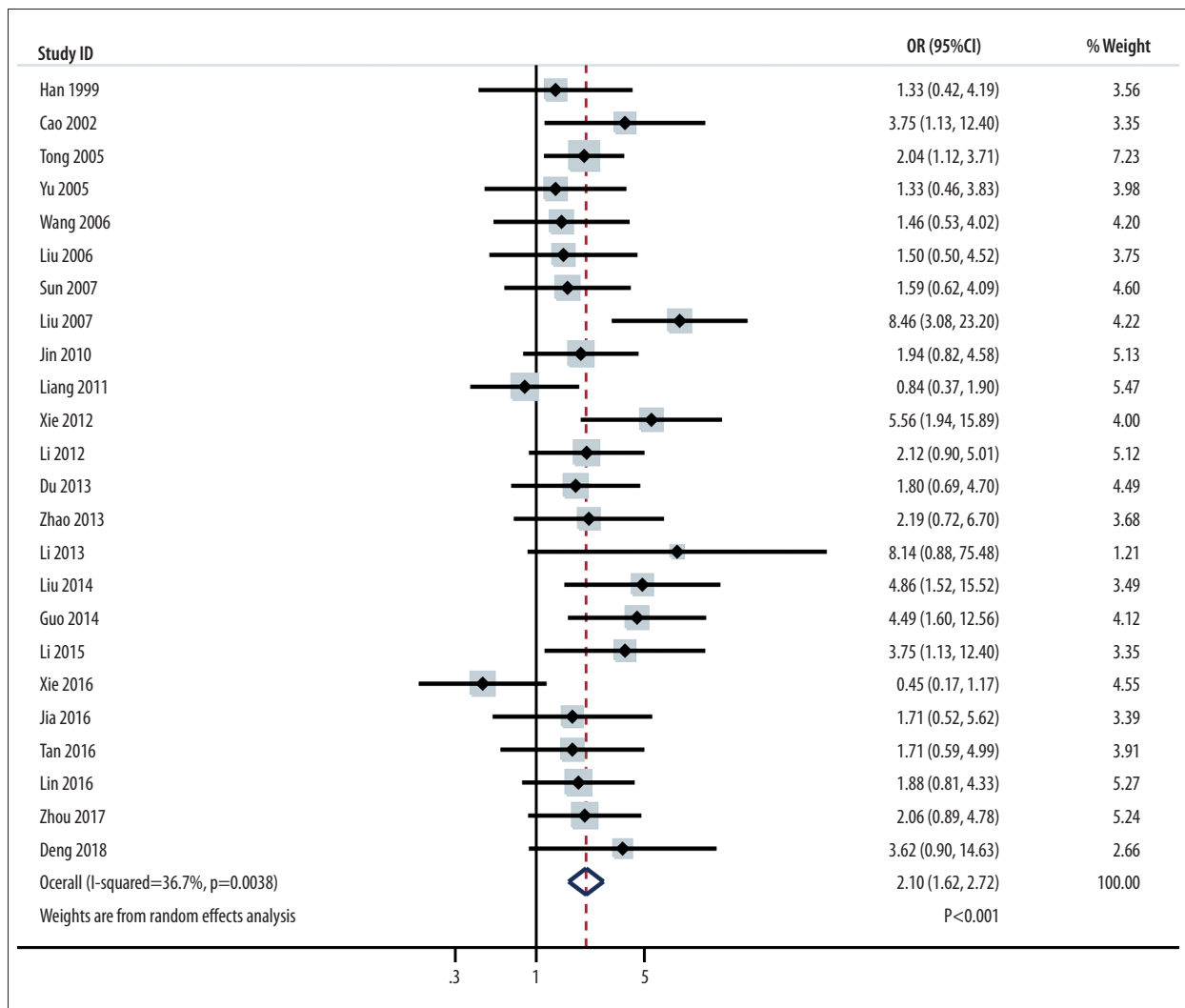
The markedly effective rate

All included studies reported the effectiveness of acupuncture on the incidence of the markedly effective rate in patients with angina due to CAD. Overall, patients who received acupuncture combined with standard treatment for angina had a significantly improved benefit in terms of the incidence of the markedly effective rate when compared with standard treatment alone (OR, 2.10; 95% CI, 1.62–2.72; P<0.001) (Figure 2). Potential heterogeneity was observed (I^2, 36.7%; P=0.038). Sensitivity analysis showed that the pooled result was stable after sequential exclusion of individual trials (Figure 3). Publication year (P=0.867), sample size (P=0.861), mean age (P=0.152), percentage of male subjects (P=0.687), disease duration (P=0.380), standard treatment (P=0.527), duration of treatment (P=0.952), and the Jadad score (P=0.855) were not found to have a significant role on the incidence of markedly effective rate based on univariate meta-regression analysis of pre-defined factors (Table 2). Subgroup analysis showed significant differences between acupuncture combined with standard treatment and standard treatment alone for the markedly effective rate in most subsets. However, no significantly increased benefit of acupuncture was observed if the pooled sample size of the trial was ≥100 (OR, 2.12; 95% CI, 0.92–4.89; P=0.079). The mean age of the patients was not available (OR, 1.59; 95% CI, 0.62–4.09; P=0.332) (Table 2).

Table 1. Baseline characteristic of studies included in the meta-analysis.

Study	Publication year	Sample size	Mean age (years)	Percentage male (%)	Duration of disease	Background therapy	Duration of treatment	JADAD scale
Han [26]	1999	70	58.1	60.0	7.8 years	Isosorbidedinitrate 10 mg×3/day	1.0 month	2
Cao [27]	2002	51	63.4	23.5	4.8 years	Isosorbidedinitrate 5–10 mg×3/day; aspirin 50–300 mg×3/day	15 days	1
Tong [28]	2005	200	62.9	57.5	1.9 years	Aspirin 150 mg; 5-Nitor sorbitol ester 40 mg/day, metoprolol 25 mg×2/day, simvastatin 20 mg/day	1.0 month	1
Yu [29]	2005	63	51.5	46.0	2.0 months-22.0 years	Nitroglycerin 5mg/day	14 days	2
Wang [30]	2006	62	63.6	45.2	NA	Aspirin 50 mg/day, metoprolol 12.5–25 mg/day, Isosorbide nitrate 10mg/day	1.0 month	2
Liu [31]	2006	62	57.5	82.3	2.1 years	5-Isosorbidemononitrate 20mg twice/day, diltiazem hydrochloride 30 mg 3 times/day and aspirin 50mg/day	1.0 month	2
Sun [32]	2007	108	32-76	63.0	0.5 months–12.0 years	Nitroglycerin 1mg/day, and diltiazem 60 mg 3 times/day	14 days	2
Liu [33]	2007	105	60.5	62.9	6.4 years	Isosorbidedinitrate 10 mg×3/day, metoprolol 12.5 mg×2/day, nifedipine 10 mg×2/day, and simvastatin 10 mg/day	10 days	2
Jin [34]	2010	93	54.1	60.2	2.0 months–25.0 years	Metoprolol 12.5 mg×2/day, aspirin 50 mg/day, simvastatin 10 mg/day	14 days	1
Liang [35]	2011	120	49.0	44.2	NA	Traditional Chinese medicine	1.0 month	2
Xie [36]	2012	67	60.6	61.2	NA	Isosorbidedinitrate 10–60 mg×3/day	1.0 month	2
Li [37]	2012	90	58.1	47.8	10.0 months–12.0 years	Nitrates, aspirin, and β receptor blocker	1.0 month	2
Du [38]	2013	80	59.4	62.5	NA	Metoprolol, aspirin, heparin	NA	1
Zhao [39]	2013	60	60.0	48.3	7.9 years	Isosorbidemononitrate 50 mg/day, trimetazidinedihydrochloride 20 mg×3/day	20 days	2
Li [40]	2013	40	59.9	35.0	NA	Traditional Chinese medicine	1.0 month	2
Liu [41]	2014	65	53.9	67.7	NA	Traditional Chinese medicine	1.0 month	2
Guo [42]	2014	68	49.9	57.4	3.0 months-15.0 years	Isosorbidemononitrate 20 mg/day, aspirin 80 mg/day	14 days	2
Li [43]	2015	51	45.9	27.5	3.4 years	Isosorbidedinitrate 5–10 mg×3/day; aspirin 50–300 mg×3/day	30 days	2
Xie [44]	2016	80	55.1	70.0	NA	Traditional western medicine	NA	2

Table 1 continued. Baseline characteristic of studies included in the meta-analysis.

Study	Publication year	Sample size	Mean age (years)	Percentage male (%)	Duration of disease	Background therapy	Duration of treatment	JADAD scale
Jia [45]	2016	60	58.6	46.7	NA	Aspirin 100 mg/day, metoprolol 6.25–25 mg/day, Isosorbide nitrate 10 mg×3 times/day, atorvastatin 10 mg/day	1.0 month	2
Tan [46]	2016	65	65.1	47.7	7.3 years	Traditional Chinese medicine	1.0 month	2
Lin [47]	2016	90	51.9	48.9	10.4 years	Traditional Chinese medicine	2.0 months	2
Zhou [48]	2017	90	59.3	46.7	4.1 years	Traditional Chinese medicine	1.0 month	2
Deng [49]	2018	76	56.8	64.5	1.7 years	Nitrates, β-blockers, ca-antagonists, angiotensin converse enzyme inhibitors	1.0 month	2

Study ID	OR (95%CI)	% Weight
Han 1999	1.33 (0.42, 4.19)	3.56
Cao 2002	3.75 (1.13, 12.40)	3.35
Tong 2005	2.04 (1.12, 3.71)	7.23
Yu 2005	1.33 (0.46, 3.83)	3.98
Wang 2006	1.46 (0.53, 4.02)	4.20
Liu 2006	1.50 (0.50, 4.52)	3.75
Sun 2007	1.59 (0.62, 4.09)	4.60
Liu 2007	8.46 (3.08, 23.20)	4.22
Jin 2010	1.94 (0.82, 4.58)	5.13
Liang 2011	0.84 (0.37, 1.90)	5.47
Xie 2012	5.56 (1.94, 15.89)	4.00
Li 2012	2.12 (0.90, 5.01)	5.12
Du 2013	1.80 (0.69, 4.70)	4.49
Zhao 2013	2.19 (0.72, 6.70)	3.68
Li 2013	8.14 (0.88, 75.48)	1.21
Liu 2014	4.86 (1.52, 15.52)	3.49
Guo 2014	4.49 (1.60, 12.56)	4.12
Li 2015	3.75 (1.13, 12.40)	3.35
Xie 2016	0.45 (0.17, 1.17)	4.55
Jia 2016	1.71 (0.52, 5.62)	3.39
Tan 2016	1.71 (0.59, 4.99)	3.91
Lin 2016	1.88 (0.81, 4.33)	5.27
Zhou 2017	2.06 (0.89, 4.78)	5.24
Deng 2018	3.62 (0.90, 14.63)	2.66
Ocerall (I-squared=36.7%, p=0.0038)	2.10 (1.62, 2.72)	100.00
Weights are from random effects analysis	P<0.001	

Figure 2. Effect of acupuncture as adjunctive therapy on the incidence of the markedly effective rate.
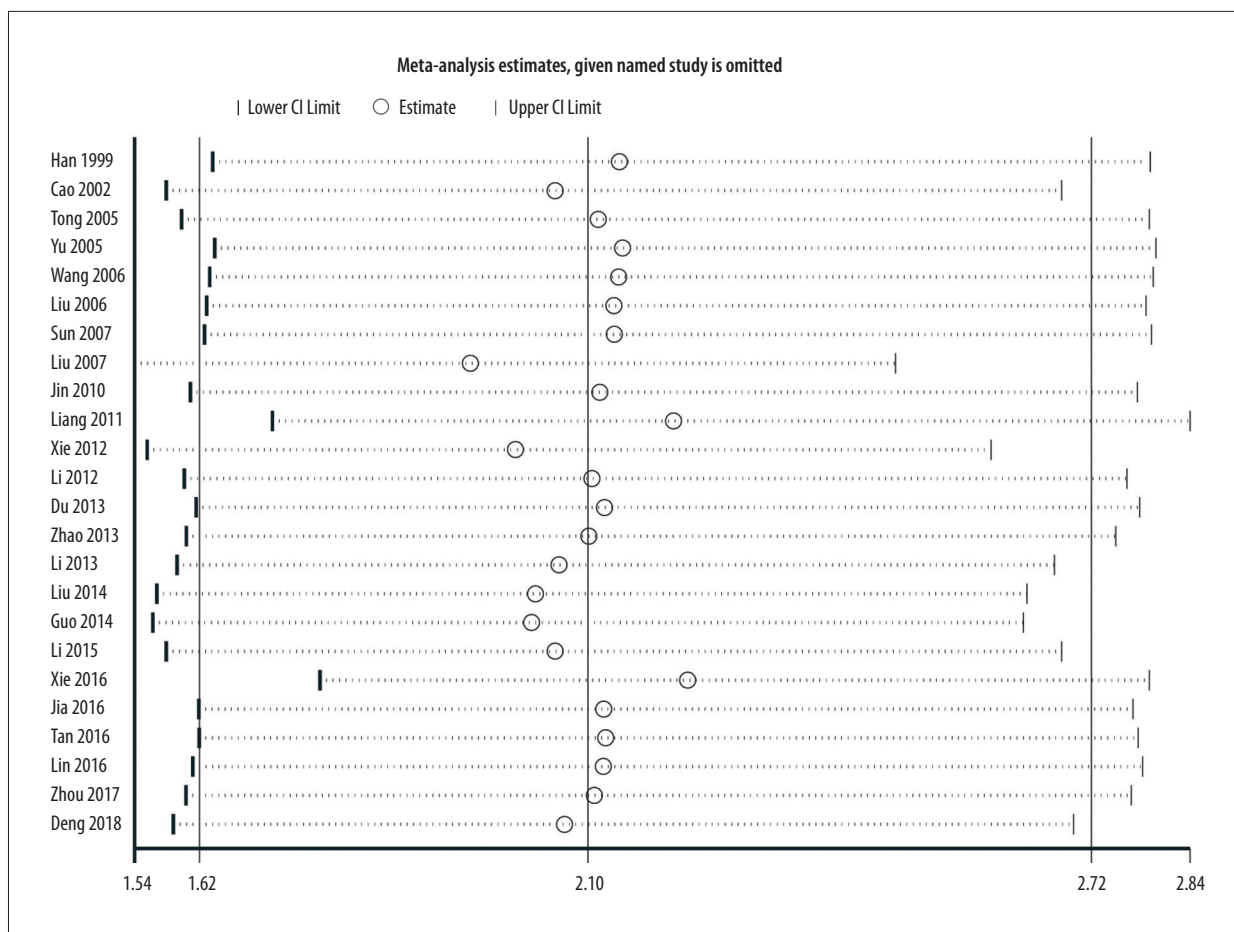
Figure 3. Sensitivity analysis for the markedly effective rate.

The moderately effective rate

A total of 23 trials reported the effectiveness of acupuncture on the incidence of the moderately effective rate in patients with angina due to CAD. The overall, there was no significant difference between acupuncture combined with standard treatment and standard treatment alone on the incidence of a moderately effective rate (OR, 0.98; 95% CI, 0.80–1.21; P=0.876) (Figure 4). Non-significant heterogeneity was observed (I^2, 11.9%; P=0.298). Sensitivity analysis indicated that the results were not altered by the sequential exclusion of any particular trial (Figure 5). The results of univariate meta-regression analysis showed that publication year (P=0.501), sample size (P=0.306), mean age (P=0.603), percentage of male subjects (P=0.271), disease duration (P=0.727), standard treatment (P=0.871), duration of treatment (P=1.000), and the Jadad score (P=0.705) did not significantly influence the effectiveness of acupuncture on the incidence of the moderately effective rate. No significant differences between acupuncture combined with standard treatment and standard treatment alone on the incidence of the moderately effective rate were observed in all subsets (Table 3).

Publication bias

The symmetry of the funnel plot for the markedly effective rate was moderate, and Egger's and Begg's test results showed no significant publication bias for the incidence of the markedly effective rate (Egger's test, P=0.122; Begg's test, P=0.197) (Figure 6). Also, the symmetry of funnel plot for the moderately effective rate was good, and the Egger's and Begg's tests results showed no evidence of publication bias for the incidence of the moderately effective rate (Egger's test, P=0.716; Begg's test, P=0.616) (Figure 7).

Discussion

Currently, in China, the use of Western medicines are still the gold standard for the treatment of angina due to coronary artery disease (CAD) because of the limited availability of effective noninvasive treatment strategies. The current meta-analysis was designed to pool the evidence regarding acupuncture as adjunctive therapy for patients with angina due to CAD. In total, 1,916 patients with CAD from 24 randomized controlled

Table 2. Subgroup analysis for markedly effective rate.

Subgroups	Number of cohorts	OR (95% CI)	P value	I² (P value)	P value of univariate meta-regression
Publication year					
Before 2010	8	2.11 (1.38–3.23)	0.001	35.0 (0.149)	0.867
2010 or after	16	2.11 (1.51–2.96)	<0.001	41.3 (0.043)	
Sample size					
≥100	4	2.12 (0.92–4.89)	0.079	75.9 (0.006)	0.861
<100	20	2.10 (1.61–2.73)	<0.001	20.4 (0.202)	
Mean age (years)					
≥60.0	7	2.86 (1.77–4.61)	<0.001	40.7 (0.120)	
<60.0	16	1.85 (1.35–2.54)	<0.001	33.2 (0.096)	0.152
NA	1	1.59 (0.62–4.09)	0.332	– (–)	
Percentage of male patients (%)					
≥60.0	10	2.24 (1.30–3.87)	0.004	63.5 (0.003)	0.687
<60.0	14	1.98 (1.53–2.56)	<0.001	0.0 (0.566)	
Disease duration (years)					
≥2.0	9	2.44 (1.67–3.56)	<0.001	17.1 (0.290)	
<2.0	2	2.23 (1.29–3.87)	0.004	0.0 (0.459)	0.380
NA	13	1.88 (1.26–2.82)	0.002	50.5 (0.019)	
Background therapy					
Western medicine	18	2.16 (1.59–2.92)	<0.001	39.1 (0.046)	0.527
Chinese medicine	6	1.95 (1.15–3.32)	0.014	37.9 (0.153)	
Treatment duration (month)					
1.0	15	2.05 (1.57–2.66)	<0.001	5.5 (0.391)	0.952
<1.0	9	2.12 (1.23–3.68)	0.007	62.8 (0.006)	
JADAD scale					
2	20	2.11 (1.53–2.90)	<0.001	46.1 (0.013)	0.855
1	4	2.12 (1.41–3.19)	<0.001	0.0 (0.791)	

trials (RCTs) were included. The results of this meta-analysis showed that acupuncture combined with standard therapy resulted in a stabilizing effect in improving the markedly effective rate. However, the moderately effective rate was not statistically significant. The therapeutic effects of acupuncture for angina due to CAD did not differ according to publication year, sample size, mean age, the percentage of male subjects, disease duration, standard treatment, duration of treatment, and the Jadad score (Oxford quality scoring system).

Previously published systematic reviews have reported the effectiveness of acupuncture in patients with CAD. Zhang et al. conducted a meta-analysis of eight RCTs and found that the addition of acupuncture therapy significantly reduced the symptoms of angina and improved electrocardiography measures when compared with conventional drug treatment alone [9]. No significant differences were observed for the outcomes of the overall effective rate related to the reduction of nitroglycerin use [9]. Also, nitroglycerin treatment and time to the onset of angina relief were significantly improved in patients who
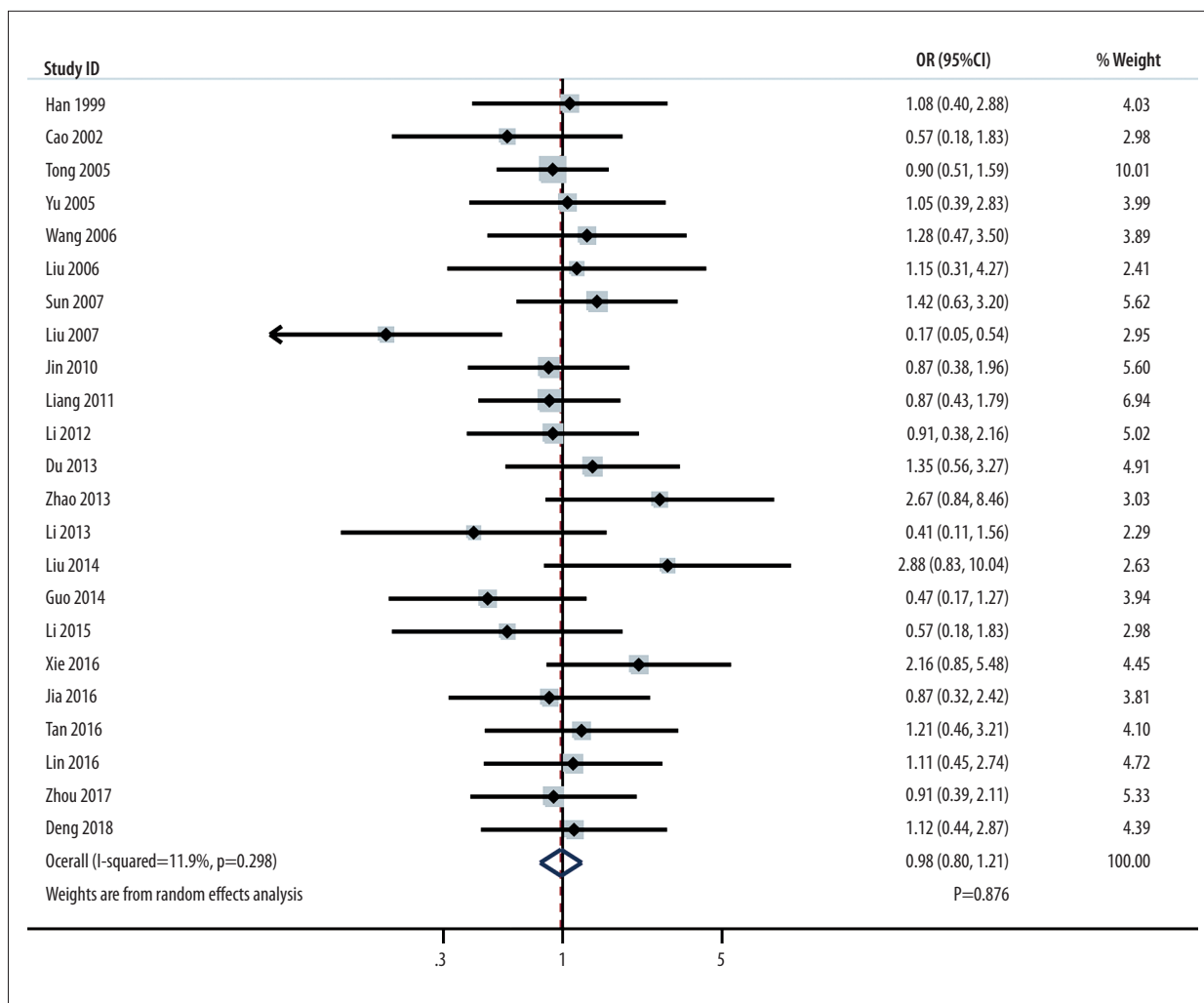
Figure 4. Effect of acupuncture adjunctive therapy on the incidence of the moderately effective rate.

received acupuncture treatment [9]. However, conventional drugs were not given to the patients in the acupuncture group, and the additional therapeutic effects of acupuncture were not evaluated [9]. Yu et al. showed that the use of acupuncture significantly improved the symptoms of angina and electrocardiography finding in patients with angina, with no added risk of adverse events [10]. However, this study did not distinguish between the types and sources of angina [10]. Also, the results of stratified analysis based on follow-up duration and disease status might have resulted in bias due to various interventions, which included simple acupuncture, electroacupuncture, and fire needle therapy [10]. A review of studies on acupuncture therapy alone for the treatment of angina showed efficacy of between 80–96.2%, which was almost as effective as conventional drug treatment [11]. Chen et al. showed that acupuncture combined with the use of conventional drug treatment resulted in an improved benefit in terms of the incidence of acute myocardial infarction and relief of angina and also improved the electrocardiography (ECG) findings [12]. Also, acupuncture

therapy alone was shown to be superior to conventional drugs in terms of the rate of angina occurrence, improvement in ECG changes, and time to onset of angina relief [12]. However, the therapeutic effects of acupuncture combined with conventional therapy in patients with specific characteristics were not evaluated [12]. Therefore, the current comprehensive quantitative meta-analysis based on RCTs was conducted to determine the effectiveness of acupuncture combined with standard treatment when compared with standard treatment alone in patients with angina due to CAD.

Meta-analysis showed that acupuncture as an adjunctive therapy was associated with an increased incidence of a markedly effective rate. Although most individual trials reported no significant difference between acupuncture combined with standard treatment and standard treatment alone, the reason for this lack of difference could be the net therapeutic effects of acupuncture was smaller and contributed a broad 95% confidence interval (CI). However, there was a non-significant trend of the
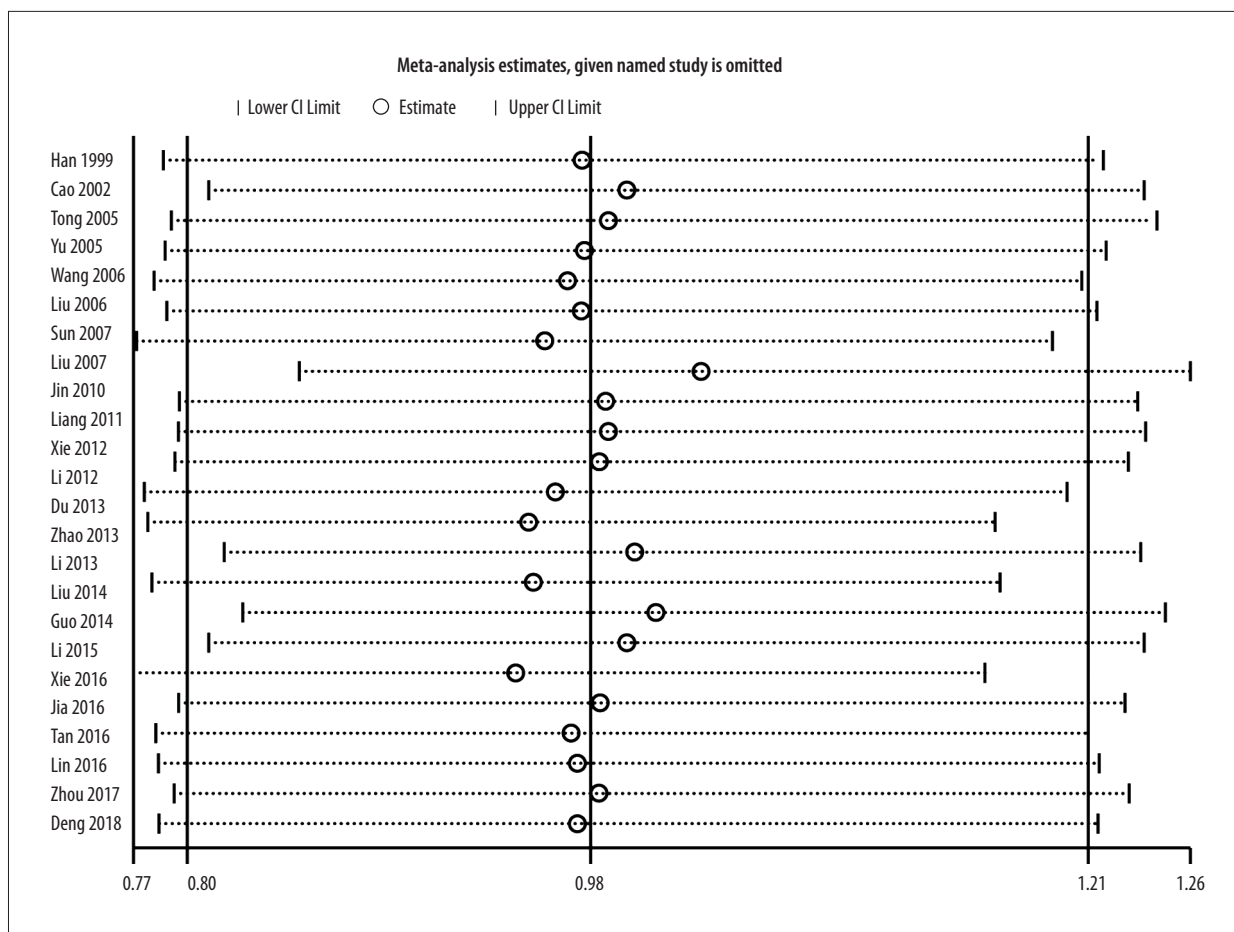
Figure 5. Sensitivity analysis for the moderately effective rate.

benefit of acupuncture in patients with angina due to CAD. The potential explanation for this could be that unstable angina is categorized as chest tightness and pain in traditional Chinese medicine, and the source of angina might include imbalances in function of the heart, spleen, and kidney. Acupuncture might improve the Chinese complementary changes of yin, yang, and vital energy deficiency of the coronary arteries and veins and eliminate blood stagnation. No significant difference was observed between acupuncture combined with standard treatment and standard treatment alone for the incidence of the moderately effective rate, which could be because most patients reported a markedly effective rate, and fewer patients reported a moderately effective rate, resulting in an outcome bias. Therefore, the overall result of the moderately effective rate for adjunctive treatment with acupuncture in patients with angina due to CAD does not provide a definitive conclusion, and future controlled studies are required.

The significant differences between adjunctive treatment with acupuncture combined with other treatments and standard treatment alone for the incidence of the markedly and the moderately effective rates in most subsets were consistent with the overall analysis. However, inconsistent results for the markedly effective rate were found in RCTs with a sample size of ≥100, and the mean age of patients was not available. The reason for this could be that a smaller number of trials were included in these subsets and the power was not enough to detect potential differences between acupuncture combined with standard treatment and standard treatment alone. Also, although there were no significant differences between subgroups, the overall results for patient mean age ≥60.0 years, the percentage of male patients ≥60.0%, disease duration ≥2.0 years, and the use of Western medicine as standard treatment resulted in an increased incidence of the markedly effective rate than the corresponding subsets. The potential reasons included high symptom scores in elderly patients with angina, significant differences of lifestyles and habits between men and women, and the severity of angina might correlate with disease duration, and high residual risk of angina in patients who received Western medicine. These factors indicate that standard therapy must be used for the treatment of angina and that acupuncture should be considered only as an adjunctive treatment. However, these results require further validation with large-scale controlled clinical studies.

**Table 3.** Subgroup analysis for moderate effective rate.

Subgroups	Number of cohorts	OR (95% CI)	P value	I² (P value)	P value of univariate meta-regression
Publication year					
Before 2010	8	0.87 (0.58–1.32)	0.524	33.4 (0.161)	0.501
2010 or after	15	1.04 (0.81–1.33)	0.768	0.0 (0.449)	
Sample size					
≥100	4	0.74 (0.38–1.46)	0.385	66.4 (0.030)	0.306
<100	19	1.05 (0.83–1.32)	0.682	0.0 (0.663)	
Mean age (years)					
≥60.0	6	0.87 (0.46–1.63)	0.654	60.7 (0.026)	
<60.0	16	0.99 (0.78–1.26)	0.958	0.0 (0.735)	0.603
NA	1	1.42 (0.63–3.20)	0.403	– (–)	
Percentage of male patients (%)					
≥60.0	9	1.12 (0.72–1.76)	0.613	46.9 (0.058)	0.271
<60.0	14	0.90 (0.71–1.15)	0.420	0.0 (0.797)	
Disease duration (years)					
≥2.0	9	0.87 (0.55–1.37)	0.539	39.2 (0.102)	
<2.0	2	0.96 (0.59–1.56)	0.863	0.0 (0.701)	0.727
NA	12	1.06 (0.81–1.38)	0.682	0.0 (0.452)	
Background therapy					
Western medicine	17	0.97 (0.75–1.25)	0.804	20.3 (0.217)	0.871
Chinese medicine	6	1.02 (0.69–1.49)	0.927	0.0 (0.433)	
Treatment duration (month)					
1.0	14	0.98 (0.77–1.25)	0.874	0.0 (0.934)	1.000
<1.0	9	0.95 (0.58–1.56)	0.838	57.2 (0.017)	
JADAD scale					
2	19	1.00 (0.77–1.30)	0.990	23.2 (0.175)	0.705
1	4	0.92 (0.62–1.36)	0.677	0.0 (0.705)	

The main limitations of this study included the quality of the studies identified and the blinding of patient treatment. The intention to treat analysis was not reported in most included RCTs. Also, the overall results had low confidence levels. The other limitations included heterogeneity across included trials that was not fully analyzed due to missing data on patient characteristics. Also, this meta-analysis was based on published RCTs, and gray literature and unpublished data were not included, which may have caused publication bias. Detailed analysis was not conducted due to missing individual data.

However, this meta-analysis of a systematic review of the literature showed that patients with CAD who received acupuncture as an adjunctive therapy for angina showed an increase in the incidence of the markedly effective rate, but no significant change in the incidence of the moderately effective rate. Large-scale RCTs should be conducted for patients with specific characteristics of angina to verify the results of the subgroup analysis.
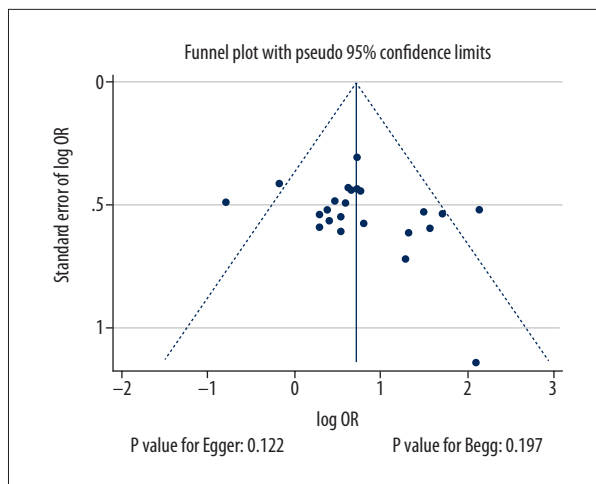
Figure 6. Funnel plot for the markedly effective rate.
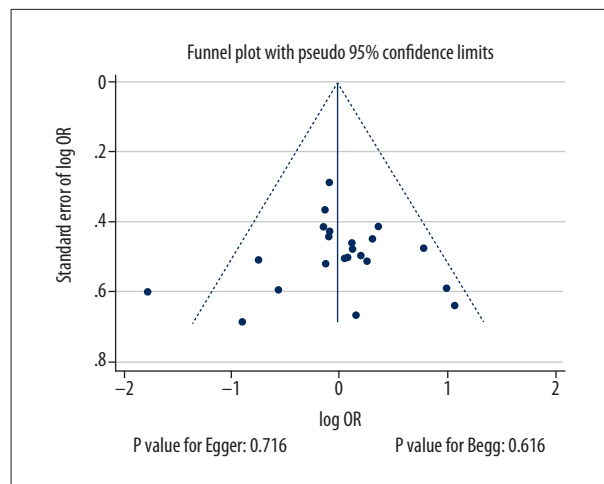
Figure 7. Funnel plot for the moderately effective rate.

Conclusions

The findings from a quantitative meta-analysis showed that acupuncture combined with standard treatment for patients with angina due to coronary artery disease (CAD) resulted in

an additional benefit on the markedly effective rate. Given the low quality of studies included, these results are not conclusive, and further high-quality and large-scale randomized clinical trials (RCTs) are required to verify the therapeutic effects of acupuncture for angina due to CAD.

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