Research Article

Network Meta-Analysis of Acupoint Catgut Embedding in Treatment of Simple Obesity

Zhuo-yuan Wang,1,2 Xiao-yan Li,1,2 Xiao-jun Gou,1,2 Chun-lan Chen,1,2 Zun-yuan Li,1,2 Chuang Zhao,1,2 Wen-ge Huo,1,2 Yu-hong Guo,1,2 Yan Yang,1,2 and Zhi-dan Liu1,2

1Baoshan Hospital affiliated to Shanghai University of Traditional Chinese Medicine, Shanghai 201999, China
2Baoshan District Hospital of Integrated Traditional Chinese and Western Medicine of Shanghai, Shanghai 201999, China

Correspondence should be addressed to Xiao-yan Li; lxy_0220@163.com and Xiao-jun Gou; gouxiaojun1975@163.com

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Objective. To evaluate the clinical efficacy of acupoint catgut embedding in the treatment of simple obesity through network meta-analysis.

Methods. PubMed, Cochrane, Embase, China National Knowledge Infrastructure (CNKI), Wanfang, and VIP database (VIP) were searched by using computer from 2011 to August 2021, and 35 RCT studies were retrieved. The quality of the literature was evaluated using the modified Jadad scoring table, and Stata 15.0 software was used for traditional meta-analysis and network meta-analysis. Results. Thirty-five RCTs (3040 cases in total) were included. Acupoint embedding, acupuncture, electroacupuncture, TCM, acupoint embedding + acupuncture, acupoint embedding + exercise diet therapy, acupoint embedding + TCM, exercise diet therapy, acupoint embedding + moxibustion, and acupoint embedding + cupping were investigated in the studies. The results of network meta-analysis were as follows: in terms of total effective rate, acupoint catgut embedding was superior to acupuncture, electroacupuncture, and exercise diet therapy \( (P < 0.05) \); electroacupuncture, acupoint catgut embedding + acupuncture, acupoint catgut embedding + exercise diet therapy, acupoint catgut + TCM, acupoint catgut + moxibustion, and acupoint catgut embedding + cupping were superior to acupuncture \( (P < 0.05) \); acupoint catgut + moxibustion was superior to electroacupuncture \( (P < 0.05) \); acupoint catgut + TCM, acupoint catgut + moxibustion, and acupoint catgut + cupping were superior to TCM treatment \( (P < 0.05) \); and electroacupuncture, acupoint catgut, acupoint catgut + acupuncture, acupoint catgut + exercise diet therapy, acupoint catgut + TCM, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were superior to sports diet therapy \( (P < 0.05) \). Regarding weight loss, acupuncture treatment was superior to acupoint catgut embedding therapy \( (P < 0.05) \); acupoint catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were superior to acupuncture and electroacupuncture treatment \( (P < 0.05) \); acupoint catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, and acupoint catgut embedding + moxibustion were superior to TCM treatment \( (P < 0.05) \); and acupoint catgut embedding, acupoint catgut embedding + acupuncture, catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were superior to exercise diet therapy \( (P < 0.05) \). In terms of BMI reduction, acupoint catgut embedding + moxibustion and acupoint catgut embedding + cupping were more evident than acupuncture treatment \( (P < 0.05) \); and acupoint catgut embedding + moxibustion was more evident than electroacupuncture treatment \( (P < 0.05) \). Conclusion. Acupoint catgut embedding and its combination with other therapies are the first choice for the treatment of simple obesity.

1. Introduction

Obesity is a chronic disease due to excessive accumulation or abnormal distribution of fat in the body [1]. Simple obesity is a kind of obesity caused by excessively more intake than consumption, excluding other diseases or medical factors [2]. Simple obesity is now an epidemic health problem, leading to higher incidence of other diseases. Excessive fat accumulation in the body is an important manifestation of obese people, resulting in a higher body mass index (BMI).
than normal [3]. Over the past few decades, obesity has been considered to be the result of unbalanced intake and consumption of high-calorie diet. The survey shows that from 1993 to 2015, the prevalence of overweight and obesity, especially abdominal obesity, increased significantly among Chinese adults [4]. Obesity is the main risk factor of dyslipidemia and cardiovascular disease (CVD) [5]. At present, there are many treatment methods for obesity. Some literature studies show that acupoint catgut embedding and joint use with other therapies can improve the effective rate of treatment for simple obesity and reduce the BMI of patients [6]. This study used network meta-analysis to compare the efficacy of acupoint catgut embedding and its combination with other methods in the treatment of simple obesity, so as to provide some evidence support for clinical adjuvant therapy.

2. Data and Methods

2.1. Methods. PubMed, Cochrane, Embase, China National Knowledge Infrastructure (CNKI), Wanfang, and VIP Database (VIP) were selected as databases. "Catgut embedding at acupoints", "simple obesity", and "obesity" were Chinese and English search terms. The combination of subject headings and free words was the retrieval method. Title, abstract and keywords or Title, Abstract and Keywords were used as search entries. From the establishment of the database to August 2021 was the time for publication of the literature.

2.2. Inclusion and Exclusion Criteria. The inclusion criteria of the literature were as follows: (1) patients who met the diagnostic criteria established by the Fifth National Obesity Academic Research Conference [7]; (2) type of study: RCTs were included according to the criteria in the Cochrane Collaborative Workbook; (3) intervention measures: the baseline data were complete, and at least two groups were included. Catgut embedding therapy was used in the test group, and the main indicators were drug response rate, body weight change, and BMI; and (4) languages were limited to Chinese and English.

The exclusion criteria were as follows: (1) non-randomized control; (2) literature with a sample size of less than 10 or repeated publications; (3) studies with incomplete data and lack of rigorous study design; and (4) studies with unclear efficacy outcome evaluation and analysis.

2.3. Literature Evaluation. The quality of the literature was assessed using the risk of bias assessment tool provided by the Cochrane Collaboration. The following items were considered: (1) the generation of the random assignment plan, (2) whether the patients and doctors were blinded, (3) whether the outcome evaluation was blinded or not, (4) whether it was a hidden allocation scheme, (5) whether it was a selected study result, (6) whether the result data were complete or not, and (7) whether there was other bias.

The quality of the included literature was evaluated on a scale of 1 to 7 using the modified Jadad scale from the aspects of random sequence generation, randomization concealment, blinding, and complete follow-up. Scores 1–3 were considered low quality and 4–7 high quality.

2.4. Data Extraction. According to the above principles, two researchers independently searched and screened the literature and evaluated the quality of the final included results using EndNote software. In case of any disagreement, the third researcher would join and make a decision.

2.5. Statistical Processing. Body weight and BMI were numerical variables. The difference between the variables before and after treatment was used to calculate the standard deviation of the variable difference with the help of the correlation coefficient (R = 0.5), and 95% confidence intervals (CI) of the median and percentile of the difference were estimated. Effectiveness was count data, for which the odds ratio (OR) was used for statistical analysis, and with 95% CI calculated. The heterogeneity analysis was performed using the $I^2$ value. If $I^2<50\%$, the heterogeneity was small and could be ignored, and the fixed effect model was used. If $I^2>50\%$, the heterogeneity was large, and the random effect model was used.

STATA15.0 software was used to draw the network evidence relationship diagram, forest plot, rank probability diagram, and funnel plot with corresponding statistics, and the consistency test was used to compare the ring consistency. In this study, the surface under the cumulative ranking curve (SUCRA) was used to calculate the cumulative ranking probability of each treatment regimen. A higher SUCRA value indicates more effective intervention.

3. Literature Search Results

3.1. Literature Search. Using the above retrieval strategies, 2385 studies were retrieved from the databases, 864 duplicate studies were deleted, 1470 studies that obviously did not meet the inclusion criteria were excluded according to the title and abstract, and 51 were initially included. After intensive reading of the full text, 16 substandard studies were excluded, and finally 35 RCTs were included. The document screening process is shown in Figure 1.

3.2. Basic Information of Included Literature. The included 35 RCTs were all from China, with a total of eligible 3040 patients. Acupoint catgut embedding, acupuncture, electroacupuncture, TCM, acupoint catgut embedding + acupuncture, acupoint catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, exercise diet therapy, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were used mainly for treatment. The basic characteristics of the included literature studies are shown in Table 1.
3.3. Literature Quality Research. In the included literature, there were 15 studies [12, 16, 18, 19, 21, 22, 24, 26, 28, 34, 36, 38, 39, 41, 42] using the random number table method, 16 studies [10, 11, 13–15, 17, 20, 23, 25, 27, 29–32, 37, 40] only presented random, 1 study [33] used the treatment method, 1 study [8] adopted the odd-even numbering method, 1 study [9] used the envelope assignment method, 1 study [35] used the odd and even admission numbers, 1 study [24] mentioned single-blindness, no study mentioned allocation concealment, and all study results data were complete. See Table 2 for details.

3.4. Traditional Meta-Analysis Results. Meta-analysis showed that the total effective rate of acupoint catgut embedding + TCM treatment, acupoint catgut embedding + moxibustion treatment, and acupoint catgut embedding + cupping treatment was more evident than that by acupoint catgut embedding treatment alone, acupoint embedding + TCM treatment was superior to TCM treatment, acupoint embedding treatment was superior to acupuncture, acupoint catgut embedding was superior to electroacupuncture, acupoint catgut embedding + exercise diet therapy was superior to exercise diet therapy, and there was no significant difference in other direct comparison results. The meta-analysis results are shown in Table 3.

3.5. Results of Network Meta-Analysis

3.5.1. Evidence Network. The results of the total effective rate were as follows: the acupoint embedding was the center point, and the star-shaped structure of 10 intervention nodes formed 6 triangular closed loops, which were acupoint embedding-acupuncture-acupoint embedding + acupuncture, acupoint embedding-electrical acupuncture-exercise diet therapy, acupoint embedding-acupuncture-acupoint embedding + cupping, acupoint embedding-TCM-acupoint embedding + TCM, and acupoint embedding-acupoint embedding + exercise diet therapy-exercise diet therapy.

The reduction of body mass was as follows: the star-shaped structure of 9 intervention nodes centered on acupoint embedding, forming a total of 5 triangular closed loops, namely, acupoint embedding-acupuncture-acupoint embedding + TCM, acupoint embedding-acupuncture needling-acupoint catgut embedding + cupping, acupoint catgut embedding-electroacupuncture-exercise diet therapy, acupoint catgut embedding-TCM-acupoint catgut embedding + TCM, and acupoint catgut embedding-acupoint catgut embedding + exercise diet therapy-exercise diet therapy.

The reduction of BMI was as follows: the star-shaped structure with 9 intervention nodes centered on acupoint embedding, forming a total of 5 triangular closed loops, namely, acupoint embedding-acupuncture-acupoint embedding + TCM, acupoint embedding-acupuncture-catgut embedding + cupping, catgut embedding-electroacupuncture-sports diet therapy, acupoint catgut-TCM-acupoint catgut embedding + TCM, and acupoint catgut-acupoint catgut embedding + exercise diet therapy-exercise diet therapy. The network evidence graph results are shown in Figures 2–4.

3.5.2. Consistency Test. The variable of the total effective rate of treatment contained 6 closed loops, the lower limit of the 95% CI of the 5 loop inconsistency factors (IFs) after the consistency test was 0, there was no obvious inconsistency, and the 95% lower limit of 1 closed loop IF was 0.16, failing to reach 0. Inconsistency was statistically significant, indicating inconsistency.

The decrease in body mass involved 5 closed loops, the lower limit of the 95% CI of the discordance factor IF contained 0, and there was no significant discordance.
| Author and year | Interventions | Number (male/female) | Age (years) | Interventions | Number (male/female) | Age (years) | Interventions | Number (male/female) | Age (years) | Period of treatment (week) | Evaluation standard course of disease |
|-----------------|---------------|----------------------|-------------|---------------|----------------------|-------------|---------------|----------------------|-------------|-----------------------------|----------------------------------|
| Luo Liangqi 2016 [8] | Acupoint catgut embedding | 30 (11/19) | 32.8 ± 3.6 | Acupuncture | 30 (10/20) | 31.6 ± 4.3 | 4/4 | (1) |
| Zhou Wei 2020 [9] | Acupoint catgut embedding | 45 | 21–45 | Electroacupuncture | 45 | 21–45 | 8/8/8 | (1) (2) (3) (4) (5) |
| Li Miaomiao 2017 [10] | Acupoint catgut embedding | 30 (4/26) | 18–58 | Electroacupuncture | 30 (4/26) | 25–53 | 4/4 | (1) (2) (3) |
| Zheng Xi 2020 [11] | Acupoint catgut embedding + moxibustion | 48 (24/24) | 41.97 ± 15.22 | Acupoint catgut embedding | 48 (25/23) | 42.15 ± 15.69 | 8/8 | (1) (2) (3) (6) (7) (8) |
| Duan Xiaorong 2017 [12] | Acupoint catgut embedding + cupping | 50 (11/39) | 35.48 ± 8.269 | Acupuncture | 50 (10/40) | 35.14 ± 7.743 | 12/12 | (1) (2) (3) |
| Wang Zheng 2020 [13] | Acupoint catgut embedding | 56 (32/24) | 43.3 ± 2.6 | Acupuncture | 56 (30/26) | 43.5 ± 2.7 | 4/4 | (1) (2) (3) (9) |
| Zhou Lijie 2017 [14] | Acupoint catgut embedding | 33 (4/29) | | Acupuncture | 33 (2/31) | | 4/4 | (1) (2) (3) (9) |
| Wu Xiaomei 2015 [15] | Acupoint catgut embedding | 32 (7/25) | 33 ± 11 | Acupuncture | 30 (6/24) | 35 ± 10 | 4/4 | (1) (2) (3) (5) |
| Huang Qiong 2020 [16] | Acupoint catgut embedding | 39 (21/18) | 38.27 ± 2.52 | Acupuncture | 39 (20/19) | 37.34 ± 2.57 | 12/12 | (2) (3) (7) (8) |
| Lin Guanghua 2015 [17] | Acupoint catgut embedding + cupping | 30 (4/26) | 32.56 ± 16.62 | Acupoint catgut embedding | 30 (3/27) | 31.98 ± 17.05 | 8/8 | (1) (2) (3) |
| Deng Ru 2021 [18] | Acupoint catgut embedding | 30 (15/15) | 58.5 ± 2.4 | Acupuncture | 30 (14/16) | 47.7 ± 3.6 | 8/8 | (1) (2) (3) (5) |
| Huang Wei 2015 [19] | Acupoint catgut embedding + exercise diet therapy | 80 (0/80) | 20–45 | Acupoint catgut embedding | 80 (0/80) | 20–45 | 12/12 | (1) (2) (3) (4) |
| Lin Chenjuan 2020 [20] | Acupoint catgut embedding + TCM | 30 (17/13) | 33.81 ± 6.32 | Acupoint catgut embedding | 30 (14/16) | 33.12 ± 6.45 | 12/12/12 | (1) (2) (3) (5) (7) (8) (10) (11) (13) (2) (3) (5) (6) (12) (14) (15) |
| Wen Qingfen 2021 [21] | Acupoint catgut embedding + TCM | 41 (17/24) | 33.48 ± 10.39 | Acupoint catgut embedding | 30 (18/23) | 33.56 ± 10.52 | 8/8 | (1) (3) (5) |
| Su Junxian 2017 [22] | Acupoint catgut embedding + TCM | 38 (11/27) | 38.05 ± 5.91 | Acupoint catgut embedding | 39 (14/15) | 38.70 ± 6.16 | 4/4/4 | (1) (3) (5) |
| Wang Rui 2017 [23] | Acupoint catgut embedding + exercise diet therapy | 30 (5/25) | 32.45 ± 10.40 | | | | | |

Table 1: Basic characteristics of included studies.
| Author and year | Interventions | Trial 1 | | Number (male/ female) | Age (years) | Interventions | Trial 2 | | Number (male/ female) | Age (years) | Interventions | Trial 3 | | Number (male/ female) | Age (years) | | Period of treatment (week) | Evaluation standard course of disease |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wang Lingshu 2019 [24] | Acupoint catgut embedding + TCM | 60 (28/32) | 34.1 ± 7.42 | Acupoint catgut embedding | 60 (29/31) | 34.0 ± 7.40 | 6/6 | | (1) (2) (3) (5) (6) |
| Chen Rongzhong 2016 [25] | Acupoint catgut embedding | 47 | 42.8 ± 2.9 | Acupuncture | 47 | 42.8 ± 2.9 | 8/8 | | (1) (2) (5) (12) (16) |
| Zhou Hualing 2018 [26] | Acupoint catgut embedding + TCM | 28 (4/24) | 30.67 ± 2.48 | Acupuncture | 28 (3/25) | 31.25 ± 2.07 | 16/4 | | (1) (2) (3) (5) (12) |
| Zheng Xiao 2015 [27] | Acupoint catgut embedding | 40 (4/36) | 15–56 | Electroacupuncture | 40 (3/37) | 14–60 | 12/12 | | (1) (3) (5) |
| Guo Wenjiang 2014 [28] | Acupoint catgut embedding | 36 (14/22) | 33.6 ± 1.5 | Acupuncture | 35 (11/24) | 34.2 ± 1.5 | 6/6 | | (1) |
| Zhang Hong 2017 [29] | Acupoint catgut embedding | 40 (22/18) | 61.35 ± 3.11 | Acupuncture | 40 (23/17) | 61.26 ± 3.07 | 12/12 | | (1) (2) (3) (5) (7) (8) (10) (11) (12) |
| Zhao Huaiyi 2015 [30] | Acupoint catgut embedding | 50 (2/48) | 25–60 | Electroacupuncture | 50 (2/48) | 23–60 | 4/6 | | (1) (2) (3) (5) (12) |
| Yao Ruijie 2014 [31] | Acupoint catgut embedding | 25 (10/15) | 38.3 ± 9.83 | Acupuncture | 25 (9/16) | 37.78 ± 9.27 | 12/12 | | (1) (4) (5) (6) (12) (17) |
| Chen Zhi 2013 [32] | Acupoint catgut embedding | 40 (5/35) | 39.65 ± 4.82 | Acupuncture | 40 (6/34) | 38.95 ± 4.54 | 6/6 | | (1) (2) (3) |
| Huang Weixuan 2019 [33] | Acupoint catgut embedding + exercise diet therapy | 100 (29/71) | 48.9 ± 12.1 | Exercise Diet therapy | 100 (26/74) | 49.3 ± 11.8 | 12/12 | | (1) (2) (3) (5) (7) (8) (10) |
| Yan Bing 2021 [34] | Acupoint catgut embedding | 29 (11/18) | 33.5 ± 9.4 | Acupuncture | 30 (10/20) | 33.7 ± 10.2 | 8/8 | | (3) (5) (7) (8) (10) (11) (12) (14) (18) |
| Li Lijuan 2016 [35] | Acupoint catgut embedding | 50 (20/30) | 35.2 ± 12.6 | Electroacupuncture | 50 (19/31) | 36.7 ± 11.8 | 8/8 | | (1) (2) (3) |
| Wang Quan 2018 [36] | Acupoint catgut embedding + TCM | 50 (26/24) | 31.32 ± 2.72 | TCM | 50 (26/24) | 31.31 ± 2.72 | 12/12 | | (2) (3) (5) (7) (8) (10) |
| Zhao Binbin 2015 [37] | Acupoint catgut embedding + cupping | 30 (4/26) | 32.56 ± 16.62 | Acupoint catgut embedding | 30 (3/27) | 31.98 ± 17.05 | 8/8 | | (1) (2) (3) (5) |
| Liang Bingjun 2019 [38] | Acupoint catgut embedding + TCM | 40 (24/16) | 41.23 ± 7.41 | TCM | 40 (25/15) | 41.25 ± 7.59 | 4/4 | | (1) (2) (3) |
| Author and year | Interventions | Trial 1 | Interventions | Trial 2 | Interventions | Trial 3 | Period of treatment (week) | Evaluation standard course of disease |
|----------------|---------------|---------|---------------|---------|---------------|---------|---------------------------|----------------------------------|
| Lv Mingfang 2020 [39] | Acupoint catgut embedding + moxibustion | 40 (25/15) | 30.7 ± 4.1 | Acupoint catgut embedding | 40 (23/17) | 31.5 ± 3.7 | 8/8 | (1) (2) (3) (5) (6) (12) (17) (19) |
| Chen Yuanyuan 2015 [40] | Acupoint catgut embedding + acupuncture | 40 | 18–46 | Acupoint catgut embedding | 40 | 18–46 | Acupuncture | 40 | 18–46 | 4/4/4 | (1) |
| Hou Sujuan 2016 [41] | Acupoint catgut embedding + acupuncture | 68 (44/24) | 27.1 ± 1.5 | Acupuncture | 68 (45/13) | 26.8 ± 1.2 | 5/5 | (1) (4) (6) (8) |
| Tian Feng 2014 [42] | Acupoint catgut embedding | 22 | 26–49 | Acupuncture | 22 | 26–49 | 8/8 | (1) |

Note: TCM: traditional Chinese medicine; (1): effective rate; (2): body weight (kg); (3): BMI (kg/m2); (4): body fat percentage (%); (5): waistline (cm); (6): WHR (waist-hip ratio); (7): TC; (8): TG; (9): appetite score; (10): LDL-C; (11): HDL-C; (12): hip circumference; (13): adverse reaction; (14): fat thickness; (15): Chinese medicine syndrome scores; (16): chest circumference; (17): plumpness; (18): IWQOL-Lite score; (19): body fat percentage.
BMI reduction involved 5 closed loops, the lower limit of the 95% CI of the discordance factor IF contained 0, and there was no significant discordance. The results of the consistency check are shown in Figures 5–7.

3.5.3. Results of Network Meta-Analysis. The results of the total effective rate were as follows: the healing of acupoint catgut embedding was better than that of acupuncture, electroacupuncture, and exercise diet therapy (P < 0.05). The total effective rate of acupoint catgut embedding + moxibustion was higher than that of acupoint catgut embedding (P < 0.05); electroacupuncture, catgut embedding + acupuncture, acupoint catgut embedding + acupuncture, acupoint catgut embedding + sports diet therapy, acupoint catgut embedding + TCM, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were superior to sports diet therapy (P < 0.05). The results are shown in Figure 8.

The results of weight loss were as follows: acupuncture treatment was superior to acupoint catgut embedding therapy (P < 0.05); acupoint catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, acupoint catgut embedding + moxibustion, and acupoint catgut embedding + cupping were superior to acupuncture and electroacupuncture treatment (P < 0.05); acupoint catgut embedding + exercise diet therapy, acupoint catgut embedding + TCM, and acupoint catgut embedding + moxibustion were superior to TCM treatment (P < 0.05); and acupoint catgut embedding, acupoint catgut embedding + acupuncture, acupoint catgut embedding + moxibustion, and acupoint

| Study | Stochastic method | Randomized hiding | Blinding | Results data integrity | Jadad score |
|-------|-------------------|-------------------|----------|------------------------|-------------|
| Luo Liangqi 2016 [8] | Parity number | Unclear | Unclear | Integrity | 5 |
| Zhou Wei 2020 [9] | Envelope drawing method | Unclear | Unclear | Integrity | 5 |
| Li Miaomiao 2017 [10] | Random | Unclear | Unclear | Integrity | 4 |
| Zheng Xi 2020 [11] | Random | Unclear | Unclear | Integrity | 4 |
| Duan Xiaorong 2017 [12] | Random number list | Unclear | Unclear | Integrity | 5 |
| Wang Zheng 2020 [13] | Random | Unclear | Unclear | Integrity | 4 |
| Zhou Lijie 2017 [14] | Random | Unclear | Unclear | Integrity | 4 |
| Wu Xiaomei 2015 [15] | Random | Unclear | Unclear | Integrity | 4 |
| Huang Qiong 2020 [16] | Random number list | Unclear | Unclear | Integrity | 5 |
| Lin Guanghua 2015 [17] | Random | Unclear | Unclear | Integrity | 4 |
| Deng Ru 2021 [18] | Random number list | Unclear | Unclear | Integrity | 4 |
| Huang Wei 2015 [19] | Random number list | Unclear | Unclear | Integrity | 5 |
| Lin Chenjuan 2020 [20] | Random | Unclear | Unclear | Integrity | 4 |
| Wen Qingfen 2021 [21] | Random number list | Unclear | Unclear | Integrity | 5 |
| Su Junxian 2017 [22] | Random number list | Unclear | Unclear | Integrity | 5 |
| Wang Rui 2017 [23] | Random | Unclear | Unclear | Integrity | 4 |
| Wang Lingshu 2019 [24] | Random number list | Unclear | Unclear | Integrity | 6 |
| Chen Rongzhong 2016 [25] | Random | Unclear | Unclear | Integrity | 4 |
| Zhou Hualing 2018 [26] | Random number list | Unclear | Unclear | Integrity | 5 |
| Zheng Xiao 2015 [27] | Random | Unclear | Unclear | Integrity | 4 |
| Guo Wenchang 2014 [28] | Random number list | Unclear | Unclear | Integrity | 5 |
| Zhang Hong 2017 [29] | Random | Unclear | Unclear | Integrity | 4 |
| Zhao Huayi 2015 [30] | Random | Unclear | Unclear | Integrity | 4 |
| Yao Ruijie 2014 [31] | Random | Unclear | Unclear | Integrity | 4 |
| Chen Zeli 2013 [32] | Random | Unclear | Unclear | Integrity | 4 |
| Huang Weixuan 2019 [33] | Therapies | Unclear | Unclear | Integrity | 3 |
| Yan Bing 2021 [34] | Random number list | Unclear | Unclear | Integrity | 5 |
| Li Lijuan 2016 [35] | Single and double numbers | Unclear | Unclear | Integrity | 5 |
| Wang Quan 2018 [36] | Random number list | Unclear | Unclear | Integrity | 5 |
| Zhao Binbin 2015 [37] | Random | Unclear | Unclear | Integrity | 4 |
| Liang Bingjun 2019 [38] | Random number list | Unclear | Unclear | Integrity | 5 |
| Ly Mingfeng 2020 [39] | Random number list | Unclear | Unclear | Integrity | 5 |
| Chen Yuanjuan 2015 [40] | Random | Unclear | Unclear | Integrity | 4 |
| Hou Sujuan 2016 [41] | Random number list | Unclear | Unclear | Integrity | 5 |
| Tian Feng 2014 [42] | Random number list | Unclear | Unclear | Integrity | 5 |
Table 3: Traditional meta-analysis results.

| Interventions                                      | Number of studies included | OR/MD (95% CI)          | P   | χ²   | P   | I²  |
|----------------------------------------------------|----------------------------|-------------------------|-----|------|-----|-----|
| **Total effective rate**                           |                            |                         |     |      |     |     |
| Acupoint catgut embedding vs. acupuncture          | 12                         | 3.77 (2.49, 5.71)       | ≤0.001 | 7.56 | 0.75 | 0%  |
| Acupoint catgut embedding vs. electroacupuncture  | 5                          | 1.99 (1.10, 3.61)       | 0.02 | 4.82 | 0.31 | 17% |
| Acupoint catgut embedding + TCM vs. acupoint catgut embedding | 3                          | 2.32 (1.14, 4.72)       | 0.02 | 2.70 | 0.26 | 26% |
| Acupoint catgut embedding + TCM vs. TCM            | 3                          | 5.99 (2.63, 13.66)      | ≤0.001 | 0.46 | 0.80 | 0%  |
| Acupoint catgut embedding + moxibustion vs. acupoint catgut embedding | 2                          | 4.57 (1.75, 11.92)      | 0.002 | 0.00 | 0.96 | 0%  |
| Acupoint catgut embedding + cupping vs. acupoint catgut embedding | 2                          | 4.46 (0.91, 21.97)      | 0.07 | 0.00 | 1.00 | 0%  |
| Acupoint catgut embedding + acupuncture vs. acupuncture | 2                          | 3.49 (1.42, 8.61)       | 0.007 | 0.00 | 0.96 | 0%  |
| Acupoint catgut embedding + exercise diet therapy vs. exercise diet therapy | 1                          | 3.33 (1.51, 7.32)       | 0.003 |      |      |     |
| Acupoint catgut embedding + exercise diet therapy vs. acupoint catgut embedding | 1                          | 3.35 (1.03, 10.89)      | 0.04 |      |      |     |
| Acupoint catgut embedding + TCM vs. acupuncture    | 1                          | 3.27 (0.63, 17.07)      | 0.16 |      |      |     |
| Acupoint catgut embedding + cupping vs. acupuncture | 1                          | 3.55 (0.65, 19.37)      | 0.14 |      |      |     |
| **Body weight**                                    |                            |                         |     |      |     |     |
| Acupoint catgut embedding vs. acupuncture          | 9                          | −3.86 (−5.56, −2.61)    | ≤0.001 | 19.16 | 0.01 | 58% |
| Acupoint catgut embedding vs. electroacupuncture  | 4                          | −0.34 (−3.11, 2.43)     | 0.81 | 0.99 | 0.80 | 0%  |
| Acupoint catgut embedding + TCM vs. acupoint catgut embedding | 3                          | −2.04 (−3.24, −0.84)    | ≤0.001 | 1.24 | 0.54 | 0%  |
| Acupoint catgut embedding + TCM vs. TCM            | 3                          | −5.61 (−7.21, −4.01)    | ≤0.001 | 0.35 | 0.84 | 0%  |
| Acupoint catgut embedding + moxibustion vs. acupoint catgut embedding | 2                          | −4.96 (−6.26, −3.67)    | ≤0.001 | 1.24 | 0.27 | 19% |
| Acupoint catgut embedding + cupping vs. acupoint catgut embedding | 2                          | −4.14 (−8.18, −0.10)    | 0.04 | 0.00 | 1.00 | 0%  |
| Acupoint catgut embedding + exercise diet therapy vs. exercise diet therapy | 1                          | −4.20 (−6.45, −1.95)    | ≤0.001 |      |      |     |
| Acupoint catgut embedding + exercise diet therapy vs. acupoint catgut embedding | 1                          | −2.78 (−4.47, −1.09)    | 0.001 |      |      |     |
| Acupoint catgut embedding + TCM vs. acupuncture    | 1                          | −5.44 (−7.85, −3.03)    | ≤0.001 |      |      |     |
| Acupoint catgut embedding + cupping vs. acupuncture | 1                          | −2.85 (−9.33, 3.63)     | 0.39 |      |      |     |
| **BMI**                                            |                            |                         |     |      |     |     |
| Acupoint catgut embedding vs. acupuncture          | 8                          | −1.84 (−2.23, −1.44)    | ≤0.001 | 134.27 | 0.00 | 95% |
| Acupoint catgut embedding vs. electroacupuncture  | 5                          | −0.47 (−1.11, 0.17)     | 0.15 | 7.56 | 0.11 | 47% |
| Acupoint catgut embedding + TCM vs. acupoint catgut embedding | 4                          | −1.30 (−2.33, −0.27)    | 0.01 | 50.67 | 0.00 | 94% |
| Acupoint catgut embedding + TCM vs. TCM            | 4                          | −1.56 (−2.30, −0.82)    | ≤0.001 | 18.60 | 0.00 | 84% |
| Acupoint catgut embedding + moxibustion vs. acupoint catgut embedding | 2                          | −2.69 (−3.22, −2.16)    | ≤0.001 | 0.04 | 0.84 | 0%  |
| Acupoint catgut embedding + cupping vs. acupoint catgut embedding | 2                          | −1.92 (−2.90, −0.94)    | ≤0.001 | 0.00 | 1.00 | 0%  |
| Acupoint catgut embedding + exercise diet therapy vs. exercise diet therapy | 2                          | −1.66 (−2.16, −1.15)    | ≤0.001 | 0.36 | 0.55 | 0%  |
| Acupoint catgut embedding + exercise diet therapy vs. acupoint catgut embedding | 1                          | −2.18 (−5.25, 0.89)     | 0.16 |      |      |     |
| Acupoint catgut embedding + TCM vs. acupuncture    | 1                          | −4.82 (−5.75, −3.89)    | ≤0.001 |      |      |     |
| Acupoint catgut embedding + cupping vs. acupuncture | 1                          | −0.98 (−1.87, −0.09)    | 0.03 |      |      |     |
catgut embedding + cupping were superior to exercise diet therapy ($P < 0.05$). The results are shown in Figure 9.

The results of BMI reduction were as follows: acupoint catgut embedding + moxibustion and acupoint catgut embedding + cupping were superior to acupuncture treatment ($P < 0.05$); and acupoint catgut embedding + moxibustion was superior to electroacupuncture treatment ($P < 0.05$). The results are shown in Figure 10.

### 3.5.4. Sorting of Mesh Meta-Analysis Results

Three different outcome indicators were ranked, and there were some differences in the ranking results. Lower average rank indicates better outcome indicators. Finally, it was revealed the intervention measures of acupoint catgut embedding combined with moxibustion showed a better effect in the treatment of simple obesity. The ranking of network meta-analysis results is shown in Table 4.

### 3.6. Publication Bias

The funnel plot was drawn according to the total effective rate, and the scatter points were mostly located in the upper half, symmetrically distributed on both sides of the red indicator line, indicating small publication bias. However, there was a scatter at the bottom of the funnel plot, indicating a small sample effect, as shown in Figure 11.
4. Discussion

Simple obesity is defined as malnutrition without obvious causes. When the accumulation of body fat exceeds the consumption level of the body, the patient’s weight exceeds the standard weight due to excessive body fat [43]. Nowadays, many factors are considered to be the etiology of obesity, such as neuroregulation, free radicals, and heredity [44, 45]. In traditional Chinese medicine, it is believed that dysfunction of the spleen and stomach is the root cause of obesity. Increasing intake of sweet and greasy food and declining function of the spleen and stomach leads to accumulation of fat in the body. Obesity affects the quality of life of patients and damages their physical and mental health. In clinical reports, acupoint catgut embedding is a safe and effective intervention for obesity.

Adipocytes, adipose tissue, endocrine regulation, and inflammatory factors are the focus of study on the mechanism of action of acupoint catgut embedding in the treatment of simple obesity [46]. In the process of acupoint catgut embedding, needle insertion can cause tissue damage, fat cell death, or a small range of liquefaction, and to a certain extent, can reduce the number of cells in adipose tissue [47]. Under an optical microscope, less adipocytes, less

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**Figure 4:** Evidence graph of BMI reduction by network meta-analysis of different therapies and catgut embedding at acupoints for simple obesity.

**Figure 5:** Inconsistency test results of total effective rate. A: acupoint catgut embedding; B: acupuncture; C: electroacupuncture; D: TCM; E: acupoint catgut embedding + acupuncture; F: acupoint catgut embedding + exercise diet therapy; G: acupoint catgut embedding + TCM; H: exercise diet therapy; J: acupoint catgut embedding + cupping.

**Figure 6:** Inconsistency test results of body weight reduction. A: acupoint catgut embedding; B: acupuncture; C: electroacupuncture; D: TCM; E: acupoint catgut embedding + acupuncture; F: acupoint catgut embedding + exercise diet therapy; G: acupoint catgut embedding + TCM; I: acupoint catgut embedding + moxibustion.
lipid droplets in the cytoplasm, uniform cells, and more compact adipocytes were observed in obese mice [48]. Leptin (LP), as a product of adipocyte secretion, is a peptide hormone that acts on multiple tissues and organs through its receptor and has multiple effects on regulation of the body.

Yan Runhu [49] treated rats fed with high-fat diet for 12 weeks with catgut implantation at acupoints. The results showed that catgut implantation at acupoints could upregulate the expression of OB-Rb mRNA in the hypothalamus of obese rats and reduce the expression of SOCS-3 mRNA in the hypothalamus of obese rats.
hypothalamus cells and the content of SOCS-3 in peripheral blood serum, which suggested that catgut implantation at acupoints promoted signal transduction after LP and fasting insulin receptors, improved leptin resistance (LR) and insulin resistance (IR), and promoted LP and fasting insulin to exert biological effects. Therefore, it can be used as an important mechanism of acupoint catgut embedding for weight loss. Deng Min [50] observed the effect of catgut implantation at acupoints on inflammatory factors in mice and found that catgut implantation at acupoints could inhibit the expression of interleukin-1mRNA, tumor necrosis factor-α-mRNA, and monocyte chemoattractant protein-1 mRNA in adipose tissue and could reduce the occurrence and development of inflammatory reactions. Therefore, it is further predicted that the possible mechanism of weight loss by catgut implantation at acupoints is to increase the expression of inflammatory factors in adipose tissue. The meta-analysis of acupoint catgut embedding and related therapies for obesity revealed that acupoint catgut embedding and other therapies showed a high healing rate in the treatment of simple obesity and could reduce the BMI of the patients [6]. Acupoint catgut embedding has become one of the effective measures for the treatment of obesity and has shown good clinical results with a variety of combined therapies, which are widely used [51].

To investigate the curative effect of catgut implantation at each acupoint and related therapies, a network meta-analysis was conducted. A total of 35 studies were included in this study, including 3040 patients. There was a significant difference between the two groups before and after treatment. In network meta-analysis, the effect of various treatment methods was compared. Compared with traditional meta-analysis, it contains more original data. The statistical accuracy of different groups is not enough, but it has no impact on the final results of network meta-analysis [47]. This study ranked the improvement of treatment effect, body mass, and BMI of patients with simple obesity by comparing the treatments including acupoint catgut embedding, acupuncture, TCM, electroacupuncture, and exercise diet therapy alone, as well as the combination of acupoint catgut embedding with different therapies. Therefore, it can be used as an important mechanism of acupoint catgut embedding for weight loss.
embedding + moxibustion, acupoint catgut embedding + TCM, and acupoint catgut embedding + cupping. Based on the results of network meta-analysis of the three indexes, acupoint catgut embedding and its combination with other therapies were the best treatments for simple obesity. There was no obvious asymmetry in the comparison correction funnel chart, indicating no publication bias, but there was a scatter at the bottom, indicating the influence of small samples. The inconsistency test indicated good consistency of each closed loop. However, the use of different acupoints, treatment courses, and drugs in the studies leads to clinical heterogeneity, which needs more high-quality RCT studies to verify.

There are some limitations in this study. Firstly, there are adverse reactions in the included literature, so it may cause bias. Secondly, some studies do not mention the random assignment of treatment groups, which may lead to selection bias. Finally, the sample size in some studies is relatively small, which may affect the accuracy of the meta-analysis results.
sequence method and do not blind the subjects and doctors, which may have an impact on the efficacy results. Thirdly, most of the observation indexes were body mass, effective rate, BMI, WC, HC, waist-hip ratio, and so on, lacking objective laboratory indexes. Finally, the short-term effect is good, but there are few follow-up records. The long-term effect needs to be further discussed. This systematic review aims to update and improve.

5. Conclusion

Acupoint catgut embedding and its combination with different therapies significantly increase the effective rate in treatment of simple obesity, resulting in improved body mass and BMI of the patients. The use of acupoint catgut embedding therapy is a better choice and provides a more reliable clinical reference. In clinical treatment, acupoint catgut embedding can be selected based on the conclusion of this study and considering syndrome differentiation. However, the conclusion is affected by the quality of the included studies, and this study needs more high-quality, large-sample RCT studies to verify.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors’ Contributions

Chun-lan Chen, Zun-yuan Li, Chuang Zhao, Wen-ge Huo, Yu-hong Guo, Yan Yang, and Zhi-dan Liu participated in the study design and wrote the article. Zhuo-yuan Wang analyzed the data. Xiao-yan Li and Xiao-jun Gou reviewed the manuscript. All the authors read and approved the final manuscript. Xiao-yan Li and Xiao-jun Gou contributed equally to this work and should be considered corresponding authors.

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