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Review Article

Review on the effects of obesity treatment with acupuncture and phytoacupuncture

针灸和药物针灸治疗肥胖的疗效回顾

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ABSTRACT

Objective: The purpose of this study is to review the impact on the usage of traditional Chinese medicine in the treatment of obesity, specifically the usage of acupuncture and phytoacupuncture.

Methods: PubMed and Google Scholar databases were searched to identify randomized controlled trials, which the methodology focused on the use of acupuncture and phytoacupuncture for the treatment of obesity from the beginning of these databases to February 2018, supplementing with literature retrospective and manual searches.

Results: A total of 8 trials including 566 participants met the selected criteria. In the alterations of the body mass index and waist circumference, acupuncture and phytoacupuncture seems to have a positive effect as opposed to the subjects who received superficial acupuncture or none. However, there were other parameters that showed promising results such as improvements in the levels of (1) serum total cholesterol, low-density lipoprotein and serum fasting triglyceride, (2) serum insulin and leptin, plasma ghrelin and cholecystokinin and (3) serum pro-oxidant antioxidant balance, as well as improvements in (4) skin fat thickness in the upper limbs, trunk and abdomen, (5) abdominal fat and deep subcutaneous fat tissue. The main acupoints employed in the selected studies are found along several meridians such as the stomach, spleen and conception vessel, and the plants used had the main objective of accelerating the metabolism, reducing appetite and resolving the unbalances in the genesis of obesity.

Conclusion: It is suggested that acupuncture and phytoacupuncture can be useful tools for weight loss. When combined with a life-style change, they can contribute to achieve better results than just a life-style change by itself. Nevertheless, the need for further studies to clarify mechanisms of action and adequacy of protocols in order to obtain more homogeneous results is also present.

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Introduction

Obesity is a pathology characterized by the abnormal or excessive accumulation of body fat, being considered by many as the epidemic of the twenty-first century. In most of the cases, this accumulation of fat is due to a sedentary life-style, inappropriate for a person's age, as well as bad eating habits, resulting in hormonal alterations that will also complicate the situation.

The body mass index (BMI) correlates the height and weight of an individual (kg/m^2). Patients whose values fall in the interval be-

tween 25 and 30 are considered to be overweight, and above 30 to be in the field of obesity. However, it is also important to evaluate the waist circumference (WC) when assessing obesity [1,2].

According to 2016's data from the World Health Organization (WHO), obesity and overweight have been gradually increasing, with almost two billion adults above 18 years old presenting excess weight, and 650 million already considered obese. It was also estimated that 41 million children under 5 years old, and 340 million aged between 5 and 19, are also in this situation.

Being considered a pathology, obesity is also the cause of a wide range of other pathologies, such as hypertension, type II diabetes, heart failure, renal failure, increased risk of myocardial infarction and stroke. Also very important, some respiratory diseases

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and various types of oncological diseases are also associated with obesity [2–4]. Depression, on the other hand, seems to be present not only in the group of causes, but also in the group of consequences of obesity, deserving a special attention when treating this type of patients [5].

According to traditional Chinese medicine (TCM), obesity and the appearance of other factors that may end up later in obesity, can be translated by different syndromes, such as spleen *qi* and *yang* deficiency; kidney *qi* and *yang* deficiency; liver *qi* stagnation; spleen *qi* deficiency; and heart spirit disturbance. However, there is also the possibility that obesity can be a consequence of a spleen and stomach dysfunction caused by aging, resulting in phlegm and fat, affecting the lung, liver and kidney [6,7]. Taking this into account, we may say that the pathology may have distinct origins and it is of utmost importance to perform an individualized and holistic diagnosis.

The methods used by TCM, for the most part, are characterized by being non to very little invasive and the substances used are also mostly obtained naturally. As such, it is also a legitimate way to try to solve it with this type of approach, as several authors have already tried in other areas [8–15].

Acupuncture is a treatment procedure used in TCM, consisting in the puncture of specific points (or areas) of the body, situated along what may be called meridians or conduits where it is postulated that the *qi* circulates [16–18]. The objective is to regulate the flow of *qi* within the body or, by other words, regulate the nervous, circulatory, endocrine and exocrine systems, promoting an increased state of well-being of the patient.

As for Phytotherapy, it is another TCM technique characterized by the usage of plants, based in their proprieties, flavours and actions [19]. These plants can be used alone or in combination, following certain rules, with the objective of obtaining better and faster results. In turn, phytoacupuncture emerges as a combination of both techniques. After the acupuncture points are selected, this technique can be employed by (1) dipping the tip of the needles in decoctions of plant before insertion, or (2) by injecting a certain volume of the decoction to be used, producing an even greater synergy between the two techniques [20].

In this context, we intend to make a literary review of the results obtained in studies already carried out using acupuncture and phytoacupuncture on the treatment of obesity, in order to clarify which methods are the most effective as well as possible changes that may be relevant to future studies, bestowing more validity to these type of resources.

Methodology

Data research and criteria

The study search was performed until 14 February 2018, on PubMed and Google Scholar databases. Of the results, only randomized controlled trials were selected. The following keywords were used in the search: “obesity”, “acupuncture”, “phytotherapy”, “herbal acupuncture” and “traditional Chinese medicine”.

The study selection comprehended a primary analysis of the title and abstract of the retrieved studies, selecting those who met the following criteria:

Inclusion criteria

(1) Types of studies

Randomized controlled trials that compared acupuncture and/or phytoacupuncture with a control group.

(2) Types of participants

Trials in which study participants had been diagnosed with overweight or obesity.

(3) Types of interventions

Trials which the methodology was focused on the use of acupuncture (electroacupuncture included) and phytoacupuncture. In the studies, these techniques could be employed in comparison to a control group with or without another intervention. The studies could also employ these techniques in combination with other techniques in the same intervention group.

Exclusion criteria

- (1) Trial using animal subjects were excluded.
- (2) Trials that used a clearly inappropriate method of randomization were excluded.
- (3) Studies that investigated other methods based on traditional Chinese medicine techniques that employ the use of acupoints, for example acupressure, *tuina* or laseracupuncture, were excluded.

Results

Search results

The search resulted in a total of 220 articles. 193 were excluded after title or abstract screening and another 17 after full-text analysis. 8 trials including 566 participants met the selected criteria and were included in this study.

Intervention and in indicis

The main criteria that defines if a patient presents obesity are weight, BMI and WC. However, since body weight is comprised of fat and muscle mass, this point does not present validity to be included in the defined criteria for result analysis. As such, BMI and WC will be the main criteria to be analysed. At times, other existing evidences shall be referenced.

As control group, to observe the effects of acupuncture, the studies used patients who did not receive acupuncture, or it was made superficially or in unspecific acupoints. As for phytoacupuncture, control groups received an injection of saline solution or did not receive any kind of injection.

Acupoints

The main acupoints used on the various protocols for the treatment of obesity mostly have its location on the abdominal region. The abdominal region is where there is a higher concentration of adipose tissue in cases of obesity. On the stomach meridian were used the Chéngmǎn (承满 ST20), useful for the treatment of dyspepsia and abdominal distension; Tàiyī (太乙 ST23), Tiān shū (天枢 ST25) and Nèitíng (内庭 ST44) for abdominal distension; Huà ròu mén (滑肉门 ST24) for gastrointestinal disorder; Wàilíng (外陵 ST26) for abdominal cramps; Zú sān lǐ (足三里 ST36) used for dyspepsia and abdominal distension; Fēng lóng (丰隆 ST40) for the treatment of oedema and hypertension [21]. On the spleen meridian were used the Sānyīnjiāo (三阴交 SP6 for stomach and pancreatic disturbances, epigastric distension and dyspepsia; and Yīnlíngquǎn (阴陵泉 SP9) for abdominal distension, dyspepsia, abdominal cramps and oedema [22]. On the conception vessel were used the Guānyuán (关元 CV4) for small-intestine disturbances and abdominal pain; Qìhǎi (气海 CV6) for abdominal distension, abdominal cramps and pain; Shuǐfēn (水分 CV9) for abdominal distension and pain, and oedema; Xiàwǎn (下脘 CV10) for dyspepsia and

abdominal distension; and Zhōngwǎn (中脘CV12) for epigastric and intestinal pain, and abdominal distension [23].

There were certain other points also used along the lung, small intestine, stomach, spleen, heart, bladder, Sanjiao, gallbladder, liver meridians and governing vessel as adjuvant acupoints.

On the other hand, when used together, the effect of certain points can be lipolysis, metabolism acceleration, inhibition of fat absorption, increased *qi* circulation, dissipation of humidity and heat, tonification of *qi*, *yin* and *yang*, among other effects. Therefore, when treating patients with excess energy some points can be combined such as the LI11 and ST40, or CV6 and SP9 for patients with energy deficit, as Mazidi, Abbasi-Parizad [24] states. In order to reduce stomach heat, ST34 and ST44 were used, LR3 for liver depression, and CV4 for reducing the spleen and *qi* deficiency, according to Sun [25]. (Table 1).

Decoctions and plants

In TCM, it is postulated that plants possess certain characteristics. For example, the four properties: hot, warm, cool, and cold; The five flavours: sour, bitter, sweet, pungent, and salty; Different properties and flavours have different actions on the body. With balanced “hot” and “cold” plants, the *yin* and *yang* balance is corrected, and this theory guides the clinical medication employed by TCM doctors for each disease.

Yin and *yang* should be understood as the two opposite aspects that run through everything. In the body *yang* represents that which is functional, hyper functional, dynamic, ascending or hot, while *yin* represents that which is structural, substantial, hypo functional, static, descending or cold [29]. In a study relating *yin-yang* functions of herbs used in TCM, it was found that the *yin*-tonic herbs have an average of six times more antioxidant activity and polyphenolic contents than the *yang*-tonic herb [30]. Progressively, from a western-view, we may be starting to understand the health implications of TCM theories with the use of modern biochemical tools, as was also done in the study of Liao, Banbury [31].

In the classic book *Sùwèn* (《素问》 Plain Questions), “sweet” and “pungent” flavours are referred to as inducers of perspiration and related to *yang*, and “sour” and “bitter” flavours as inducers of emesis, purgation, and related to *yin*. *Yin* and *yang* restrict one another in order to achieve balance, this balance is homeostasis.

In general, plants can be used in food or solely for medicinal use, most of the time in form of decoction.

Amongst all the plants used in the included studies, some stand out, such as *Herba Ephedrae* for the appetite reduction effect [32,33], *Radix et Rhizoma Glycyrrhizae* for the detoxifying effect, *Radix Astragali* for tonifying *qi*, blood and the spleen [32,34], and *Folium Mori* for the lipolytic and fat absorption inhibiting effect [32,35], all used as acupoint injection.

However, regardless of the presented individual benefits, the plants are often combined as a decoction. The potentiating synergies of the plants allow a faster and stronger medicinal effect. Furthermore, the use of specific plants can result in unwanted side-effects that can be controlled by resorting to other plants simultaneously. As an example, there is the combination of *Herba Ephedrae* and *Radix Aconiti Praeparata* with the objective of tonifying *yang* and dissipating cold. In this case, the *Aconitum carmichaeli* will prevent the patient from suffering palpitations and dyspepsia, as these are side-effects of *Herba Ephedrae* [33].

Other decoctions used in the studies were: Fangjihuangqitang [32,34], composed by *Stephania tetandra*, *Radix Astragali*, *Rhizoma Atractylodis Macrocephalae*, *Radix et Rhizoma Glycyrrhizae* and *Rhizoma Zingiberis*; Xiaofeiyin [32,35], composed by *Radix Platycodonis*, *Herba Ephedrae*, *Folium Mori*, *Liriope platyphylla*, *Scutellaria baicalensis* and *Prunus armeniaca*; and Piqixu (Bigiheo) [32,36],

Table 1
Characteristics of the included studies using acupuncture.

Article	Publication year	Country	Sample	TG / CG	Age (years)	BMI	Acupoints Used	Treatment duration
[27]	2002	China	60 / 60		13 – 52	≥ 25	Main points: ST24, ST25 and ST26, CV10 and CV5 Adjuvant points: ST32, ST34, ST36 and ST40, SP6, SP9 and SP10, LI11 and SJ6	15 sessions of 30 minutes
[25]	2008	China	AO 1st month n = 31 AO 2nd month n = 13 AO 3rd month n = 11 SO 1st month n = 52 SO 2nd month n = 28 SO 3rd month n = 24		29.6 ± 7.29 (AO) 36.3 ± 9.9 (SO)	23.7 ± 1.0 (AO) 28.8 ± 3.8 (SO)	Main points: ST20, ST25, ST28 and ST36, SP6, CV6 and CV12 Adjuvant points: ST21 and ST40, SP11, LR9, SJ6 and SJ13, GB26	Electroacupuncture 20 minute sessions: 3 times a week for a month (3 cycles of treatment)
[24]	2017	China	79 / 82		38.68 ± 0.98 (TG) 37.41 ± 1.01 (CG)	32.30 ± 0.52 (TG) 32.74 ± 0.59 (CG)	Main points: ST25, SP6, CV4, CV9 and CV12, GB28 Adjuvant points: LI11 and ST40 (patients with excess energy) CV6 and SP9 (patients with deficit of energy) ST36 and ST40, SP6, HT7, LI4	2 sessions of 20 minutes a week, for 6 weeks
[28]	2012	Turkey	22 / 15		36.8 ± 7.8 (TG) 34.6 ± 6.3 (CG)	33.33 ± 4.50 (TG) 33.92 ± 4.92 (CG)		2 sessions of 20 minutes, 2 times a week, for 5 weeks

Notes: TG – treatment group; CG – control group; AO – abdominal obesity; SO – symmetric obesity.

composed by *Panax ginseng*, *Astragalus membranaceus*, *Discorea batatas*, *Atractylodes japonica*, *Poria cocos*, *Citrus unshiu*, *Zizyphus jube* and *Glycyrrhiza uralensis*. (As shown on Table 2)

Body mass index (BMI)

By analysing studies that quantitatively present the alterations of BMI, it is possible to conclude that acupuncture seems to have a positive effect in its reduction, as opposed to the subjects who received superficial acupuncture or none. In a study performed by Wang [27] it was shown that the difference in BMI from the subjects that received acupuncture was an average of -2.45, as opposed to -1.04 in the control group using an herbal tea intervention. The study of Sun [25], using electroacupuncture, was performed in 3 sessions lasting a month each. The results of the first month reported a difference of -1.1 in the abdominal obesity group and -1.3 in the symmetric obesity group; -0.4 and 0.9 respectively for the second month; and -0 and -0.6 for the third and last cycle. The difference was an average of -1.9 for abdominal obesity and -4 for the symmetric obesity group, with statistically significant results. According to the study of Gucel, Bahar [28], the BMI difference in the treatment group was -1.43, while an increase of BMI was observed in the Sham-acupuncture control group. In the Study of Kim, Shin [33], the Mahuang-chuanwu pharmacupuncture group showed significantly greater results in comparison to the saline solution group (Tables 3 and 4). However, since both groups underwent several other interventions such as diet or electroacupuncture, both groups showed significant improvements in BMI.

Waist circumference (WC)

Regarding WC, it was observed in the study of Sun [25] that there was an average decrease of 7.5 cm for the abdominal obesity group and 11.8 cm for the symmetric obesity group.

Using phytoacupuncture, the study of Kim, Shin [33] observed an average difference of -8.81 cm using Mahuang-chuanwu, with a significant difference when compared to the -2.77 cm in the group of saline solution injection. As stated above, both groups underwent several other interventions causing both groups to show significant improvements in WC.

Using Piqixu, Cha [36] found an average reduction of 4.58 cm, while the control group showed a reduction of 3.36 cm with no statistical difference. However, using Bangkihwanqtang, the results obtained by Lee, Chung [34] were non-significant. (Tables 3 and 4).

Other parameters

Throughout the analysis of the studies, there were some parameters that we also found noteworthy. In the study of Gucel, Bahar [28], it was showed a significant decrease in serum insulin and leptin, and a very significant increase in plasma ghrelin and cholecystokinin. The study of Mazidi, Abbasi-Parizad [24] found that acupuncture and a diet, but not the diet alone, are able to significantly reduce serum pro-oxidant antioxidant balance (PAB) in obese patients. Sun [25] showed that beyond WC and BMI improvements, the symmetric obesity group also displayed a significant decrease of skin fat thickness in the upper limbs, trunk and abdomen. Abdominal fat, in the study of Cha [36], showed a higher reduction in the phytoacupuncture group with 5.22% against 3.14% in the control group, and deep subcutaneous fat tissue area was the only outcome that showed a significant difference between the two groups in the study of Lee, Cho [35]. (Tables 3 and 4)

Discussion

BMI and WC are commonly used indicators to detect obesity, reflecting total body weight and the accumulation of fat in the ab-

Table 2
Characteristics of the included studies using phytoacupuncture.

Article	Publication year	Country	Sample TG / CG	Age average/ Age interval	Inclusion criteria	Herbal formula	Acupoints	Acupoint injection administration	Treatment duration
[33]	2009	Korea	24 / 28	43.42 ± 11.18	BMI ≥ 25	<i>Ephedra sinica</i> + <i>Aconitum carmichaeli</i> (TG) Saline solution (CG)	ST25, GB26, CV4 and CV6	0.5 mL in each point	2 times a week, for 5 weeks
[36]	2004	Korea	21 / 21	35.5 (TG) 36.5 (CG)	Spleen qi deficiency syndrome BMI ≥ 25	Piqixu (TG) No injection (CG)	ST25, CV4, CV10 and CV12	0.2 mL in each point	2 times a week, for at least 3 weeks
[35]	2009	Korea	20 / 20	20 – 55	BMI ≥ 25 WC ≥ 85 cm	Xiaofei Yin (TG) Saline solution (CG)	Non-specific abdominal points	4 mL in each point	2 times a week, for 6 weeks
[34]	2001	Korea	16 / 15	16 – 35	BMI ≥ 25	Fangjihuangqitang (TG) No injection (CG)	ST25, BL23 and BL53	0.2 mL in each point	8 times for 3 weeks

Notes: TG – treatment group; CG – control group; AO – abdominal obesity; SO – symmetric obesity.

dominal area. This last one is related to visceral-fat levels and thus, special attention must be addressed to these cases.

The included studies have confirmed great heterogeneity in their results. Several aspects may be responsible for such. Differences in methodology by the different authors seems to be the main cause, however, we observed that the number of subjects is relatively small, as well as the differences in the samples regarding age, gender and present pathologies may influence the results.

No cases of adverse effects were reported in these studies, suggesting safety and harmlessness in these therapies.

Acupuncture, as well as some plants used, presented positive effects in weight and fat reduction, also alleviating the hunger sensation, fatigue and abdominal distension. Especially with acupuncture, some studies also revealed some metabolism alterations and the treatment of some related negative consequences of obesity, such as pain. In the treatment groups where acupuncture was employed, it was verified that the differences between pre- and post-BMI measures were significantly greater than the ones found in control groups [24–28]. Other findings also suggested that acupuncture may help regulate weight due to its beneficial effects on hormones such as leptin, insulin, ghrelin and cholecystokinin [28]. As well, it was observed improvements in Pro-Oxidant Antioxidant Balance (PAB) values [24] which seems to be an important finding since PAB has shown to be increased in patients with cardiovascular disease as well as obese patients and is positively correlated to body weight [37–40]. As for Phytoacupuncture, the conclusions were not so linear. Some studies have verified only a significant reduction of WC [36], while others also showed significant changes in BMI [33,35]. In one study [34], it was also possible to observe an improvement of the metabolic activity.

This analysis allowed us to suggest that acupuncture and phytoacupuncture can be useful tools for weight loss. When combined with a life-style change, they can contribute to achieve better results than just a life-style change by itself. However, to validate these techniques, more studies are needed in order to show which acupuncture protocol produces the most satisfying effects, as well as to be able to adapt each treatment towards the gender and age of each subject. It would also be necessary to define which decoction has better efficiency, as well as the best acupoints to be used in conjunction. The need for samples with an increased number of participants has also been revealed.

Overall, even if it is suggested that acupuncture and phytoacupuncture can be useful tools on weight loss, the importance of improving its methodology is clear in order to obtain more reliable results.

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Declaration of Competing Interest

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Tabela 4

Results of the included studies using phytoacupuncture.

Article	Publication year	Decoction	Sample TG / CG	BMI difference	WC difference	Findings
[33]	2009	Mahuang-chuanwu	24 / 28	- 0.76 ± 0.67 (TG) - 0.34 ± 1.06 (CG)	- 8.38 ± 5.38 (TG) - 2.77 ± 3.35 (CG)	Reduction of the BMI, body weight, and WC
[36]	2004	Piqixu	21 / 21	Non-significant	- 4.58 ± 2.54 (TG) - 3.36 ± 2.53 (CG)	Reduction of the WC Non-significant changes of BMI between groups
[35]	2009	Xiaofeiying	20 / 20	Non-significant	Non-significant	Reduction of the BMI, WC and superficial fat in both groups
[34]	2001	Fangjihuangqitang	16 / 15	Non-significant	Non-significant	Reduction of deep fat in the treatment group Increased muscle mass Increased metabolism

Notes: TG – treatment group; CG – control group; AO – abdominal obesity; SO – symmetric obesity.

Table 3
Results of the included studies using acupuncture.

Article	Publication year	BMI before treatment	BMI after treatment	BMI difference	Initial WC	Final WC	WC difference
[27]	2002	27.61 ± 1.98 (TG) 27.43 ± 2.23 (CG)	25.16 ± 1.94 (TG) 26.39 ± 2.21 (CG)	- 2.45 ± 0.53 (TG) - 1.04 ± 0.47 (CG)	(AO) 84.5 ± 4.2 (1st month)	(AO) 80.2 ± 4.1 (1st month)	(AO) - 4.3 (1st month)
[25]	2008	(AO) 22.7 ± 1.0 (1st month) (AO) 22.4 ± 1.2 (2nd month) (AO) 21.8 ± 1.2 (3rd month) (SO) 28.8 ± 3.8 (1st month) (SO) 27.1 ± 4.0 (2nd month) (SO) 25.4 ± 2.2 (3rd month)	(AO) 22.6 ± 1.0 (1st month) (AO) 22.0 ± 1.3 (2nd month) (AO) 21.8 ± 1.3 (3rd month) (SO) 27.5 ± 3.8 (1st month) (SO) 26.2 ± 3.8 (2nd month) (SO) 24.8 ± 2.2 (3rd month)	(AO) - 0.4 (2nd month) (AO) - 0 (3rd month) (SO) - 1.3 (1st month) (SO) - 0.9 (2nd month) (SO) - 0.6 (3rd month)	(AO) 78.4 ± 3.4 (2nd month) (AO) 77.4 ± 2.5 (3rd month) (SO) 95.1 ± 9.7 (1st month) (SO) 88.7 ± 9.8 (2nd month) (SO) 84.2 ± 7.7 (3rd month)	(AO) 77.0 ± 3.2 (2nd month) (AO) 77.0 ± 2.0 (3rd month) (SO) 90.4 ± 8.9 (1st month) (SO) 85.9 ± 9.9 (2nd month) (SO) 83.3 ± 7.3 (3rd month)	(AO) - 1.4 (2nd month) (AO) - 0.4 (3rd month) (SO) - 4.7 (1st month) (SO) - 2.8 (2nd month) (SO) - 0.9 (3rd month)
[24]	2017	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
[28]	2012	33.33 ± 4.50 (TG) 33.92 ± 4.92 (CG)	31.90 ± 4.27 (TG) 34.46 ± 4.79 (CG)	- 1.43 + 0.54	Not reported	Not reported	Not reported

Notes: TG – treatment group; CG – control group; AO – abdominal obesity; SO – symmetric obesity.

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