Literature Review

Auriculotherapy on treatment of obesity: a systematic review

Auriculoterapia no tratamento da obesidade: uma revisão sistemática

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ABSTRACT | INTRODUCTION: Obesity can cause premature death of individuals affected by this dysfunction. In an attempt to alleviate the disorders of this disease, auriculotherapy appears as a treatment that aims to promote weight loss and better quality of life. **OBJECTIVES:** Identify the efficacy of auriculotherapy in weight control of obese individuals. **METHODOLOGY:** A systematic review (CRD42020198862) was carried out according to PRISMA recommendations in the PubMed, Lilacs, Scielo and PEDro databases, from July to October 2016, with descriptors Obesity and auriculotherapy. Were included Ramdomized Clinical Trials published until 2015, in Portuguese, English and Spanish, and containing the key words in the title or abstract. In the analysis, the following were considered as primary outcome: Body Mass Index and body weight, and secondary outcome: waist circumference and leptin. **RESULTS:** Four articles studied the effect of auriculotherapy on obesity and showed a statistically significant reduction in the intervention groups, as well as in the two studies that evaluated body weight. Two studies analyzed waist circumference and showed a statistically significant decrease for the intervention group, while in the three studies that evaluated leptin, in two there was a reduction at the end of treatment, and in the third there was no difference in any of the groups. **CONCLUSION:** Auriculotherapy associated with diet may be effective in controlling the weight of obese patients, as well as anthropometric measurements and leptin levels.

KEYWORDS: Obesity. Auriculotherapy. Complementary therapies.

RESUMO | INTRODUÇÃO: A obesidade pode ocasionar a morte prematura dos individuos acometidos por esta disfunção. Na tentativa de amenizar as desordens dessa doença, a auriculoterapia surge como um tratamento que visa promover a perda de peso e melhor qualidade de vida. **OBJETIVO:** Identificar a eficácia da auriculoterapia no controle do peso de indivíduos obesos. **METODOLOGIA:** Realizou-se uma revisão sistemática (CRD42020198862) segundo as recomendações PRISMA, nos bancos de dados PubMed, Lilacs, Scielo e PEDro, no periodo de julho a outubro de 2016, com descritores *Obesity* e *auriculotherapy*. Foram incluídos Ensaios Clínicos Controlados publicados até 2015, em português, inglês e espanhol, e contendo as palavras chaves no título ou resumo. Na análise foram considerados como desfecho primário: Índice de Massa Corporal e peso corporal, e desfecho secundário: circunferência da cintura e leptina. **RESULTADOS:** No total foram incluídos cinco estudo. Desses, quatro artigos estudaram o efeito da auriculoterapia na obesidade e apresentaram redução estatisticamente significante nos grupos de intervenção, assim como nos dois estudos que avaliaram o peso corporal. Dois estudos analisaram a circunferência da cintura e apresentaram decréscimo estatisticamente significativo para o grupo de intervenção, já nos três estudos que avaliaram a leptina, em dois houve redução ao final do tratamento, sendo que no terceiro não houve diferença em nenhum dos grupos. **CONCLUSÃO:** A auriculoterapia associada a dieta pode ser eficaz no controle do peso de paciente obesos, assim como nas medidas antropometricas e nos níveis de leptina.

PALAVRAS-CHAVE: Obesidade. Auriculoterapia. Terapias complementares.

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Introduction

Obesity is a disease characterized by the accumulation of excessive fat[1] that can trigger or aggravate a series of other diseases such as metabolic syndrome, diabetes mellitus type 2, cardiovascular disease, respiratory disease, digestive tract, psychiatric and neoplasms, and can cause the premature death of individuals affected by this disease[2].

This condition is defined by the Body Mass Index (BMI), which according to the World Health Organization (WHO), can be classified as malnourished (BMI < 18.5 kg/m²), eutrophic (BMI ≥18, 5 and <25 kg/m2), overweight (BMI ≥25 and <30 kg/m²), obesity grade I (BMI ≥30 and <35 kg/m²), obesity grade II or severe (BMI ≥35 and <40 kg/m2) and obesity grade III or morbid (BMI ≥40 kg/m²)[3].

Between 2006 and 2012, the prevalence of overweight in the adult population in the capitals of 26 Brazilian states and in the Federal District increased from 43.2% (2006) to 51.0% (2012), with an average annual increase of 1.37% calculated for the period, which demands an urgent response from the public authorities[4].

Although BMI is the most common method to define obese and overweight populations, it does not clearly reflect body composition[1] and other measures such as waist circumference (WC)[5] and leptin level are required, which provide new diagnostic approaches for the treatment of obesity[6].

The treatment of obesity requires identification and change of inadequate components in the lifestyle, as well as food re-education and physical activity[7]. Due to the difficulties in adhering to treatment, other types of interventions have been studied, it is in this context that Alternative and Complementary Medicine (ACM) has been gaining space in the fight against obesity[8].

MACs are considered complementary when used in conjunction with conventional medicine, alternative when used in place of conventional medicine, and integrative when incorporated into the complementary approach to health care[9].

Auriculotherapy is an integrative and complementary practice from Traditional Chinese Medicine[10] that is carried out throughout the world for the treatment of various health conditions, such as pain relief, disorders of the respiratory, digestive and nervous systems, as well as for psychological and emotional problems[11].

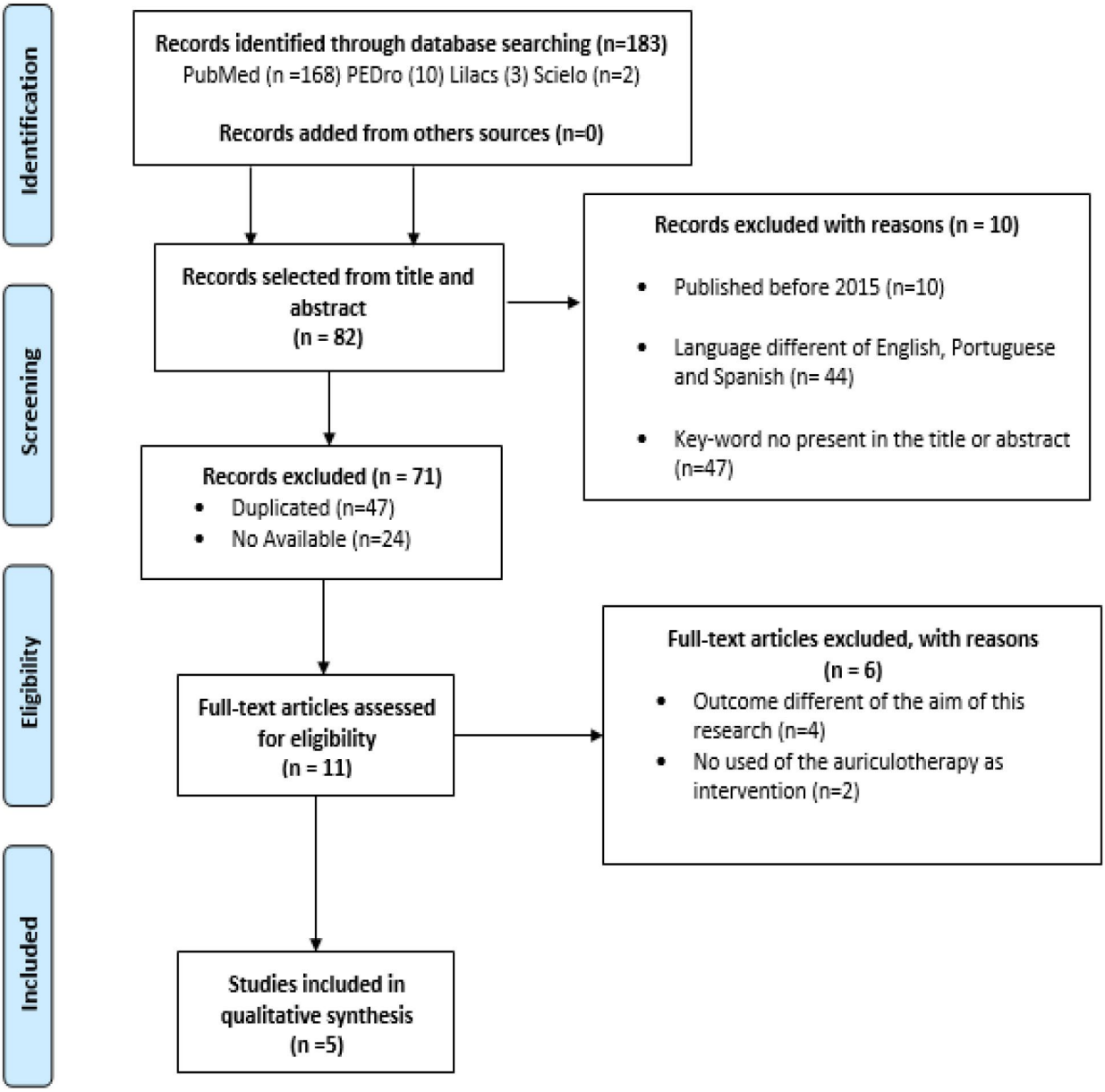
This practice has been used to control obesity in a natural way, since it works by stimulating points in the ear, through needles, seeds, stones, lasers, electrical treatment and pressure through the hands[12], resulting in the improvement of metabolic and digestive activities, in addition to the relief of anxiety[13] and suppression of appetite[14].

Despite its increasing use for the treatment of obesity, it is necessary to evaluate whether the use of auriculotherapy is effective for weight reduction in obese individuals compared to placebo or standard treatment. Thus, the objective of this study was to evaluate the effectiveness of auriculotherapy in weight control of obese individuals.

Method

This article is a Systematic Literature Review (CRD42020198862) that followed the recommendations proposed by Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA statement[15] (Appendix 1). The acronym PICO strategy was used to construct the study design, defining as "Population (P)" the obese patients, "Intervention (I)" the auriculotherapy, "Control (C)" the standard treatment or placebo/sham and "Outcomes (O)" the measurement of body weight.

Figure 1. Flowchart of studies included in the research



Eligibility Criteria

Participants in the included randomized controlled trials (RCTs) meet the following criteria: (1) overweight or obese individuals; (2) used auriculotherapy, with any type of auricular stimulation, compared to a sham control group or any other intervention; (3) independent of treatment time. RCTs that were not using auriculotherapy as an intervention were not included in this study; The BMI and the body weight was the first outcome, considered above 25 kg/m^2 and CC and leptin were considered as secondary outcome.

Search strategy

The searches were conducted from July to October 2016 by two independent researchers in the following electronic databases: PubMed, Lilacs, Scielo and PEDro. The following combinations of descriptors were used, without filter in the electronic databases during the searches: Obesity AND auriculotherapy, Obesity AND ear acupuncture, Obesity AND auricular acupuncture and Obesity AND auricular acupressure. Initially, the articles available in the databases were sorted according to inclusion criteria (published until 2015; available in Portuguese, English and Spanish; presence of descriptors in the title and/or abstracts). The titles and abstracts of all articles identified by the search strategy were evaluated, and then excluded those texts that were not available in full, duplicates, those that did not fit the type of study and those that did not present at least weight and/or BMI as an outcome.

Selection of articles and extraction of data

To ensure the reliability of the findings a peer review was performed, where each researcher independently extracted the data from the articles using an Excel spreadsheet search script such as author identification, study publication date, type of study, participants (sample number, mean age, gender, anthropometric data, etc.) and outcomes. Any disagreements regarding article selections were resolved by a third evaluator.

Evaluation of methodological quality

The evidence was analyzed using the PEDro[16] scale (Appendix 2), which measures the quality of randomized controlled trials and ranks them against 11 criteria: (1) Eligibility criteria, (2) Randomization, (3) Secret allocation of subjects, (4) Initial comparability, (5) Blinding of subjects, (6) Blinding of therapists, (7) Blinding of assessors, (8) Follow-up, (9) Intention to treat, (10) Inter-group comparison, (11) Measures of accuracy and variability.

The final score on the PEDro quality scale was given by adding together the number of criteria that were rated as satisfactory under criteria 2 to 11, as criterion 1 is not considered for the final score because it is an item that assesses the external validity of the trial[17]. Scores of 9-10 were considered excellent methodological quality, 6-8 good quality, 4-5 moderate and below 4 poor quality[18].

Results

Description of the study

The search initially identified 183 potentially relevant articles in the databases. After reading the title and abstract of each article found in the initial search, 82 studies met the inclusion criteria. Of these, 47 were excluded because they were duplicated and 24 because they were not available in full. Of the 11 articles selected for full reading, 4 were excluded because they did not have body weight measurement as an outcome and 2 because they did not use auriculotherapy as an intervention. Thus, only five studies met the eligibility criteria for systematic review. The articles included in this review were presented in the flowchart (Appendix 1), and their characteristics described in Table 1 (Appendix 2).

Chart 1. Mythological features of Randomized Clinical Trials included (to be continued)

Author	Aim	Intervention (Protocol / time / intensity)	Point of auriculotherapy	Main results
Ippoliti, Liguori, Petti *et al,* 2008[19]	To investigate the effect of the traditional Chinese low-calorie diet with and without ear acupuncture (EA) on body weight, BMI, waist circumference (WC) in obese patients. In addition, investigating the behavior of some cytokines, such as leptin.	Group A (n=30): Subgroup A1(n=15): EA (seed) + Traditional Chinese low-calorie diet of 900 calories. Subgroup A2(n=15): EA sham + traditional Chinese calorie diet of 900 calories. Group B (n=30): Ocidental traditional Chinese low-calorie diet of 900 calories Both groups: lasting of 6 weeks	Hungry, Shenmen,Liver, Kidney, Lung, Stomach and Mouth	Group A, the weight body difference was 85,39 ± 15,56 kg para 77,32 ± 14,67 kg, BMI 31,88 ± 4,96 to 28,96 ± 4,54, WC 7,38 ± 3,23 cm and leptina 28,64 ± 3,96 ng / ml. Group B, the difference in weight of body was 84,18 ± 15,08 kg to 81,19 ± 15,8 kg; BMI 31,71 ± 5,00 to 30,57 ± 5,02; WC 2,00 ± 0,26cm and leptina 9,31 ± 4,69 ng / ml.
Darbandi M, Darbandi S, Mobarhan *et al*, 2012[20]	To investigate the effects of ear acupressure combined with a hypocaloric diet on the leptin hormone level.	Group A (n=43): EA (seed of vaccaria) + diet hypocaloric Group B (n=43): EA sham (seedless placebo ear plaster) + low calorie diet. Both groups: auriculotherapy (2x / week for 6 weeks) standing for 3 days and acupressure before eating.	Shenmen (TF4), Stomach (CO4), Hungry point, Mouth (CO1), Ear Centre (HX1) and Sanjiao	The group A presented before the treatment significant changes in plasmatic levels of leptine (18,57%, p <0,01) and in the body mass (3%, p <0,01). In Group B no changes were observed about leptine and the reduction in BMI was (2%, p <0,01).
Darbandi M, Darbandi S, Owji *et al*, 2014[21]	To comparatively evaluate the effects of conventional ear and body electroacupuncture on abdominal fat mass in obese men.	Group A (n=20): Body Electraocupuncture + low calorie diet. Group B (n=20): Body Sham Electraocupuncture + low calorie diet. Group C (n=20): EA (seed) + low calorie diet. Group D (n=20): EA sham + low calorie diet. Both groups received 2 seasons/week (20 minutes) for 6 weeks.	Shenmen (TF4), Stomach (CO4), Hungry point, Mouth (CO1), Ear Centre (HX1) and Sanjiao (CO17)	In the group A, was observed a significant reduction in the value in the BMI (P <0,005), WC (P <0,05, P <0,005). The group C showed significant decrease in BMI (P <0,005) e CC (P <0,005) after comparison with group B and D.

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Chart 1. Mythological features of Randomized Clinical Trials included (conclusion)

Author	Aim	Intervention (Protocol / time / intensity)	Point of auriculotherapy	Main results
Yeh, Chu, Hsu *et al*, 2014[22]	To investigate the effect of a 10-week intervention of auricular electrical stimulation combined with auricular acupressure on weight reduction in obese outpatients.	Group A (n=36): auricular electrical stimulation combined with auricular acupressure + diet. Group B (n=34): auricular electrical stimulation combined with auricular acupressure (sham) + diet. Both Groups: 20 minutes/weeks and auricular acupressure 4 times per days 10 weeks.	Shenmen (TF4), Stomach (CO4) Endocrine (CO18) and Hungry	The BMI significantly decreased in the group A in 2,08 ± 2,00 kg / m^2 (t = 6,26, p <0,001) e 1,02 ± 2,06 kg / m^2 in group B (t = 2,90, p = 0,007).
Ito, Yamada, Kira *et al*, 2015[23]	Identify the mechanisms by which changes in eating behavior and the levels of various hormones related to appetite in response to auricular acupuncture exert their effects.	Grupo A (n=5): EA (fixed intradermal needle) The needle was fixed with adhesive tape weekly/month Group B (n=5): EA sham (not fixed intradermal needle). The needles did not pierce the skin and were fixed with adhesive tape weekly/month.	Hungry and Stomach.	The difference among the weight before the treatment and after 01 week of treatment was significant for all participants of the ear acupuncture's (p = 0,02) and in the group B (p = 0,18). The level of leptine not changed significantly in no one of the groups.

EA- Ear Acupuncture; BMI- Body Mass Index; WC- Waist Circumference.

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Risks of bias

The method used to assess the risk of RCT bias found for this study was the PEDro evidence scale (Appendix 3). Of the five studies, four[19,21-23] were rated as of good quality, as they obtained from 6 to 8 points, and only one RCT[20] presented excellent methodological quality, with a maximum score of 9 points.

Chart 2. Analysis of methological quality of Randomized Clinical Trials according PEDro's scale

		Ippoliti, Liguori, Petti et al 2008[18]	Darbandi M, Darbandi S, Mobarhan, *et al* 2012 [19]	Darband M, Darbandi S, Owji, *et al* 2014[20]	Yeh, Chu, Hsu, *et al* 2014[21]	Ito, Yamada, Kira, *et al* 2015[22]
1.	Criteria of eligibility	+	+	+	+	+
2.	Randomization	+	+	+	+	+
3.	Blinding Allocation of Sample	+	+	+	+	+
4.	Initial comparability	+	+	+	+	+
5.	Sample blinding	-	+	+	-	+
6.	Therapists blinding	-	-	-	-	-
7.	Blinding of evaluators	-	+	-	-	-
8.	Follow-up	+	+	+	+	+
9.	Intention of treating	+	+	+	+	+
10	Intergroup comparison	+	+	+	+	+
11.	Precision and variability measures.	+	+	+	+	+
	Total	7	9	8	7	8

Effects of the interventions

Body Mass Index (BMI)

Four studies used BMI as an outcome[19-22]. In the study of Ippoliti et al.[19], BMI decreased from 31.88 ± 4.96 to 28.96 ± 4.54 in group A (auriculotherapy with or without seed + traditional Chinese diet) and 31.71 ± 5.00 to 30.57 ± 5.02 in group B (hypocaloric diet), with statistically significant intergroup comparison of $p < 0.01$. The volunteers of the Darbandi et al.[20] study presented statistically significant reductions in their mean BMI (3%, $p < 0.01$) after treatment in the intervention group (hypokaline diet + ear acupressure) and reduction of (2%, $p < 0.01$) observed in the control group (sham ear acupuncture + hypocaloric diet). Yeh et al.[22] after the intervention found a statistically significant reduction of 2.08 ± 2.00 kg/m^2 in the experimental group ($t = 6.26$, $p < 0.001$) and 1.02 ± 2.06 kg / m^2 in the placebo group ($t = 2.90$, $p = 0.007$).

In the study by Darbandi et al.[21], the participants were divided into four different groups, two of which were intervention groups (Group A - electroacupuncture on a low-calorie diet, and Group C - acupuncture on a low-calorie diet) and two controls (Group B - placebo of Group A, and Group D - placebo of Group C). The groups that underwent interventions, even if distinct, had statistically significant reduction in the mean BMI difference ($p < 0.005$) group A, and BMI ($p < 0.005$) group C.

Body Weight

Only two RCTs evaluated body weight as an outcome[19,23]. The study of Ippoliti and team[19] showed a reduction in body weight between the first and last day of intervention in Group A (acupuncture with or without seed + traditional Chinese hypocaloric diet) from 85.39 ± 15.56 kg to 77.32 ± 14.67 kg, and in Group B (western hypocaloric standard diet) was 84.18 ± 15.08 kg to 81.19 ± 15.8 kg, the statistically significant difference between groups was ($p < 0.01$), with the greatest weight loss observed in Group A. For Ito et al.[23], the difference in weight before treatment and after one week of treatment was statistically significant for all participants of the acupuncture group ($p = 0.02$), while in the placebo group the changes were not statistically significant ($p = 0.18$).

Waist circumference (WC)

Two authors used waist circumference as a parameter[19,21] as an outcome of the studies. Ippoliti et al.[19] identified between the first and last day of the intervention, an inter-group reduction of WC of 7.38 ± 3.23 cm for group A (auriculotherapy plus traditional Chinese hypocaloric diet) and 2.00 ± 0.26 cm for group B (western hypocaloric standard diet), being statistically significant ($p < 0.01$) with a greater reduction of this anthropometric measurement in group A. In the study by Darbandi et al.[21], Group A (hypocaloric plus diet electroacupuncture) had a statistically significant reduction in the mean waist circumference difference ($p < 0.05$, $p < 0.005$) when compared to controls (Groups B and D), while Group C (hypocaloric diet plus auriculotherapy) had a statistically significant decrease in WC ($p < 0.005$) when compared to Group B (hypocaloric diet plus sham electroacupuncture).

Leptin hormone

Of the five articles included, three evaluated leptin hormone levels[19,20,23]. Of these, two used blood samples[19,23] as evaluation parameters that were taken in the morning on an empty stomach to record the leptin content, and on the last day of treatment. Ippoliti et al.[19] observed that in the group where auriculotherapy was associated with traditional Chinese diet the mean leptin difference was 28.64 ± 3.96 ng/ml, and in the group that did not receive it was 9.31±4.69 ng/ml. In the study of Ito et al.[23] there was no difference in leptin levels between groups.

Discussion

In auriculotherapy any change in a particular organ or part of the body can be detected or treated by the auditory pavilion, this is due to the large number of nerve branches derived from the spinal and cranial nerves that connect the auricular points to the brain regions[11]. It is in this context that auriculotherapy has an effect on obesity, since it acts in the homeostatic control of the energetic balance caused by this dysfunction[24].

The studies that investigated BMI as an outcome presented in both groups (intervention and control) a reduction in body mass; however, the results in the intervention groups were more significant. In all studies, the intervention groups associated auriculotherapy with diet and treatment time was between 6 and 10 weeks. Bueno et al.[25] evaluated in their study the adherence of overweight individuals to a food education program and the anthropometric evolution. The treatment lasted 10 weeks and resulted in a reduction in BMI, body weight, and WC; however, only 50% of individuals who enrolled in the program remained until the end of the research. The treatment of auriculotherapy, although demanding

little time, can also be finished with the decrease in the number of initial participants, but although there were losses, an improvement of anthropometric parameters was observed.

The reduction of body weight evaluated in the groups of the selected studies was significant for all the participants of the intervention groups, while for the individuals of the placebo groups the changes in body weight were not significant. Camilo & Ribeiro[26], who reviewed in the literature studies that analyzed weight loss in patients undergoing bariatric surgery at least 12 months postoperatively, found significant weight loss mainly between 6 and 12 months postoperatively, however there was weight gain between 6 and 8 years postoperatively. In this case, auriculotherapy can be more effective, as the treatment time for weight loss is between 4, 6, and 10 weeks, but it is not yet known about the time of weight gain, however, patients are not submitted to invasive procedures as is the case with surgery.

In the treatment with auriculotherapy when comparing the waist circumference parameters between the first and last day of the intervention there was a decrease in the measurements of the participants in the intervention groups. Many studies are including WC in anthropometric measurements, as it is able to provide an estimate of risk for the development of metabolic diseases associated with obesity[27]. Mariath et al.[28] evaluated the nutritional status and risk factors for chronic non-communicable diseases among 1,252 employees of an industry in Santa Catarina, Brazil and found high values of WC in 33% of employees, with significant difference between genders. This result allowed preventive and educational activities to be developed by the company in order to improve the employees' quality of life and productivity. In this case, auriculotherapy showed good results and would be a low cost and fast alternative for the treatment of these individuals.

Fonseca-Junior et al.[29] investigated the effects of exercise programs in the clinical and surgical treatment of morbid obesity and concluded that aerobic and resistance exercise programs are important in the treatment of morbid obesity, but care should be taken with the volume and intensity of exercise. Regarding the energetic expend during Benatti and Junior[30] physical exercises, they found alterations in the leptin levels, which has direct action in the alimentary behavior and energetic expend. In some studies that also evaluated leptin after treatment with auriculotherapy, the change in leptin levels was observed, although in one of the studies the levels did not change significantly in any of the groups.

Strengths and limitations of the study

The strengths of the research were the high quality of the evidence found in the search for auriculotherapy in the treatment of obesity according to the PEDro scale; the identification of the ear points used and the presentation of reproducible eligibility criteria.

As a limitation, this review presents a search period restricted to articles published until 2015, a high number of articles excluded because they are not available in full and because no direct contact was made with their authors.

Figure 2. Checklist for riding a Systematic Review with Metanalysis

Section/topic	Item #	Checklist item
ADMINISTRATIVE INFORMATION		
Title		
Identification	1a	Identify the report as a protocol of a systematic review
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number
Authors		
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support		
Sources	5a	Indicate sources of financial or other support for the review
Sponsor	5b	Provide name for the review funder and/or sponsor
Role of sponsor/ funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated
Study records		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data		
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)

Figure 3. Criteria's list for analyzing the evidence of the articles

PEDro scale

1.	eligibility criteria were specified	no ❑ yes ❑ where:
2.	subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	no ❑ yes ❑ where:
3.	allocation was concealed	no ❑ yes ❑ where:
4.	the groups were similar at baseline regarding the most important prognostic indicators	no ❑ yes ❑ where:
5.	there was blinding of all subjects	no ❑ yes ❑ where:
6.	there was blinding of all therapists who administered the therapy	no ❑ yes ❑ where:
7.	there was blinding of all assessors who measured at least one key outcome	no ❑ yes ❑ where:
8.	measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	no ❑ yes ❑ where:
9.	all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"	no ❑ yes ❑ where:
10.	the results of between-group statistical comparisons are reported for at least one key outcome	no ❑ yes ❑ where:
11.	the study provides both point measures and measures of variability for at least one key outcome	no ❑ yes ❑ where:

Conclusion

From the results, it was possible to conclude that auriculotherapy can be effective in controlling the weight of obese patients, as well as in anthropometric measures and leptin when associated with diet. The studies analyzed were classified with moderate and good methodological quality, which, in a way, guarantees reliability to the results presented. Although the effects found in other types of treatment are similar or superior to those found in auriculotherapy, it can be assumed that it is a more viable option for the management of obesity, since in addition to being a non-invasive, low-cost, fast and easy to apply technique, it requires less time to obtain the desired results. However, a more precise estimation of the effect will require larger and well-planned trials that adopt BMI and body weight as main outcomes.

Author contributions

Freitas LCS and Coutinho BD contributions to the conception, design, acquisition, analyzed the data and interpretation of data. Freitas LCS and Coutinho BD analyzed the data. Sousa PHC revised the article critically for important intellectual content. All authors made substantial contributions to drafting the report, agree and approve the final version of this work.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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