



Does auriculotherapy have therapeutic effectiveness? An overview of systematic reviews

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ABSTRACT

Background and purpose: Auriculotherapy is a therapeutic technique used for a wide variety of conditions. Nevertheless, similarly to any health related intervention, the clinical use of this therapy requires scientific evidence of effectiveness in order to support its rational use. The main goal of this article is to critically analyze published literature on auriculotherapy and to provide an overview of the effectiveness of this technique in the management of health disorders.

Methods: The inventory of published reviews on this subject was carried out in November 2017, by assessing the following computerized databases: PubMed, MEDLINE, PsycINFO, EBM, Cochrane Database of Systematic Reviews, CINAHL Plus NRC and Science Direct. Were only considered the systematic reviews based on meta-analysis with high methodological quality described according to AMSTAR (Assessment of Multiple Systematic Reviews). The eligible articles were systematically reviewed to find out in which health conditions auriculotherapy can be used with effectiveness.

Results: A total of 14 reviews were eligible according to the inclusion and exclusion criteria. Those reviews were focused on the management of insomnia, smoking cessation and pain, within the clinical scope of Neurology, Orthopaedics and Rheumatology.

Conclusions: Auriculotherapy has shown to have positive effects while associated to conventional treatments of insomnia, chronic and acute pain. Further well designed studies are required to evaluate the effectiveness of this technique in the treatment of other health conditions.

1. Introduction

Mammalian ear is a complex structure with origin in tissues of neural crest, mesoderm, endoderm and ectodermal. This anatomic structure includes ossicles, cartilage, muscles, nerves, blood vessels and epithelial membranes [1]. The current understanding of the mechanisms behind different reflex therapies, such as auriculotherapy, stands on the embryological hypothesis as well as on the strong innervation of the ear. In fact, the ear is one of few anatomic structures built up of tissue from each of the primary tissues found in an embryo. Therefore, this could hypothetically be related to the representation of the human body in the ear reflexology charts [2–5].

International standards and nomenclature were firstly developed in the nineties with the contribute of the World Health Organization (WHO). Most recently, Auricular Acupuncture Points (AAPs) were

accepted as a biomathematical model of the brain's anatomical organization. This view came out while assessing the neurophysiological correlations between auricular zones and their brain correspondences [6].

The sensory innervation of vegetative nerve centers receives information from the internal organs by electrical impulses conducted through Alpha, Beta and Gamma fibers. In turn, these are disseminators of sensitive perceptions to touch, pressure, temperature and proprioception that reach the sensory nuclei of the cranial nerves and the posterior horn of the Spinal Cord [3,5,7–10]. The information provided by thermal, algic and proprioceptive stimuli is transmitted from the auricular pavilion by the fibers of the following nerves: i) auriculotemporal nerve; ii) auricular branch of the vagus nerve (ABVN); iii) minor occipital nerve (sensitive branch of the cervical plexus) and iv) greater auricular nerve [3,5,7–10]. The auriculotemporal nerve

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Table 1
High quality reviews on auriculotherapy grouped by medical specialty and level of effectiveness.

Medical Specialty and pathologies	Number of Reviews	Effectiveness	Lack of Effectiveness
Neurology: Insomnia.	4	Lan et al., 2015 [17]; Yeung et al., 2012 [23]; Lee et al., 2008 [24]; Chen et al., 2007 [25].	–
Traumatology: perioperative pain; acute pain.	3	Murakami et al., 2017 [26]; Yeh et al., 2014 [27]; Asher et al., 2010 [13].	–
Psychiatry: smoking cessation; cocaine dependence	3	Di et al., 2014 [28]; White et al., 2014 [29].	Gates et al., 2006 [30].
Rheumatology: Low back pain, chronic tension headache; chronic neck pain; Knee osteoarthritis; Rheumatoid arthritis; chronic non-specific spinal pain; posterior pelvic pain.	3	Asher et al., 2010 [13]; Zhao et al., 2015 [31]; Yeh et al., 2014 [27].	–
Gastroenterology: constipation	1	Yang et al., 2014 [32]	–
Immunology: allergic rhinitis	1	Zhang et al., 2010 [33].	–
Obstetrics: nausea and vomiting in early pregnancy	1	Matthews et al., 2014 [34]	–
Ophthalmology: glaucoma	1	Law et al., 2013 [35]	–

originates from the mandibular branch of the trigeminal nerve, which mainly supplies the antero-superior and antero-medial areas of the external ear. ABVN is the only peripheral branch of the vagus nerve, covering a considerable part of the auricular shell and most of the area around the auditory canal. The minor occipital nerve originates from the C-2 branch of the cervical plexus, being responsible for the sensitive innervation of the upper third of the auricle. Finally, the major auricular nerve originates from the C-2 to C-3 branches of the cervical plexus, being responsible for the innervation of the lower region of the auricle [5]. As well, the electrical impulses are transmitted to other upper nervous systems structures such as the cranial nerve nuclei, the limbic system, the thalamus, the hypothalamus, the reticular formation, the cerebellum and the cerebral cortex. This signal processing and control is the base of the Sympathetic and Parasympathetic neurophysiological regulation [11].

In this scenario, auriculotherapy has been pointed out as a promissory method to treat conditions that go from substance abuse [12] to pain [13], obesity [14], anxiety [15], epilepsy [16], and sleep disorders [17]. Nonetheless, the effectiveness of this technique has only been tested in a relatively small number of evidence-based trials [3].

Given these arguments, the main goal of this work was the systematic study of the existing scientific evidence on the effectiveness of auriculotherapy as a therapeutic tool.

2. Methods

2.1. Inclusion and exclusion criteria

This systematic review followed the methodology guidelines detailed in the PRISMA checklist [18]. Our systematic review included: i) all systematic reviews with meta-analysis of high quality according to the criteria established by Assessment of Multiple Systematic Reviews [19]; ii) analyzed variable: efficacy of auriculotherapy versus placebo, sham acupuncture or usual treatment, in any type of pathology; iii) any type of ear-acupuncture therapy or ear-acupressure therapy (such as needles inserted into ear acupoints, electric stimulation, seeds or magnetic pellets attached to ear acupoints, or prick blood-letting technique on ear acupoints).

Were excluded from this work all the narrative and systematic reviews of low methodological quality, according to the criteria established by Assessment of Multiple Systematic Reviews (AMSTAR) [19].

2.2. Search strategy

Two independent researchers aided by a health sciences librarian searched the electronic databases by establishing key MESH terms, as well as free terms according to the PRESS standards [20]. The considered keywords are listed in the appendix file 1. The following

electronic databases were assessed in November 2017: PubMed, MEDLINE, PsycINFO (Psychology and Behavioral Sciences Collection), EBMR (Evidence-Based Medicine Reviews), the Cochrane Database of Systematic Reviews, CINAHL Plus, NRC (Nursing Reference Centre) and Science Direct. The references listed in the output studies and reviews were also scanned for relevant literature. PubMed was firstly searched and the adopted strategy was adapted to the other databases. As well, PROSPERO was also searched for ongoing or recently completed systematic reviews.

2.3. Selection, data extraction and analysis

The titles and abstracts of the output articles were screened for eligibility. The full texts of the preliminarily selected articles were then reviewed to confirm that they met the inclusion criteria. Elected articles were further analyzed in order to extract the required information, which included first author name, year of publication and country, study characteristics such as sample size, adverse effects, methodological quality, participants' characteristics (target population, age and gender) and outcome measures. All doubts about the eligibility of certain studies were discussed between the authors of this study. The effectiveness criteria for auriculotherapy interventions was based on the statistical differences versus placebo, sham acupuncture or usual treatment [21,22].

The AMSTAR checklist was used to assess the methodological quality of the included systematic reviews. The instrument is an 11-item questionnaire that asks reviewers to answer yes, no, can't answer or not applicable. All items scoring "yes" received one point, up to a maximum of eleven points for each review.

The criteria for AMSTAR includes 3 grades of evidence: i) score between 9 and 11 indicates that systematic review is of good quality; ii) score between 5 and 8 indicates that systematic review is of medium quality and iii) score between 0 and 4 indicates that systematic review is of low quality [19]. See Tables 2–5 and the appendix file 2 for detailed information.

The statistical differences between the treatments and the sham or control groups were evaluated considering variables such as the standardized mean difference (SMD), the 95% confidence interval (CI), the mean difference (MD), the relative risk (RR) or the heterogeneity (I^2).

3. Results

3.1. Search output and selection

A total of 3975 articles were retrieved from the initial search. Among them, 59 studies were considered after the preliminary screening evaluation. From these latter, 14 met the eligibility criteria and 45 were excluded (13 were in animals, 29 were on acupuncture and

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