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Foot reflexology in autoimmune diseases: Effectiveness and mechanisms

Jozélio Freire de Carvalho, Aaron Lerner, Carina Benzvi

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Abstract

Foot reflexology (FR) is a Chinese-originated and non-invasive complementary therapy increasingly used by functional, alternative and para-medical professionals. Enhance attempts are made to study FR in non-functional organic conditions. The present invited Editorial discusses the application of FR in autoimmune diseases (AD), highlighting a few successful studies demonstrating symptomatic relief and objective improvements. Despite promising results, the FR domain remains under-investigated and an urgent need to confirm and understand the effect of FR in chronic diseases, including AD, is highly recommended.

Key Words: Reflexology; Foot reflexology; Sensorineural hearing loss; Autoimmune diseases; Autoimmunity

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Core Tip: Reflexology is an ancient Chinese technique largely used although with few scientific evidence. The present Editorial reviews reflexology effects in autoimmune disorders and comments on a recent clinical case of successful use of reflexology in a sensorineural hearing loss.

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INTRODUCTION

Foot reflexology (FR) is an ancient technique originated from China, and widely used worldwide as a complementary and alternative therapy for multiple complaints and conditions. FR is a non-invasive pressure and touch therapy applying thumb pressure with finger and hand techniques on any particular point or zone on the feet that could stimulate the related part of the body, which generates a reflex affecting corresponding glands, organs and systems of the body[1]. This manual technique has been studied in diverse clinical conditions, including anxiety, stress, pain and fatigue induced by disease, surgery and pregnancy[2-4].

Previous authors have compared reflexology to sham treatment for other conditions with varying results. For instance, Williamson *et al*[5] found improvements in both reflexology and sham groups in the treatment of menopausal symptoms. In asthma, improvements in quality of life after reflexology were observed[6]. Moreover, a significantly greater reduction in premenstrual symptoms compared to a sham treatment was documented[7]. On the other hand, no improvements were detected in patients with irritable bowel syndrome in comparison to placebo[8].

Interestingly, a physiological correspondence between foot reflex areas and cerebral hemisphere areas have been established[9]. In an interesting study on smoking cessation, the FR effect was evaluated with functional magnetic resonance imaging (MRI). The authors detected a link between brain regions correlated with foot stimulation, especially the precentral gyrus of the frontal lobe and the postcentral gyrus of the parietal lobe[10].

A recent case report described FR improving chronic sensorineural hearing loss (SNHL) in a young Chinese girl[11]. After six months of daily 30-minute foot stimulation, her hearing threshold returned to normal, documented with functional brain MRI showing enhanced activity in language-related brain areas. This is the first study to provide physiological evidence of FR's impact on hearing recovery, addressing a gap in understanding how FR could be clinically beneficial.

Several autoimmune diseases (ADs) have been associated with SNHL, highlighting the complex relationship between the immune system and auditory function. Systemic autoimmune conditions such as systemic lupus erythematosus (SLE)[12], rheumatoid arthritis (RA)[12], Sjögren's Syndrome[13], Wegener's Granulomatosis[13], and polyarteritis nodosa[13] have been linked to SNHL. Studies have shown significantly higher odds of developing SNHL in patients with SLE (12.11 times) and RA (2.23 times) compared to the general population. Other autoimmune conditions, including vitiligo[12], autoimmune thyroiditis[14], and eosinophilic granulomatosis with polyangiitis[15], have also been associated with SNHL. Of note, autoimmune inner ear disease, which can occur in isolation or in conjunction with systemic ADs, represents a specific condition affecting less than 1% of all SNHL cases, though its prevalence may be underestimated [16]. The mechanisms underlying these associations and the true prevalence of SNHL in various ADs remain a subject of ongoing research, emphasizing the need for further exploring this field.

The present Editorial will extend those observations and try to screen the literature for FR applications and efficacy in various ADs.

LITERATURE SEARCH

Literature search was performed using the PubMed database and found a few articles on FR in ADs. Systematic research of articles published in PubMed/MEDLINE, Web of Science, LILACS and SciELO, dating from 1960 to April 2024 was performed. We executed a literature search using the following MeSH terms "foot reflexology" AND "rheumatic diseases", "autoimmune diseases", "rheumatoid arthritis", "antiphospholipid syndrome", "dermatomyositis", "undifferentiated connective tissue disease", "Raynaud phenomenon", "spondylarthritis", "psoriasis", "vitiligo", "pemphigus", "erythema elevatum diuturnum", "inflammatory bowel disease", "Crohn disease", "ulcerative colitis", "autoimmune hepatitis", "primary biliary cholangitis", "primary sclerosing cholangitis", "autoimmune pancreatitis", "autoimmune enteropathy", "thyroiditis", "Grave's disease", "Hashimoto disease", "type 1 diabetes", "Addison disease", "autoimmune hypopituitarism", "multiple sclerosis", "myasthenia gravis", "autoimmune myocarditis", "autoimmune pericarditis", "IgA nephropathy", "uveitis", "idiopathic thrombocytopenic purpura" and "idiopathic dilated cardiomyopathy".

The studies have several limitations. Most involve small sample sizes, lack control groups, and use inconsistent methodologies, making comparisons difficult. Additionally, follow-up periods are often too short to assess long-term effects, and the mechanisms by which FR might impact ADs remain underexplored. These gaps highlight the need for larger, standardized studies with longer follow-ups to better understand FR's potential in ADs.

The present search found 6 articles on FR in RA ($n = 2$) and multiple sclerosis ($n = 4$) (Table 1). Regarding RA, one study was an open prospective trial with 60 participants[17], and the other one was a randomized controlled trial with 30 patients[18]. Both studies evaluated patients during a 6-week period of weekly FR sessions. In the two trials no improvement in pain and sleep was observed; however, in the first article[18], a reduction in fatigue was detected.

Concerning multiple sclerosis, a systematic review on FR on this brain neurological disease disclosed 9 articles containing 545 patients[19]. Most studies evaluated FR applying 30-60 minutes weekly for 4-11 weeks and found a reduction in pain, fatigue, muscle spasm, stiffness, psychological symptoms, Improvement in quality of liver, bowel and bladder functions in most studies.

Table 1 Studies on foot reflexology and autoimmune diseases

Ref.	Study design, N, country	Disease, age, sex	Disease duration	Comparator, reflexology sessions, outcome
Otter <i>et al</i> [18]	Open prospective, 30, United Kingdom	RA, 59.8 years, 100% F	18.8 years	Foot reflexology <i>vs</i> foot massage, 45 minutes weekly for 6 weeks, improved fatigue, sleep and foot pain
Bakir <i>et al</i> [17]	Randomized controlled trial, 60, Turkey	RA, 50.16 ± 14.32 (22-74 year), 76.6% F	12.25 ± 7.65 years	Usual RA therapy + reflexology <i>vs</i> control (usual RA therapy and no reflexology), 30 minutes weekly for 6 weeks, Improved pain and sleep
Deenadayalan <i>et al</i> [19]	Systematic review, 545 (9 articles), India	MS, 4/9-100% F, 5/9-M/F	ND	Reflexology <i>vs</i> Control group in 8/9 studies, 30-60 minutes weekly for 4-11 weeks, reductions in pain, fatigue, muscle spasm, stiffness, psychological symptoms, Improvement in quality of life, bowel and bladder functions
Lee <i>et al</i> [11]	Case report, 7, China	SHL, 3 months, girl	Since birth	Reflexology (<i>n</i> = 1) <i>vs</i> No reflexology (<i>n</i> = 6), 30 minutes weekly for 24 weeks, hearing threshold recovered to a normal level. The girl can speak

RA: Rheumatoid arthritis; MS: Multiple sclerosis; SHL: Sensorineural hearing loss; F: Female; M: Male.

DISCUSSION

Only a few scientific reports are available on FR and brain/systemic conditions and fewer are on FR and ADs. No doubt that the literature shortage hampers a wider clinical application of this ancient Chinese mode of therapy. Several aspects should be discussed concerning efficiency and the mechanistic mode of action of the FR, connecting foot to remote organs, including the human brain (Figure 1).

Analyzing the endpoints outcomes, one can see that the improvements were mostly on subjective and functional complaints[17-19]. Fatigue, pains and aches, sleep quality, psychological symptoms and quality of life are not objective enough and are difficult to quantitate, document and compare between patients[20]. Taking those limitations in account, our search on FR and ADs detected some subjective relief of symptoms that should be further evaluated by well-designed and controlled studies.

Several mechanisms might operate in relieving the patients' complaints (Figure 1): Reflexology theoretically helps to release enkephalins, which block pain messages to the brain, thus relieving pain and anxiety levels[21].

Brain and kidney-associated FR increases blood flow to the corresponding organs in that zone[22].

Reflexology is based on the principle that the hands and feet are a mirror of the body. Those reflex points correspond to the individual central and remote organs all over the human body[23]. The hypothesis is that the pressure massage application stimulates the corresponding organs associated with the area being massaged.

The brain might be the intermediate organ that connect FR to peripheral organs. In fact, several studies showed activation of cerebral areas, like the superior frontal gyrus, inferior frontal gyrus, and right middle temporal cortex[9,10,24] documented by functional MRIs, in various conditions, including in the present Chinese girl[11].

The spinal cord route. In addition to transmitting sensory information, the nerve endings in our feet also play a role in motor function. The muscles in our feet are controlled by motor neurons that are connected to the brain through the spinal cord. Impulses from the tibial nerve then travel to the brain to provide sensory information and help control the voluntary and involuntary movement of the lower limbs[25,26].

FR increases beta and gamma waves, and activates the frontal cortex as documented in normal individuals by electroencephalography (EEGs)[27].

Finally, the intestinal microbiome is heavily involved in brain functions[28-30] it is hypothesized that FR might change the "gut-brain". Indeed, recently, acupoint massage therapy was shown to change the gut microbiotic composition and diversity and the cytokine profile[31]. However, to our knowledge, the effects of FR on the human intestinal microbiome were not investigated.

It should be stressed that FR is mainly advocated and practiced by complementary, functional and alternative medicines for symptoms and some organic conditions. Despite all those potential physiological pathways mentioned above, a note of caution should be declared. Although the results of the present Editorial showed some functional, EEG and brain-beneficial changes, FR remains under investigated and its mechanistic biological pathways are still unknown [8].

There is not enough evidence to support reflexology as an approved therapy or cure for any organic condition. Some studies show positive health benefits, but most studies on reflexology are of poor quality. The area is under-researched, and almost unresearched[8,32,33]. Future studies should focus on objective measurements and standardized protocols. Key areas for investigation include biomarker studies (*e.g.*, inflammatory markers, stress hormones), advanced neuroimaging techniques (fMRI, PET scans), autonomic nervous system assessments (heart rate variability, galvanic skin response), and immunological evaluations. Researchers should also employ validated pain quantification methods, standardized functional assessments, and sleep studies. Larger, multi-center randomized controlled trials with appropriate control groups and longer follow-up periods are essential. Additionally, exploring the potential effects of FR on the gut microbiome and conducting economic analyses could provide valuable insights. By incorporating these objective measures and rigorous study designs, researchers can more effectively quantify the benefits of FR and establish its potential role in managing autoimmune and other chronic conditions.

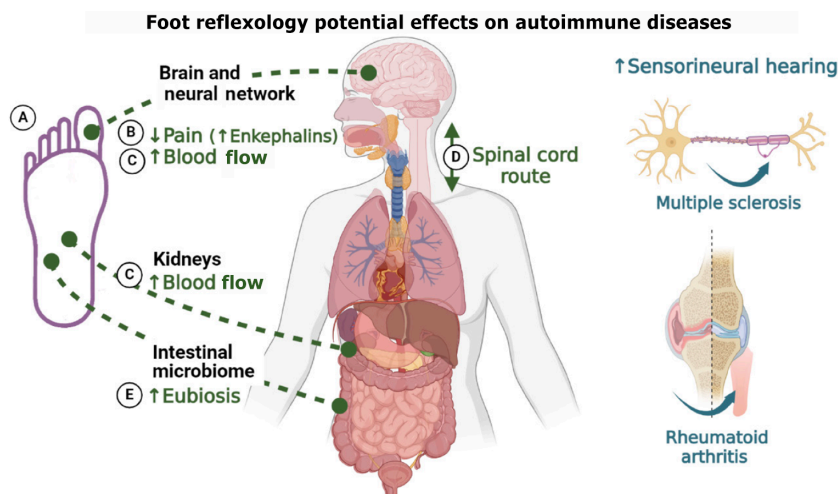


Figure 1 Mechanisms and potential effects of foot reflexology in relieving autoimmune diseases. A: Hands and feet reflect the entire body, with reflex points corresponding to central and remote organs. Pressure massage stimulates these corresponding organs; B: Reflexology may help release enkephalins, which block pain messages to the brain, reducing pain and anxiety. Magnetic resonance imaging show that foot reflexology (FR) activates cerebral areas (e.g., superior frontal gyrus, inferior frontal gyrus, right middle temporal cortex); C: Brain and kidney-associated reflexology increases blood flow to these corresponding organs; D: Motor neurons in the feet connect to the brain via the spinal cord, controlling voluntary and involuntary lower limb movement; E: The intestinal microbiome is heavily involved in brain functions. It is hypothesized that FR might affect the "gut-brain" axis. This figure was created in BioRender.com.

CONCLUSION

In summary, it is quite strange that such a widely used and popular therapy is scientifically under-investigated. Therefore, well-constructed, large-scale, and randomized controlled and blinded trials are urgently needed to confirm the effect of FR for chronic diseases, including ADs.

FOOTNOTES

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