

Acupuncture in the treatment of Dry Eye Syndrome with anxiety symptoms. A case report

Francesco Pesavento (1), Antonello Lovato (1), Stefano Cappello (2), Marco Postiglione (1)

(1) Italian Association for Scientific Research and Updating (AIRAS) Padua, Italy; (2) Italian Optometric Society (SOPTI), Rome, Italy.

This article is distributed under the terms of the Creative Commons Attribution Noncommercial License (CC BY-NC 4.0) which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

Abstract

Dry Eye Syndrome (DES) is an eye disorder caused by alteration of production or composition of tear film. Symptoms include dry eye dryness, burning, itching and pain, and often is associated with emotional stress, anxiety and depression. Evidence of the effectiveness of acupuncture to treat DES has recently appeared in literature but not on acupuncture treatment of DES related anxiety or depression symptoms. A 53-year-old male, good health, no serious medical conditions, with history of contact lenses wearing, anxious personality traits and anxiety symptoms, suffering from DES, was treated with acupuncture, twice a week for three weeks with somatic and ear acupoints selected from literature. Inferior marginal lacrimal meniscus, lipid layer interferometry, tear ferning test, psychiatric interview, State-Trait Inventory -Y (STAI-Y) questionnaire and Hamilton-Anxiety Rating (HAM-A) scale was evaluated before and after treatment and at 15 , 30 , 60, and 90 days follow-up. Results show clear and lasting improvements with remission of eye symptoms, together with clear and stable improvements of anxiety symptoms. Acupuncture is an effective treatment also for DES related anxiety symptoms.

Key Words: Dry Eye Syndrome; acupuncture; anxiety; depression.

Eur J Transl Myol 32 (2): 10482, 2022 doi: 10.4081/ejtm.2022.10482

Dry Eye Syndrome (DES) is an eye disorder caused by alteration of the production or of the composition of the tear film. DES most common symptoms include sensation of eye dryness, burning, itching and pain, photophobia, the feeling of having a foreign body in the eye and ocular hyperemia and often is associated with general tiredness, eye strain, postural stress, emotional stress, anxiety or depression. The primary cause of DES is conjunctiva and cornea dehydration which causes eye irritation, due to qualitative alteration of the composition of tear film because of insufficient production or excessive evaporation.¹ Tear film is composed of a lipid outer layer (protective function), an aqueous middle layer (keeps atmospheric oxygen in solution to provide it to the corneal epithelium), and a mucosal inner layer (direct lubricating function). The root causes of DES are multiple, including diseases (ex: autoimmune disorders, diabetes, blepharitis and conjunctivitis) and unfavorable environmental factors (ex: excessively dry environment, incorrect or prolonged use of contact lenses, prolonged exposure to electronic device screens).¹ Treatments frequently are

based on continuing topical application of artificial tears or lubricating gels to restore the tear film and relieve symptoms. However, it is fundamental to act on underlying diseases, predisposing factors, any complications and the related symptoms.^{1,2} Studies have demonstrated the association between DES and anxiety and depression symptoms. Wan et al.³ confirmed that depression and anxiety are prevalent in patients with DES when compared to the control group. Nepp et al.⁴ researched psychiatric symptoms in 110 patients suffering from DES concluding that people with DES are known to suffer from anxiety and depression and leading to the hypothesis that psychological stress acts on the nervous system by inhibiting lacrimal gland function. Bitar et al.⁵ confirmed there is a significant correlation between DES and the anxiety and depression symptoms, concluding that an effective treatment for this disorder could have a positive effect on anxiety and depression symptoms as well. Tiskaoglu also confirmed a clear association between depression and DES in patients with new diagnosis of depression.⁶ The effectiveness of acupuncture for the treatment of anxiety symptoms has been extensively studied, with many

papers illustrating different selections of acupoints and different selection criteria for the acupoints used. A review published by the British Acupuncture Council reported that acupuncture improved symptoms of anxiety.⁷ A recent systematic review on 32 clinical and preclinical studies published between 2000 and 2010, also reported the significant and positive results obtained with acupuncture treatment for anxiety symptoms.⁸ Evidence of the effectiveness of acupuncture in the treatment of DES has recently appeared in literature. A double-blind randomized controlled trial, conducted at the University of Pittsburgh,² showed that symptoms improve as soon as a week after starting treatment with acupuncture and, most importantly, that there is a stable and significant improvement 6 months after the end of treatment with a tendency to reduce use of artificial tears in addition to a lessening of subjective symptoms (such as the sensation of dry eyes and irritability). A critical literature review carried out by a Korean research team in 2018,⁹ highlighted that acupuncture in combination with the use of artificial tears is an effective remedy, as is acupuncture alone and that the treatment turns out to be even more effective if continued for more than a month with sessions fewer than three a week. Another analysis of the literature in 2015 confirmed both the effectiveness of acupuncture on DES and its superiority as a treatment as compared to the use of artificial tears.¹⁰ Literature on results of acupuncture treatment of DES related anxiety or depression symptoms is very scanty. Thus a patient suffering from DES and the related anxiety symptoms was assessed before and after acupuncture treatment to evaluate effectiveness of this treatment also on anxiety symptoms.

Materials and methods

A 53-year-old male, who reported has always been in good health, in very good physical shape, no mention of serious medical conditions, nor hospitalization and not on any type of medical drug therapy was recruited. As regards psychiatric mental health disorders, patient reported no personal nor family history, no previous psychiatric evaluation, nor to have ever taken psychiatric medication. Patient declared history of contact lenses wearing (i.e. many years) due to hyperopia and has been suffering from sensation of eye dryness, burning and itching for three years, alleviated by use of artificial tears every two hours every day. Patient self-reported as an anxious person and stated that the eye symptoms have become such an issue to provoke irritability and anxiousness. Patient was consistent with the following diagnosis before treatment: "Dry eye syndrome, combined with anxious personality disorder and generalized anxiety disorder" (H04.1 - F60.6 - F41.1, ICD-10 criteria) and (301.82 - 300.02, DSM-5 criteria).^{11,12} Informed consent was obtained and the study protocol (i.e. assessment and

treatment protocols) obtained approval of the Ethics Committee of the Scientific Association to which the authors are affiliated (protocol number: AIRAS 05012021-CR).

The patient underwent an acupuncture treatment of two 30-minute sessions per week for 3 weeks for a total of 6 sessions. At the 60-day follow-up, he was treated for the 7th session, a "booster session", before scheduled evaluation. The treatment was done by an accredited acupuncturist registered to the FISA (Federazione Italiana Scuole di Agopuntura or Italian Federation of Acupuncture Schools). Standards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA) criteria and Case Report guidelines (CARE) were complied.

Acupoints employed, selected from literature,^{2,9,10-16} were: BL2, ST2, TE23, Ex-HN5, SI18, GB14, G14, ST36 and BL65 as for somatic acupuncture while Omega1 (SC2), Eye Disorder 2 (IT1-AT1), PMS (LO3-LO4) on the dominant ear (i.e. the right ear) and Shenmen (TF2) and PMS (LO3-LO4) on the left ear as for auricular acupuncture, respectively.

All needles of somatic acupuncture points received a stimulation through circular manual, applied every 5 minutes. Needles used on face and on ear were: Seirin 0.18 x 15 mm for the first 5 sessions and Seirin 0.20 x 15 mm for the 6th and the "booster session". Needles used on body were: Seirin 0.20 x 30mm for the first 5 sessions, Seirin 0.25 x 30mm for the 6th and the "booster session". Insertion depth was between 2 and 4 mm. Evaluation protocol was as follows. Immediately before (T0) and after the first 6 sessions of treatment (T1), assessment of the inferior marginal lacrimal meniscus together with interferometry of the lipid layer, tear ferning test, psychiatric interview, STAI-Y questionnaire,^{13,14} and HAM-A scale,¹⁵ were carried out. Follow-up evaluation sessions were at 15 (T2), 30 (T3), 60 (T4), and 90 (T5) days after the first 6 sessions of treatment, respectively, during which assessment of the inferior marginal tear meniscus, interferometry of the lipid layer, tear ferning test and psychiatric interview was carried out (STAI-Y and HAM-A scale were not evaluated at these stages) (See Table 1). Simultaneous psychiatric and tear film evaluations were always performed by two independent blinded assessors

Results

Treatment Protocol Results

The effects of the acupuncture sessions as reported by the patient are as follows.

Session 1: Patient reported that the eye socket felt warm, moist and no longer dry from that same evening.

Session 2: Patient reported artificial tears use every four hours instead of every two hours.

Session 3: Patient reported to have interrupted the use of artificial tears after this session and to have never used them again.

Acupuncture in the treatment of Dry Eye Syndrome with anxiety

Eur J Transl Myol 32 (2): 10482, 2022 doi: 10.4081/ejtm.2022.10482

Table 1: Results of the follow-up

Days after treatment	Pre-evaluation	End of the treatment ¹	15 days	30 days	60 days ²	90 days
Time Scale	T0	T1	T2	T3	T4	T5
Ocular Symptoms	yes	none	none	none	none	none
Use of artificial tears	yes	no (from session 3)	no	no	no	no
Subjective Anxious Symptoms (Psychiatric Evaluation)	yes	none (from session 5)	none	none	none	none
Ham-A Scale	25	1	not applied	not applied	not applied	not applied
Stai Y1(state)	52	25	not applied	not applied	not applied	not applied
Stai Y2 (trait)	48	42	not applied	not applied	not applied	not applied
Tear film (quantity and quality)	bad	good	good	good	good	good
Ferning test	few thinned ferns	very dense and abundant ferns	dense and abundant ferns	dense and abundant ferns	dense and abundant ferns	dense and abundant ferns
Interferometry test	moderate lipid layer moving slowly at every blink	moderate lipid layer moving faster at every blink	moderate lipid layer moving faster at every blink	moderate lipid layer moving faster at every blink	moderate lipid layer moving faster at every blink	moderate lipid layer moving faster at every blink
Lower tear meniscus	very thin inferior marginal lacrimal meniscus with a very thin and fragmented black line	bigger lower tear meniscus with a thick and pronounced black line	normal lower tear meniscus with a thick and pronounced black line	normal lower tear meniscus with a thick and pronounced black line	normal lower tear meniscus with a thick and pronounced black line	normal lower tear meniscus with a thick and pronounced black line

1: at 3 weeks; after treatment session number 6; 2: after treatment session number 7 or “booster session”

Session 4: Patient reported he felt calmer, less anxious and better able to cope with events, despite a very challenging and stressful moment both at work and in personal life.

Session 5: Patient reported ongoing use of contact lenses though without applying artificial tears and without issues. Patient reported that when contact lenses

were removed, his eyes no longer felt dry but felt satisfactorily moist. Furthermore, patient reported disappearance of anxiousness symptoms.

Session 6: Patient reported subjective feeling of well-being, no use of artificial tears, no eye symptoms, no anxiety symptoms

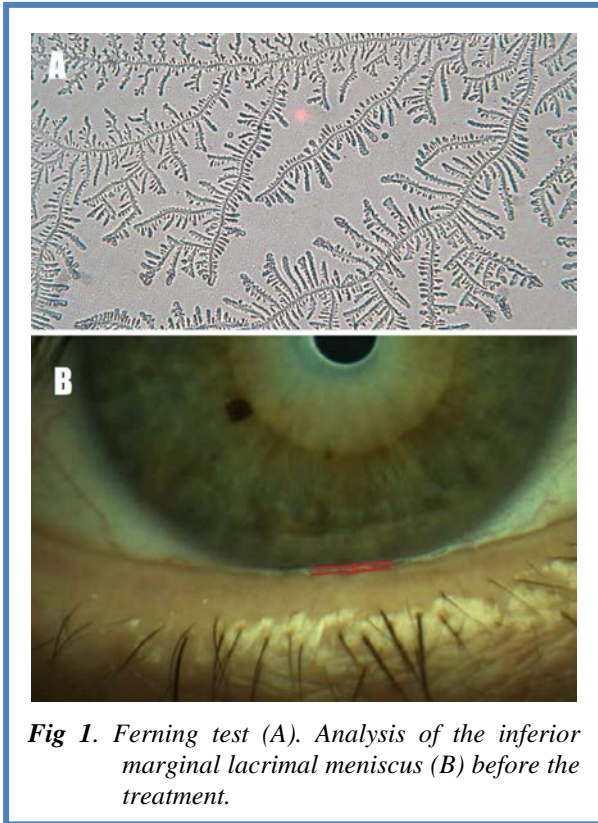


Fig 1. Ferning test (A). Analysis of the inferior marginal lacrimal meniscus (B) before the treatment.

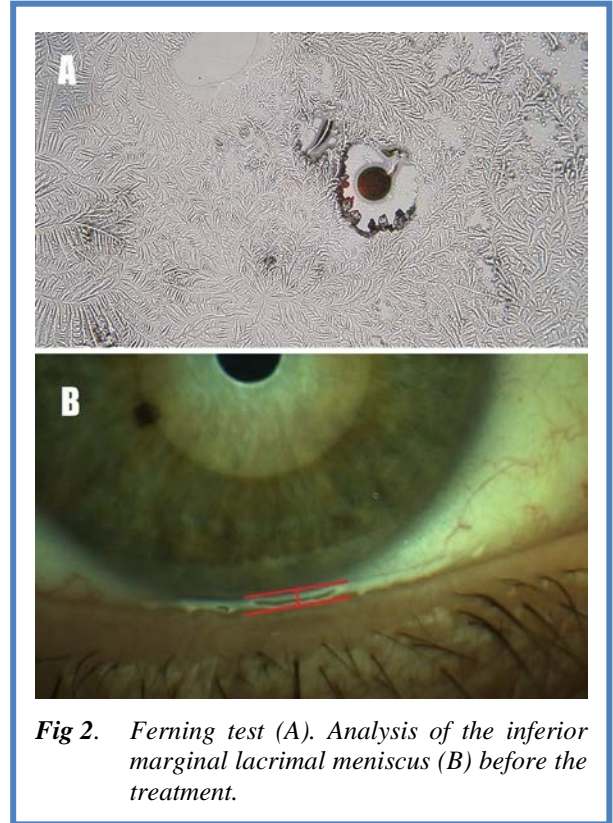


Fig 2. Ferning test (A). Analysis of the inferior marginal lacrimal meniscus (B) before the treatment.

At follow-up appointments carried out at 15 (T2), 30 (T3), 60, (T4) and 90 (T5) days after the 6th session, patient still used contact lenses but without using artificial tears and reported disappearance of DES symptoms and of psychiatric symptoms (Table 1). At all evaluations, patient denied taking any kind of psychiatric or other medication.

Evaluation Protocol Results

Pre-treatment evaluation (T0) showed evidence of a very thin inferior marginal lacrimal meniscus, with a very thin and fragmented black line (Figure 1 - B). Tear ferning test showed few thinned ferns (Figure 1 - A). Interferometry of the lipid layer highlighted a moderate lipid layer, moving slowly at every blink. Psychiatric interview highlighted anxiety symptoms such as a sense of emotional tension, restlessness and anxious personality traits. Evaluation of anxiety symptoms with the HAM-A scale gave a score of 25. The STAI-Y questionnaire gave a score of 52 in the Y1 subscale (state anxiety) and a score of 48 on the Y2 subscale (trait scale), respectively (Table 1). Post-treatment evaluation (T1) showed evidence of a bigger lower tear meniscus, with a thick and pronounced black line (Figure 2 - B). Tear ferning test highlighted very dense and abundant ferns (Figure 2 - A). Interferometry of the lipid layer showed a moderate lipid layer, moving faster at every blink as compared to pre-treatment evaluation. The same results were observed at the follow-up appointments at 15 (T2), 30 (T3) and 60, (T4) days (results at 60 days shown in Figure 3 - A and B).

Assessment at follow-up appointment at 90 (T5) days showed a maintained excellent quantity and quality of the tear film.

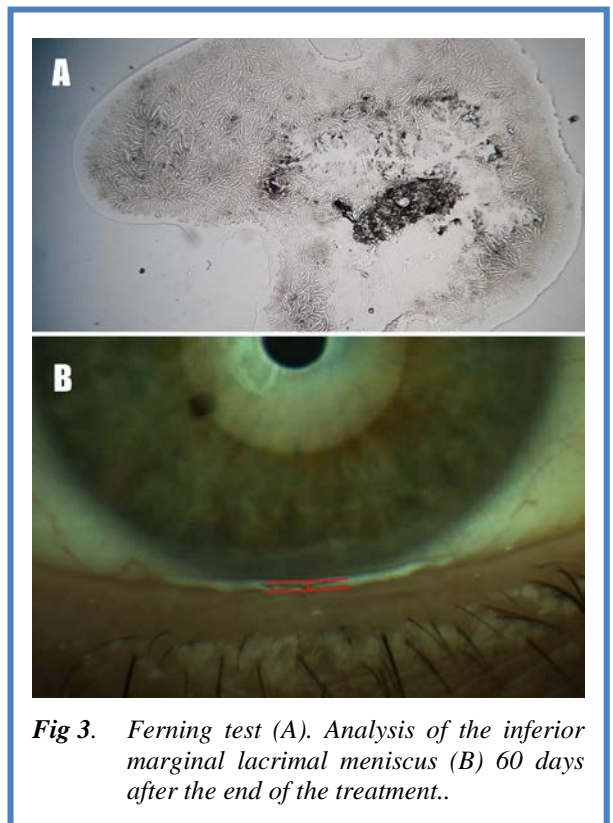


Fig 3. Ferning test (A). Analysis of the inferior marginal lacrimal meniscus (B) 60 days after the end of the treatment..

As regards evaluation of psychiatric symptoms, the STAI-Y questionnaire and the HAM-A scale showed an improvement over all aspects at T1 (i.e. at the end of the treatment). Specifically, the HAM-A Scale score dropped from 25 to 1 (i.e. to a mild muscle tension), the Y1 subscale score (i.e. state anxiety) of the STAI-Y dropped from 52 to 25 (i.e. below the cut-off score), while the Y2 subscale score (i.e. trait anxiety) dropped from 48 to 42, respectively (Table 1).

Psychiatric interview performed at T1 did not reveal any anxiety symptoms, while it confirmed the presence of anxious personality traits, though not symptomatic. Evaluation of anxiety by psychometric tests was therefore suspended, given that the patient reported subjective well-being at the following checks. The authors then decided to continue the evaluation by psychiatric interview only. To date the patient is continuing the treatment by undergoing one session every 60 days and reports no eye symptoms or anxiety and no longer uses artificial tears.

Discussion

Auricular acupuncture (AA) is a microsystem acupuncture where the ear is viewed as the somatotopic representation of the entire human body.¹⁶ AA differs from somatic acupuncture in the mechanism of action (MOA) which is based on the activation of reflex pathways by stimulating the nerve endings of the vagus, trigeminal or facial nerves.¹⁶ The different MOA of the somatic acupuncture as compared to the AA allows the two methods to be integrated to obtain greater and better results, thus enhancing the effect of somatic acupuncture. Data gathered from assessment of the inferior marginal lacrimal meniscus, interferometry of the lipid layer, tear ferning test, psychiatric interview and psychometric tests seem to confirm that it is possible to get good results from the treatment of DES with acupuncture, both as regards the typical symptoms of this syndrome and those affecting the mental sphere. Notably, the patient no longer used artificial tears from the third session (i.e. 10 days after the beginning of the treatment). Furthermore the patient reported no longer experiencing eye dryness, itching nor burning symptoms. Meanwhile, quantity and quality of composition of the tear film improved (Figure 2), so much so the patient was able to permanently interrupt use of artificial tears. Assessment on quantity and quality of composition of the tear film done at follow-up evaluation at T2, T3, and T4, showed a distinct and lasting improvement (Figure 3) on DES symptoms with an increased production of tear film and a more balanced and functional composition of the tear's aqueous, mucosal and lipid components. Final assessment done at T5 follow-up (with only one "booster session" done after 60 days from last treatment session) showed that tear film still displayed satisfactory quality and quantity, with patient reporting being free of DES symptoms. As regards the eye symptoms,

improvement obtained was maintained throughout the duration of the follow-up sessions and beyond.

As regards anxiety symptoms, the authors fully agree with the what is found in literature on the efficacy of acupuncture for anxiety symptoms treatment, both of the state and the trait components.^{7,8}

The psychiatric interview showed a complete remission of anxiety and a greater ability to face daily life stress as soon as after the fourth treatment session (i.e. 15 days after the beginning of the treatment). The decrease in scores as seen on T1 evaluation scales (of the HAM-A Scale and STAI-Y questionnaire) as compared to T0, is in line with what was reported by the patient and with what was detected during the psychiatric assessment, that is what can be described as a complete remission of the subjective anxiety symptoms. As expected, state anxiety improved more than trait anxiety.

After a first psychiatric assessment, the patient was evaluated as not affected by depressive symptoms and therefore the authors decided not to pursue the evaluation of possible antidepressant effects of the acupuncture treatment. However, it is reasonable to believe that the same treatment protocol may have a good outcome even on potential depressive symptoms associated to DES. In addition to being a case report, a second limitation of this study was the choice of an unstructured interview to investigate psychic symptoms and DES instead of a structured or semi-structured interview. The choice was motivated by desire to encourage maximum interaction and active participation in symptom description by the patient. Data obtained from this clinical case confirms, in accordance with reference literature,^{2,9,10} that use of acupuncture to treat DES symptoms can give remarkable results, both as additional treatment to conventional artificial tears as well as instead of them. In conclusion, authors suppose that, in accordance with the reference literature,¹⁰ the therapeutic effect of acupuncture on this syndrome originates from the activation of the nervous, hormonal, and immunological systems that are closely tied to etiology of DES. In fact, data obtained and analyzed confirm that acupuncture is an effective treatment also of DES related anxiety symptoms.

List of acronyms

AA - Auricular Acupuncture
CARE - Case Report Guidelines
DES - Dry Eye Syndrome
HAM-A - Hamilton-Anxiety Rating Scale
MOA - mechanism of action
STAI-Y - State-Trait Inventory -Y
STRICTA - Standards for Reporting Interventions in Clinical Trials of Acupuncture

Contributions of Authors

FP acquired data on psychiatric evaluations, wrote and edited the study; AL acupuncture consultant and supervised the study; SC conceived the study and

acquired data on tear film assessment; MP critically revised the manuscript also as English language consultant. Authors approved the final manuscript.

Acknowledgments

Special thanks are due to all the staff of AIRAS for their precious support and teachings, especially to its founders, Francesco Ceccherelli, M.D. and Giuseppe Gagliardi, M.D.

Funding

The authors did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors has neither financial interests nor conflicts of interest to declare in relation to the materials in the manuscript.

Ethical Publication Statements

We confirm that we have read the journal's position on ethical issues involved in publication and affirm that this report is consistent with those guidelines.

Corresponding Author

Pesavento Francesco, M.D., Psychiatrist, Italian Association for Scientific Research and Updating (AIRAS), Via Avellino, 11, 35142 Padua, Italy.

ORCID: 0000-0002-3098-8609

E-mail: fpesavento@virgilio.it

E-mails and ORCID iD of co-authors

Antonello Lovato: lovatoantonello@gmail.com

ORCID iD: 0000-0001-5465-3646

Stefano Cappello: ottica.cappello@gmail.com

ORCID iD: 0000-0002-9546-6844

Marco Postiglione: postiglia@yahoo.it

ORCID iD: 0000-0001-6092-940X

References

1. Facts about dry eye. National Eye Institute website. <https://nei.nih.gov/health/dryeye/dryeye>. Updated December 2020.
2. Dhaliwal DK, Zhou S, Samudre SS, Lo NJ, Rhee MK. Acupuncture and dry eye: current perspectives. A double-blinded randomized controlled trial and review of the literature. *Clin Ophthalmol*. 2019 Apr 24;13:731-740. doi: 10.2147/OPTH.S175321.
3. Wan KH, Chen LJ, Young AL. Depression and anxiety in dry eye disease: a systematic review and meta-analysis. *Eye (Lond)*. 2016 Dec;30(12):1558-1567. doi: 10.1038/eye.2016.186. Epub 2016 Aug 12.
4. Nepp J. Psychosomatische Aspekte beim trockenen Auge [Psychosomatic aspects of dry eye syndrome]. *Ophthalmologe*. 2016 Feb;113(2):111-9. doi: 10.1007/s00347-015-0187-3. German.
5. Bitar MS, Olson DJ, Li M, Davis RM. The Correlation Between Dry Eyes, Anxiety and Depression: The Sicca, Anxiety and Depression Study. *Cornea*. 2019 Jun;38(6):684-689. doi: 10.1097/ICO.0000000000001932.
6. Tiskaoglu NS, Yazıcı A, Karlıdere T, Sari E, Oguz EY, Musaoglu M, Aslan S, Samet Ermiş S. Dry Eye Disease in Patients with Newly Diagnosed Depressive Disorder. *Curr Eye Res*. 2017 May;42(5):672-676. doi: 10.1080/02713683.2016.1236966. Epub 2016 Nov 21.
7. Tu CH, MacDonald I, Chen YH. The Effects of Acupuncture on Glutamatergic Neurotransmission in Depression, Anxiety, Schizophrenia, and Alzheimer's Disease: A Review of the Literature. *Front Psychiatry*. 2019 Feb 12;10:14. doi: 10.3389/fpsy.2019.00014.
8. Errington-Evans N. Acupuncture for anxiety. *CNS Neurosci Ther*. 2012 Apr;18(4):277-84. doi: 10.1111/j.1755-5949.2011.00254.x. Epub 2011 Jun 7.
9. Kim BH, Kim MH, Kang SH, Nam HJ. Optimizing acupuncture treatment for dry eye syndrome: a systematic review. *BMC Complement Altern Med*. 2018 May 3;18(1):145. doi: 10.1186/s12906-018-2202-0.
10. Yang L, Yang Z, Yu H, Song H. Acupuncture therapy is more effective than artificial tears for dry eye syndrome: evidence based on a meta-analysis. *Evid Based Complement Alternat Med*. 2015;2015:143858. doi: 10.1155/2015/143858. Epub 2015 Apr 16.
11. W.H.O. ICD -10 International statistical classification of diseases and related health problems 10th revision, Volume 1, Tabular list, Fifth edition 2016.
12. American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (Fifth ed.)*. Arlington, VA: American Psychiatric Publishing. ISBN 978-0-89042-555-8.
13. Spielberger, C.D.; Gorssuch, R.L.; Lushene, P.R.; Vagg, P.R.; Jacobs, G.A (1983). *Manual for the State-Trait Anxiety Inventory*. Consulting Psychologists Press.
14. Pedrabissi, L. Santinello, M. (1989) *STAI State-Trait Anxiety Inventory Forma Y Manuale*. Organizzazioni Speciali, Firenze.
15. Hamilton M. The assessment of anxiety states by rating. *Br J Med Psychol* 1959; 32: 50-5.
16. Lovato A. *Agopuntura Auricolare Teoria e Clinica*. Noi Edizioni 2019, Milano Italy. ISBN 9788832128819.

Submission: March 26, 2022

Revision received: June 14, 2022

Accepted for publication: June 14, 2022