



Letter to the Editor

Acupuncture for pediatric bilateral amblyopia

Amblyopia is defined as a reduction in best-corrected visual acuity (BCVA) of one or both eyes caused by conditions that affect abnormal visual development. It can be classified as strabismus, refractive, visual deprivation, and occlusion. Refractive amblyopia can be further classified into unilateral (anisometropic) or bilateral (isoametropic) amblyopia. Bilateral amblyopia can develop in children with a large degree of refractive error and/or astigmatism in both eyes, and the severity of the refractive error is reported to be directly related to amblyopia from the effect of blurred retinal images. According to an earlier study, spectacle correction for one year improved the bilateral refractive amblyopia in 74% of children (3–10 years).¹ Patching or atropine had to be performed in the sensitive period in patients who did not respond to spectacle correction, however, there is a controversy regarding its effectiveness, especially in children aged more than 7 years.²

Acupuncture is widely used in to treat ophthalmological diseases in Asian countries, and several studies have demonstrated its efficacy in amblyopia.³ However, no study has reported the efficacy of acupuncture in bilateral amblyopia. Herein, we present cases with bilateral amblyopia who failed to respond spectacle correction but showed improvement after acupuncture treatment.

We retrospectively reviewed the medical records of patients who visited the Kimjoongho Korean Medical Clinic for bilateral refractive amblyopia. Patients having used spectacles for more than 12 months and aged between 5–13 years at the initial visit, with binocular visual acuity below 20/30 and spherical equivalent below -6.0 D or above 4.0 D and who consented for acupuncture treatment for six consecutive months were considered.^{1,4} Patients were excluded if the interval between treatments was reported to be more than four weeks, the presence of neuro-ophthalmic conditions including strabismus or other abnormalities in the ocular media and retina was detected, or if other treatments such as patching or citicoline were initiated during the treatment period.

Acupuncture treatment was performed by a Korean medical physician with over 10 years of experience. Stainless steel needles (30 mm long and 0.25 mm in diameter; Dong Bang, Gyeonggi-do, Korea) were applied at 15 acupuncture points (LI4, BL1, BL2, GB14, TE23, Ex-HN5, and ST2 in bilateral, and EX-HN1 in unilateral). Needles were superficially pricked in children without Deqi. The acupuncture procedure lasted 15 min and had an infrared heat lamp over the eye to keep it warm.

We recorded the patients' BCVA at baseline and after six months using Han's visual chart,⁵ spherical equivalent and astigmatism at baseline, and the number of treatments sessions. Since Han's visual chart was devised before the revision of the international standard in 1994, the visual acuity line interval was considered as 0.1.

Selected patients included 4 boys and 3 girls with an average age of 9.26 years who underwent an average of 45.14 treatment sessions (Table 1). The binocular visual acuity improved above 20/30 after the acupuncture treatment in 4 patients (Case 2, 5, 6, and 7) that included 3 patients who had passed through the sensitive period (aged > 7). There were no adverse events reported during the treatment.

Bilateral amblyopia is generally considered to be resulting from an insufficient stimulation to the cerebral cortex due to the input of blurred retinal images. Acupuncture increases brain-derived neurotrophic factor (BDNF) in retinal cells, are known to improve visual function by regulating the production of dopamine and thus aiding in the recovery of amblyopia.^{6,7} Earlier studies have reported that the retinal blood flow in children with amblyopia was reduced,⁸ but it increased when the visual acuity was restored.⁹ Peripheral acupuncture stimulates provides a local stimulus to the eye and increases retinal blood flow circulation,¹⁰ thereby improving visual acuity.

A limitation of this study was that the effects of optical correction could not be excluded completely, and to overcome this limitation, the study included the patients who failed one year of spectacle correction. We could not follow up for the treatment effect. Because the patients were subsequently received acupuncture treatment after evaluation. Moreover, a generalization of study results in case studies is never advisable. In spite of these limitations, this study is meaningful as it presents the first case series of bilateral amblyopia that improved with acupuncture treatment. Further studies exploring the efficacy of acupuncture in bilateral amblyopia as an adjuvant or salvage treatment would be worthwhile and interesting to conduct.

Author contribution

BK: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **MHK:** Conceptualization, Writing - Review & Editing. **JK:** Conceptualization, Resources, Writing - Review & Editing. **SP:** Conceptualization, Investigation, Writing - review & editing. **IC:** Conceptualization, Writing - Review & Editing.

Table 1
Patients' characteristics and changes in visual acuity before and after the six-month acupuncture treatment.

Case	Gender (M/F)	Age (year)	Treatment sessions	Spherical equivalent (OD/OS)	Astigmatism (OD/OS)	Visual acuity (OD/OS)	
						Baseline	After six-month treatment
1	M	5.11	46	-6.5/-6.75	-1.5/-1.75	0.2/0.2	0.4/0.3
2	F	6.4	53	6.75/4.25	-0.5/-1.5	0.4/0.4	0.7/0.7 ^a
3	F	8.6	45	-6.25/-8.5	-1/-1.5	0.5/0.3	0.8/0.3
4	F	10.2	55	-8.75/-7.75	-/-	0.4/0.5	0.6/0.9
5	M	10.9	36	-6.75/-7.5	-3/-2.25	0.4/0.5	0.7/0.8 ^a
6	M	11.5	44	-6.25/-6.25	-0.5/-1	0.4/0.5	0.7/0.8 ^a
7	M	12.1	37	-6.25/-6.75	-2.25/-1.75	0.4/0.4	0.7/0.7 ^a
Total	4/3	9.26 ± 2.66	45.14 ± 7.20			0.39 ± 0.09 / 0.40 ± 0.12	0.66 ± 0.13 / 0.64 ± 0.24

^a The case's binocular visual acuity was above 20/30 after six-month of acupuncture treatment.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Ethical statement

Parents of patients agreed using medical records. The institutional review boards approved this research (KOMCIRB 2018-09-008-001).

Data availability

Data will be made available upon request.

CRedit authorship contribution statement

Bonghyun Kim: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Min Hee Kim:** Conceptualization, Writing - review & editing. **Joongho Kim:** Conceptualization, Resources, Writing - review & editing. **Soyoung Park:** Conceptualization, Investigation, Writing - review & editing. **Inhwa Choi:** Conceptualization, Writing - review & editing.

References

- Wallace DK, Chandler DL, Beck RW, et al. Treatment of bilateral refractive amblyopia in children three to less than 10 years of age. *Am J Ophthalmol* 2007;144(4):487-96.
- Repka MX, Kraker RT, Holmes JM, et al. Atropine vs patching for treatment of moderate amblyopia. *JAMA Ophthalmology* 2014;132(7):799.
- Yan X, Zhu T, Ma C, Liu A, Dong L, Wang J. A meta-analysis of randomized controlled trials on acupuncture for amblyopia. *Evidence-based complementary and alternative medicine : eCAM* 2013;2013(12):648054.
- Wallace DK, Repka MX, Lee KA, et al. Amblyopia preferred practice pattern®. *Ophthalmology* 2018;125(1):P105-42.
- Hahn CS. Study on the korean test chart. *J Korean Ophthalmol Soc* 1964;5(1):13-22.

- Sansevero G, Baroncelli L, Scali M, Sale A. Intranasal BDNF administration promotes visual function recovery in adult amblyopic rats. *Neuropharmacology* 2019;145(Pt A):114-22.
- Mui AM, Yang V, Aung MH, et al. Daily visual stimulation in the critical period enhances multiple aspects of vision through BDNF-mediated pathways in the mouse retina. Frishman L, ed. *PLoS one* 2018;13(2):e0192435.
- Lonngi M, Velez FG, Tsui I, et al. Spectral-domain optical coherence tomographic angiography in children with amblyopia. *JAMA ophthalmology* 2017;135(10):1086-91.
- Hashimoto R, Kawamura J, Hirota A, Oyama M, Sakai A, Maeno T. Changes in choroidal blood flow and choroidal thickness after treatment in two cases of pediatric anisohypermetropic amblyopia. *American journal of ophthalmology case reports* 2017;8:39-43.
- Bittner AK, Seger K, Salveson R, et al. Randomized controlled trial of electro-stimulation therapies to modulate retinal blood flow and visual function in retinitis pigmentosa. *Acta Ophthalmol (Copenh)* 2018;96(3):e366-76.

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