DOI: 10.5603/OJ.2022.0018

Spectacles and orthokeratology lenses as non-operative management in myopia: a brief review

Itzar Chaidir Islam[1], Najmatuzzahra Kamaluddin[1, 2], Widya Natasya Asa'ad[1, 3], Annisa Mutmainnah Arifuddin[4, 5], Nurhasanah Marsudin[6], Hikmatul Inayah Mudassir[6], Nursyamsi Ahmad[7]

[1]Medical Faculty, Hasanuddin University, Makassar, Indonesia
[2] Datu Pancaitana Hospital, Watampone, Indonesia
[3]Primaya Hospital, Makassar, Indonesia
[4]Baruga Primary Health Center, Bantaeng, Indonesia
[5]Medical Faculty, Muslim Indonesia University, Makassar, Indonesia
[6]Medical Youth Research Club, Medical Faculty, Hasanuddin University, Makassar, Indonesia
[7]Department of Ophthalmology, Medical Faculty, Hasanuddin University, Makassar, Indonesia

ABSTRACT

Myopia or nearsightedness is a condition caused by inaccurate light rays being perceived on the retina. It is caused by elongation of the eyeball and increased curvature of the cornea. In myopia, parallel light rays entering the eye are not focusing on the retina. Spectacles lens and orthokeratology therapy were two treatments option for myopia. This literature review aims to compare two non-operative treatment options in myopia cases, especially the spectacles lens glasses and orthokeratology, including the advantages and disadvantages of each therapy.

The literature search in this review was carried out using Pubmed and Google Scholar databases with three main keywords: myopia, perifocal lens, and orthokeratology. Fifty articles were obtained as references.

Highly aspherical lenslets (HAL) of spectacles lens showed a positive effect on reducing low contrast visual acuity. Unfortunately, lens decentration could occur in spectacles lens users, resulting in an induced prismatic effect in the future. Besides, wearing an orthokeratology lens significantly affects the central corneal zone flattening and increases the relative corneal refractive power (RCRP). However, if the user stops using orthokeratology lenses, the cornea could be returned to its original shape within a few days.

Conclusion: Spectacles lens and Orthokeratology have some benefits and limitations in preventing myopia progression. Therapy selection must continue to be individualized for each patient to enhance recovery outcomes.

KEY WORDS: spectacles lens; orthokeratology; myopia

Ophthalmol J 2022; Vol. 7, 109–113

CORRESPONDING AUTHOR:
Itzar Chaidir Islam, Jl. Perintis Kemerdekaan Km.10, Tamalanrea, 90245, tel: +6285340201000; e-mail: itzarislam@unhas.ac.id

INTRODUCTION

Myopia or nearsightedness is caused by inaccurate light rays to be perceived on the retina [1–3]. It is a frequent refractive error case where distant things look blurred, but close items are seen [4]. In myopia, the focal point of the refractive media system is located in front of the macula lutea. It has been classified into three degrees of disease, including high, moderate, and low myopia [5].

Myopia has become a significant global public health issue, especially in East Asia [6]. By 2050, the estimated myopia prevalence will be about 49.8% of the worldwide population, especially at productive ages between 20 and 45 years [7, 8]. Myopia is caused by two main factors: morphological abnormalities in the cornea or lens and elongation of the axial line of the eye [9–11]. However, environmental effects and daily behaviors such as reading habits, prolonged use of gadgets, and some activities that require high access to visual contacts, such as a microscopist, can also be a risk of causing myopia [12, 13].

Several studies have been conducted to prevent myopia progression. Increasing outdoor activities, using concave lenses, and performing LASIK surgery was the most established treatment method [14, 15]. Besides, new therapeutic options such as spectacles lenses and orthokeratology significantly affected myopia improvement [16]. However, this therapy method must be adjusted based on the patient's age, the degree of myopia, and the final goal of correction to consider the patients' benefit and prognosis [2, 17].

This literature review compares two non-operative treatment options in myopia cases, especially spectacles lens glasses and orthokeratology therapy. In this paper, the advantages and disadvantages of each treatment will be presented to provide information for patients in selecting the appropriate type of myopia management.

The literature search in this review was carried out using Pubmed and Google Scholar databases with three main keywords: myopia, spectacles lens, and orthokeratology. The articles were selected based on language, type of publication, suitability of methods, subject characteristics, exposure, and outcome. All references that match the inclusion criteria are processed using the Mendeley® citation manager, whereas 53 articles are obtained as references.

MYOPIA

Myopia is a disorder induced by the elongation of the eyeball and increased curvature of the cornea, which results in parallel light rays entering the eye failing to concentrate in front of the retina, rendering distant objects incorrect [18, 19]. Several risk factors for myopia have been discovered, including genetic factors, less time outside, longer near work, a shorter reading distance, and a positive family history of myopia. Myopia is most frequently shown by a reduction in the visual distance [8].

Myopia can be detected by examination of visual acuity with the Snellen chart and fundoscopic examination [20]. Myopia is related to the development of major pathological disorders such as macular degeneration, retinal detachment, glaucoma, and cataracts; therefore, efforts to control myopia progression have recently intensified [21]. Several methods have been made, such as increasing outdoor activities, topical atropine, concave lenses, perifocal lens glasses, orthokeratology therapy, and Laser-assisted in situ keratomileuses (LASIK) surgery [22, 23].

Patients with early-onset and severe myopia have a worse long-term visual acuity prognosis [24]. Moreover, patients with longer axial lengths have a faster rate of myopia progression and a higher risk of developing myopic retinal degeneration, choroidal thickness, and other related diseases [20, 25–27].

SPECTACLES LENS

The lens and the cornea are the primary refractive components of the human eye. We optimize the visual system with a new refractive component by wearing an ophthalmic lens to rectify a refractive problem. Lensometers are used to determine the unique properties of every type of spectacles lens. Numerous methods and techniques are available to improve the capability and function of ophthalmic equipment, including the focimeter, lateral shear interferometer, point diffraction interferometer, Newton interferometer, Twyman-Green interferometer, Talbot interferometry, Moiré deflectometry, Hartmann test, Ronchi test, and Fringe reflection test [28].

In the past, most spectacles' lenses were constructed of glass. Today, most spectacles are constructed from various sophisticated polymers, and most sight lenses are composed of polycarbonate. These new lenses are lighter, scratch-resistant, and less likely to break than glass. They can also be coated with a filter to protect the eyes from ultraviolet exposure [29]. Blue-light-filtering spectacles lenses can significantly filter out a portion of high-energy short-wavelength light without impairing visual performance or sleep quality. These lenses may be used to protect the retina from specific blue-light hazards [30].

The ophthalmic lens design is concerned with correcting aberrations in spectacles lenses caused by the eye rotating away from the optical center of the lens. A study by Hanna et al. (2019) showed that lens decentration occurs in spectacles lens users, resulting in induced prismatic effect and subsequent vision impairments such as asthenopia or diplopia in the future [31]. Oblique astigmatism and mean oblique error are the most prominent aberrations (power error). The goal of distant vision spectacles lens design is to provide point views of far area features on the far point sphere. Today's best-form lens series is built to be tangential error-free when fitted at an average vertex distance. When lenses with a low T-error-form are fitted at a larger vertex distance than usual, they function similarly to point-focal lenses [32].

On the other side, perifocal lenses are a relatively new technology that may be used to correct the refraction of light or slow myopia's growth. Lens designs aimed at lowering hyperopia even induce relative myopia in the retina's periphery, resulting in clear vision in the fovea [33]. Perifocal lenses facilitate refraction of the eye's center and periphery along the horizontal meridian. This lens provides greater positive power in the periphery lens than in the central lens, resulting in a significantly clearer visual distance. Additionally, this lens has an aperture that is clear in the center with a length of approximately 10 mm on both sides center along the horizontal meridian with the same distance to the lower section enabling clear vision at sight to lower. After 4-5 years of therapy, patients with a mean of –0.38 0.04 D and as high as –1.16 0.20 D might exhibit repair strength refraction after wearing the perifocal lens for 12–18 months [34, 35].

Some work analyzes the efficacy of highly aspherical lenslets (HAL) and slightly aspherical lenslets (SAL). Both lenses feature a spherical front surface surrounded by 11 concentric rings produced by continuous aspherical lenslets (diameter of 1.1 mm). The lens region that is not covered by lenslets corrects for distance. At any eccentricity, the geometry of the aspherical lens is expected to produce the myopic defocused volume (VoMD) in front of the retina, which acts as a myopia control signal. Additionally, based on optical modeling, HAL caused a bigger VoMD in front of the retina than SAL; hence, we hypothesize that a larger VoMD will be more successful in reversing myopia development [36].

Spectacles lens with a specific design (perifocal lens) demonstrates the potential benefit of constant and gradual improvement of refraction. However, the use of this therapy shows a longer correction time. Therefore, this therapeutic option tends to be more recommended as an optical tool to slow the development and progression of myopia patients [37].

ORTHOKERATOLOGY THERAPY

Orthokeratology is a non-invasive technique specially designed as a compatible contact lens to temporarily reshape the cornea to improve vision. Orthokeratology-induced peripheral myopic defocus is the primary mechanism responsible for halting myopia progression in patients undergoing orthokeratology therapy. Wearing orthokeratology lenses overnight also flattens the central zone of the cornea and increases the relative corneal refractive power (RCRP). The pattern of RCRP causes myopic peripheral defocus of the retina, which is known to be one of the mechanisms of action of orthokeratology lenses in which the causes, as mentioned earlier, a further slowing of the axial length of the eye [38, 39].

Orthokeratology lenses are made of plastic, have a strong texture, and better strength than soft lenses, which tend to tear easily [40]. Unfortunately, if the user stops using orthokeratology lenses, the cornea could be returned to its original shape within a few days [41]. Orthokeratology has developed into a clinically proven and effective procedure for correcting refractive problems [42]. It utilizes hard materials to ensure the best oxygen transmission rate and is worn at night to reduce and control myopia [43]. Orthokeratology involves flattening the cornea to decrease the eye's total refractive power. The corneal structural alterations are caused by a thickening of the mid-periphery and a thinning of the central cornea [44].

Myopia development's most commonly understood explanation focuses on refractive alterations outside the macula [45]. Myopia prevalence has increased between 10% and 25% in young adolescents and 60–80% in industrialized communities in West and East Asia. Over the last several decades, there have been indications that gas-permeable contact lenses can help children's myopia development [46].

Orthokeratology provides patients with a unique factor and eliminates the daily wearing of contact lenses or glasses [47]. Visual acuity is quite good, with the majority achieving 20/20 and over 90% achieving 20/30. The most significant complaints found with OK are halos secondary to the spherical aberration [48].

Orthokeratology is a pain-free, child-safe, and reversible procedure [49]. It supports visual acuity by designing simply inserted and precisely fitted lenses into the eyes; this also proved a safe and efficient procedure that can cure nearsightedness, farsightedness, astigmatism, and presbyopia. [50]. It is an excellent option rather than LASIK for individuals who do not prefer to take the risk or are not physically prepared for surgery. The risk is significantly reduced by following a strict lens washing and disinfection regimen and wearing the lenses as advised [51, 52].

Three classical patterns may be observed to evaluate the lens outcome when a difference map is formed between the initial corneal topography and the newly created corneal topography behind the orthokeratology lens [16]. Orthokeratology requires a tool that measures corneal topography. Using the sagittal corneal height and the corneal shape can better predict the amount of ametropia that can be corrected and, therefore, what initial lens is ordered. Finally, it may be used to track the effect of the lens on the eye and refine the lens fit. A center flat region is intended, encircled by a ring of relative steepening. Orthokeratology treatment also needs frequent lens care since it can cause irritation, inflammation, and infection [40, 43, 53].

CONCLUSION

Spectacles lenses and orthokeratology have some benefits and limitations in preventing myopia progression. Therapy selection must continue to be individualized for each patient to enhance recovery outcomes.

Acknowledgment

The authors would like to thank Medical Youth Research Club (MYRC) for their support in writing this article.

Funding

None declared.

Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Fredrick DR, Fredrick DR. Myopia: was mother right about reading in the dark? Br J Ophthalmol. 2001; 85(5): 509–510, doi: 10.1136/bjo.85.5.509, indexed in Pubmed: 11316701.
2. Bullimore MA, Ritchey ER, Shah S, et al. The Risks and Benefits of Myopia Control. Ophthalmology. 2021; 128(11): 1561–1579, doi: 10.1016/j.ophtha.2021.04.032, indexed in Pubmed: 33961969.
3. Gurnani B, Kaur K, Kannusamy V. Myopia: Current concepts and review of literature. TNOA J Ophthal Sci Res. 2020; 58(4): 280, doi: 10.4103/tjosr.tjosr_85_20.
4. de Jong PT. Myopia: its historical contexts. Br J Ophthalmol. 2018; 102(8): 1021–1027, doi: 10.1136/bjophthalmol-2017-311625, indexed in Pubmed: 29437569.
5. Ohno-Matsui K, Kawasaki R, Jonas JB, et al. META-analysis for Pathologic Myopia (META-PM) Study Group. International photographic classification and grading system for myopic maculopathy. Am J Ophthalmol. 2015; 159(5): 877–83.e7, doi: 10.1016/j.ajo.2015.01.022, indexed in Pubmed: 25634530.
6. Sun JT, An M, Yan XBo, et al. Prevalence and Related Factors for Myopia in School-Aged Children in Qingdao. J Ophthalmol. 2018; 2018: 9781987, doi: 10.1155/2018/9781987, indexed in Pubmed: 29507811.
7. Holden BA, Fricke TR, Wilson DA, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmology. 2016; 123(5): 1036–1042, doi: 10.1016/j.ophtha.2016.01.006, indexed in Pubmed: 26875007.
8. Chiang WY, Chen YW, Liu YP, et al. Early Age of the First Myopic Spectacle Prescription, as an Indicator of Early Onset of Myopia, Is a Risk Factor for High Myopia in Adulthood. J Ophthalmol. 2021; 2021: 6612116, doi: 10.1155/2021/6612116, indexed in Pubmed: 34258048.
9. Meng W, Butterworth J, Malecaze F, et al. Axial length of myopia: a review of current research. Ophthalmologica. 2011; 225(3): 127–134, doi: 10.1159/000317072, indexed in Pubmed: 20948239.
10. Wang B, Naidu RK, Qu X. Factors related to axial length elongation and myopia progression in orthokeratology practice. PLoS One. 2017; 12(4): e0175913, doi: 10.1371/journal.pone.0175913, indexed in Pubmed: 28419129.
11. Yotsukura E, Torii H, Ozawa H, et al. Axial Length and Prevalence of Myopia among Schoolchildren in the Equatorial Region of Brazil. J Clin Med. 2020; 10(1), doi: 10.3390/jcm10010115, indexed in Pubmed: 33396242.
12. Morgan IG, French AN, Rose KA. Risk factors for myopia: Putting causal pathways into a social context. In: Ang M, Wong TY. ed. Updates on Myopia: A Clinical Perspective. Springer 2020: 133–170.
13. Yotsukura E, Torii H, Inokuchi M, et al. Current Prevalence of Myopia and Association of Myopia With Environmental Factors Among Schoolchildren in Japan. JAMA Ophthalmol. 2019; 137(11): 1233–1239, doi: 10.1001/jamaophthalmol.2019.3103, indexed in Pubmed: 31415060.
14. Jonas JB, Ang M, Cho P, et al. IMI Prevention of Myopia and Its Progression. Invest Ophthalmol Vis Sci. 2021; 62(5): 6, doi: 10.1167/iovs.62.5.6, indexed in Pubmed: 33909032.
15. Cao K, Wan Y, Yusufu M, et al. Significance of Outdoor Time for Myopia Prevention: A Systematic Review and Meta-Analysis Based on Randomized Controlled Trials. Ophthalmic Res. 2020; 63(2): 97–105, doi: 10.1159/000501937, indexed in Pubmed: 31430758.
16. Cho P, Tan Qi. Myopia and orthokeratology for myopia control. Clin Exp Optom. 2019; 102(4): 364–377, doi: 10.1111/cxo.12839, indexed in Pubmed: 30380591.

17. Bullimore MA, Richdale K. Myopia Control 2020: Where are we and where are we heading? Ophthalmic Physiol Opt. 2020; 40(3): 254–270, doi: 10.1111/opo.12686, indexed in Pubmed: 32338775.
18. Cai XB, Shen SR, Chen DF, et al. An overview of myopia genetics. Exp Eye Res. 2019; 188: 107778, doi: 10.1016/j.exer.2019.107778, indexed in Pubmed: 31472110.
19. Wong CW, Ang M. Updates on myopia: A clinical perspective. Springer 2020: 1–305.
20. Ikuno Y. Overview of the complications of high myopia. Retina. 2017; 37(12): 2347–2351, doi: 10.1097/IAE.0000000000001489, indexed in Pubmed: 28590964.
21. Grzybowski A, Kanclerz P, Tsubota K, et al. A review on the epidemiology of myopia in school children worldwide. BMC Ophthalmol. 2020; 20(1): 27, doi: 10.1186/s12886-019-1220-0, indexed in Pubmed: 31937276.
22. Ostrow GI, Kirkeby L. Myopia — EyeWiki. American Academy of Ophthalmology. 2018.
23. Cooper J, Tkatchenko AV. A Review of Current Concepts of the Etiology and Treatment of Myopia. Eye Contact Lens. 2018; 44(4): 231–247, doi: 10.1097/ICL.0000000000000499, indexed in Pubmed: 29901472.
24. Verkicharla PK, Kammari P, Das AV. Myopia progression varies with age and severity of myopia. PLoS One. 2020; 15(11): e0241759, doi: 10.1371/journal.pone.0241759, indexed in Pubmed: 33216753.
25. Pugazhendhi S, Ambati B, Hunter AA. Pathogenesis and Prevention of Worsening Axial Elongation in Pathological Myopia. Clin Ophthalmol. 2020; 14: 853–873, doi: 10.2147/OPTH.S241435, indexed in Pubmed: 32256044.
26. Tideman JW, Snabel MCC, Tedja MS, et al. Association of Axial Length With Risk of Uncorrectable Visual Impairment for Europeans With Myopia. JAMA Ophthalmol. 2016; 134(12): 1355–1363, doi: 10.1001/jamaophthalmol.2016.4009, indexed in Pubmed: 27768171.
27. Muhiddin HS, Mayasari AR, Umar BT, et al. Choroidal Thickness in Correlation with Axial Length and Myopia Degree. Vision (Basel). 2022; 6(1), doi: 10.3390/vision6010016, indexed in Pubmed: 35324601.
28. Mendoza-Villegas PG. Measurement of spectacle lenses: A review. Opt Pura y Apl. 2014; 47(2): 145–162, doi: 10.7149/opa.47.2.145.
29. Manika M, Wadhwani M. Spectacles Lens Materials and their Special Coatings at a Glance. Acta Sci Ophthalmol. 2021; 4(4): 81–4.
30. Leung TW, Li RWH, Kee CS. Blue-Light Filtering Spectacle Lenses: Optical and Clinical Performances. PLoS One. 2017; 12(1): e0169114, doi: 10.1371/journal.pone.0169114, indexed in Pubmed: 28045969.
31. Husna H, Yulianti A. Lens decentration of spectacle wearers. AIP Conference Proceedings. 2019, doi: 10.1063/1.5141632.
32. Jalie M. Modern spectacle lens design. Clin Exp Optom. 2020; 103(1): 3–10, doi: 10.1111/cxo.12930, indexed in Pubmed: 31222837.
33. Tarutta EP, Tarasova NA, Proskurina OV, et al. Peripheral defocus of myopic eyes corrected with Perifocal-M glasses, monofocal glasses, and soft contact lenses. Russ Ophthalmol J. 2018; 11(4): 36–42, doi: 10.21516/2072-0076-2018-11-4-36-41.
34. Hasebe S, Jun J, Varnas SR. Myopia control with positively aspherized progressive addition lenses: a 2-year, multicenter, randomized, controlled trial. Invest Ophthalmol Vis Sci. 2014; 55(11): 7177–7188, doi: 10.1167/iovs.12-11462, indexed in Pubmed: 25270192.
35. Sankaridurg P, Donovan L, Varnas S, et al. Spectacle lenses designed to reduce progression of myopia: 12-month results. Optom Vis Sci. 2010; 87(9): 631–641, doi: 10.1097/OPX.0b013e3181ea19c7, indexed in Pubmed: 20622703.
36. Bao J, Yang A, Huang Y, et al. One-year myopia control efficacy of spectacle lenses with aspherical lenslets. Br J Ophthalmol. 2022; 106(8): 1171–1176, doi: 10.1136/bjophthalmol-2020-318367, indexed in Pubmed: 33811039.
37. Gao Yi, Lim EeW, Yang A, et al. The impact of spectacle lenses for myopia control on visual functions. Ophthalmic Physiol Opt. 2021; 41(6): 1320–1331, doi: 10.1111/opo.12878, indexed in Pubmed: 34529275.
38. Kang P, Maseedupally V, Gifford P, et al. Predicting corneal refractive power changes after orthokeratology. Sci Rep. 2021; 11(1): 16681, doi: 10.1038/s41598-021-96213-x, indexed in Pubmed: 34404885.
39. Wang J, Yang D, Bi H, et al. A New Method to Analyze the Relative Corneal Refractive Power and Its Association to Myopic Progression Control With Orthokeratology. Transl Vis Sci Technol. 2018; 7(6): 17, doi: 10.1167/tvst.7.6.17, indexed in Pubmed: 30533280.
40. VanderVeen DK, Kraker RT, Pineles SL, et al. Use of Orthokeratology for the Prevention of Myopic Progression in Children: A Report by the American Academy of Ophthalmology. Ophthalmology. 2019; 126(4): 623–636, doi: 10.1016/j.ophtha.2018.11.026, indexed in Pubmed: 30476518.
41. Carracedo G, Espinosa-Vidal TM, Martínez-Alberquilla I, et al. The Topographical Effect of Optical Zone Diameter in Orthokeratology Contact Lenses in High Myopes. J Ophthalmol. 2019; 2019: 1082472, doi: 10.1155/2019/1082472, indexed in Pubmed: 30719336.
42. Wang A, Yang C. Influence of Overnight Orthokeratology Lens Treatment Zone Decentration on Myopia Progression. J Ophthalmol. 2019; 2019: 2596953, doi: 10.1155/2019/2596953, indexed in Pubmed: 31827908.
43. Kong QH, Du XY, Li X, et al. Effects of orthokeratology on biological parameters and visual quality of adolescents with low-grade corneal astigmatism myopia. Eur Rev Med Pharmacol Sci. 2020; 24(23): 12009–12015, doi: 10.26355/eurrev_202012_23989, indexed in Pubmed: 33336786.
44. Ghatsila O. Modern Orthokeratology — a Review. IOSR J Dent Med Sci. 2018; 17(3): 18–24.
45. Lipson MJ, Brooks MM, Koffler BH. The Role of Orthokeratology in Myopia Control: A Review. Eye Contact Lens. 2018; 44(4): 224–230, doi: 10.1097/ICL.0000000000000520, indexed in Pubmed: 29923882.
46. Santodomingo-Rubido J, Villa-Collar C, Gilmartin B, et al. Myopia control with orthokeratology contact lenses in Spain: refractive and biometric changes. Invest Ophthalmol Vis Sci. 2012; 53(8): 5060–5065, doi: 10.1167/iovs.11-8005, indexed in Pubmed: 22729437.
47. Chan B, Cho P, Cheung SW, et al. Practice of orthokeratology by a group of contact lens practitioners in Hong Kong. Part 2: orthokeratology lenses. Clin Exp Optom. 2003; 86(1): 42–46, doi: 10.1111/j.1444-0938.2003.tb03056.x, indexed in Pubmed: 12568650.
48. Ms JC, Weibel K, Borukhov G. Use of Atropine to Slow the Progression of Myopia: A Literature Review and Guidelines for Clinical Use. Vis Dev Rehab. 2018: 12–28, doi: 10.31707/vdr2018.4.1.p12.
49. Charm J. Orthokeratology: clinical utility and patient perspectives. Clin Optom (Auckl). 2017; 9: 33–40, doi: 10.2147/OPTO.S104507, indexed in Pubmed: 30214358.
50. Bullimore MA, Johnson LA. Overnight orthokeratology. Cont Lens Anterior Eye. 2020; 43(4): 322–332, doi: 10.1016/j.clae.2020.03.018, indexed in Pubmed: 32331970.
51. Kumar K, Optom DM. Review article of orthokeratology. World J Pharm Med Res. 2020; 6(6): 130–1.
52. Schallhorn SC, Venter JA, Hannan SJ, et al. Effect of postoperative keratometry on quality of vision in the postoperative period after myopic wavefront-guided laser in situ keratomileusis. J Cataract Refract Surg. 2015; 41(12): 2715–2723, doi: 10.1016/j.jcrs.2015.06.034, indexed in Pubmed: 26796452.
53. Van Der Worp E, Ruston D. Orthokeratology: An Update. Optom Pract. 2006; 7: 47–60.