OPTOPOL technology

MYOPIA FORECAST

In OCT-B ® module

Understanding Myopia

Definition:

Myopia, or near-sightedness, is a refractive error causing distant objects to appear blurry while near objects remain clear. The prevalence of myopia is increasing globally, particularly among children and young adults, making it a significant public health concern.

Causes:

Genetic predisposition.

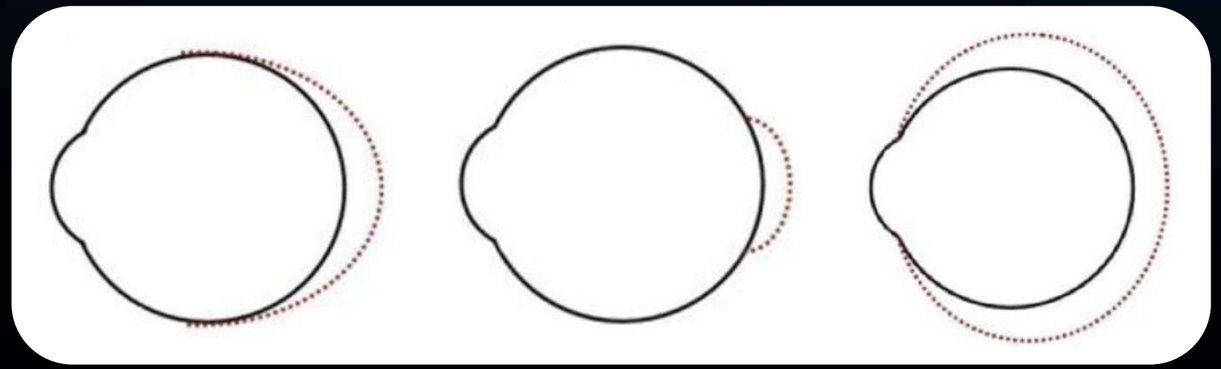
Environmental factors: increased near work, limited outdoor exposure.

Impact on Eye Health:

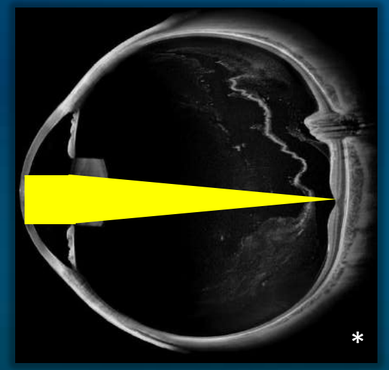
Leads to structural changes in the retina, choroid, and sclera.

Myopia development:

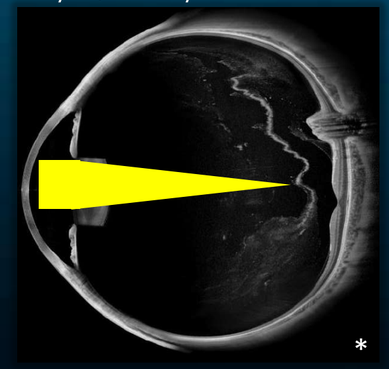
Axial | Posterior pole | Global



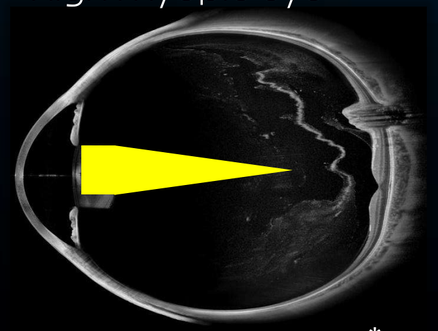
Emmetropic eye



Myopic eye



High myopic eye



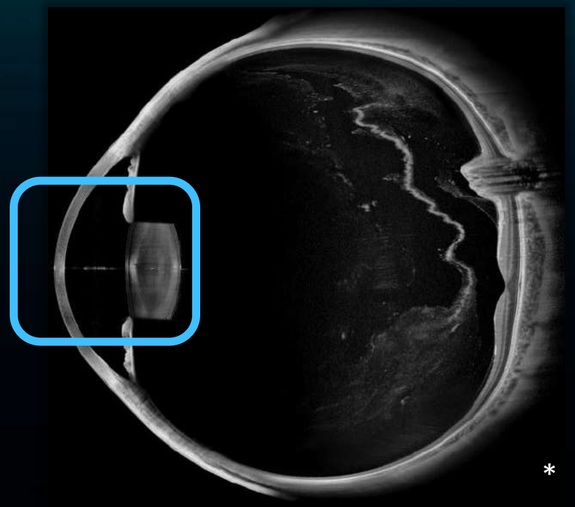
* Image composed of 7 scans acquire using All In One REVO FC 130, image created using graphic design software for promotional purposes only.

Types of Myopia

Myopia can be devided into two basic types depending on the region which causes the pathology.

Refractive Myopia

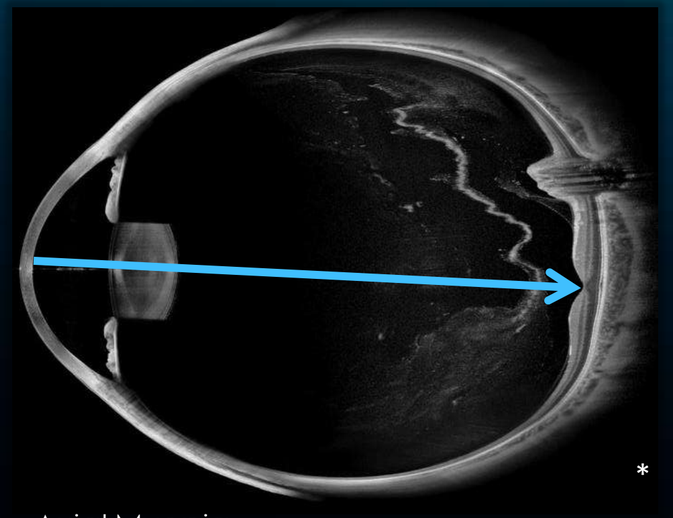
This type of myopia results from increases in the eye's optical power, typically due to shifts in the shape or position of the cornea and lens (e.g. an excessively curved cornea). Refractive myopia can occur alongside axial myopia, contributing to the overall degree of myopia measured. [1]



Refractive Myopia

Axial Myopia

This form of myopia is the most common and is predominantly driven by excessive elongation, in which the optical axis progressively grows and becomes too long relative to the eye's refractive power.[1]



Axial Myopia

* Image composed of 7 scans acquire using All In One REVO FC 130, image created using graphic design software for promotional purposes only.

1. Flitcroft DI, He M, Jonas JB, et al. IMI – Defining and Classifying Myopia: A Proposed Set of Standards for Clinical and Epidemiologic Studies. *Invest Ophthalmol Vis Sci.* 2019;60(3):M20. doi:10.1167/iovs.18-25957

Understanding Myopia

Types of myopia

1. Simple Myopia

Description: The most common type of myopia, caused by long eye or cornea curvature errors.

Levels:

- **Low myopia**: Less than -3.00 D.
- **Moderate myopia**: Between -3.00 D and -6.00 D.

Impact: Generally stable after adolescence and does not lead to serious complications.

2. High Myopia

Description: Severe form in which the refractive error exceeds -6.00 D

Cause: Often due to excessive elongation of the eyeball.

Risk: Associated with complications such as:

- Retinal detachment
- Glaucoma
- Myopic macular degeneration

Impact: Requires regular monitoring to manage potential complications.

3. Pathological (Degenerative) Myopia

Description: A progressive and severe form caused by structural changes in the eye, often inherited.

Characteristics:

Progresses into adulthood. Leads to retina thinning and other complications.

Risk: High likelihood of vision-threatening conditions like choroidal neovascularization and macular degeneration.

4. Pseudo-Myopia

Description: A temporary form of myopia caused by excessive near work or eye strain, leading to the ciliary muscle spasm.

Reversibility: Often resolves when the spasm subsides with rest or treatment.

Impact: Can become permanent if the strain continues over time.

5. Nocturnal Myopia

Description: Myopia that occurs or worsens in low-light conditions.

Cause: Increased pupil size in dim light, leading to focus errors.

Impact: Diminished night vision quality.

6. Induced (Acquired) Myopia

Description: Myopia caused by external factors, such as:

Drugs: Certain medications like sulfonamides.

Disease: Conditions like diabetes or cataracts.

Environmental factors: Prolonged near work or inadequate outdoor light exposure.

Reversibility: May improve if the underlying cause is addressed.

7. Progressive Myopia

Description: Myopia that worsens over time, typically in childhood or adolescence.

Cause: Excessive elongation of the eyeball due to genetic and environmental factors.

Management: Myopia control measures such as orthokeratology, atropine drops, or specialized lenses may slow down the progression.

Understanding Myopia - background

Background and environment analysis

Gender influence

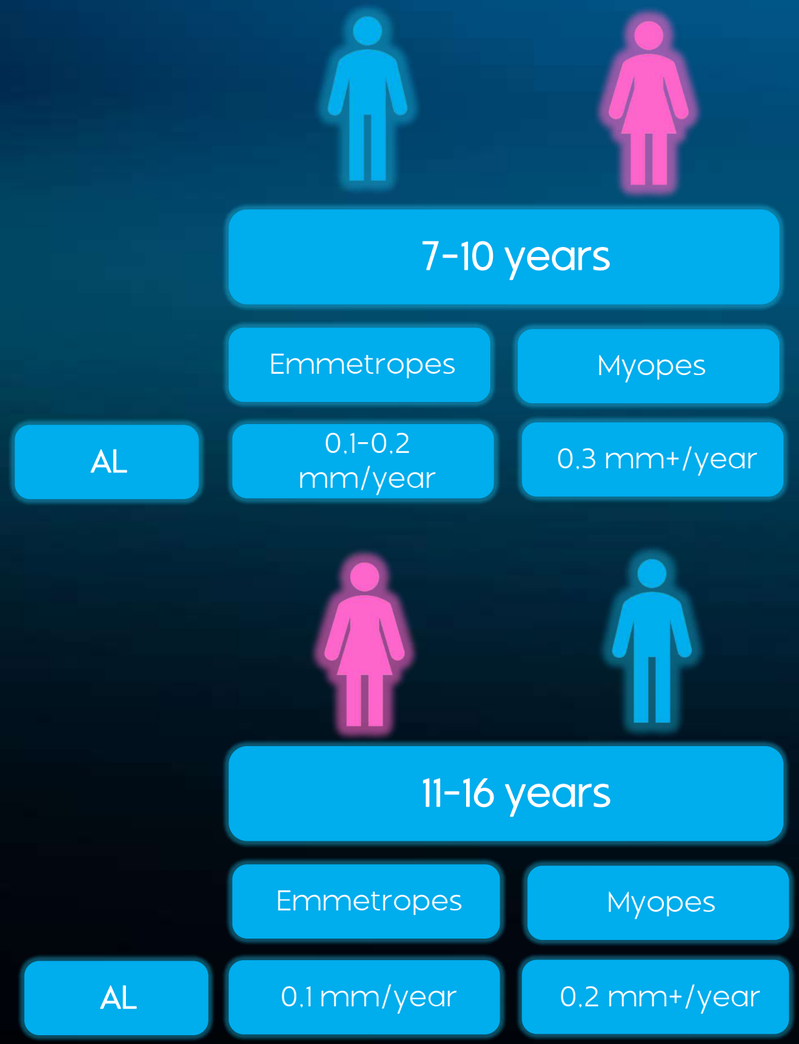
Males tend to have around 0.5 mm longer eyes than females, despite similar refractive error and axial growth rates. This is common in emmetropia and myopia follow up when comparing the same age but different genders.

Age influence

- Before a child becomes 10 years old their eyes grow faster. Emmetropic eyes grow by around 0.1-0.2 mm till that age whereas myopic growth is 0.3mm per year. Yearly increase in AL over 0.2 mm may be myopia indicator.
- Teenagers' eyes grows slower at about 0.1 mm per year till about 16-17 year-olds. Pathological myopic value is about 0.17 mm and can last longer. Stabilisation is reached usually at the age of 16.3 at 25 mm - females, 25.5 mm -males.

Family history influence

- No Myopic Parents - risk of developing myopia is relatively low, **around 10-15%.**
- One Myopic Parent **25-30% risk**
- Two Myopic Parents **50-60% risk or higher.**

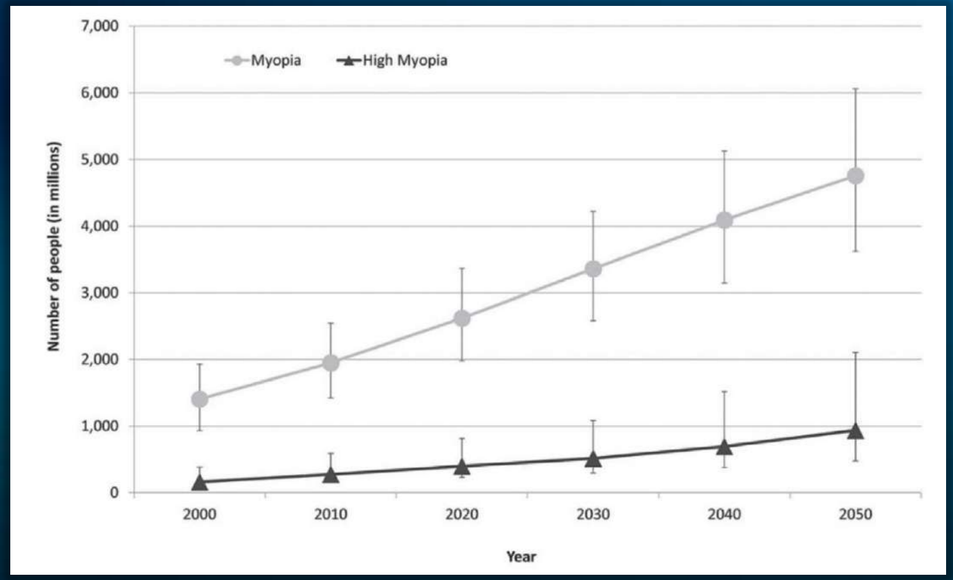


Global myopia trends

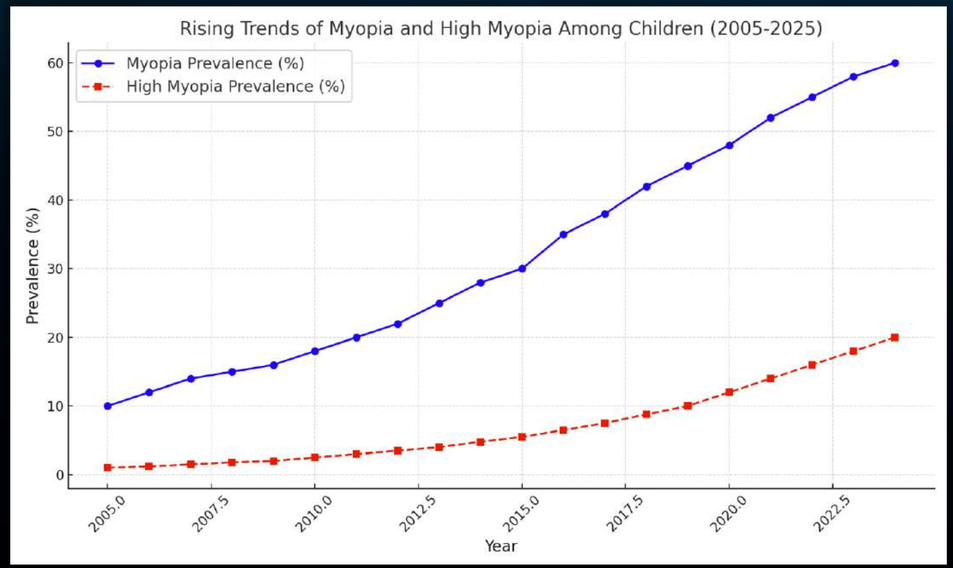
The myopia epidemic is growing rapidly. It is prognosed that by 2050 up to 5 billion people will be affected - approximately half of the world's population.

Currently, about 30% suffers from myopia.[2] This escalating trend highlights the need for effective management strategies. In recent years, it has been well documented that there is an increasing prevalence of myopia worldwide, and that there are now safe and effective strategies to slow down its progression.3, 4 Global research shows that myopia has been recognized as a significant public health concern and is at an almost epidemic level.

In 2021, the World Council of Optometry passed a resolution publicly declaring support for myopia management being the standard of care for myopic patients worldwide.5 One component of the evidence-based standard of care resolution relates to frequent follow-up measurements of myopia.



Myopia prevalence in last 20 years time*



Myopia prevalence forecast till in general population 2050. 1

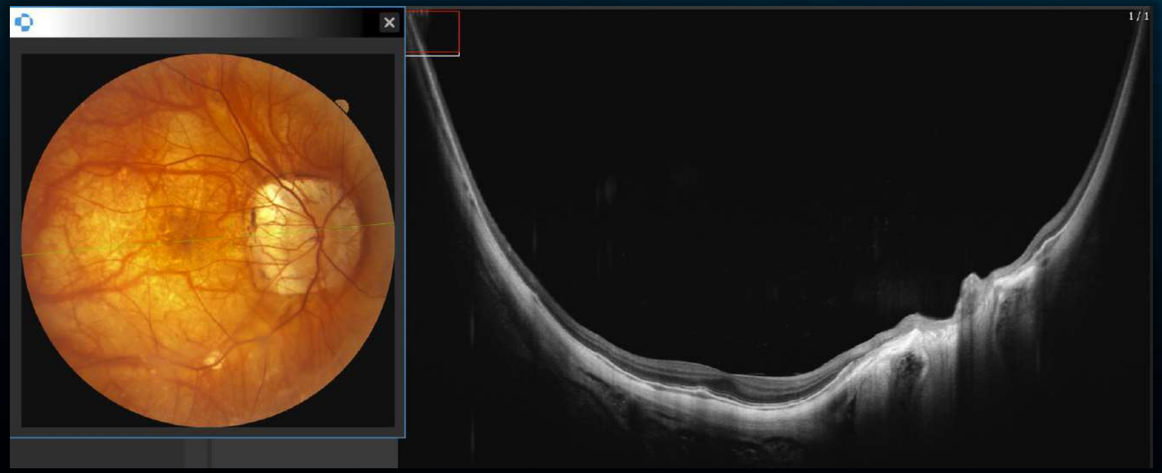
1Holden BA: Ophthalmology. 2016.51
2.3. Sankaridurg P. Tahhan N. Kandel H. et al. IMI Impact of Myopia. *Invest Ophthalmol Vis Sci.* 2021:62(5):2. doi:10.1167/iovs.62.5.2Holden BA. Fricke
5.TR. Wilson DA. *et al.* Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology.* 2016: 123:1036-42.
Walline JJ. Lindsley KB. Vedula SS. *et al.* Interventions to slow progression of myopia in children. *Cochrane Database Syst Rev.* 2020: 1:CD004916.
*Comparative Study of Macular Vascular Density and Retinal Thickness in Myopia Children with Different Microscope Diopters Based on OCTA Meiling Chen and Fanning Zhao

Understanding Myopia

Beyond its impact on patients' daily life, high myopia increases the risk of severe ocular complications, such as:

- Retinal detachment
- Myopic maculopathy
- Glaucoma
- Cataract

REVO glaucoma analysis



REVO UWF single B-scan High Myopia

[*] Comparative Study of Macular Vascular Density and Retinal Thickness in Myopia Children with Different Microscope Diopters Based on OCTA Meiling Chen and Fanning Zhao

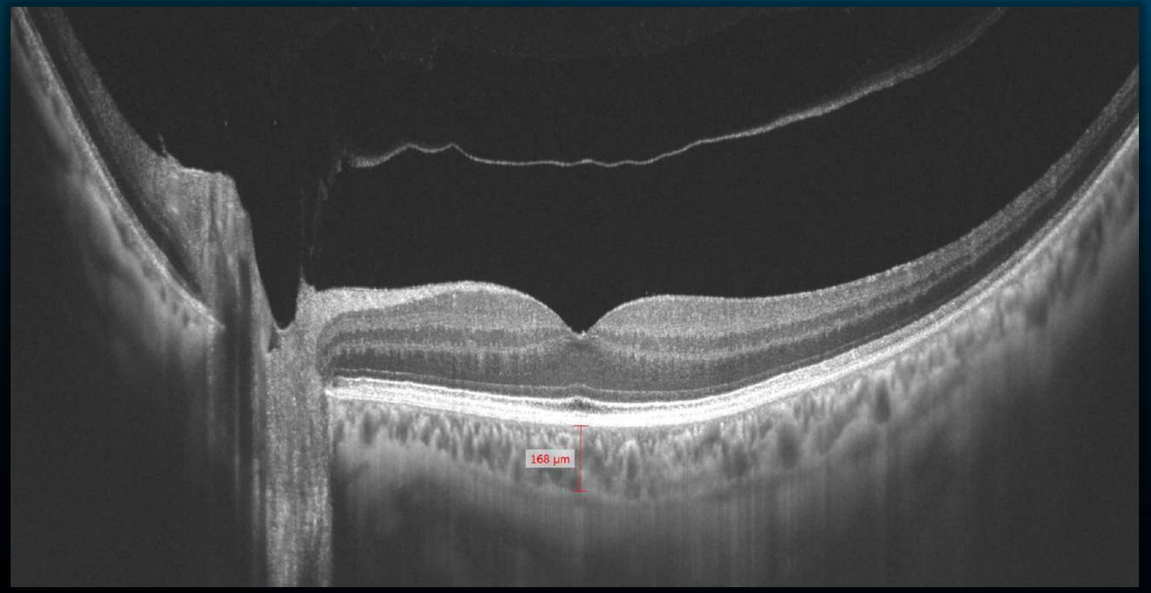
OCT Biometry module in Myopia monitoring

Benefits of Myopia Control:

- Early detection of axial elongation.
- Real-time monitoring of treatment efficacy.
- Insight into structural changes in the retina and choroid
- Protects long-term visual health.

Tools provided by an OCT/Biometer device:

- Axial Length Measurement - primary metric for assessing myopia progression. This provides correlation with future risk of ocular complications.
- Topography module information containing K values, refraction, topographic maps.
- Detection of Posterior Staphyloma - critical in high myopia management.
- Choroid Monitoring using OCT scans (manual measurements below fovea) - helps to evaluate structural stress and scleral remodeling.
- Perfect for parent education and a persuasive tool to introduce the treatment.



Myopia treatment Strategies

Evidence-Based Interventions

Pharmacological:

- Low-dose atropine to slow axial elongation.

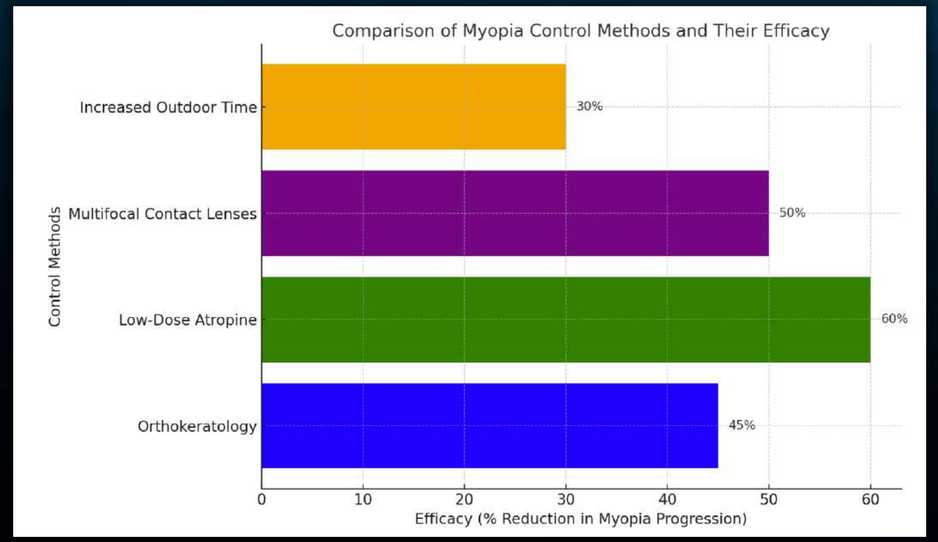
Optical:

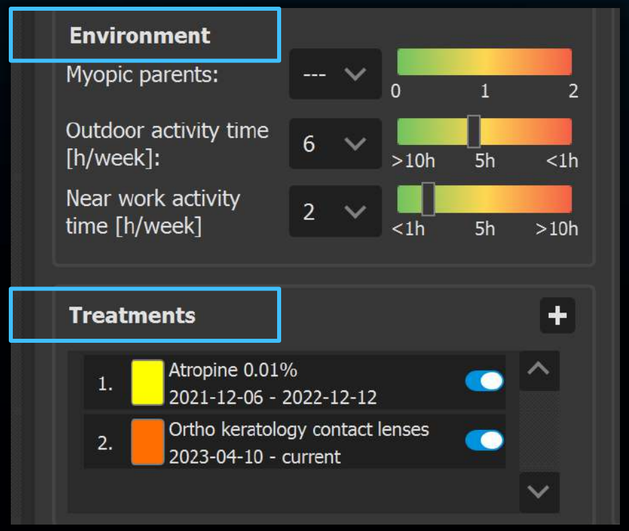
- Orthokeratology (Ortho-K) for corneal reshaping.
- Multifocal glasses and contact lenses to reduce progression.

Behavioral:

- Increase outdoor activities.
- Limit near work and screen time.

All methods of treatment and environmental conditions may be displayed on progression graphs to visualize the treatment effect.

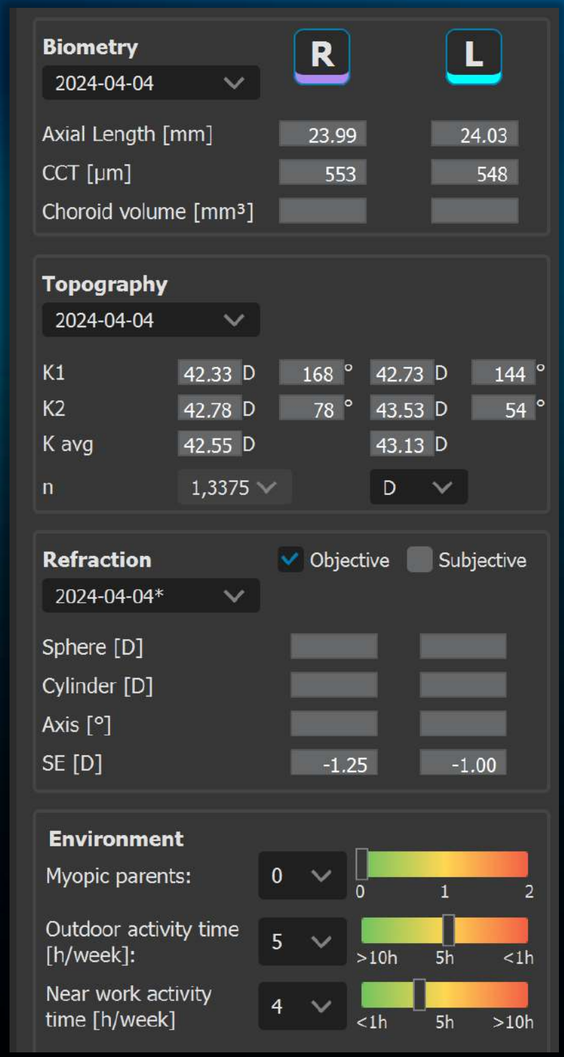




REVO OCT application in Myopia Forecast

Myopia forecast module allows the user to follow up and save all of the following results and environmental background information:

- Axial length
- K readings
- Objective refraction
- Subjective refraction
- Refractive error progression
- Environmental conditions
- Parents education reports
- Choroid thickness (under fovea)



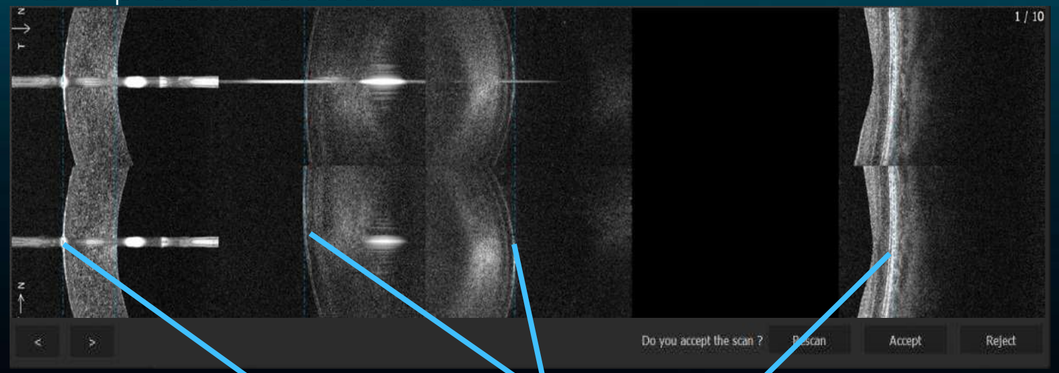
REVO OCT application in Myopia Forecast

Myopia forecast module window. More details are available in the REVO user manual chapter 20.7 Myopia forecast.

Step by step to Myopia Forecast

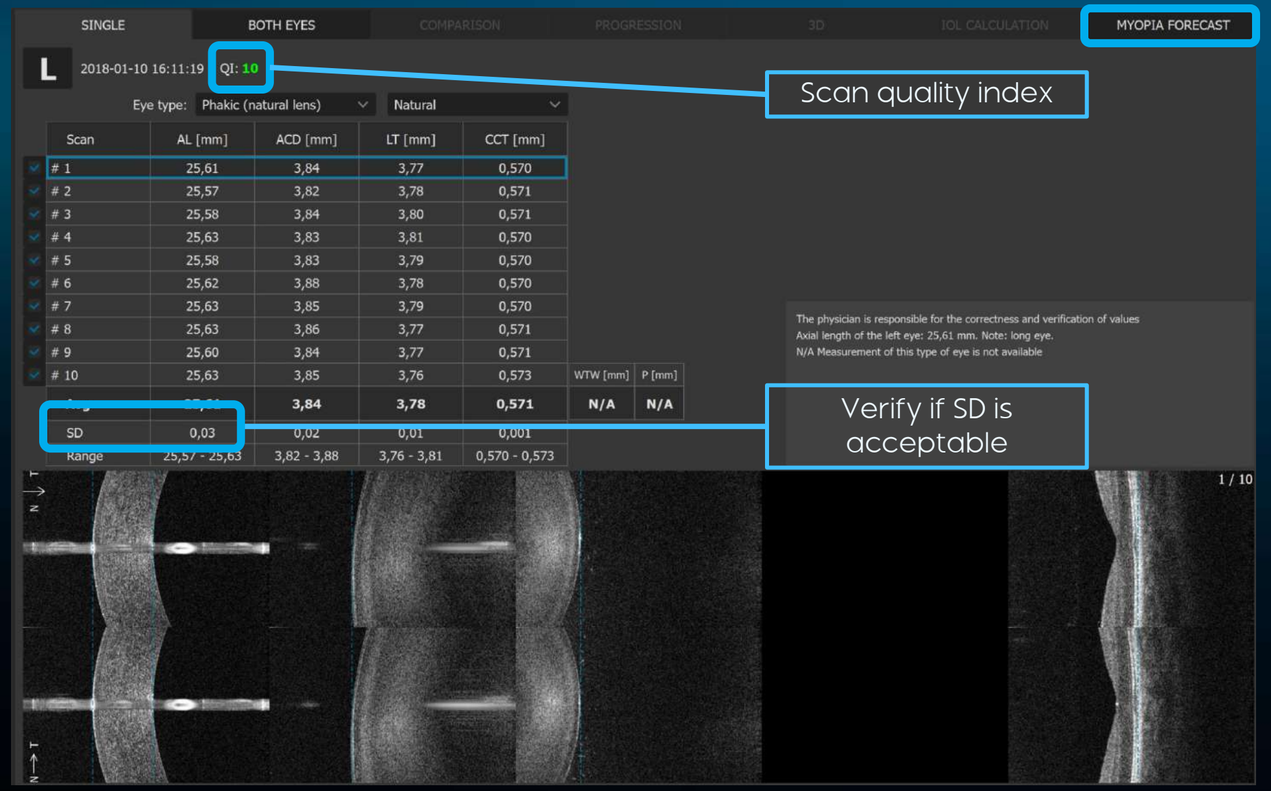
Take the biometry measurement*, select Myopia Forecast tab to proceed. If the biometry and topography modules are active, the Myopia Protocol can be used. Patient gender should be determined in order to display any reference scales.

REVO protocol selection window



Before accepting an exam after acquisition, it should be verified for proper visualization of structures. If required, a manual rescan should be done.

REVO B-OCT exam acceptance window



REVO B-OCT results window

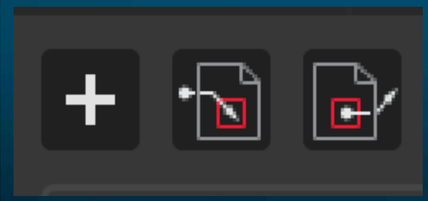
*daily calibration is required (tool is required with biometry module)

Step by step to Myopia Forecast

There are three schemes of data entering:

- exams from REVO OCT (AL, Topographic data, make sire to select proper reference database type and fit it to patient's ethnicity
- manual entry of: environmental information, subjective refraction, family information
- historical data (import available) - importing results exported from another REVO device or adding manually values taken on other diagnostic devices

Myopia forecast main window



By pressing „+" add new visits and enter AL measures manually or import results to add them in the forecast.

Depending on the patient's ethnicity select a proper reference scale

After adding more visits, points will appear on the graph, and trends and changes analysis can be done.

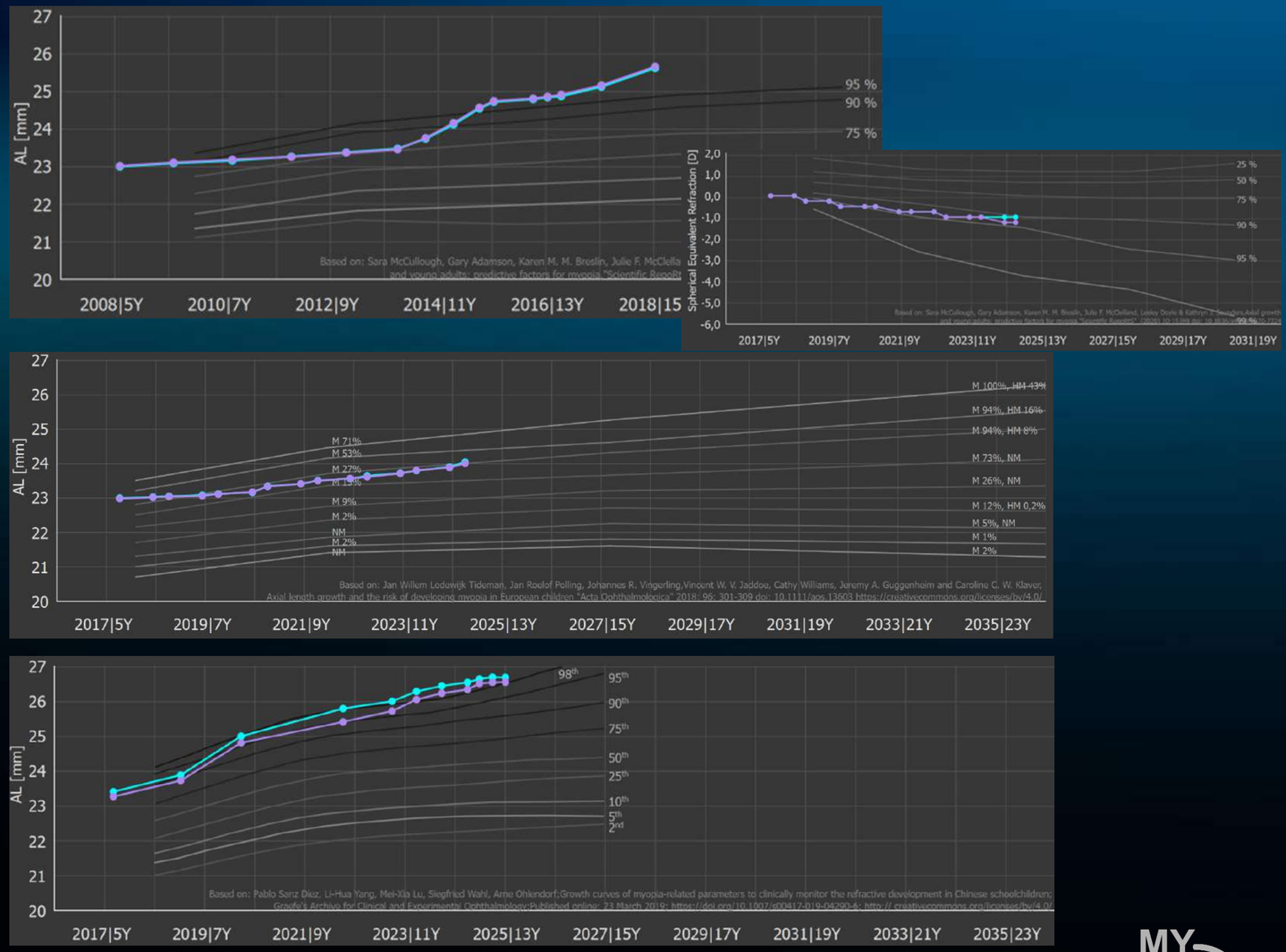
REVO OCT application in Myopia Forecast

Myopia forecast module provides the following age norms:

Nicer European (1) – a scale representative of European children. The Resarch covered a 6-year period and was conducted on the same subjects, devided in 2 age groups. This is the only scale in comparison to others that provides guidelines for AL and R (refractive) values change in relation to normative database. Norm range 6-16 years.

Tidman (2) – a model based on European children. AL measures were performed on several patients and exams were taken to statistics. No follow-up of the same subjects in this case. The scale has the widest age range. Norm range 6-18 years.

Sanz Diez (3) – the research was carried out in China where there is higher prevalence of myopia. Suitable for Asian patients. After long-term monitoring of different age groups an AL normative database was created. Norm range 6-15 years.



(1) Nicer European - *Axial growth and refractive change in white European children and young adults: predictive factors for myopia* Sara McCullough. Gary Adamson. Karen M. M. Breslin. Julie F. McClelland. Lesley Doyle & Kathryn J. Saunders:
(2) *Tidman - Axial length growth and the risk of developing myopia in European children* Jan Willem Lodewijk Tideman. Jan Roelof Polling. Johannes R. Vingerling. Vincent W. V. Jaddoe. Cathy Williams. Jeremy A. Guggenheim and Caroline C. W. Klaver.
(3) *Sanz Diez - Growth curves of myopia-related parameters to clinically monitor the refractive development in Chinese school children* Pablo Sanz Diez. Li-Hua Yang. Mei-Xia Lu. Siegfried Wahl. Arne Ohlendorf:

Case 1 Study: REVO OCT-guided Myopia Management

Clinical Scenario

Patient Profile:

5-year-old European, with progressive myopia. Lack of outdoor activities, spending a lot of time on their mobile phone. Monitored till present time (13yo).

Initial axial length: 23,32 mm.

Approach:

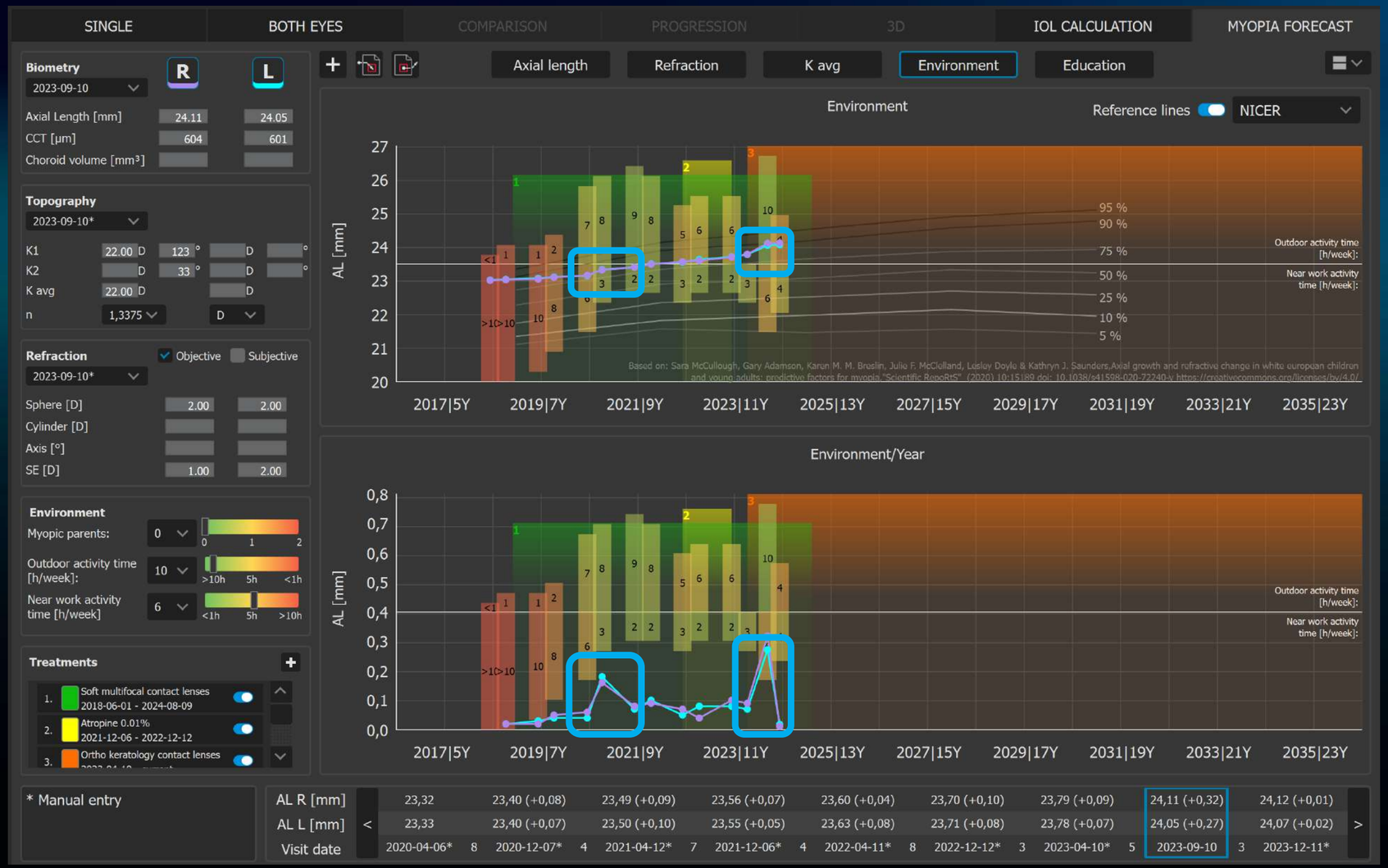
Conduct baseline OCT biometry.

Parents education followed by introduction of more outdoor activities and limitation of the patient's time spent on the phone.

Initiation low-dose atropine therapy combined with later Ortho-K application.

Monitoring axial length and choroidal thickness at 5-7-month intervals.

Case 1



Case 1. Myopia forecast showing significant yearly growth till lifestyle change and treatment application.

Outcome:

Axial length growth reduced from 0.2 mm to <0.1 mm/year thanks to the lifestyle change and atropine use.

Further analysis after the introduction of Ortho-K lenses shows an effect of slowing down the increase in AL.

Case 2 Study: REVO OCT-guided Myopia Management

Clinical Scenario

Patient Profile:

5-year-old Asian with progressive myopia. Monitored till 2018 (16-year-old)

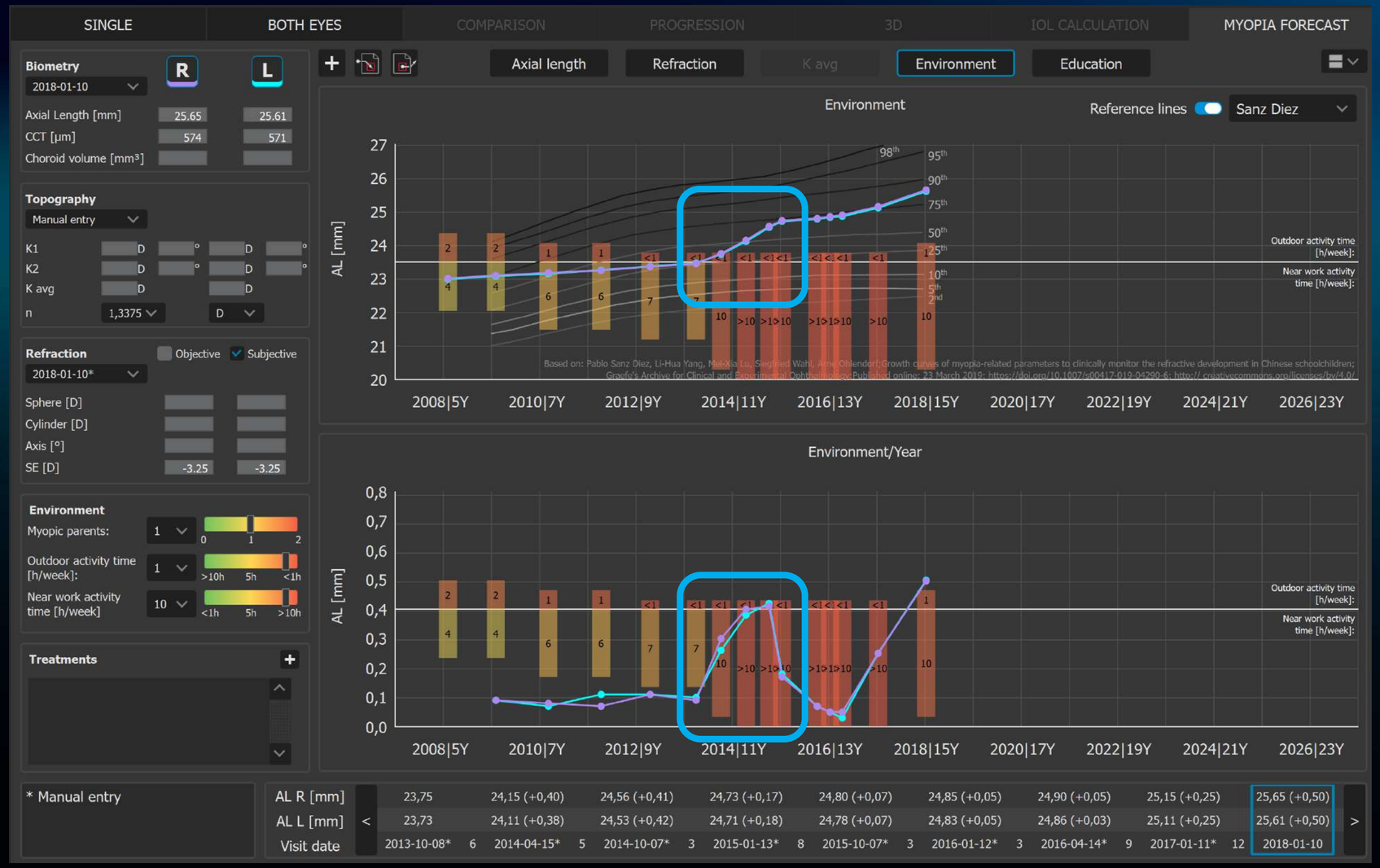
Initial axial length: 23.75 mm.

Approach:

Conduct baseline OCT biometry.

The patient's parents had not agreed to implement any kind of treatment. No preventive action had been implemented. The visit intervals had not been regular. The patient is now reporting blurry vision.

Case 2



Outcome:

A significant progression of AL increase has been recorded. The subject had not been treated and a follow-up confirmed rapid myopia progress.

Case 2. Patient without any treatment. High myopia progression visible at the age of 11.

Case 3 Study: REVO OCT-guided Myopia Management

Clinical Scenario

Patient Profile:

A 13-year-old female Asian patient presented with a history of wearing single-vision soft contact lenses and spectacles. Myopia was increasing rapidly.

Myopia management initiated from 07.2024.
Initial axial length: 23.32 mm.

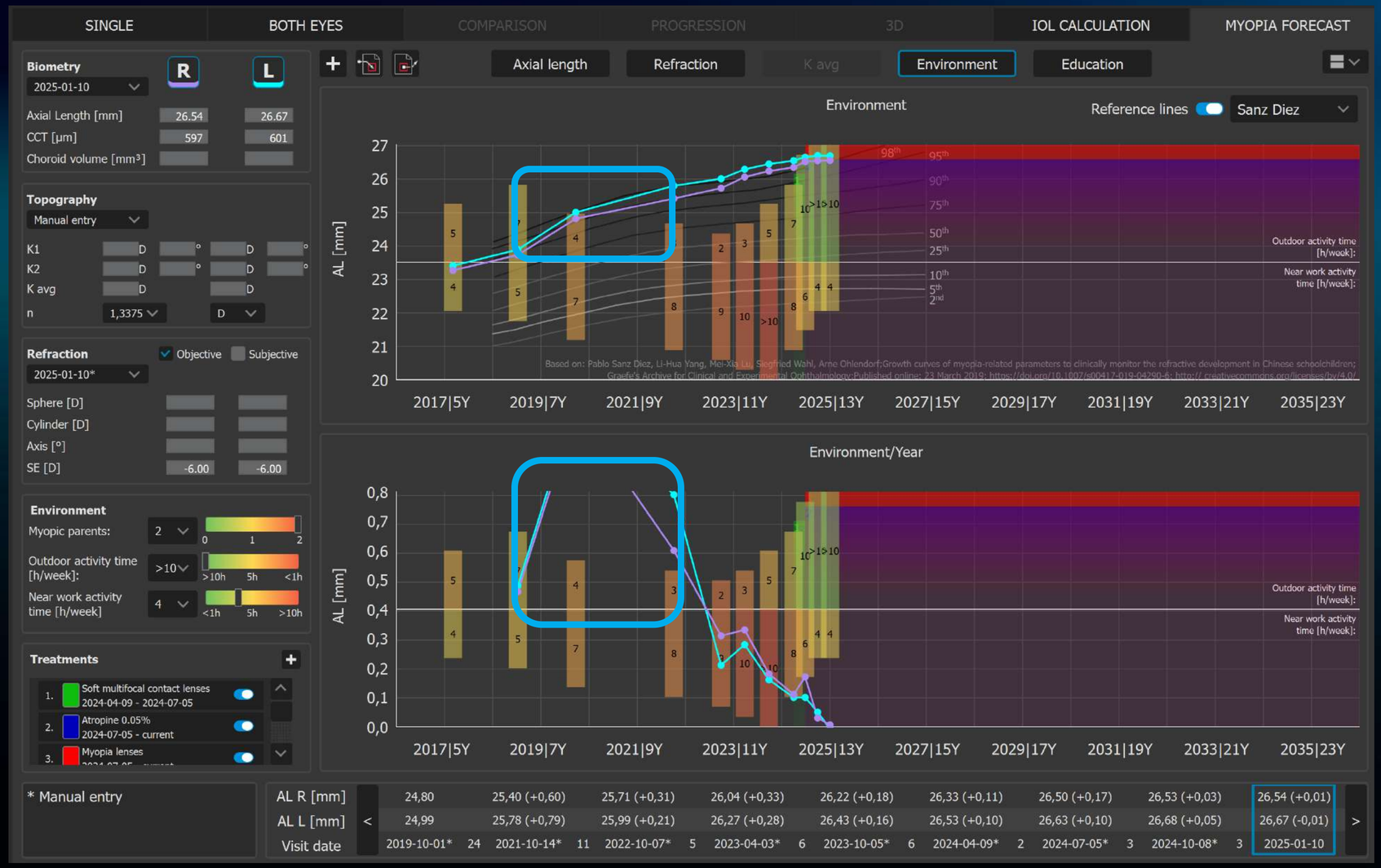
Approach:

Conduct baseline OCT biometry.

The patient tolerated the 0.05% atropine well, with some mild complaints about brightness and night time vision.

Combining low-dose atropine with peripheral defocus contact lenses seemed to stabilize the axial length.

Case 3



Outcome:

The axial length growth reduced and stabilized after implementation of peripheral lenses and pharmacological treatment.

Case 3. Example of proper monitoring and treatment progression

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