Guidance for Industry

Guidance for Premarket Submissions of Orthokeratology Rigid Gas Permeable Contact Lenses

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U.S. Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health

Vitreoretinal & Extraocular Devices Branch
Division of Ophthalmic, Ear, Nose and Throat Devices
Office of Device Evaluation

Preface

Public Comment:

Comments and suggestions may be submitted at any time for Agency consideration to

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Comments may not be acted upon by the Agency until the document is next revised or updated. For questions regarding the use or interpretation of this guidance contact James F. Saviola, O.D. at 240 276-4232 or by electronic mail at james.saviola@fda.hhs.gov

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Guidance[1] for Premarket Submissions of Orthokeratology Rigid Gas Permeable Contact Lenses

1. INTRODUCTION

This guidance document is intended to provide guidance for rigid gas permeable (RGP) contact lens manufacturers that submit marketing applications for contact lenses intended for use as orthokeratology devices. A large segment of the document is devoted to a labeling template that includes the primary package, a package insert, a practitioner fitting guide and a two part patient booklet. Detailed examples of specific labeling components required by regulation are provided. A primary goal of the labeling is to communicate reasonable expectations of success to the user.

In order to develop the necessary information for the labeling, the clinical portion of the guidance identifies specific recommendations for a clinical protocol to develop performance data for submission of a daily wear premarket notification (510(k)) or an overnight wear premarket approval application (PMA). These clinical criteria are recommended to adequately demonstrate safety and effectiveness for the intended use of temporary reduction of refractive error. Sample data reporting tables that are supplemental to the standard contact lens clinical data reporting tables found in the clinical sections of previous contact lens and lens care guidance documents are also included.

The preclinical aspects that are necessary to demonstrate the safety and effectiveness of the device for its intended use are incorporated by reference to previous contact lens guidance documents and are not repeated in this document.

We consider clinical studies of contact lenses for daily wear to be non-significant risk, whereas studies of overnight use or extended wear to be significant risk investigations. Significant risk investigations require an IDE. For overnight or extended wear contact lens studies an adequate investigational plan and informed consent document should be presented to an institutional review board (IRB) and the Food and Drug Administration (FDA) for review and approval. IRB approval is always required before initiating a clinical study of both significant risk and non-significant risk devices while significant risk studies require both IRB and FDA approvals before initiating clinical testing.

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1 This document is intended to provide guidance. It represents the Agency's current thinking on this topic. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public. An alternative approach may be used if such approach satisfies the requirements of the applicable statute, regulations, or both.

Clinical data should be obtained in accordance with an investigational plan that will ensure subject protection and the development of data adequate to support the safety and effectiveness of the device for its intended use.

The information in this guidance document is intended to assist persons in the collection and preparation of data for a 510(k) or PMA submission. This document does not create legal requirements. It identifies the preclinical and clinical areas that FDA believes should be addressed to establish valid scientific evidence as required by the act. The use of this document to prepare preclinical and clinical protocols will not ensure IDE approval, PMA approval, or 510(k) clearance. By following the recommendations in this document the necessary aspects of a submission should be addressed.

One may either follow the recommendations in this guidance document or use different data collection protocols and analysis procedures. We are available to discuss alternative approaches in advance to help prevent the expenditure of time and effort on activities that may not address the relevant issues associated with these devices.

Preclinical or clinical data in other documents on file with CDRH may be incorporated by reference. To be referenced, documents such as IDEs, 510(k)s, PMAs or device master files (DMFs) should have been submitted by the applicant, or the applicant should provide CDRH with appropriate authorization from the holder. This authorization should be in the form of a letter addressed to the Document Mail Center, HFZ-401, CDRH, 9200 Corporate Blvd., Rockville, Maryland 20850, referencing the correct document number.

The Division of Ophthalmic, Ear, Nose and Throat Devices (DOED) should be consulted if you have questions concerning remain this guidance document. DOED's telephone number is 301-594-1744.

2. **PRECLINICAL**

The preclinical areas that should be addressed consist of manufacturing/chemistry, toxicology, and microbiology information. The guidance for preclinical information is referenced to the *Premarket Notification (510(K) Guidance Document for Daily Wear Contact Lenses dated May 12, 1994*, or the most current version. The types of manufacturing data and preclinical testing that should be completed prior to seeking IDE approval from an IRB and FDA, or prior to submitting a 510(k) or PMA for review are contained therein. Each section includes a summary of the basic requirements and suggested methods for meeting these requirements.

A manufacturer may be able to address many of the preclinical aspects by reference to an approved PMA or SE 510(k) for the material. If the material to be used for the orthokeratology lens is obtained from another source, a letter of reference may be obtained from the material supplier.

Guidance for color additive requirements and procedure for adding lens finishing laboratories for manufacturing and marketing of RGP contact lenses are incorporated by reference to the aforementioned *Premarket Notification (510(K) Guidance Document for Daily Wear Contact Lenses dated May 12, 1994.*

3. **CLINICAL**

A. Introduction

The clinical portion of this document includes additional elements of specific clinical data collection and suggested methodologies to be included in the protocol. This is in addition to the information included in the *Premarket Notification (510(K) Guidance Document for Daily Wear Contact Lenses dated May 12, 1994*. The clinical protocol is part of the investigational plan and should be submitted to an IRB and FDA in order to obtain approval of an IDE.

The design of an investigation to demonstrate the safety and efficacy of orthokeratology (also known as Precise Corneal Molding, Controlled Kerato-Reformation, Ortho Focus, etc.) may involve daily wear and/or overnight (sleep time) wear of rigid gas permeable lenses employing a reverse geometry design. As this procedure has been practiced for the past several years, retrospective clinical data may be useful in establishing endpoints in the design of a prospective study.

B. Project Goals

The study goals should be clearly stated, including definitions of success that are defined in objective, quantifiable parameters.

For example, success should be defined as:

- A specific level of uncorrected visual acuity,
- A level of stability of corneal topographic eccentricity values,
- A level of attempted versus achieved reduction in manifest refractive error (the proportions of subjects within ±0.50, ±1.00, and ±2.00 of the targeted amount of correction).

The unaided acuity (manifest acuity) and changes in refraction that occur with the procedure are to be emphasized. It is recommended that a LogMAR Chart (also known as EDTRS) be used although a Snellen Chart is acceptable.

C. Patient Selection

This should include any known factors that would qualify or disqualify an individual as being suitable candidate for Ortho K. If there are specific goals or labeling claims in mind, we recommend subsets of special cases to support those goals or labeling claims.

Examples of entrance criteria may include but are not limited to:

- Degree of myopia, such as -4.00 diopters or less,
- Level of corneal eccentricity as measured by corneal topography,
- Degree of corneal and refractive astigmatism,
- Stability of pre-treatment refractive error,
- History of corneal refractive surgery,
- Ocular health status, especially, corneal,
- Systemic health conditions that have ocular/corneal components,
- Medications having ocular/corneal effects, and
- Reproductive status for female subjects.

D. Protocol

In developing the protocol, a number of issues should be considered.

- What are the desired labeling claims?
- What are the specific goals of the study?
- What are the inclusion and exclusion criteria for the subjects?

Multi-center data would provide information on the consistency of results from the methodology applied and eliminates the inherent bias in utilizing only one investigator.

A study of 50 to 60 completed subjects from a minimum of 3 to 5 clinical sites is recommended for a daily wear orthokeratology study. The patients should be followed for a minimum of three (3) months, although a longer period may be necessary to reach defined stability.

Stability should be defined by quantifiable measures such as:

- the determination of when the eccentricity (e) value reaches 0,
- lack of change in corneal topography readings,
- a change in refractive error of ±0.50 D as determined by two consecutive refractions performed at a specific time interval,
- unaided visual acuity changes (also determined by two consecutive assessments performed at a specific time interval).

The proposed values and endpoints for these variables may be projected from retrospective data documented in the literature or verifiable unpublished clinical reports.

For an overnight or extended wear study please refer to section G below.

E. Issues

The practitioners should follow an established methodology during the study. This will allow the sponsor the opportunity to collect data that is combinable for statistical analysis. The following data should be collected during the study:

- Number of patients screened.
- Number of patients entered into the program based on the established inclusion and exclusion criteria for selecting patients.
- Number of previous PMMA and/or RGP lens wearers (data should be reported separately for previous PMMA and/or RGP wearers vs. soft lens or new wearers.

Established endpoints of efficacy:

- Number of lines of reduction of uncorrected acuity.
- Amount of change of corneal curvature to induce refractive error changes.
- Number of patients whose uncorrected acuity is 20/40, 20/30, or 20/20 or better at 1 month and every 3 month follow up. Analyze data with respect to pretreatment data in the patient record.
- A level of attempted versus achieved reduction in manifest refractive error (the proportions of subjects within ±0.50, ±1.00, and ±2.00 of the targeted amount of correction for the follow-up intervals from the time-point of stability out to the end of the study).
- Stability should be defined by quantifiable measures such as the determination of when the eccentricity (e) value reaches 0, lack of change in corneal topography readings, a change in refractive error of ±0.50 D as determined by two consecutive refractions performed at a specific time interval, and unaided visual acuity changes (also determined by two consecutive assessments performed at a specific time interval).
- Number and criteria for discontinuance of patients.
- Length of time wearing the orthokeratology lens prior to changing over to the Myopic Reduction Maintenance Lens (MRML) or the retainer lens.
- Longevity of procedure with minimum wear time of retainer lens after stability of refractive reduction is achieved.

Established safety parameters:

- Signs/Symptoms, Complications, Adverse Events, Slit Lamp Findings, and the associated grading scales for these findings; K-readings or Corneal Maps and noted changes.
- Loss of baseline Best Corrected Visual Acuity of 2 or more lines and 1 or more lines.
- Increase in corneal/refractive astigmatism of 2D or more and 1D or more as compared to baseline.

- Identification of lens/mold fittings and criteria used to ascertain the needs for these changes and lens replacements with reasons.

Design and wearing schedule of retainer lenses,

- Average number hours worn per day, or per week (a patient diary may be necessary to accurately collect wear time data);
- Associated signs, symptoms, complaints, complications, adverse events, slit lamp findings.
- Patient information; brochures, informed consent, program description.

F. Results

The above information should be collected, analyzed, and presented in tabular form by the sponsor to address the following points:

Sample data tables that should be completed **in addition to** the standard data reporting tables contained in the *Premarket Notification (510(K) Guidance Document for Daily Wear Contact Lenses dated May 12, 1994* are included in the appendices to this section.

The following types of data analyses are considered important for the evaluation of safety and effectiveness.

1. Keratometry or Corneal topography:

   Summary statistics do not provide an accurate description of the effects of orthokeratology. For this reason, FDA recommends the following analysis for keratometry and/or corneal topography.

   - An analysis of changes in keratometry measurements stratified by diopters (keratometric) and meridia should be provided.

   - An analysis of change in absolute corneal astigmatism should also be provided.

   - Analysis of corneal topography for changes in eccentricity along with changes in the steep and flat meridia would provide additional information in place of keratometry.

2. Refractive Power:

   An analysis of reduction of refractive error by pre-treatment manifest refraction should be provided. This should include:

- An analysis of pre-treatment refractive parameters stratified by sphere and cylinder for subjects having astigmatic myopia.

- An analysis of pre-treatment refractive parameters in comparison to post-treatment refractive parameters stratified by dioptric power for all completed subjects at the 1 month and 3 month visits for daily wear and the 6, 9, and 12 month visits for overnight wear.

- An analysis of the intended correction versus the achieved correction stratified by dioptric power for all subjects as well as subjects completing all visits.

- It is important for the practitioner to know when the patient has achieved the maximum amount of reduction in refractive error that is going to be achieved with orthokeratology so that the patient can be placed on a maintenance program.

- A definition and method of determining refractive stability for the orthokeratology procedure should be provided. A change in refractive error of ±0.50 D determined by two consecutive refractions performed at a specific time interval should be included in this objective definition. The proposed values and endpoints for these variables may be projected from retrospective data documented in the literature or verifiable unpublished clinical reports.

- An analysis of the stability of the manifest refraction should be performed for all eyes treated; for eyes treated for spherical myopia (and for eyes treated for astigmatic myopia if applicable).

- This analysis should be performed for the overall cohort and on all subjects who were seen at all visits specified in the protocol and stratified by dioptric group, evaluated at the 95% confidence interval for the mean difference (not the difference in the means).

- An analysis of the relationship between changes in keratometric readings (or topographical changes) and corresponding reductions in manifest refraction for the overall cohort and subjects completing all visits specified in the protocol, stratified by dioptric group should be provided.

3. Visual Acuity:

   The intended purpose of orthokeratology is the reduction of myopic refractive errors so those individuals may reduce the need for corrective lenses for functioning. The practitioner needs to know what effects (namely the degree of improvement in uncorrected visual acuity) that can be obtained by the programmed reformation of the corneal surface induced by the reverse geometry

process of the contact lens. To address these objectives, the following data should be presented in the marketing application:

- An analysis of uncorrected visual acuity pre- and post-treatment for subjects who completed all visits stratified by dioptric group for the 1 month and each 3 month visits up to and including the 12 month visit for overnight wear should be provided. The amount of pre-treatment myopia in a dioptric range, along with the current initial uncorrected VA would address this point.

- Information should be presented statistically and in tabular form regarding subjects whose pre-treatment best corrected visual acuity was reduced by 1, 2, or 2 or more lines post-treatment.

- An analysis of pre- and post-treatment best corrected visual acuity stratified by diopter for subjects who completed all visits specified in the protocol should be provided.

4. Wearing Time and Stability:

   Two main goals of orthokeratology are the reduction of refractive error and, improved uncorrected visual acuity. It would be helpful for practitioners of orthokeratology to know what are the minimum and maximum wearing schedules necessary in order to maintain the reduction in refractive error with subsequent improvement in visual acuity that was achieved while undergoing orthokeratology. The application should include:

   - An analysis of the effects of wearing schedule on the maintenance of the refractive and visual acuity outcomes. This may be addressed by following subjects are different time points during the day, or by scheduling follow up visits at different times such as early morning or late afternoon.

   - The time necessary to return to baseline corneal and refractive measurements is a topic that would be of interest to potential users. While it may be impractical to ask successfully completed subjects to return lenses and monitor the time it takes to return to baseline, it is highly recommended that discontinued subjects be monitored for longer than the initial exit visit to address this issue.

5. Intraocular Pressure (IOP):

   Applanation tonometry measurements of subjects IOP at baseline, mid-study and final visit are recommended. The value of IOP as a predicting variable of orthokeratology success has been discussed in the literature. By prospectively

collecting these data the manufacturer would be able to determine if this factor should be addressed in the patient selection portion of the product labeling.

G. Additional Considerations for Overnight Wear Studies (Prospective Investigations)

The element of overnight wear for the purposes of modification of refractive error indicates the Premarket Approval (PMA) process is necessary. This is a new indication (for ortho K), using a currently approved extended wear contact lens material.

To date there has not been a marketing approval by FDA for an extended wear RGP lens for use in an overnight orthokeratology procedure. The overnight wear of contact lenses is considered a significant risk to subjects that requires an Investigational Device Exemption (IDE) prior to initiating clinical study.

If the IDE is not submitted by the PMA holder, a letter from the PMA holder granting FDA permission to reference the currently approved extended wear indication should be provided in the IDE. The PMA holder should acknowledge that they are aware the referenced company plans to conduct a clinical study for a new indication.

Primary safety issues include whether the orthokeratology corneal molding presents additional risk overnight when the cornea is hypoxic. Also there is concern that the rates of corneal abrasion may be increased with overnight use and that irregular astigmatism may develop.

To address these additional safety issues, a study of 150 to 200 completed subjects followed for a twelve-(12) month duration is recommended.

H. Retrospective Data

Retrospective data are useful to support the study design and some protocol issues such as sample size, length of study, likely candidates, number of visits during treatment, special subsets of patients, or statistical justifications for prospective studies. These data also serve as prior clinical experiences that are required by regulation to be submitted in an application (IDE).

Prior experience may be helpful in determining the training requirements for clinicians. However, due to difficulties is addressing the consistency of data collection practices across all study sites, the record sampling plan and the mechanism utilized to minimize bias, FDA does not recommend the use of retrospective clinical data to support a marketing application.

I. Recommended Orthokeratology Data Tables

Supplemental to standard contact lens data tables

KERATOMETRY CHANGES FROM BASELINE TO FINAL VISIT

The charts should be done by pre-treatment dioptric group for all completed eyes:

	Keratometry Change from Baseline to Final Visit Pretreatment Myopia (Spherical Diopters)											
	≤1.0 D		**1.25 to 2.00 D**		**2.25 to 3.00 D**		**3.25 to 4.00 D**		**4.25 to 5.0 D**		**5.25 to 6.00 D**	
K Reading Change	**n/%**		**n/%**		**N/%**		**n/%**		**n/%**		**n/%**	
FLATTEN	**H**	**V**	**H**	**V**	**H**	**V**	**H**	**V**	**H**	**V**	**H**	**V**
0.00												
0.12 to 0.50												
0.62 to 1.00												
1.12 to 1.50												
1.62 to 2.00												
Etc.												
STEEPER												
0.00												
0.12 to 0.50												
0.62 to 1.00												
1.12 to 1.50												
etc.												

Corneal topography may substitute for keratometry. Eccentricity values should be included if available.

ABSOLUTE CHANGE IN CORNEAL CYLINDER
FROM BASELINE TO FINAL VISIT

	Corneal Cylinder Change from Baseline to Final Visit Pretreatment Myopia (Spherical Diopters)											
	≤1.0 D		1.25 to 2.00 D		2.25 to 3.00 D		3.25 to 4.00 D		Etc,		Totals	
Astigmatism Change	n/%		n/%		n/%		n/%				n/%	
0.00												
Decreases												
0.12 to 0.50												
0.62 to 1.00												
1.12 to 1.50												
1.62 to 2.00												
Etc.												
Increase												
0.00												
0.12 to 0.50												
0.62 to 1.00												
1.12 to 1.50												
Etc.												

DEMOGRAPHICS OF REFRACTIVE PARAMETERS

Corneal Astigmatism	Pretreatment Myopia (Spherical Diopters)					
	≤1.0 D	1.25 to 2.00 D	2.25 to 3.00 D	3.25 to 4.00 D	Etc.	Totals
	n/%	n/%	n/%	n/%		n/%
0.00						
0.12 to 0.50						
0.62 to 1.00						
1.12 to 1.50						
1.62 to 2.00						
Etc.						

CHANGE IN REFRACTIVE PARAMETERS

Tables for completed eyes at the1 month and for every 3 month visit.

Refractive Change	Refractive Change from Baseline Visit Pretreatment Myopia (Spherical Diopters)					
	≤1.0 D	1.25 to 2.00 D	2.25 to 3.00 D	3.25 to 4.00 D	Etc.	Totals
Decrease	n/%	n/%	n/%	n/%		
0.00						
0.12 to 0.50						
0.62 to 1.00						
1.12 to 1.50						
1.62 to 2.00						
Etc.						
Increase						
0.00						
0.12 to 0.50						
0.62 to 1.00						
1.12 to 1.50						
1.62 to 2.00						
Etc.						

ACCURACY OF INTENDED VS. ACHIEVED CORRECTION*
STRATIFIED BY DIOPTRIC GROUP
AT EACH 3 MONTH VISIT

	Pretreatment Myopia (Diopters)				
MR	**≤1.0 D**	**1.25 to 2.00 D**	**2.25 to 3.00 D**	**ETC.**	**Totals**
	n/N (%)	n/N (%)	n/N (%)		n/N (%)
±0.50 D					
±1.00 D					
±2.00 D					
Etc.					
Not Reported					
Total					
Overcorrected					
>+1					
>+2					
Etc.					
Undercorrected					
<-1					
<-2					
Etc.					
Not reported					
Total					

STABILITY OF MANIFEST REFRACTION*
STRATIFIED BY DIOPTRIC GROUP

Change in Spherical Diopters	Pre-treat and 1 Month n/N (%)				1 and 3 Months n/N (%)			
	Pre-treatment myopia							
	≤1.0 D	**1.25 to 2.00 D**	**2.25 to 3.00 D**	**ETC.**	**≤1.0 D**	**1.25 to 2.00 D**	**2.25 to 3.00 D**	**ETC.**
	n/N (%)	n/N (%)	n/N (%)		n/N (%)	n/N (%)	n/N (%)	
≤1.00 D								
1.25 to 2.00D								
2.25 to 3.00								
Etc.								
Mean Difference								
SD								
95% CI								

*This analysis should be performed only on subjects who were present at all visits specified in the protocol. It should be continued for each 3 month interval.

REDUCTION IN MANIFEST REFRACTION AS A FUNCTION OF KERATOMETRY CHANGE (stratified by preoperative manifest refraction)

	Reduction of Pretreatment Myopia (Spherical Diopters) at each 3 month Visit					
Keratometry Change in Flat meridian	**≤1.0 D** n/N (%)	**1.25 to 2.00 D** n/N (%)	**2.25 to 3.00 D** n/N (%)	**3.25 to 4.00 D** n/N %)	**Etc.** n/N (%)	**Totals** n/N (%)
Flatten						
0.12 to 0.50						
0.62 to 1.00						
1.12 to 1.50						
1.62 to 2.00						
Etc.						
Steepen						
0.12 to 0.50						
0.62 to 1.00						
1.12 to 1.50						
1.62 to 2.00						

* For all eyes minus those intentionally undercorrected

UCVA STRATIFIED BY PRE-TREATMENT DIOPTRIC GROUP

Tables for 1 month and each 3 months.

x Month

	Pretreatment Myopia (Spherical Diopters)					
UCVA	**≤1.0 D**	**1.25 to 2.00 D**	**2.25 to 3.00 D**	**3.25 to 4.00 D**	**Etc.**	**Totals**
	n/%	**n/%**	**n/%**	**n/%**		**n/%**
20/20 or better						
20/25 or better						
20/32 or better						
20/40 or better						
20/80 or better						
20/200 or better						
Not reported						
Total						

SUMMARY OF INTRAOCULAR PRESSURE

IOP	Initial Visit n/N (%)	3 Month n/N (%)	Final N/N (%)

* Indicate method of measurement

CHANGE IN BEST SPECTACLE CORRECTED
VISUAL ACUITY INITIAL TO FINAL
STRATIFIED BY PRETREATMENT DIOPTRIC GROUP

	Pretreatment Myopia (Diopters)					
Change in VA	**≤1.0 D**	**1.25 to 2.00 D**	**2.25 to 3.00 D**	**3.25 to 4.00 D**	**ETC.**	**Total**
	n/%	**n/%**	**n/%**	**n/%**	**n/%**	**n/%**
Decrease > 2 lines						
Decrease 2 lines						
Decrease 1 line						
No change						
Increase 1 line						
Increase 2 lines						
Increase >2 lines						
Not reported						
Total						

DATALINE LISTINGS OF EYES WITH LOSS OF ≥ 2 LINES OF BSCVA

	Pre-treatment			**3 Month**		
Patient code	UCVA	MR	BSCVA	UCVA	MR	BSCVA

SUMMARY OF KEY SAFETY AND EFFICACY VARIABLES

	1 Month n/N (%)	3 Month n/N (%)	each 3 Months n/N (%)
Efficacy Variables			
UCVA 20/20 or better*			
UCVA 20/40 or better*			
Change in sphere 0.50D			
Change in sphere 1.00D			
Change in sphere 1.50D			
Change in sphere 2.00D			
Change in sphere 2.50D			
Change in sphere 3.00D			
Safety Variables			
Loss of ≥ 2 lines BSCVA			
BSCVA worse than 20/40			
Increase > 1 D cylinder			
BSCVA worse than 20/25 if 20/20 or better pre-treatment			

For all eyes minus those intentionally undercorrected

WEAR TIME EFFECT ON UNCORRECTED VISUAL ACUITY

Tables 1 month and every 3 months

	Daily Wear time (hours)						
UCVA	0 to 4	4.1 to 6	6.1 to 8	8.1 to 10	10.1 to 12.0	Etc.	Total
	n/N (%)	n/N (%)	n/N (%)	n/N (%)	n/N (%)		n/N (%)
20/15							
20/20							
20/30							
20/40							
20/50 to 60							
Etc.							
Not reported							
Total							

4. **SHIPPING CONTAINER LABEL**

TRADE NAME (generic name) RIGID GAS PERMEABLE CONTACT LENS FOR ORTHOKERATOLOGY -[Daily Wear][Overnight Wear]

CONTENTS: One/Two contact lens(es)

CAUTION: Non-sterile. Clean and condition lenses prior to use.

Base Curve:
Diameter:
Power:
Secondary Curve:
Color:
Center Thickness:

Lot Number:

CAUTION: Federal law prohibits dispensing without a prescription.

Applicant's Name
Address

5. **PACKAGE INSERT**

TRADE NAME (generic name) RIGID GAS
PERMEABLE CONTACT LENSES FOR ORTHOKERATOLOGY - [Daily Wear][Overnight Wear]

IMPORTANT: Please read carefully and keep this information for future use. This package insert is intended for the eyecare practitioner, but should be made available to patients upon request. The eyecare practitioner should provide the patient with the patient instructions that pertain to the patient's prescribed lens.

CAUTION: Federal Law Prohibits Dispensing Without a Prescription.

WARNING: Contains a [identify] compound which harms public health and environment by destroying ozone in the upper atmosphere. A notice similar to the above Warning has been placed in the patient information of this product, pursuant to EPA regulation.]

DESCRIPTION:

Trade Name (TN) Rigid Gas Permeable (RGP) contact lenses for [daily wear][overnight wear] orthokeratology are lathe cut contact lenses with [spherical] or [aspherical] anterior or posterior surfaces in clear [and tinted] version. The posterior curve is selected so as to property fit an individual eye for orthokeratology and the anterior curve selected to provide the necessary optical power for a temporary reduction of myopia. A peripheral curve system on the posterior surface allows tear exchange between the lens and the cornea.

TN contact lenses for orthokeratology are made from a [fluoro silicone acrylate][silicone acrylate][etc] polymer, generic name, with a water content of less than [ ] percent. [The tinted lens contains [listed name of color additive] as a color additive.] TN contact lenses for orthokeratology are to be worn for [daily wear only] [daily wear or overnight wear].

LENS PARAMETERS AVAILABLE:

Chord Diameter

Center Thickness for Low Minus Lens:
for Plus Lens:
Base Curve
Secondary Curves
Flatter or steeper than Base Curve

Peripheral Curves
Flatter or steeper than Base Curve
Powers
Aspheric Lens Eccentricity
(Oblate, Prolate or Tangent Conic)

The physical properties of the lens are:
Refractive Index
Light Transmittance...
Wetting Angle
(Contact Receding Angle)
Specific Gravity
Hardness
Water Content
0xygen Permeability and method of measurement

ACTIONS:

TN contact lenses for orthokeratology produce a temporary reduction of myopia by changing the shape (flattening) of the cornea, which is elastic in nature. Flattening the cornea reduces the focusing power of the eye, and if the amount of corneal flattening is properly controlled, it is possible to bring the eye into correct focus and compensate for myopia. Contact lenses rest directly on the corneal tear layer and can influence the corneal shape. Regular contact lenses are designed to cause little or no effect but TN contact lenses for orthokeratology are designed to purposely flatten the shape of the cornea by applying slight pressure to the center of the cornea. If the central cornea is flattened this reduces the focusing power of the eye, and if the amount of corneal flattening is sufficient, it is possible to bring the eye into correct focus and compensate for myopia. After the contact lens is removed, the cornea retains its altered shape for part or all of the remainder of the day. (A Myopic Reduction Maintenance Lens or Retainer Lens should be worn each day to maintain the corneal flattening, or the myopia will revert back to the pretreatment level.)

INDICATIONS (USES):

The TN (generic name) Rigid Gas Permeable orthokeratology contact lenses are indicated for use in the reduction of myopic refractive error in non-diseased eyes. The lens is indicated for [daily wear][extended wear from X to X days between removal for cleaning and disinfection as recommended by the eye care practitioner] in an orthokeratology fitting program for the temporary reduction of myopia of up to X.00 diopters. The lens may be disinfected using a chemical disinfection system only.

Note: To maintain the orthokeratology effect of myopia reduction lens wear must be continued on a prescribed wearing schedule.

CONTRAINDICATIONS (REASONS NOT TO USE:

DO **NOT USE** YOUR TN contact lenses when any of the following conditions exist:

- Acute and subacute inflammations or infection of the anterior segment of the eye.
- Any eye disease, injury, or abnormality that affects the cornea, conjunctiva or eyelids.
- Severe insufficiency of tears (dry eyes)
- Corneal hypoesthesia (reduced corneal sensitivity).
- Any systemic disease which may affect the eye or be exacerbated by wearing contact lenses.
- Allergic reactions of ocular surfaces or adnexa which may be induced or exaggerated by wearing contact lenses or use of contact lens solutions.
- Allergy to any ingredient, such as mercury or Thimerosal, in a solution which is to be used to care for your contact lenses.
- Any active corneal infection (bacterial, fungal or viral).
- If eyes become red or irritated.

WARNINGS:

Caution: TN contact lenses for orthokeratology are shipped to the practitioner non-sterile. Clean and condition lenses prior to use.

Incorrect use of contact lenses and lens care products can result in serious injury to the eye. It is essential to follow your eyecare practitioner's directions and all labeling instructions for proper use of contact lenses and lens care products. Eye problems, including corneal ulcers, can develop rapidly and lead to loss of vision. If you experience eye discomfort, excessive tearing, vision changes, or redness of the eye, immediately remove your lenses and do not wear them until you have been examined by your eye care practitioner. All contact lens wearers should see their eyecare practitioner according to the schedule given to them.

TN contact lenses for orthokeratology [are to be worn on a daily wear basis only. Do not wear your
lenses while sleeping, at the risk of serious adverse reactions.][may be worn on an overnight wear basis while sleeping as recommended by the eye care practitioner.]

Studies have shown that contact lens wearers who are smokers have a higher incidence of adverse reactions than nonsmokers.

PRECAUTIONS:

Specific Precautions

- Clinical studies have demonstrated that contact lenses manufactured from the TN (generic name) rigid gas permeable lens materials are safe and effective for their intended use. However, the clinical studies may not have included all design configurations or lens parameters that are presently available in the materials. Consequently, when selecting an appropriate lens design and parameter the eyecare practitioner should consider all factors that effect lens performance and ocular health. The potential impact of these factors should be weighed against the patient's needs; therefore, the continuing ocular health of the patient and lens performance on the eye should be carefully monitored.

- Patients should be instructed to follow the instructions below in order to prevent damage to their eyes or lenses.

Solution Precautions

- Different solutions cannot always be used together, and not all solutions are safe for use with all lenses. Use only recommended solutions with the contact lenses.

- Do not heat the wetting/soaking solution and lenses.

- Always use fresh unexpired lens care solutions.

- Always follow directions in the package inserts of the contact lens solutions used.

- Use only a chemical lens care system. Use of a heat (thermal) lens care system can cause damage by warping TN contact lenses.

- Sterile unpreserved solutions, when used, should be discarded after the time specified in the labeling directions.

- Do not use saliva or anything other than the recommended solutions for lubricating or wetting lenses.

- Always keep the lenses completely immersed in the recommended storage solution when the lenses are not being worn (stored).

Handling Precautions

- Always wash and rinse hands before handling lenses. Do not get cosmetics, lotions, soaps, creams, deodorants, or sprays in the eyes or on the lenses. It is best to put on

lenses before putting on makeup. Water-base cosmetics are less likely to damage lenses than oil-base products.

- Be certain that your fingers or hands are free of foreign material before touching your contact lenses, as microscopic scratches of the lenses may occur, causing distorted vision and /or injury to the eye.

- Carefully follow the handling, insertion, removal, cleaning, disinfecting, storing and wearing instructions in the patient information booklet and those prescribed by your eyecare practitioner.

- Always handle your lenses carefully and avoid dropping them.

- Never use tweezers or other tools to remove your lenses from the lens container unless specifically indicated for that use. Pour your lens into your hand.

- Do not touch the lens with your fingernails.

- To minimize lens warpage during cleaning, the lenses should be cleaned in the palm of the hand rather than between the thumb and fingers.

Lens Wearing Precautions

- If the lens sticks (stops moving) on the eye, follow the recommended directions on Care for a Sticking Lens in the patient information booklet. The lens should move freely on the eye for the continued health of the eye. If nonmovement of the lens continues, you should immediately consult your eyecare practitioner.

- Never wear your contact lenses beyond the period recommended by your eyecare practitioner.

- Avoid, if possible, all harmful or irritating vapors and fumes when wearing lenses.

- If aerosol products such as sprays are used while wearing lenses, exercise caution and keep eyes closed until the spray has settled.

Lens Case Precautions

- Contact lens cases can be a source of bacterial growth. To prevent contamination and to help avoid serious eye injury, always empty and rinse the lens case with fresh, sterile rinsing solution and allow to air dry.

- Lens cases should be replaced at regular intervals as recommended by the lens case manufacturer or eyecare practitioner.

Topics to Discuss with the Eyecare Practitioner

- Ask your eyecare practitioner about wearing your lenses during sporting activities.
- Always contact your eyecare practitioner before using any medicine in your eyes.
- As with any contact lens, follow-up visits are necessary to assure the continuing health of your eyes. You should be instructed as to a recommended follow-up schedule.

Who Should Know That the Patient is Wearing Contact Lenses

- Inform your doctor (health care practitioner) about being a contact lens wearer.
- Always inform your employer of being a contact lens wearer. Some jobs may require the use of eye protection equipment or may require that you not wear contact lenses.

ADVERSE EFFECTS (PROBLEMS AND WHAT TO DO: Patient's should be informed that the following problems may occur:

- Eyes stinging, burning, itching (irritation), or other eye pain
- Comfort is less than when lens was first placed on eye.
- Feeling of something in the eye such as a foreign body or scratched area.
- Excessive watering (tearing) of the eyes
- Unusual eye secretions
- Redness of the eyes
- Reduced sharpness of vision (poor visual acuity)
- Blurred vision, rainbows, or halos around objects
- Sensitivity to light (photophobia)

If you notice any of the above: IMMEDIATELY REMOVE YOUR LENSES.
If the discomfort or problem stops, then look closely at the lens. If the lens is in any way damaged, DO NOT put the lens back on your eye. Place the lens in the storage case and contact your eyecare practitioner. If the lens has dirt, an eyelash, or other foreign objects on it, or the problem stops and the lens appears undamaged, you should thoroughly clean, rinse and disinfect the lens; then reinsert it. If the problem continues, you should IMMEDIATELY remove the contact lenses and consult your eyecare practitioner.

When any of the above problems occur, a serious condition such as infection, corneal ulcer, neovascularization, or iritis may be present. You should be instructed to keep the lens off the eye and seek immediate professional identification of the problem and prompt treatment to avoid serious eye damage.

CLINICAL STUDY RESULTS:

A total of # (# patients) eyes were enrolled in the clinical study with # eyes (# patients) completing a minimum of # months of contact lens wear. Of the completed eyes a total of # eyes showed some reduction in myopic refractive error during the #-month time period that the TN contact lenses for orthokeratology were worn. The average reduction was # diopters with a range from X to X diopters.

The average amount of myopia that can be expected to be corrected is shown in the following table. These values are only averages and some patients can be expected to achieve more or less than these averages.

AVERAGE REDUCTION IN MYOPIA (Diopters)

INITIAL Myopia	REDUCTION Myopia
-1.00	#
-2.00	#
-3.00	#
-4.00	#
Etc.	#

The amount of myopia reduced varied between patients and could not be predicted prior to treatment. There was an insignificant difference between the patients who wore contact lenses prior to the study and those with no previous contact lens experience.

TN contact lenses for orthokeratology provided a temporary full reduction in some patients with up to # diopters of myopia. For patients with greater than # diopters of myopia only a partial reduction of myopia can be expected. The percentage of patients that can be expected to achieve full or partial temporary refractive reduction is shown in the following table.

PERCENT OF EYES THAT ACHIEVED FULL OR PARTIAL TEMPORARY REDUCTION OF MYOPIA

INITIAL MYOPIA	FULL TEMPORARY REDUCTION	UP TO 0.50 D. UNDER FULL REDUCTION	FINAL V.A. 20/20 or better	FINAL V.A. 20/40 or better
<1.00 D	%	%	%	%
-1.25 to - 2.00 D.				
-2.25 to - 3.00 D.				
-3.25 to - 4.00 D.				
Etc.				

For the patients (# eyes) that completed this study, the initial visual acuity by best refraction was 20/20 or better for # eyes and 20/40 or better for all eyes (#). At the final visit, visual acuity with contact lenses was equal to or better than 20/20 for # eyes, 20/40 for # eyes and # eyes had a visual acuity of 20/70. # eyes had a one-line drop in visual acuity for contact lenses compared to best refraction, # eyes had a two-line drop and # eyes had a three-line drop. In each case the reduced visual acuity was attributed to[give reason].

The percentage of eyes that achieved uncorrected visual acuity of 20/20 or better and 20/40 or better in relation to the initial myopia is given in the above table. A total of # (%) eyes achieved a visual acuity of 20/20 or better and # (%) eyes achieved 20/40 or better.

EFFECTS ON ASTIGMATISM

Either increases or decreases in astigmatism may occur following orthokeratology. Of the # eyes (# patients) which completed the three month clinical, % showed no change in corneal astigmatism, % showed a decrease less than one diopter, while % showed an increase less than one diopter and % showed an increase greater than one diopter.

WEARING TIME

The average wearing time required for patients who wore TN contact lenses for orthokeratology for various time periods was as follows:

One week	hours/days
Two weeks	hours/days
One month	hours/days
Three months	hours/days
[Etc.	days]

There was considerable variability, however, as many patients required several hours more or less than the averages as shown for the [three][twelve]-month time period as follows:

Daily Wear

Time Worn	Percent of patients		
0 to 4 hours	%	4.1 to 8 hours	%
8.1 to 12 hours	%	12.1 to 16 hours	%

Overnight Wear

Time Worn	Percent of Patients		
1 to 3 days	%	3 to 4 days	%
4 to 5 days	%	5 to 7 dyas	%

FITTING:

Conventional methods of fitting rigid contact lenses for orthokeratology DO NOT APPLY to the TN contact lenses for orthokeratology. For a description of fitting techniques, refer to the Fitting Guide for TN contact lenses for orthokeratology, copies of which are available from:

Applicant's Name
Address

WEARING SCHEDULE:

Although many practitioners have developed their own initial wearing schedules, the following sequence is recommended as a guideline. Patients should be cautioned to follow the wearing schedule recommended by the eyecare practitioner regardless of how comfortable the lenses feel.

The following schedule depends upon the professional judgment of the eyecare practitioner and should be modified according to the response to the initial lenses.

Daily Wear

Maximum wearing time:

Day	Wearing Time (Hours)
1	3
2	6
3	7
4	8
5	9
6	10
7	15
8 and after	All hours awake

Overnight Wear

Maximum Wearing Time

[Patients should be advised NOT TO SLEEP while wearing TN contact lenses for orthokeratology. Studies have not been conducted to show that the TN rigid gas permeable contact lens is safe to wear during sleep.] There is a tendency for some patients to overwear the lenses initially. It is important to remind patients to adhere to the maximum wearing schedule above. In order to maintain the orthokeratology effect of myopia reduction lens wear should be continued on a wearing scheduled determined by the eye care practitioner. Refer to the Professional Fitting and Information Guide for information on Myopic Reduction Maintenance Lens or Retainer Lens wear.

LENS CARE DIRECTIONS:

Patient should be advised to follow the directions contained in the package insert for the Adjunct Solutions. The Adjunct Solutions which were used with TN contact lenses for orthokeratology are as follows:

Chemical Lens Care System

Clean
Rinse
Disinfect
Store
Lubricate/Rewet
Enzyme

* is a trade mark of [Solution manufacturer].

The directions from the package inserts from these products should be followed. Failure to adhere to these procedures may result in the development of serious ocular complications. A patient should not switch from one care system to another unless it has been determined by the eyecare practitioner that this is necessary. Do not mix or alternate the disinfection and storage systems unless so indicated on the product label.

Always wash and rinse your hands thoroughly before handling your contact lenses.

TN contact lenses for orthokeratology must be both cleaned, rinsed and disinfected each time you remove them. One procedure does not replace the other. Cleaning is necessary to remove mucus and film from the lens surface. Disinfecting is necessary to destroy harmful germs. To minimize lens warpage during cleaning, the lenses should be cleaned in the palm of the hand rather than between the thumb and fingers.

Clean one lens first. (The recommended procedure is to always clean the same lens first to avoid mix-ups). Rinse the lens thoroughly to remove the cleaning solution. Place the lens into the correct storage chamber and fill the chamber with the recommended disinfection solution as recommended by your eyecare practitioner.

Tightly close the top of each chamber of the lens storage case.

To disinfect your lenses, leave them in the solution for at least the period of time indicated on the product label. Leave the lenses in the unopened storage case until you are ready to put them in your eye.

LENS CASE CLEANING AND MAINTENANCE:

Contact lens cases can be a source of bacteria growth. Lens cases should be emptied, cleaned, rinsed with solutions recommended by the lens case manufacturer, and allowed to air dry. Lens cases should be replaced at regular intervals as recommended by the eyecare practitioner.

ENZYME CLEANING:

Enzyme cleaning may be recommended by your eyecare practitioner. Enzyme cleaning does not replace routine cleaning and disinfecting. You should carefully follow the instructions in the enzymatic cleaning labeling.

EMERGENCIES:

If chemicals of any kind (household products, gardening solutions, laboratory chemicals , etc.) are splashed into the eyes, the patient should flush eyes immediately with tap water and then remove lenses promptly.

CONTACT THE EYECARE PRACTITIONER OR VISIT A HOSPITAL EMERGENCY ROOM WITHOUT DELAY.

HOW SUPPLIED:

Each lens is supplied non-sterile in an individual plastic case. The case, packing slip or invoice is marked with the base curve, dioptic power, diameter, secondary curve, center thickness, [color] and Lot #.

REPORTING OF ADVERSE REACTIONS:

All adverse reactions should be reported immediately to the manufacturer. Telephone xxx-xxx-xxxx or 800-yyy-yyyy.

(Printed month/Year)

Applicant's Name and address

6. **PATIENT INFORMATION BOOKLET (PART 1) FOR POTENTIAL USERS:**

Trade Name **(generic name**)
RIGID GAS PERMEABLE CONTACT LENSES FOR ORTHOKERATOLOGY for [Daily Wear][Overnight Wear]

CAUTION: Federal law prohibits dispensing without a prescription.

WARNING: Contains a [identify] compound which harms public health and environment by destroying ozone in the upper atmosphere.

TABLE OF CONTENTS

GLOSSARY

Adnexa: Tissues near the eye.
Adverse effects: Undesirable effects.
Aphakia: Eye that does not have a lens structure.
Astigmatism: Eye condition in which one or more surfaces of the cornea or lens has a shape that is not round but more like that of a spoon.

Contact Lens Sticking: Lack of movement of a contact lens on the cornea.
Cornea: The clear, bubble-like structure on the front of the eye, where light first enters the eye.
Corneal abrasion: Loss of cells on the corneal surface due to mechanical trauma.
Corneal edema: Accumulation of fluid in the cornea.
Corneal hypoesthesia: Partial loss of sensitivity to touch in the cornea.
Corneal staining: Bright areas on the cornea where dye collects and which indicates an abrasion or other disturbance of the cornea.
Corneal ulcer: small area of tissue loss in the cornea.

Disinfection: Destruction of bacteria and viruses but not some spores.
Diopter: Unit of power for glasses or contact lenses.

Enzyming contact lenses: Placing contact lenses in a solution that contains an enzyme that dissolves proteins on the surface of the lens.

Hypoesthesia: Reduced corneal sensitivity to touch.

Iritis: Infection of the iris or colored portion of the eye.

Lacrimal secretion: Tearing.

Myopia: Medical term for nearsightedness.
Myopic Reduction Maintenance Lens: A modification of the orthokeratology contact lens design in which the central portion of the lens applies just enough pressure to the cornea to maintain the corneal flattening achieved but with no additional corneal flattening.

Neovascularization: New vessel growth in the cornea.

Orthokeratology: Contact lens fitting procedure that temporarily reduces nearsightedness after contact lenses have been removed.

Refract: Bending of light in order to make it focus.
Refractive anomalies: Eye conditions leading to blurred vision including nearsightedness, farsightedness and astigmatism.
Retainer Lenses: Another name for the Myopic Reduction Maintenance Lens.
Retina: Structure at the back of the eye that receives the light image.

Rewetting contact lenses: Placing a solution in the eye while contact lenses are worn that acts as an artificial tear to wet the lens.

Sticking lens: Lens on the cornea that does not move.

[Additions]

INTRODUCTION

The information in this booklet is to help you decide whether or not to be fitted with the TN contact lenses for orthokeratology. Orthokeratology is a contact lens fitting procedure that temporarily reduces nearsightedness (known by the medical name of myopia) after contact lenses have been removed. By temporary it is meant that the contact lenses are worn for a portion of the [day] [night] and then removed, whereupon the nearsightedness remains reduced for all or part of the remainder of the day. The exact time period over which the myopia remains reduced varies with each patient. Generally, TN contact lenses for orthokeratology should be worn for part of each day for the orthokeratology effect to continue.

HOW THE EYE FUNCTIONS

The eye is very much like a camera and must be in good focus to see objects clearly. The focusing power of the eye comes from two eye structures, the cornea and the lens [(Figure 1)]. The cornea is the clear, bubble-like structure on the front of the eye, where light first enters the eye. It provides about two thirds of the eye's focusing power, and the lens inside the eye provides the other third. In a normal eye light focuses at the retina, at the back of the eye, which acts like the film in a camera. Some eyes focus, or refract, the light too much, so that the images of distant objects are formed in front of the retina, and the image on the retina is blurred, producing myopia [(Figure 2)].

Myopia usually starts in childhood and gets progressively worse through adolescence. It normally stops increasing by the late teens, but it can sometimes continue to get worse into the mid-twenties.

HOW TN CONTACT LENSES FOR ORTHOKERATOLOGY FUNCTION

TN contact lenses for orthokeratology produce a temporary reduction of nearsightedness by changing the shape (flattening) of the cornea, which is elastic in nature. Contact lenses rest directly on the cornea, separated only by a layer of tears, and can influence the corneal shape. Regular contact lenses are designed to nearly match the shape of the cornea and thereby cause little or no flattening effect but TN contact lenses for orthokeratology are designed to purposely not match the shape of the cornea but instead apply slight pressure to the center of the cornea [(Figure 3)], in a design known as reverse geometry. Pressure is produced when the lens is less curved than the cornea, which places more of the lens weight on the center of the cornea. If the cornea is flattened this reduces the focusing power of the eye, and if the amount of corneal flattening is sufficient, it is possible to bring the eye into correct focus and compensate for myopia [(Figure 4)]. After the lens is removed, the cornea retains its altered shape for all or part of the remainder of the day.

Figure 1: Normal Eye

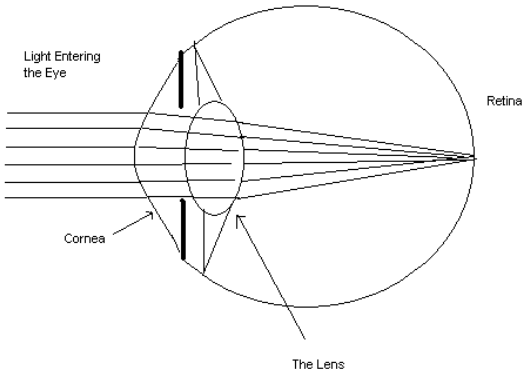


Figure 2: Nearsighted eye

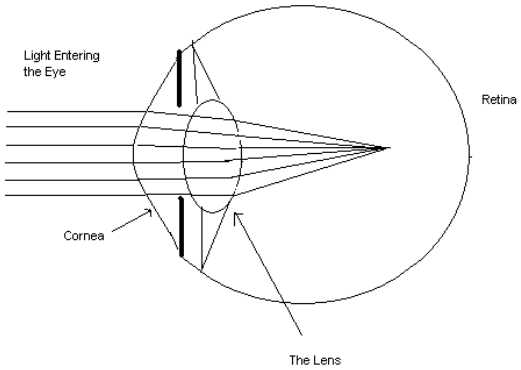


Figure 3: Eye Fitted With TN contact lenses for orthokeratology.

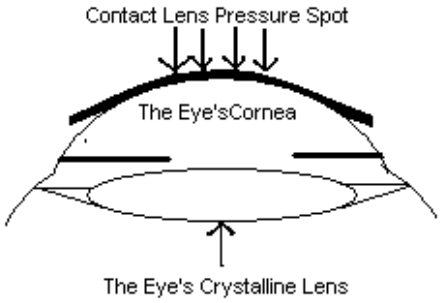
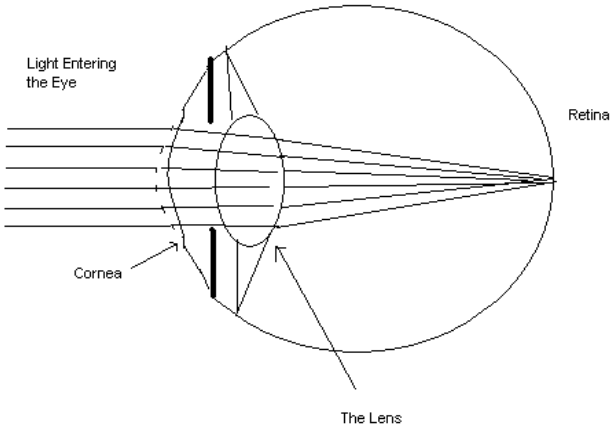


Figure 4: Nearsighted Eye After Orthokeratology



TN contact lenses for orthokeratology are indicated for patients who desire to have time periods during the day in which they do not need to wear their contact lenses, but still be able to see clearly. This might include such activities as swimming and other sports. TN contact lenses for orthokeratology may be indicated in occupations that require exposure to smoke, noxious gases or conditions of low humidity, such as might occur, for example,

for flight attendants, in which case their contact lenses can be removed without interference with vision. Some patients are content to wear their contact lenses for normal activities during part of the day and remove them for evening activities.

ALTERNATIVE WAYS TO CORRECT NEARSIGHTEDNESS

Nearsightedness (myopia) can be corrected by any method that reduces the focusing power of the eye. The most common methods of reduction are by glasses or regular contact lenses. These represent a means of correcting myopia only during the time that the glasses or regular contact lenses are worn, with no lasting effect on the myopia. Other methods of correcting myopia involve various surgical procedures. These involve techniques to reshape the cornea so that it is flattened in a way that is similar to that produced by TN contact lenses for orthokeratology, except that the surgical procedures are permanent.

CLINICAL STUDY DATA

TN contact lenses for orthokeratology may produce a temporary reduction of all or part of your myopia. The amount of reduction will depend on many factors, including the amount of your initial myopia, the elastic characteristics of your eye and the way that your contact lens fits on your eye.

[Summary example] A total of # (# patients) eyes were enrolled in a pre-marketing clinical study. Of those enrolled, # eyes (# patients) completed a minimum of [three][twelve] months of contact lens wear. Of the completed eyes a total of # eyes showed some reduction in myopic refractive error during the [3] [12]-month time period that the TN contact lenses for orthokeratology were worn. The average reduction was # diopters with a range from # to # diopters.

The average amount of myopia that can be expected to be corrected is shown in the following table. These values are only averages and some patients can be expected to achieve more or less than these averages.

AVERAGE REDUCTION IN MYOPIA (Diopters)

INITIAL Myopia	REDUCTION Myopia
-1.00	#
-2.00	#
-3.00	#
-4.00	#
Etc.	#

[Summary of data]

TN contact lenses for orthokeratology provided a temporary full reduction in some patients with up to # diopters of myopia. For patients with greater than # diopters of myopia only a partial reduction of myopia can be expected. The percentage of patients that can be expected to achieve full or partial temporary refractive reduction is shown in the following table.

PERCENT OF EYES THAT ACHIEVED FULL OR PARTIAL TEMPORARY REDUCTION OF MYOPIA

INITIAL MYOPIA	FULL TEMPORARY REDUCTION	UP TO 0.50 D. UNDER FULL REDUCTION	FINAL V.A. 20/20 or better	FINAL V.A. 20/40 or better
<1.00 D	%	%	%	%
-1.25 to - 2.00 D.	%	%	%	%
-2.25 to - 3.00 D.	%	%	%	%
-3.25 to - 4.00 D.	%	%	%	%
Etc.				

WEARING TIME

The average wearing time required for patients who wore the TN contact lenses for orthokeratology was consistently about # [hours] [days] during the entire [three] [twelve] month study. The study [did] [did not] report how long the improved vision lasted once lenses were removed. [On average improved vision lasted about # hours.]

[Summarize the lens wearing time data.]

EFFECTS ON ASTIGMATISM

Either increases or decreases in astigmatism may occur following orthokeratology. Of the # eyes (# patients) which completed the [three] [twelve] month clinical study, #% showed no change in corneal astigmatism, #% showed a decrease less than one diopter, while #% showed an increase less than one diopter and #% showed an increase greater than one diopter.

MAINTAINING EFFECTS OF TN CONTACT LENSES FOR ORTHOKERATOLOGY - MYOPIC REDUCTION MAINTENANCE LENS OR RETAINER LENS WEAR

The long-term wear of TN contact lenses for orthokeratology does not eliminate the need to continue wearing contact lenses to produce the orthokeratology effect. After the cornea has been flattened by wearing TN contact lenses for orthokeratology, new lenses are prescribed that are Myopic Reduction Maintenance Lenses or Retainer Lenses. Retainer Lenses are a modification of the patient's TN contact lens for orthokeratology design in which the central portion of the lens applies just enough pressure to the cornea to maintain the corneal flattening achieved but with no additional corneal flattening. The retainer lenses are generally worn for the same schedule as the TN contact lenses for orthokeratology and should be worn each day to maintain the orthokeratology effect.

[Studies have not been conducted to support the safety of wearing TN contact lenses for orthokeratology for overnight or extended wear.]

RISK ANALYSIS

There is a small risk involved when any contact lens is worn. It is not expected that TN contact lenses for orthokeratology will provide a risk that is greater than other rigid gas permeable contact lenses.

The two most common side effects which occur in rigid contact lens wearers are corneal edema and corneal staining. It is anticipated that these two side effects will also occur in some wearers of TN contact lenses for orthokeratology. Other side effects which sometimes occur in all contact lens wearers are pain, redness, tearing, irritation, discharge, abrasion of the eye or distortion of vision. These are usually temporary conditions if the contact lenses are removed promptly and professional care is obtained.

In rare instances, there may occur permanent corneal scarring, decreased vision, infections of the eye, corneal ulcer, iritis, or neovascularization. The occurrence of these side effects should be minimized or completely eliminated if proper schedule of care is followed. You should remove your contact lenses if any abnormal signs are present. Never wear your contact lenses while in the presence of noxious substances. Be certain to return for all follow-up visits required by your eyecare practitioner.

WEARING RESTRICTIONS AND INDICATIONS

INDICATIONS

TN contact lenses for orthokeratology are indicated for use in the reduction of myopic refractive error in non-diseased eyes. The lens is indicated for [daily wear][extended wear from X to X days between removals for cleaning and disinfection as recommended by the eye care practitioner] in an orthokeratology fitting program for the temporary

reduction of myopia of up to # diopters. The lens may be disinfected using a chemical lens care system only.

Note: To maintain the orthokeratology effect of myopia reduction, lens wear should be continued on a prescribed wearing schedule.

[Do Not Wear Your Lenses While Sleeping.]

CONTRAINDICATIONS (REASONS NOT TO USE)

DO NOT USE YOUR TN contact lenses for orthokeratology when any of the following conditions exist:

- Acute and subacute inflammations or infection of the anterior chamber of the eye.
- Any eye disease, injury, or abnormality that affects the cornea, conjunctiva or eyelids.
- Severe insufficiency of tears (dry eyes)
- Corneal hypoesthesia (reduced corneal sensitivity) if not aphakic.
- Any systemic disease which may affect the eye or be exacerbated by wearing contact lenses.
- Allergic reactions of ocular surfaces or adnexa which may be induced or exaggerated by wearing contact lenses or use of contact lens solutions.
- Allergy to any ingredient, such as mercury or Thimerosal, in a solution which is to be used to care for your TN contact lenses for orthokeratology.
- Any active corneal infection (bacterial, fungal or viral).
- If eyes become red or irritated

WARNINGS:

You should be advised of the following warnings pertaining to contact lens wear:

[Daily wear lenses are NOT indicated for overnight wear, and you should not wear lenses while sleeping. Clinical studies have shown that the risk of serious adverse reactions such as corneal infection or ulcers is increased when contact lenses are worn overnight.]

Problems with contact lenses and lens care products could result in serious injury to the eye. It is essential that you follow your eyecare practitioner's direction and all labeling instructions for proper use of lenses and lens care products, including the lens case. Eye problems, including corneal ulcers, can develop rapidly and lead to loss of vision.

Studies have shown that contact lens wearers who are smokers have a higher incidence of adverse reactions than nonsmokers.

If you experience eye discomfort, excessive tearing, vision changes, or redness of the eye you should immediately remove your lenses and promptly contact your eyecare practitioner.

7. **PATIENT INSTRUCTIONS (PART 2) AFTER YOUR TN (generic name) RIGID GAS PERMEABLE CONTACT LENSES FOR ORTHOKERATOLOGY HAVE BEEN FITTED**

CAUTION: Federal law prohibits dispensing without a prescription.

WARNING: Contains a [identify] compound which harms public health and environment by destroying ozone in the upper atmosphere.

TABLE OF CONTENTS

PRECAUTIONS:

Specific Precautions

- Clinical studies have demonstrated that contact lenses manufactured from the TN (generic name) rigid gas permeable lens materials are safe and effective for their intended use. However, the clinical studies may not have included all design configurations or lens parameters that are presently available in the materials. Consequently, when selecting an appropriate lens design and parameter the eyecare practitioner should consider all factors that effect lens performance and ocular health. The potential impact of these factors should be weighed against the patient's needs; therefore, the continuing ocular health of the patient and lens performance on the eye should be carefully monitored.

- Patients should be instructed to follow the instructions below in order to prevent damage to their eyes or lenses.

Solution Precautions

- Different solutions cannot always be used together, and not all solutions are safe for use with all lenses. Use only recommended solutions with the contact lenses.

- Do not heat the wetting/soaking solution and lenses.

- Always use fresh unexpired lens care solutions.

- Always follow directions in the package inserts of the contact lens solutions used.

- Use only a chemical lens care system. Use of a heat (thermal) lens care system can cause damage by warping TN contact lenses.

- Sterile unpreserved solutions, when used, should be discarded after the time specified in the labeling directions.

- Do not use saliva or anything other than the recommended solutions for lubricating or wetting lenses.

- Always keep the lenses completely immersed in the recommended storage solution when the lenses are not being worn (stored).

Handling Precautions

- Always wash and rinse hands before handling lenses. Do not get cosmetics, lotions, soaps, creams, deodorants, or sprays in the eyes or on the lenses. It is best to put on lenses before putting on makeup. Water-base cosmetics are less likely to damage lenses than oil-base products.

- Be certain that your fingers or hands are free of foreign material before touching your contact lenses, as microscopic scratches of the lenses may occur, causing distorted vision and /or injury to the eye.

- Carefully follow the handling, insertion, removal, cleaning, disinfecting, storing and wearing instructions in this booklet and those prescribed by your eyecare practitioner.

- Always handle your lenses carefully and avoid dropping them.

- Never use tweezers or other tools to remove your lenses from the lens container unless specifically indicated for that use. Pour your lens into your hand.

- Do not touch the lens with your fingernails.

- To minimize lens warpage during cleaning, the lenses should be cleaned in the palm of the hand rather than between the thumb and fingers.

Lens Wearing Precautions

- If the lens sticks (stops moving) on the eye, follow the recommended directions on Care for a Sticking Lens in this booklet. The lens should move freely on the eye for the continued health of the eye. If nonmovement of the lens continues, you should immediately consult your eyecare practitioner.

- Never wear your contact lenses beyond the period recommended by your eyecare practitioner.

- Avoid, if possible, all harmful or irritating vapors and fumes when wearing lenses.

- If aerosol products such as sprays are used while wearing lenses, exercise caution and keep eyes closed until the spray has settled.

Lens Case Precautions

- Contact lens cases can be a source of bacterial growth. To prevent contamination and to help avoid serious eye injury, always empty and rinse the lens case with fresh, sterile rinsing solution and allow to air dry.

- Lens cases should be replaced at regular intervals as recommended by the lens case manufacturer or eyecare practitioner.

Topics to Discuss with the Eyecare Practitioner

- Ask your eyecare practitioner about wearing your lenses during sporting activities.

- Always contact your eyecare practitioner before using any medicine in your eyes.

- As with any contact lens, follow-up visits are necessary to assure the continuing health of your eyes. You should be instructed as to a recommended follow-up schedule.

Who Should Know That the Patient is Wearing Contact Lenses

- Inform your doctor (health care practitioner) about being a contact lens wearer.

- Always inform your employer of being a contact lens wearer. Some jobs may require the use of eye protection equipment or may require that you not wear contact lenses.

ADVERSE EFFECTS:

You should be informed that the following problems may occur:

- Eyes stinging, burning, itching (irritation), or other eye pain
- Comfort is less than when lens was first placed on eye.
- Feeling of something in the eye such as a foreign body or scratched area.
- Excessive watering (tearing) of the eyes
- Unusual eye secretions
- Redness of the eyes
- Reduced sharpness of vision (poor visual acuity)
- Blurred vision, rainbows, or halos around objects
- Sensitivity to light (photophobia)
- Dry eyes

If you notice any of the above, IMMEDIATELY REMOVE YOUR LENSES.

If the discomfort or problem stops, then look closely at the lens. If the lens is in any way damaged, DO NOT put the lens back on your eye. Place the lens in the storage case and contact your eyecare practitioner. If the lens has dirt, an eyelash, or other foreign objects on it, or the problem stops and the lens appears undamaged, you should thoroughly clean, rinse and disinfect the lens; then reinsert it. If the problem continues, you should IMMEDIATELY remove the contact lenses and consult your eyecare practitioner.

When any of the above problems occur, a serious condition such as infection, corneal ulcer, neovascularization, or iritis may be present. You should be instructed to keep the lens off the eye and seek immediate professional identification of the problem and prompt treatment to avoid serious eye damage.

PERSONAL CLEANLINESS FOR LENS HANDLING:

1. Preparing the Lens for Wearing:

It is essential that you learn and use good hygienic methods in the care and handling of your new lenses. Cleanliness is the first and most important aspect of proper contact lens care. In particular, your hands should be clean and free of any foreign substance when you handle your lenses. The procedures are:

Always wash your hands thoroughly with a mild soap, rinse completely, and dry with a lint-free towel before touching your lenses.

Avoid the use of soaps containing cold cream, lotion, or oily cosmetics before handling your lenses, since these substances may come into contact with the lenses and interfere with successful wearing.

To avoid damaging your lenses, handle them with your fingertips, and be careful to avoid contact with your fingernails. It is helpful to keep your fingernails short and smooth.

Start off correctly by getting into the habit of always using proper hygienic procedures so that they become automatic.

2. Handling the Lenses:

Develop the habit of always working with the same lens first to avoid mix-ups.

Remove the lens from its storage case and examine it to be sure that it is moist, clean, clear, and free of any nicks and tears.

3. Placing the Lens on the Eye:

Work over a table, upon which is placed a clean towel.

Do not place lenses on the eye while working over a sink.

For the right eye:

Wet the forefinger of the right hand and place the contact lens on the forefinger of the right hand.

Place the second finger of the left hand on the middle of the upper lid and press upward firmly.

Place the second finger of the right hand on the lower lid and press downward firmly.

Stare into a mirror as though looking through the second finger holding the contact lens. You will later learn to do this without a mirror.

Slowly move the hand to advance the forefinger with the contact lens towards the cornea until the lens touches the cornea and release the lids.

Release the lid and close the eye for a few seconds.

Repeat for the left eye.

There are other methods of lens placement. If the above method is difficult for you, your eyecare practitioner will provide you with an alternate method.

Note: If after placement of the lens your vision is blurred, check for the following:

The lens is not centered on the eye (see "Centering the Lens", next section in this booklet).

If the lens is centered, remove the lens (see "Removing the Lens" section) and check for the following:

a. Cosmetics or oils on the lens. Clean, rinse, disinfect, and place on the eye again.

b. The lens is on the wrong eye.

If you find that your vision is still blurred after checking the above possibilities, remove both lenses and consult your eyecare practitioner.

4. Centering the Lens:

Very rarely, a lens that is on the cornea will be displaced onto the white part of the eye during lens wear. This can also occur during placement and removal of the lenses if the correct techniques are not performed properly. To center a lens follow the procedure below.

First locate the lens by pulling away the lids. After the lens is found, gently press on the lid over the lens while looking away from the direction of the lens. Next look back towards the lens.

5. Removing the Lens:

Always remove the same lens first.

a. Wash, rinse, and dry your hands thoroughly.

b. Work over a table with a clean towel. Do not remove lenses over a sink. Place the right index finger of the right hand at the outer corner of the eye. Place the left hand cupped below the eye. Open the eyes wide as if to stare. Continue to keep the eyes open and pull the lids sideways away from nose. Blink quickly and firmly.

c. Remove the other lens by following the same procedure.

d. Follow the required lens care procedures described under the heading CARING FOR YOUR LENSES (CLEANING, RINSING, DISINFECTING, ENZYMING, STORAGE AND REWETTING/LUBRICATING).

Note: If this method of removing your lens is difficult for you, your eyecare practitioner will provide you with an alternate method.

<u>CARING FOR YOUR LENSES (CLEANING, RINSING, DISINFECTING, ENZYMING, STORAGE, AND REWETTING/LUBRICATING):</u>

1. <u>Basic Instructions:</u>

For continued safe and comfortable wearing of your lenses, it is important that you clean and rinse, then disinfect your lenses after each removal using the care regimen recommended by your eyecare practitioner. Cleaning and rinsing are necessary to remove mucus, secretions, films, or deposits that may have accumulated during wearing. The ideal time to clean, rinse, and disinfect your

lenses is immediately after wearing them. Disinfecting is necessary to destroy harmful germs.

You should adhere to a recommended care regimen. Failure to follow the regimen may result in development of serious ocular complications as discussed in the WARNINGS section above.

When you first receive your lenses, practice how to put the lenses on and removing them while you are in your eyecare practitioners office. At that time you will be provided with a recommended cleaning and disinfection regimen and instructions and warnings for lens care, handling, cleaning, and disinfection. Your eyecare practitioner should instruct you about appropriate and adequate procedures and products for your use.

For safe contact lens wear, you should know and always practice your lens care routine:

- Always wash, rinse, and dry hands before handling contact lenses.

- Always use fresh unexpired lens care solutions.

Use the recommended system of lens care, which is chemical (not heat) and carefully follow instructions on solution labeling. Different solutions cannot always be used together, and not all solutions are safe for use with all lenses. **Do not alternate or mix lens care systems unless indicated on solution labeling.**

Always remove, clean, rinse, enzyme and disinfect your lenses according to the schedule prescribed by your eyecare practitioner. The use of an enzyme or any cleaning solution does not substitute for disinfection.

To avoid contamination, do not use saliva or anything other than the recommended solutions for lubricating or rewetting your lenses. Do not put lenses in your mouth.

The lens care products listed below are recommended by Applicant's name for use with your TN orthokeratology contact lenses.

<u>Chemical Lens Care System</u>

Clean
Rinse
Disinfect
Store
Lubricate/Rewet
Enzyme

* is a trade mark of company.

Note: Some solutions may have more than one function, which will be indicated on the label. Read the label on the solution bottle, and follow instructions.

a. Clean

Clean one lens first (always start with the same lens first to avoid mix-ups). Place the lens, front side down, in the palm of the hand and apply several drops of cleaning solution. Using the index finger of the other hand, apply slight pressure in a swirling motion for about X seconds. Do not clean the lens by rubbing it between the thumb and index fingers, as this may cause lens warpage.

b. Rinse

Rinse the lens thoroughly with clean tap water or saline to remove the cleaning solution, mucus, and film from the lens surface. Place that lens into the correct chamber of the lens storage case. Then repeat the procedure for the second lens.

c. Disinfect

After cleaning and rinsing the lenses disinfect them by using the system recommended by your eyecare practitioner and/or the lens manufacturer. Follow the instructions provided in the disinfection solution labeling.

d. Storage

To store lenses, disinfect and leave them in the closed case until ready to wear. If lenses are not to be used immediately following disinfection, you should consult the storage solution package insert or your eyecare practitioner for information on storage of your lenses.

Always keep your lenses completely immersed in a recommended disinfecting/conditioning solution when the lenses are not being worn. If you discontinue wearing your lenses, but plan to begin wearing them again after a few weeks, ask your eyecare practitioner for a recommendation on how to store your lenses.

Note: TN contact lenses for orthokeratology cannot be heat (thermally) disinfected.

e. Care of Your Lens Case

Contact lens cases can be a source of bacteria growth. After removing your lenses from the lens case, empty and rinse the lens storage case with solution(s) recommended by the lens case manufacturer; then allow the lens case to air dry. When the case is used again, refill it with fresh disinfecting solution. Lens cases

should be replaced at regular intervals as recommended by the lens case manufacturer or your eyecare practitioner.

f. Lubricating/Rewetting

Your eyecare practitioner will recommend a lubricating/rewetting solution for your use. Lubricating/Rewetting solutions can be used to rewet (lubricate) your lenses while you are wearing them to make them more comfortable.

2. LENS DEPOSITS AND USE OF ENZYMATIC CLEANING PROCEDURE:

Enzyme cleaning may be recommended by your eyecare practitioner. Enzyme cleaning removes protein deposits on the lens. These deposits cannot be removed with regular cleaners. Removing protein deposits is important for the well-being of your lenses and eyes. If these deposits are not removed, they can damage the lenses and cause irritation.

Enzyme cleaning does not replace routine cleaning and disinfecting. For enzyme cleaning, you should carefully follow the instructions in the enzymatic cleaning labeling.

3. CARE FOR A STICKING (NONMOVING) LENS:

If the lens sticks (stops moving) or cannot be removed, you should apply 5 drops of the recommended lubricating or rewetting solution directly to the eye and wait until the lens begins to move freely on the eye before removing it. If non-movement of the lens continues after 30 minutes, you should IMMEDIATELY consult your eyecare practitioner.

4. EMERGENCIES:

If chemicals of any kind (household products, gardening solutions, laboratory chemicals, etc.) are splashed into your eyes, you should: FLUSH EYES IMMEDIATELY WITH TAP WATER AND IMMEDIATELY CONTACT YOUR EYECARE PRACTITIONER OR VISIT A HOSPITAL EMERGENCY ROOM WITHOUT DELAY.

5. WEARING AND APPOINTMENT SCHEDULES:

Prescribed Wearing Schedule

Daily Wear

Day	Wearing Time (Hours)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

(IF APPLICABLE – Overnight Wear)

PATIENT/EYECARE PRACTITIONER INFORMATION:

Name
Address
Phone Number
Emergency Phone Number

MANUFACTURER
Name
Address
Phone

PRINTING DATE

8. **PROFESSIONAL FITTING AND INFORMATION GUIDE FOR**
TRADE NAME (generic name) RIGID GAS PERMEABLE CONTACT LENSES FOR ORTHOKERATOLOGY

CAUTION: Federal Law Prohibits Dispensing Without a Prescription.

[WARNING: Contains a [identify] compound which harms public health and environment by destroying ozone in the upper atmosphere. A notice similar to the above Warning has been placed in the patient information of this product, pursuant to EPA regulation.]

TABLE OF CONTENTS

INTRODUCTION:

Trade Name contact lenses for orthokeratology are made from a [fluoro silicone acrylate] [silicone acrylate] [etc.] polymer with a water content of # percent. The lenses are to be worn for [daily wear only.] [overnight wear from one to # days between cleaning and disinfection as recommended by the eye care practitioner.]

PRODUCT DESCRIPTION:

The TN contact lens for orthokeratology is a rigid gas permeable contact lens in a reverse geometry design. The lens material, [generic name], is a [fluoro silicone acrylate] [silicone acrylate] [etc.] polymer which contains [listed color additive] as a color additive. The TN contact lens for orthokeratology has the following dimensions:

LENS PARAMETERS AVAILABLE:

Chord Diameter
Center Thickness
for Low Minus Lens:
for Plus Lens:
Base Curve
Secondary Curves
Flatter or Steeper than Base Curve
Peripheral Curves
Flatter or Steeper than Base Curve
Powers
Aspheric Lens Eccentricity
(Oblate, Prolate or Tangent Conic)

The physical properties of the lens are:

Refractive Index
Light Transmittance
Wetting Angle
(Contact Receding Angle)
Specific Gravity
Hardness
Water Content
Oxygen Permeability and method

ACTIONS:

TN contact lenses for orthokeratology produce a temporary reduction of myopia by changing the shape (flattening) of the cornea, which is elastic in nature. Flattening the cornea reduces the focusing power of the eye, and if the amount of corneal flattening is properly controlled, it is possible to bring the eye into correct focus and compensate for myopia. Contact lenses rest directly on the corneal tear layer and can influence the corneal shape. Regular contact lenses are designed to cause little or no effect but TN contact lenses for orthokeratology are designed to purposely flatten the shape of the cornea by applying slight pressure to the center of the cornea. If the cornea is flattened this reduces the focusing power of the eye, and if the amount of corneal flattening is sufficient, it is possible to bring the eye into correct focus and compensate for myopia. After the contact lens is removed, the cornea retains its altered shape for part or all of the remainder of the day. A myopic reduction maintenance lens or retainer lens must be worn each day to maintain the corneal flattening, or the myopia will revert back to the pre-treatment level.

INDICATIONS (USES):

The TN (generic name) Rigid Gas Permeable Contact Lenses for orthokeratology are indicated for use in the reduction of myopic refractive error in non-diseased eyes. The lens is indicated for [daily wear] [extended wear from 1 to # days between removals for cleaning and disinfection as recommended by the eye care practitioner] in an orthokeratology fitting program for the temporary reduction of myopia of up to # diopters. The lenses may be disinfected using a chemical disinfection system only.

Note: To maintain the orthokeratology effect of myopia reduction lens wear must be continued on a prescribed wearing schedule.

CONTRAINDICATIONS (REASONS NOT TO USE) WARNINGS AND ADVERSE REACTIONS:

DO NOT USE TN contact lenses for orthokeratology when any of the following conditions exist:

- Acute and subacute inflammations or infection of the anterior segment of the eye.
- Any eye disease, injury, or abnormality that affects the cornea, conjunctiva or eyelids.
- Severe insufficiency of tears (dry eyes)
- Corneal hypoesthesia (reduced corneal sensitivity).
- Any systemic disease which may affect the eye or be exacerbated by wearing contact lenses.
- Allergic reactions of ocular surfaces or adnexa which may be induced or exaggerated by wearing contact lenses or use of contact lens solutions.
- Allergy to any ingredient, such as mercury or Thimerosal, in a solution which is to be used to care for contact lenses.
- Any active corneal infection (bacterial, fungal or viral).
- If eyes become red or irritated.

Caution: TN contact lenses for orthokeratology are shipped to the practitioner non-sterile. Clean and condition lenses prior to use.

PRECAUTIONS:

Clinical studies have demonstrated that contact lenses manufactured from the TN contact lens for orthokeratology materials are safe and effective for their intended use. However, due to the small number of patients enrolled in clinical investigation of lenses, all refractive powers, design configurations, or lens parameters available in the lens material were not evaluated in significant numbers. Consequently, when selecting an appropriate lens design and parameters, the eye care practitioner should consider all characteristics of the lens that can affect lens performance and ocular health, including oxygen permeability, wettability, central and peripheral thickness, and optic zone diameter.

The potential impact of these factors on the patient's ocular health should be carefully weighed against the patient's need for refractive reduction; therefore, the continuing ocular health of the patient and lens performance on the eye should be carefully monitored by the prescribing eye care practitioner.

SELECTION OF PATIENTS:

Patients are selected who have a demonstrated need and desire for a refractive reduction by orthokeratology with rigid gas permeable contact lenses and who do not have any of the contraindications for contact lenses described above. TN contact lenses for orthokeratology are indicated for myopic patients who desire to have time periods during the day, in which they do not need to wear their contact lenses, but still be able to see clearly. This might include such activities as swimming and other sports. TN contact lenses for orthokeratology may be useful in occupations that require exposure to smoke, noxious gases or conditions of low humidity, such as would be the case for flight attendants, if their lenses can be worn before exposure to the noxious substance and removed during its presence. Some patients are content to wear their contact lenses for normal activities during part of the day and remove them for evening activities.

TN contact lenses for orthokeratology are primarily intended for patients who are within the following parameters.

Refractive error:	# to # diopters
Keratometry	# to # diopters;
Visual Acuity	20/# to 20/#

FITTING PROCEDURE:

TN contact lenses for orthokeratology are designed to be fitted so as to flatten the central cornea and thereby reduce myopia. This goal is accomplished by the lens design and the manner in which the lens is fitted.

TN Lens Description

The TN contact lens for orthokeratology has a design known as reverse geometry. This means that the secondary curve on the posterior surface has a radius of curvature that is steeper (shorter radius) than the base curve (central curve). The secondary curve is surrounded by a flatter peripheral curve near the edge [(Figure 1)]. In this way the geometry of the secondary curve is in the opposite relationship to the base curve, as occurs with standard rigid gas permeable contact lenses.

The function of the steep secondary curve in the TN contact lens for orthokeratology is to allow the base curve to be fitted flat in relation to the central cornea and still maintain lens stability on the cornea. With a regular contact lens design, that is fitted flat on the cornea, there is only one support point for the contact lens, which occurs at the center of the lens. This lens will tend to rock and decenter on the cornea. With the TN contact lens for orthokeratology there is support for the lens at both the central cornea and also in the area of the secondary curve. This will tend to reduce lens rocking and aid in centering.

The most commonly used lens design for the TN contact lens for orthokeratology has a secondary curve that is [#]diopters, steeper (higher power) than the base curve. The peripheral curve is a standard flatter curve. The secondary curve relationship can be altered to achieve an optimal lens design for each patient. Normally the secondary curve is between # and # diopters steeper than the base curve. In some lenses the secondary curve is divided into two curves of nearly equal width. The inner portion of the secondary curve is equivalent to the usual radius value of the TN lens and the outer portion is flattened to provide a smooth transition to the peripheral curve, in the manner of a blend.

Predicting Lens Results

Various methods have been proposed for predicting the amount of corneal flattening that may be achieved for a given patient by orthokeratology. There is some evidence that patients with corneas of higher eccentricities are more likely to undergo greater amounts of corneal flattening than do patients with more spherical corneas. Corneal eccentricity can be measured by video keratography or by comparing central and peripheral keratometry readings. Other studies have not supported these conclusions, however, and further research is needed. It is not possible at this time to predict which patients will achieve the greatest corneal flattening with TN contact lenses for orthokeratology.

TN contact lenses for orthokeratology may produce a temporary reduction of all or part of a patient's myopia. The amount of reduction will depend on many factors including the amount of myopia, the elastic characteristics of the eye and the way that the contact lenses are fitted. Average amounts of reduction have been established by clinical studies but the reduction for an individual patient may vary significantly from the averages.

CLINICAL STUDY RESULTS:

A total of # (# patients) eyes were enrolled in the clinical study with # eyes (# patients) completing a minimum of [three] [twelve] months of contact lens wear. Of the completed eyes a total of # eyes showed some reduction in myopic refractive error during the [3][12]-month time period that the TN contact lenses for orthokeratology were worn. This included:

- # eyes (#%) had a reduction of between 0.25 and 1.00 D,
- # eyes (#%) between 1.25 and 2.00 D,
- # eyes (#%) between 2.25 and 3.00 D,
- # eyes (#%) between 3.25 and 4.00 D and,
- # eye (# %) reduced by 4.25 D

Other clinical refractive outcomes:

- # eyes had no change and # eyes increased in minus power by 0.25D.
- The reduction in myopia was [greater][less] for eyes with a higher initial refractive error.
- # eyes over -3.50D were able to achieve a full reduction in myopia.
- For # eyes with an initial myopia of greater than 3.75D the average final exam reduction in myopia was [#D].
- The limit in initial myopia that could be reduced to emmetropia in was [#D].

The average amount of myopia that can be expected to be corrected is shown in the following table. These values are only averages and some patients can be expected to achieve more or less than these averages.

AVERAGE REDUCTION IN MYOPIA (Diopters)

INITIAL Myopia	REDUCTION Myopia
-1.00	#
-2.00	#
-3.00	#
-4.00	#
Etc.	#

The average reduction was # diopters with a range from # to # diopters. The amount of myopia reduced varied between patients and could not be predicted prior to treatment. There [was] [was

not] an insignificant difference between the patients who wore contact lenses prior to the study and those with no previous contact lens experience.

TN contact lenses for orthokeratology provided a temporary full reduction in some patients with up to # diopters of myopia. For patients with greater than # diopters of myopia only a partial reduction of myopia can be expected. The percentage of patients that can be expected to achieve full or partial temporary refractive reduction is shown in the following table:

PERCENT OF EYES THAT ACHIEVED FULL OR PARTIAL TEMPORARY REDUCTION OF MYOPIA

INITIAL MYOPIA REDUCTION	FULL TEMPORARY	UP TO 0.50 D. UNDER FULL REDUCTION	FINAL V.A. 20/20 or better	FINAL V.A. 20/40 or better
<1.00 D	%	%	%	%
-1.25 to - 2.00 D.	%	%	%	%
-2.25 to - 3.00 D.	%	%	%	%
-3.25 to - 4.00 D.	%	%	%	%
Etc.	%	%	%	%

For the patients (# eyes) that completed the study, the initial visual acuity by best refraction was 20/20 or better for # eyes and 20/40 or better for # eyes. At the final visit, visual acuity with contact lenses was equal to or better than 20/20 for # eyes, 20/40 for # eyes and # eyes had a visual acuity of 20/[#]. # eyes had a one-line drop in visual acuity for contact lenses compared to best refraction, # eyes had a two-line drop and # eyes had a three-line drop.

The percentage of eyes that achieved uncorrected visual acuity of 20/20 or better and 20/40 or better in relation to the initial myopia is given in the above table. A total of # (#%) eyes achieved a visual acuity of 20/20 or better and # (# %) eyes achieved 20/40 or better.

EFFECTS ON ASTIGMATISM

Either increases or decreases in astigmatism may occur following orthokeratology. Of the # eyes (# patients) which completed the [three][twelve] month clinical study, #% showed no change in corneal astigmatism, #% showed a decrease less than one diopter, while # % showed an increase less than one diopter and #% showed an increase greater than one diopter.

The following changes were noted:

Decrease
- from 0.12 to l.00 D was observed for #eyes (#%)
- from l.12 to l.50 D for #eyes (#%)
- more than 1.50 D for # eyes (#%)

Increase
- from 0. 1 2 to 1.00 D was observed for # eyes (# %)
  from 1. 1 2 to 2.00 D for # eyes (#%)
- from 2.12 to 3.00 D for # eyes (# %)
- from 3.12 to 3.50 D for # eyes (# %)
  more than 3.50D for # eyes (#%)

WEARING TIME

The average wearing time required for patients who wore TN contact lenses for orthokeratology for various time periods was as follows:

One week	hours/days
Two weeks	hours/days
One month	hours/days
Three months	hours/days
Etc.	hours/days

There was considerable variability, however, as many patients required several [hours][days] more or less than the averages as shown for the [three][twelve]-month time period as follows:

Daily Wear

Time Worn	Percent of patients		
0 to 4 hours	#%	4.1 to 8 hours	#%
8.1 to 12 hours	#%	12.1 to 16 hours	#%

Overnight Wear

1 to 3 days
Ec.

MYOPIC REDUCTION MAINTENANCE LENS OR RETAINER LENS WEAR

Studies have shown that the long-term wear of TN contact lenses for orthokeratology does not eliminate the need to continue wearing contact lenses in order to maintain the orthokeratology effect. After the cornea has been flattened by wearing TN contact lenses for orthokeratology, the patient will need to continue wearing Myopic Reduction Maintenance Lenses or Retainer lenses for a portion of each day. A Retainer lens may be either the last TN contact lens for

orthokeratology design or a modification of this design in which the central portion of the lens applies just enough pressure to the cornea to maintain the corneal flattening achieved but with no additional corneal flattening. The last pair of lenses in the fitting program is usually used as the first Retainer Lens. If it is found that this lens has a secondary curve that is too tight for the lens to be worn on a long-term basis, a new Retainer Lens is prescribed which has the same base curve but a flatter secondary curve, usually by one or two diopters. The retainer lenses are generally worn for the same daily schedule as the TN contact lenses for orthokeratology and must be worn each day to maintain the orthokeratology effect.

One of the most common and effective schedules is to wear the retainer lens for several hours in the morning and a few hours before bedtime. Higher lens powers may require additional wearing time.

It is important to make certain that the retainer lenses center well on the cornea, as the same lens will be worn for a prolonged period. Check the patient's lenses every 3 to 4 months.

RISK ANALYSIS

There is a small risk involved when any contact lens is worn. It is not expected that the TN contact lens for orthokeratology will provide a risk that is greater than other rigid gas permeable contact lenses.

The two most common side effects that occur in rigid contact lens wearers are corneal edema and corneal staining. It is anticipated that the same side effects will also occur in some wearers of TN contact lenses for orthokeratology. Other side effects that sometimes occur in all contact lens wearers are pain, redness, tearing, irritation, discharge, abrasion of the eye or distortion of vision. These are usually temporary conditions if the contact lenses are removed promptly.

In rare instances, there may occur permanent corneal scarring, decreased vision, infections of the eye, corneal ulcer, iritis, or neovascularization. The occurrence of these side effects should be minimized or completely eliminated if proper patient control is exercised. Patients should be instructed to remove the contact lenses if any abnormal signs are present. Patients should be instructed never to wear their contact lenses while in the presence of noxious substances. Patients should be instructed in the importance and necessity of returning for all follow-up visits required by the eye care practitioner.

[Studies have not been conducted to support the safety and effectiveness of wearing TN contact lenses for orthokeratology for overnight wear.]

FITTING OF TN CONTACT LENSES:

TN contact lenses for orthokeratology may be fitted using a modification of the standard techniques for rigid gas permeable contact lenses.

1. Prefitting Examination:

    A. complete refraction and visual health examination should be performed.
    B. pre-fitting patient history and examination are necessary to:

        - determine whether a patient is a suitable candidate for TN contact lenses for orthokeratology.(consider patient hygiene and mental and physical state).
        - collect and record baseline clinical information to which post-fitting examination results can be compared.

2. Initial Lens Power Selection:

    Standard procedures for determining power of rigid gas permeable contact lenses may be used, including compensation for vertex distance.

3. Initial Lens Diameter Selection:

    Usually, lens diameters between # mm to # mm are chosen to maximize centering to the cornea and to minimize lens movement. Lens diameters outside of this range are occasionally used for some eyes. This guide is only a general recommendation and the specification for an individual patient will depend on the eye care practitioner's professional judgment.

    Determining Starting Lens Diameter:

If K is	# and flatter…….	use # mm diameter
	# to #……..	use # mm diameter
	# and steeper……..	use # mm diameter

    Lens diameter is primarily a function of the base curve but may be influenced by power (plus lenses require a larger diameter to compensate for weight) and anatomical considerations (small palpebral opening, excessively large pupil, etc.)

4. Initial Lens Base Curve Selection:

    The base curve of the first lens fitted is generally fitted about # diopters flatter than the flattest keratometric finding but may vary according to the following table, which takes into account the corneal astigmatism. This guide is only a general recommendation and the specification for an individual patient will depend on the eye care practitioner's professional judgment.

Corneal Astigmatism			
0 to .75	flatter	flatter	flatter
1.00 to 1.50	flatter	flatter	flatter
> 1.50	flatter	flatter	flatter

As shown in the above table, the base curve determination is a function of corneal cylinder and lens diameter. This guide is only a general recommendation and the specification for an individual patient will depend on the eye care practitioner's professional judgment of the lens movement and riding position as well as the fluorescein pattern analysis.

5. Initial Lens Evaluation

Movement:

Blink induced lens movement should show downward lens movement with the lid motion (average # mm.) and then upward with the lid motion (average # mm.) as with a regular RGP contact lens. During the interblink period the lens should have little or no motion (average less than one millimeter).

Positioning:

The lens should position centrally or slightly superiorally to minimize both lens movement and lid sensation. The lens should not ride more than # mm. below center nor # mm. above center.

Characteristics of a Tight (too steep) Lens:

A lens that is too tight will show reduced movement upon blinking. The lens will be centered or decentered inferiorly and exhibit little or no movement. Bubbles may be detected behind the lens.

Characteristics of a Loose (too flat) Lens:

A lens that is too loose will move excessively on the cornea following each blink. The lens may ride in either a position that is too high or too low or in an eccentric position. A loose lens is usually uncomfortable for the patient.

TRIAL LENSES:

Trial Lens Fitting

Trial lens fitting is recommended whenever possible. Trial lens fitting allows a more accurate determination of lens specifications for the lens fit and power. Choose the first lens according to the table given for base curve selection. Trial lenses are essential in fitting patients whose corneal topography has been distorted by previous contact lens wear.

Trial Lens Set

A basic trial lens set consists of [describe lenses in this set].

CAUTION: Non-sterile lenses, clean and condition lenses prior to use.

Eye care practitioners should educate contact lens technicians concerning proper care of trial lenses. Each contact lens is shipped non-sterile in a case with no solution (dry). Therefore in

order to insure disinfection, clean and condition lenses prior to use. Hands should be thoroughly washed and rinsed and dried with a lint free towel prior to handling a lens.

Prior to reusing in a diagnostic procedure or before dispensing to a patient, lenses should be surface cleaned and disinfected, following the manufacturer's instruction.

Trial Lens Procedure

Select a trial lens and place the lens upon the eye. Evaluate the lens using white light for the following:

1. Centering

   Lens should center as well or better than a regular RGP lens. The lens should be fitted according to the interpalpebral fitting philosophy. Lenses fitted according to the "lid attachment" philosophy, in which the lens purposely rides in a high position should be avoided.

2. Movement

   Lens movement should be equivalent to or slightly less than a regular RGP lens, fitted-according to the interpalpebral philosophy.

   Evaluate the fluorescein pattern. The fluorescein pattern should show a lens with definite central touch, approximately # to # mm. diameter with a surrounding area of pooling. In the periphery there should be another area of touch and near the edge a thin band of pooling [(Figure 2)].

   The area of pooling near the transition between the base curve and secondary curve serves as a reservoir for tears and as a potential space for corneal shifting during the flattening process of orthokeratology. The cornea molds by flattening the central cornea, which reduces the space near the transition reservoir. Hence, the size of the transition reservoir, as observed from the fluorescein pattern, is a good indicator not only of the initial fit of the lens but also of the progress of corneal flattening over time as the lens is worn.

   The fluorescein pattern provides the best method for monitoring the fit of the contact lens over time. As the cornea flattens, the area of pooling at the transition becomes less and less. When this occurs the lens begins to tighten and at some point barely moves on the cornea. The lack of pooling at the transition area indicates that the lens should be changed for another that has a flatter base curve.

   When the cornea has flattened enough for the desired reduction of the patient's myopia (even though the fluorescein pattern indicates that further flattening is possible) it is time to switch to a retainer lens. A retainer lens is a contact lens that is designed to maintain the current level of corneal flattening without additional flattening. It is usually made

with the same reverse geometry design as the last lens used for corneal flattening but with less steepness for the secondary curve.

Limits of Flattening

In some cases the corneal flattening stops before a full reduction of the refractive error has been accomplished. Additional flattening may be possible by using a lens with a steeper secondary curve (# or # diopters steeper than the base curve). If no further corneal flattening occurs, it is an indication that the patient should be fitted with a retainer lens.

FOLLOW UP CARE:

a. Follow-up examinations, as recommended by the eye care practitioner, are necessary to ensure continued successful contact lens wear. Follow-up examinations should include an evaluation of lens movement, centration, comfort and fluorescein pattern. Lens movement will decrease as tear volume is diminishing during adaptation. The patient should also begin to feel more comfortable. An assessment of vision and eye health, including inspection of the cornea for edema and/or staining should be performed.

b. Prior to a follow-up examination, the contact lenses should be worn for at least 4 continuous hours and the patient should be asked to identify any problems which occur that are related to contact lens wear.

c. With lenses in place on the eyes, evaluate fitting performance to assure that the criteria of a well-fitted lens continue to be satisfied. The fluorescein pattern provides a guide to lens adaptation. If the cornea flattens rapidly there will be a larger area of central touch and the pooling at the lens transition will be reduced. The lens will usually show reduced movement. These are indications that the lens can be exchanged for another of flatter base curve. Usually, a lens with a # diopters flatter base curve should be the next choice, with variations from this up to the judgment of the eye care practitioner.

   A lens with excessive movement should be replaced with another that is #mm larger in diameter.

   If the cornea shows no flattening the lens should be replaced with another that is # diopters flatter with a secondary curve that is # diopters steeper.

d. After the lens removal, conduct a thorough biomicroscopy examination to detect the following:

   1. The presence of vertical corneal striae in the posterior central cornea and/or corneal neovascularization is indicative of excessive corneal edema.

   2. The presence of corneal staining and/or limbal-conjunctival hyperemia can be indicative of a reaction to solution preservatives, excessive lens wear, and/or a poorly fitted lens.

Solutions to various lens wearing problems are given in the following table

Ortho-K Problem Solving *[In this section use the terminology appropriate for your lenses*]

Fitting too flat may de-center the lens, cause vision problems and increase corneal astigmatism. The most important points to remember are:

1. CENTERING
2. 1-2 mm MOVEMENT
3. MODERATE APICAL TOUCH
4. PATIENT COMFORT

Problem	*Possible Cause*	*Solution*
tight lens or no movement	BC too steep diameter to large	flatten BC reduce diameter
Loose lens	BC too flat diameter too small	steepen BC increase diameter
High-riding lens	BC too flat diameter too small high myopia high amount of corneal astigmatism	steepen BC increase diameter use X
Low-riding lens		use trial lenses to determine better centration
Flare, Glare or Ghosts	BC too flat poor centration too small	steepen BC increase size use larger
Instability of Ortho-k changes	quick, large corneal changes induces quicker & larger regression rigidity of the cornea	smaller BC changes good centration at all times longer retainer wear increase c6nter thickness
Fogging and scratchy lens	dirty lens improper care & handling of lenses improper blinking oily eye make-up removers	see "Lens Care'

increase in corneal astigmatism	lens de-centered spherical lens being used? starting corneal cyl ># D	improve centration use OK design lenses smaller BC changes
Poor VA with lenses	de-centered lens; displacement of corneal & visual axis	improve centration check over-refraction
Poor VA w/out lenses	displacement of corneal & visual axis irregular corneal astigmatism	steepen BC increase diameter; improve centration

RECOMMENDED INITIAL WEARING SCHEDULE:

Although many practitioners have developed their own initial wearing schedules, the following sequence is recommended as a guideline. Patients should be cautioned to limit the wearing schedule recommended by the eye care practitioner regardless of how comfortable the lenses feel.

The following schedule depends upon the professional judgment of the eye care practitioner and should be modified according to the response to the initial lenses.

Daily Wear

Day	Maximum wearing time Wearing Time (Hours)
1	3
2	6
3	7
4	8
5	9
6	10
7	15
8 and after	All hours awake10

Overnight Wear

Myopic Reduction Maintenance Lens (Retainer Lens) Schedule

The retainer lens schedule must be customized for each patient. The retainer lens wearing time begins with the same wearing time required for the last fitted TN contact lenses for orthokeratology. There is considerable variability, however, as many patients require several hours more or less than the averages.

After a period of several days, or when the eye care practitioner is satisfied that the patient has adapted to the first retainer lenses, the retainer lens wearing time can be reduced daily by intervals of one hour. This may continue for as long as the patient can see clearly for the remainder of the day following lens removal. When it is found that the patient experiences a visual decrement following lens removal, the previous wearing time is then followed on a constant basis.

HANDLING OF LENSES:

Standard procedures for rigid gas permeable lenses may be used.

Caution: TN contact lenses for orthokeratology are shipped to the practitioner non-sterile. Clean and condition lenses prior to use.

PATIENT LENS CARE DIRECTIONS:

Please see package insert and patient information booklet.

VERTEX DISTANCE AND KERATOMETRY CONVERSION CHARTS:

Standard charts may be used.

REPORTING OF ADVERSE REACTIONS:

All serious adverse experiences and adverse reactions observed in patients wearing or experienced with the lenses should be reported to:

Applicant's Name and Address
Telephone Number

HOW SUPPLIED:

Each lens is supplied non-sterile in an individual flat pack case containing one or two lenses. The container is marked with the base curve, distance power, diameter, center thickness, [color] and lot number.

Printed (Month/Year)

(package insert attached here)

End of Guidance