I see for the future the coupling of wavefront sensors with corneal topography devices for the...
**Optical Path Difference Scanning System**

**OPD-Scan II ARK-10000**

- **Accurate and Reliable Data for Optic Diagnostics**

The NIDEK OPD-Scan II provides information on corneal topography, wavefront, autorefraction, keratometry and pupilplometry in one unit, utilizing state-of-the-art imaging and analysis technology developed specifically to measure normal to highly aberrated eyes. The system offers a variety of data maps to provide information on the total retinal image distortion, internal images, internal aberrations and visual quality of the eye, allowing highly accurate and reliable information for optic diagnostics.

**Various Data Maps**

- **OPD Map**
  The OPD (Optical Path Difference) map plots the refractive error distribution of total wavefront aberrations, lower and higher order in Diopters. This map enables the clinician to easily determine the refractive data and visual quality of the eye with one quick look. This map is unique to the NIDEK OPD-Scan II.

- **Wavefront High Order Aberration Map**
  This map shows specific high order aberration components only, extracted from the total wavefront map. Fluctuated in Diopters, this map illustrates the location and degree of high-order aberrations in the eye.

- **Zernike Graph**
  The graph plots all aberration components that make up the aberration profile of the eye, and shows the magnitude of each component such as spherical aberration, coma and trefoil. The graph is used to determine which aberrations dominate the aberrations structure of the eye and to what degree. This information may be used to correct for visual symptoms.

- **Axial Map**
  This is a corneal topography map showing the general surface shape of the cornea. With this map, clinicians can easily recognize such conditions as keratoconus and irregular astigmatism.

- **Eye Image**
  This is the actual image of the eye when the measurement is taken. By looking at the actual eye, conditions such as anisometria, keratoconus and high order aberrations can be recognized. Also displays photographic images in addition to Placido Ring images.

**Corneal Navigator (optional)**

Corneal Navigator function can be integrated into the OPD-Scan II.

- Utilizing various corneal parameters from topography, the Corneal Navigator automatically determines corneal features and shows by percentage the possibility of having a condition of normal (NRM), astigmatic (AST), keratoconus suspects (KCS), keratoconus (KC), pellucid marginal degeneration (PMD), myopic refractive surgery (MRS), hyperopic refractive surgery (HRS), and penetrating keratoplasty (PK). Instant analysis by the Corneal Navigator helps improve the quality of examination / diagnosis.

  *The Corneal Navigator is developed in collaboration with Stephen D. Klyce, PhD & Michael K. Smolek, PhD.

**Optional Software**

- **OPD-Station**
  The NIDEK OPD-Station software makes a variety of corneal / refractive analysis possible using advanced, unique and intelligent functions including the Holladay Summary and Corneal Navigator (optional). The OPD-Station provides various maps such as OPD HO Map, PSF, MTF, MTF Graph and Visual Acuity Chart in addition to the OPD-Scan II. It also shows such wavefront maps as the PSF and MTF and clinicians can select the target (OPD, Cornea, Internal) and also the type (Total, HO, Group) according to their needs.

  - **Holladay Summary**
    The "Holladay Summary" shows the patient where the aberrations are located and how they affect the quality of vision using the Wavefront, MTF, PSF and VA-chart simulations.

    *Developed in cooperation with Jack T. Holladay, MD.

  - **PSF Simulation**
    Calculates the Point Spread Function (PSF) based on the OPD data, and displays in simulation the distribution of the point spread. The Strehl Ratio serving as a metric of the visual quality of the eye is also displayed.

  - **Retinal Image Simulation**
    Calculates the distortion of incoming light based on the results of PSF analysis, and displays the simulated retinal image of the projected chart. This simulation can be used to explain the quality of vision to patients for informed consent.

  - **OPD HO Map**
    Displays in simulation the high order aberrations and shows the refractive errors which cannot be corrected with glasses.

  - **Averaging Multiple Exams**
    The OPD-Station creates an exam average from multiple exams. Noise components such as tear film and fixation disparity are excluded, providing more stable and reliable data.
The OPD-Scan II provides information on corneal topography, wavefront, aberration, keratometry and pupilometry in one unit, utilizing state-of-the-art imaging and analysis technology developed specifically to measure normal to highly aberrated eyes. The system offers a variety of data maps to provide information on the total refractive error, wavefront, corneal shape, internal aberrations and visual quality of the eye, allowing highly accurate and reliable information for optic diagnostics.

**Accurate and Reliable Data for Optic Diagnostics**

### OPD-Scan II ARK-10000

#### Total Wavefront Map

The OPD-Scan II measures corneal refractive power by corneal topography, and total refractive error as the OPD map. The Internal OPD Map plot is created by subtracting the corneal refractive power from the Total OPD to display the distribution of refractive error contained in the internal eye.

### Zernike Graph

The graph plots all aberration components that make up the aberration profile of the eye, and shows the magnitude of each component such as spherical aberration, coma and toroidal. The graph is used to determine which aberration(s) dominate the aberration structure of the eye and what degree. This information may be critical to visual symptoms.

### Internal OPD Map

The map shows the internal aberrations of the eye. It can be used to distinguish the effects of internal aberrations versus corneal or surface aberrations. For normal corneas, the map indicates the presence of internal astigmatism (especially, lenticular astigmatism), and shows the direct refractive effect of an IOL (such as tilt and haptic tilting). This map is also unique to the NIDEK OPD-Scan II.

### Axial Map

This is a corneal topography map showing the general surface shape of the cornea. With this map, clinicians can easily recognize such conditions as keratocornea and irregular astigmatism.

### Eye Image

This is the actual image of the eye when the measurement is taken. By looking at the actual eye, conditions such as the optical center specification can be identified. Also, displays photopic and mesopic images in addition to Placido Ring image.

### Various Data Maps

#### OPD Map

The OPD (Optical Path Difference) map plots the refractive error distribution of total wavefront aberrations, lower and higher order in Diopters. This map allows the clinician to easily determine the refractive data and visual quality of the eye with one quick look. This map is unique to the NIDEK OPD-Scan II.

#### Wavefront High Order Aberration Map

This map shows specific high-order aberrations components only, extracted from the total wavefront map. Plotted in Diopters, this map illustrates the location and degree of high-order aberrations in the eye.

### PSF Simulation

Calculates the Point Spread Function (PSF) based on the OPD data, and displays in simulation the distribution of the point spread. The Strehl Ratio serving as a metric of the visual quality of the eye is also displayed.

#### Retinal Image Simulation

Calculates the distorted retinal image based on the results of PSF analysis, and displays simulated retinal image of the projected chart. This simulation can be used in experiments to patients for informed consent.

#### OPD HO Map

Displays in high order aberrations and shows the refractive errors which cannot be corrected with glasses.

#### Averaging Multiple Exams

The OPD-Station creates an exam average from multiple exams. Noise components such as tear film and fixation disparity are excluded, providing more stable and reliable data.
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OPD-Scan II ARK-10000

Accurate and Reliable Data for Optic Diagnostics

The NIDEK OPD-Scan II provides information on corneal topography, wavefront, autorefration, keratometry and pupilometry. In one unit, utilizing state-of-the-art imaging and analysis technology, it develops specifically to measure normal to highly aberrated eyes. The system offers a variety of data maps to provide information on the total refractive error, wavefront, corneal shape, internal aberrations and visual quality of the eye, allowing highly accurate and reliable information for optic diagnostics.

Various Data Maps

- **OPD Map**
  - The OPD (Optical Path Difference) map plots the refractive error distribution of total wavefront aberrations, lower and higher order, in diopters. This map shows the capabilities easily determine the refractive status and visual quality of the eye with one quick look. This map is unique to the NIDEK OPD-Scan II.

- **Waveshape High Order Aberration Map**
  - This map shows specific high-order aberration components only, extracted from the total wavefront map. Fluctuated in microns, this map illustrates the location and degree of high-order aberrations in the eye.

- **Zernike Graph**
  - The graph plots all aberration components that make up the aberration profile of the eye, and shows the magnitude of each component such as spherical aberration, coma and trefoil. The graph is used to determine which aberration(s) dominate the aberration structure of the eye and to what degree. This information may be connected to visual symptoms.

- **Internal OPD Map**
  - This map shows the internal aberrations of the eye. It can be used to distinguish the effects of internal aberrations versus corneal or surface aberrations. For normal corneas, the map indicates the presence of internal astigmatism (especially, lenticular astigmatism), and shows the direct refractive effect of an IOL (such as tilt and haptic torque).

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- **Eye Image**
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Corneal Navigator (optional)

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Optional Software

- **OPD-Station Corneal / Refractive Analysis Software**
  - The NIDEK OPD-Station software makes a variety of corneal / refractive analysis possible using advanced, unique and intelligent functions including the Holladay Summary and Corneal Navigator (optional).
  - The OPD-Station provides unique maps such as the OPD-HO Map, PSF, MTF, MTF Graph and Visual Acuity Chart in addition to the OPD-II II. It also provides unique maps such as the PSF and MTF, clinicians can select the target (OPD, Cornea, Internal) and also the type (Total, HO, Group) according to their needs.
  - Developed in cooperation with Jack T. Holladay, MD.

- **Holladay Summary**
  - The "Holladay Summary" shows the patient where the aberrations are located and how they affect the quality of vision using the Wavefront, MTF, PSF and VA-chart simulations.

- **PSF Simulation**
  - Calculates the Point Spread Function (PSF) based on the OPD data, and displays in simulation the distribution of the point spread. The Strehl Ratio serving as a metric of the visual quality of the eye is also displayed.

- **Retinal Image Simulation**
  - Calculates the distribution of incoming light based on the results of PSF analysis, and displays the simulated retinal image of the projected chart. This simulation can be used in explanations to patients for informed consent.

- **OPD-HO Map**
  - Displays in simulation the high order aberrations and shows the refractive errors which cannot be corrected with glasses.

Averaging Multiple Exams

The OPD-Station creates an exam data average from multiple exams. Noise components such as tear film and fixation disparity are excluded, providing more stable and reliable data.
Features

- Measurement Selection for Improved Reliability
  The OPD-Scan II offers increased reliability of examination by automatically selecting the best measurement from multiple measurements, allowing a more reliable clinical decision.

- Fast Processing Speed
  The OPD-Scan II offers fast processing speed, minimizing stress in daily clinical use.

- Improved Accessibility to a Patient Eye
  With the improved forehead rest, it is easier to reach and keep the patient's eyelids open.

- Wide Measurement Range
  Has the ability to measure high power Cylinder providing accuracy in direct measurement measurement.
  
- Easy Data Maintenance with a Detachable HDD
  Patient data is saved to a detachable HDD, allowing quick and easy data transfer.

- Network Capabilities
  Data from the OPD-Scan II may also be analyzed at a remote location using the OPD-Station.

Jack T. Holladay, M.D., M.S.E.E., F.A.C.S.

"The OPD-SCAN II ARK-10000 is the only instrument that couples Wavefront, Topography and Refraction into one unit. This allows the isolation of any optical problem to cornea or crystalline lens making it easy to decide if lensectomy or corneal surgery is the procedure of choice. It also provides the best data for customized Corneal Refractive Surgery."
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- **Wide Measurement Range**
  Has the ability to measure high power cylinder providing accuracy in irregular aberration measurements.

- **Easy Data Maintenance with a Detachable HDD**
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  Provides the best data for customized corneal surgery.

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