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Comparative Clinical Study of Optimized WaveFront refraction to Subjective Refraction using the Huvitz HRK 7000AW Aberrometer

Objective:

The study was designed to compare the patients' visual acuity obtained from a standard subjective refraction with the visual acuity obtained from an objective refraction. The objective refraction was completed by taking a wavefront acquisition using the HRK 7000AW aberrometer and calculating the best sphero-cylindrical refraction using WaveForm's OWR (Optimized Wavefront refraction) software algorithm.

It is believed that a significant reduction in the subjectivity of the refraction process can be achieved using Zernike data to calculate the patients' prescription. Most patients do not enjoy answering "which is better 1 or 2", and can in fact become frustrated and confused trying to get the answer right. The reduction of this process saves the doctor time and improves the patient experience during the eye exam process. As a result the time needed to refract most patients is several minutes rather than 10 to 15 minutes resulting in 50 to 70% savings in time. For the majority of patients a simple spherical over refraction is required to make sure that accommodation has been accounted for properly in the final prescription.

Study Design:

100 patients were examined by an eyecare practitioner using a standard subjective refraction. Once completed each patient was given a prescription and were brought over to the WaveForm clinic for an objective refraction. Each patient was measured with the HRK 7000AW aberrometer and the resultant Zernike data was processed through WaveForm's software algorithm. This process took approximately 2 minutes to complete. Once the OWR was calculated, the new optimized prescription was loaded into a digital refractor and the patient's visual acuity was measured in each eye. No spherical over refraction was performed to further optimize the OWR prescription. Once the OWR visual acuity for each eye was measured and recorded, the eye doctor's subjective refraction was then loaded into the refractor and visual acuities were also measured.

The equipment in the lane used to measure visual acuity included a digital refractor and a digital chart on a flat panel display.

All data was recorded for comparative analysis. Each patients subjective and OWR visual acuity was compared using the following scale:

1. If the patient read within + or – two letters on the Snellen Chart for both the OWR and the subjective refraction, then this was considered be “ equal to”
2. If the patient read 3 or more letters better with the OWR compared to the subjective the OWR was considered to be “better than”
3. If the patient read 3 or more letters worse with the OWR compared to the subjective than the OWR was considered to be ‘worse than”

Study Results:

Of the 98 eyes completed in the study (a four-year old could not be measured with the aberrometer due to lack of attention) the results were as follows:

- 61.2% or 60 eyes achieved visual acuity using the OWR process that was equal to the subjective refraction
- 25.5% or 25 eyes achieved visual acuity that was better than the subjective refraction
- 13.3% or 13 eyes achieved visual acuity that was worse than the subjective refraction

Given the OWR process did not include any spherical over refraction, asked no subjective questions and was completed within 2 minutes compared to the 15 minute subjective examination process, 86.7% of the exams using this process were equal to or better than the standard subjective refraction. In addition patient’s expressed much greater satisfaction with the OWR process .in fact 100% of patients enjoy having an eye exam using the OWR process.

Of the 13 patients that achieved worse results, they included young children and teenagers where accommodation was not accounted for properly without further refinement of the sphere. Had we refined the sphere these patients would have achieved equal to results when compared to the subjective refraction. One patient had a high degree of against the rule astigmatism, and the distorted corneas did not allow for an accurate aberrometry acquisition. There were several patients that achieved 20/20 or better with the OWR, but achieved 20/15 and even 20/10 with the subjective.

When comparing the auto refraction generated by the HRK 7000AW to the OWR the results were as follows:

- 58.2% or 57 eyes achieved visual acuity using the OWR process that was equal to the AR generated by HRK
- 40.8% or 40 eyes achieved visual acuity using the OWR process that was better than the AR generated by the HRK
- 1% or 1 eye achieved visual acuity using the OWR process that was worse than the AR generated by the HRK

This demonstrates that the OWR process when combined with the HRK 7000 aberrometer provides a significantly improved prescription and therefore provides the eyecare practitioner confidence to use the combined Huvitz/WaveForm technologies to improve patient experience in their practice, save time and improve practice efficiency.

Conclusion:

The OWR process is simple, accurate and effective. For most patients when combined with a quick refinement of the sphere to account for accommodation in younger patients, this objective OWR process will be effective with over 90% of patients. This means significant time savings and improved efficiencies for the practice, reduced frustration for the patient and the doctor resulting in happier, more satisfied patients and the potential to increase practice profitability.