


Original Research Article

# Comparing the effect of conventional method of retinoscopic refraction with computerized automated refraction in various refractive error patients

Deepikadevi SN<sup>1</sup>, Sundararajan D<sup>2\*</sup>, Namitha Bhuvaneshwari K<sup>3</sup>, Murali Krishnan<sup>4</sup>

<sup>1</sup>Post Graduate, <sup>2</sup>Associate Professor, <sup>3</sup>Professor and Head, <sup>4</sup>Senior Resident  
Department of Ophthalmology, Meenakshi Medical College and Research Institute, MAHER  
University, Kanchipuram, Tamil Nadu, India

\*Corresponding author email: [dr.dd26@gmail.com](mailto:dr.dd26@gmail.com)

	International Archives of Integrated Medicine, Vol. 4, Issue 10, October, 2017. Copy right © 2017, IAIM, All Rights Reserved. Available online at <a href="http://iaimjournal.com/">http://iaimjournal.com/</a>	
	ISSN: 2394-0026 (P)	ISSN: 2394-0034 (O)
	Received on: 26-09-2017	Accepted on: 09-10-2017
	Source of support: Nil	Conflict of interest: None declared.
<b>How to cite this article:</b> Deepikadevi SN, Sundararajan D, Namitha Bhuvaneshwari K, Murali Krishnan. Comparing the effect of conventional method of retinoscopic refraction with computerized automated refraction in various refractive error patients. IAIM, 2017; 4(10): 105-110.		

## Abstract

**Introduction:** Refractive error is the most common visual impairment seen worldwide. This is one of the main cause for which patients come to ophthalmologist. This can occur at any age of the patient. Automated refractometer has become popularised method for doing refraction because of the busy practise of ophthalmologist and due to heavy patients load in screening camps. It is an easy method to learn, to operate and also time saving procedure. Patients are also very comfortable with it because of this easy procedure done in short time. But Streak retinoscopy which is considered as a Gold standard technique for refraction, has some difficulties like time consuming, dilatation of pupil and discomfort to the patient.

**Aim:** Comparing the effect of the conventional method of refraction with computerized automated refraction in various refractive error patients.

**Materials and methods:** It was an observational, cross-sectional study done in a 50 refractive error patients who attend Department of Ophthalmology OPD.

**Results:** According to the statistical analysis done to compare the refraction values of the auto refractometer and streak retinoscopy with the patient's acceptance value, results came as streak

retinoscopy values had no significant difference with the patient's acceptance value. This study also shows males were more affected by refractive errors than females and the mean age of affection in myopia was 19- 20 years and hypermetropia is 33-36 years.

**Conclusion:** Since retinal retinoscopy values are accepted well by the patients, it is the better method for refraction than auto refractometer.

## Key words

---

Auto refractometer, Streak retinoscopy, Patient acceptance, Subjective Refraction.

## Introduction

In recent years, Computerised Automatic Refractometer has become an important need because of the busy clinical schedule of ophthalmologists and also because of the increasing faith of patients in sophisticated mechanical devices. These instruments are easy to operate, are quicker than other techniques of objective refraction such as retinoscopy, and are better appreciated by the patients [1]. The present study was done to compare the results of Streak Retinoscopy, Computerised Autorefractometer testing and Subjective refraction testing in myopic and hypermetropic patients. Refractive errors or anomalies are the world wide cause of blindness and impaired vision, and it was estimated about 2.3 billion people. In that approximately 500 million people are affected in developing countries [2]. Yet in India, refractive errors are the second major cause of blindness, the second cause of low vision and the most common reason for the patients to consult ophthalmologists [3].

## Materials and methods

It was an observational, cross-section study, 50 patients were included in the study in a time period of March 2016 to July 2016, among the patients attending the ophthalmology outpatient department in Meenakshi Medical College Hospital and Research Institute.

**Inclusion criteria:** Patients age from 10 years to 40 years.

**Exclusion criteria:**

- Any pathology in eye other than arefractive error.

- Patients with anterior or posterior segment pathology.
- Patients with media opacities
- Patients less than 10 years of age.
- If improvement to 6/6 vision is not seen in pinhole with Snellen chart.

## Method

The study population of 50 people with 100 eyes was included in this study and about 21 females (42 eyes) and 29 males (58 eyes) were included in this study. Age ranges from 10 years to 50 years were included. The first author performed all the measurements using the same equipment and method as described below in all the examinations. The selected patients underwent visual acuity testing with Snellen chart at 20 feet or 6 meters distance and also with pinhole, the visual acuity was recorded. Then, the patients underwent Computerised automated refractometer CANON AR R-F refraction. The patients under the age of 16 years were dilated with cyclopentolate eye drops and Heinestreak retinoscopy refraction for each eye was done and the readings were recorded. Post mydriatic test dry refraction was done after the action of the midriatic has ceased and the readings were recorded. Patients above the age of 17 years were dilated with tropicamide eye drops and with Heinestreak retinoscopy refraction for each eye was done, after the drug reaction has been ceased dry refraction was done and the readings were recorded. Then, subjective refraction was done and patients acceptance values were recorded.

## Statistical analysis

Statistical analysis was done using Bonferroni's Multiple Comparison Test and Cross tabulation using SPSS software.

## Results

According Bonferroni's Multiple Comparison Test, comparing the spherical lens values, cylindrical lens values and its axis of the Computerised automated refractometer, Heine streak retinoscopy and the patient's acceptance value was done. The result came non-significant for both spherical and cylindrical values with that of patient's acceptance values, which means that

there is no significant difference between the comparing values. But, Heine streak retinoscopy refraction values were non-significant to the patient's acceptance value which proves that the Gold standard technique for refraction is streak retinoscopy refraction and its value has no significant difference when compared to patients' acceptance value. So, from the above results, Heine streak retinoscopy method is the better method than Computerised automated refractometer CANON AR R-F refraction (**Table - 1 to 3**).

**Table - 1:** Comparison between the automated refractometer spherical values, streak retinoscopy spherical values and the patient's acceptance value.

Bonferroni's Multiple Comparison Test	Mean Diff.	t	Significant? P < 0.05?	Summary	95% CI of diff
ARD SPH vs CRD SPH	-0.0300	0.1188	No	ns	-0.6382 to 0.5782
ARD SPH vs ACC SPH	-0.0500	0.1979	No	ns	-0.6582 to 0.5582
CRD SPH vs ACC SPH	-0.0200	0.07918	No	ns	-0.6282 to 0.5882

**Table - 2:** Comparison between the automated refractometer cylindrical values, streak retinoscopy cylindrical values and the patient's acceptance value.

Bonferroni's Multiple Comparison Test	Mean Diff.	t	Significant? P < 0.05?	Summary	95% CI of diff
ARD CY vs CRD CY	-0.0625	0.6461	No	ns	-0.2954 to 0.1704
ARD CY vs ACC CY	-0.005000	0.05169	No	ns	-0.2379 to 0.2279
CRD CY vs ACC CY	0.0575	0.5945	No	ns	-0.1754 to 0.2904

**Table - 3:** Comparison between the automated refractometer cylindrical axis value, streak retinoscopy cylindrical axis value and the patient's acceptance value.

Bonferroni's Multiple Comparison Test	Mean Diff.	t	Significant? P < 0.05?	Summary	95% CI of diff
ARD AX vs CRD AX	-44.36	5.087	Yes	***	-65.36 to -23.36
ARD AX vs ACC AX	-34.51	3.957	Yes	***	-55.51 to -13.51
CRD AX vs ACC AX	9.850	1.130	No	ns	-11.15 to 30.85

According to the cross tabulation done in this study shows males were more affected by both myopia and hypermetropia refractive errors than that of females (**Graph - 1**).

According to the above cross tabulation, myopic patients were more affected by the age group around 19- 20 years and hypermetropic patients

were more affected at the age group of 33 to 36 years (**Graph - 2**).

## Discussion

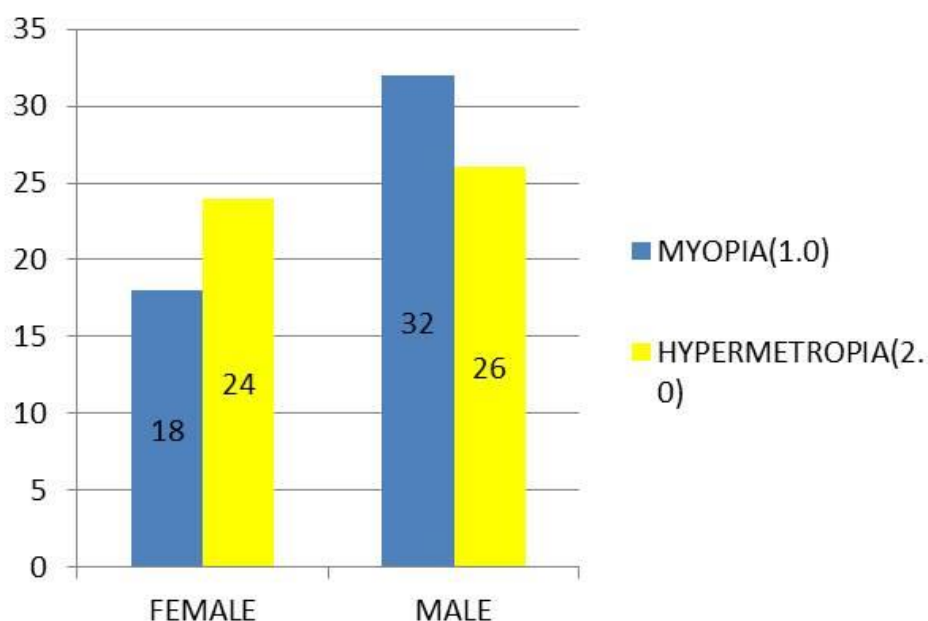
In Computerised automated refractometer CANON AR R-F, infrared rays are directed at the patient's fundus and the reflected light is

detected by the instrument. An in-built microcomputer deduces the objective refraction in terms of sphere, cylinder and axis and then automatically displays this information, corrected for a set of vertex distance. Then, the system displays three readings for each eye and the final average of all the three recordings were calculated and readings were recorded. Then, the hard copy of the readings was printed. A print out of the readings can be obtained which includes – three refractive readings for each eye, a standard ‘selected value’, ‘spherical equivalent value’ and confidence index values. The confidence index values indicate the reliability of the measured value or an error in the measurement. The cause of error reading could be due to improper alignment, blinking, eye movement, drooping of eyelashes, small pupils, opacities of the media or extreme distortion of the cornea. Additional data which can be printed along with above data include:

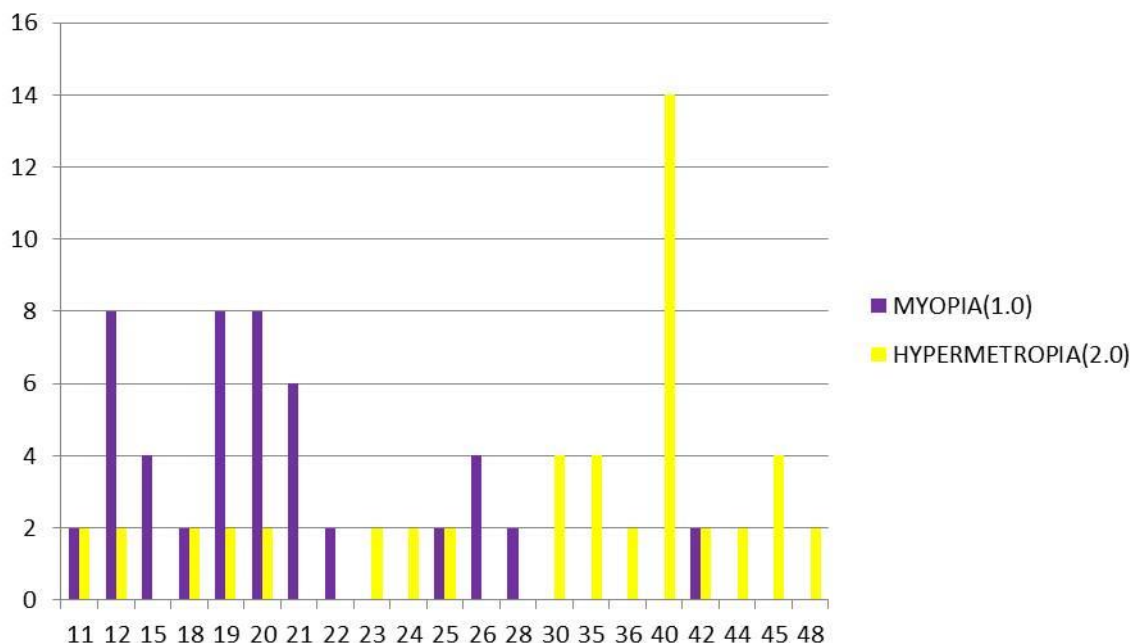
Vertex distance - VD, Interpupillary distance - PD, CL value - conversion for contact lens value. An eye print - tells graphically the patient’s refractive status based on the ‘Selected value’. This study proves that manual streak retinoscopic method holds good and the values are near to the

patient’s acceptance value when compared to the automated refractometer. Studies similar to it was done and proved similar results. T Rotsos, et al., proved that manual streak retinoscopy method is still the most accurate technique to estimate refractive errors in children<sup>4</sup>. They say retinoscopy as Gold standard because the pupil is dilated here to rule out accommodation effect in children. Pokupec R, et al. [5], Choong YF, et al. [10], showed that automated refractometer is helpful in the narrow pupil to find out the refractive errors but it is not accurate. Automated refractometer on dilated pupil or streak retinoscopic is accurate to find out the refractive errors. Uras R, et al. [6] did a study to compare an auto refractometer and retinoscopy with subjective Refraction in 192 right eyes of 192 healthy young adults. The auto refractometer gives more negative values and more positive values than the subjective ones. So, they found that streak retinoscopic is better than auto refractometer. Bullimore MA, et al. [7], did a study in comparing three types of the auto refractometer and the subject value, all auto refractometer shows minus over correction in the undilated pupil.

**Graph – 1:** Sex vs refractive type cross tabulation.



**Graph - 2:** Age vs refraction type Cross tabulation.



Tongue AC, et al. [8], found that undilated auto refractometer values are over corrected in myopia and undercorrected in hypermetropia. Verboven L, et al. [9] found that Nidek ARK-900 the third generation of objective refractors is superior to retinoscopy inaccuracy in children.

### Conclusion

As a conclusion, though auto refractometer is a useful machine in screening a large number of cases and in busy Ophthalmic clinics, it cannot replace the accuracy and the art of clinical refraction testing using Streak retinoscopy. Auto refractometer used in the undilated pupil of young patients should be used with a great caution because of the accommodation effect, which can influence the result of the auto refractometer but this is not seen in Streak retinoscopy. Therefore, even after so much improvement in technology Streak retinoscopy is a better method to evaluate refractive errors.

### References

1. Wood MG, Mazow ML, Prager TC. Accuracy of the Nidek ARK- 900 objective refractor in comparison with retinoscopy in children ages 3 to 18

years. Am J Ophthalmol., 1998; 126: 100–8.

2. Holden BA, Sulaiman S, Knox K. The challenge of providing spectacles In the developing world. Community Eye Health, 2000; 13: 33; 9-10.
3. Limburg H, Vaidyanathan K, Dalal HP. Cost effective screening of school children for refractive errors. World Health Forum, 1995; 16: 173-178.
4. T Rotsos, et al. A comparison of manifest refractions, cycloplegic refraction and retinoscopy on the RMA-3000 autorefractometer in children aged 3 to 15 years. Clin Ophthalmol., 2009; 3: 429-431.
5. Pokupec R, et al. Comparison between refractometer and retinoscopy in determining refractive errors in children- false doubt. Academic Journal, Collegium Antropologicum, Jan 2013 Supplement; 37(Supp 1): 205.
6. Uras R, Belfort R, Hofling-Lima AL, Martins EL. Ganger, et al. Autorefractometer, Retinoscope and Subjective Method Automatic objective refraction and clinical refraction – a

- comparative analysis. *Arq Bras Ophthalmol.*, 2001; 64: 33-8.
7. Bullimore MA, Fusaro RE, Adams CW. The repeatability of automated and clinician refraction. *Optom Vis Sci.*, 1998; 75: 617-22.
  8. Tongue AC. Refractive error in children. *Pediatr Clin North Am.*, 1987; 34: 1426-1437.
  9. Verboven L, Missoten L. Possibilities, and limitations of refraction measurement by an automatic refractor. *Bull Sec Belge Ophthal.*, 1982; 201: 65-70.
  10. Choong YF, Chen AH, Goh PP. A Comparison of Autorefraction and Subjective Refraction With and Without Cycloplegia in Primary School Children. *Am J Ophthalmol.*, 2006; 142: 68–74.