Man has always tried to automate all manual tasks assigned to him. In a similar way the process of automation of manual refraction has also evolved over a period of two centuries. Early attempts in this field were not fruitful since the technology available then could not cope up with this sophisticated task. Since the last 4-5 decades, with the advent of modern electronics and computers, autorefractometers (ARM’s) have evolved in a big way.

Earlier instruments in this field were mainly subjective optometers, ie. the patient himself had to adjust the instrument, to focus a target. This had led to a lot of problems starting from, improper alignment of target and the subjects pupil, to excessive accomodation by the subject. This can lead to gross irregular astigmatism values, if only portion of the pupil is used in refraction. Excessive accomodation can lead to ‘instrument myopia’. Instruments available today are objective refractometers. They are much faster and need very little, patient co-operation. These instruments mainly use two sources of light – a visible light which illuminates the target in the instrument and an infra red(IR) light which performs the refraction. Various types of fixation targets like a 3-D coloured balloon, a land scape, starry sky etc. helps to relieve the accomodation. The vertex distance can be adjusted according to whether we need a contact lens correction at zero vertex distance or a spectacle correction at 12mm or 13.5mm V.D. A retro illumination mode helps to observe any lens opacity present.

The speed of actual refraction done by most of the new instruments is close to 0.1 second. This speed helps to negate the effects of momentary changes of fixation, blinking or accomodation which may occur during the process of measurement.

Methods to overcome the effect of patient accomodation
- Speed of measurement.
- Invisible (IR) light performs the refraction and hence accomodation is not stimulated.
- The type of target set in the Autorefractometers tend to relax the accomodation.
- The instruments use a fogging lens, through which the fixation target is seen. So, the subject hopefully learns that accomodation tends to make the visible target even more blurred and therefore, relaxes accomodation.

**Optics of Autorefractometers**

Infrared or near infrared light performs the refraction. Various optical devices like a grating or rotary prism focuses targets on to the retina.

In all these, infrared light scans across the papillary area and the emerging light from the fundus in various meridians, is detected by ‘photodetectors’ or ‘sensors’. The nature of the emerging beam gives an indication of the nature of refraction. The value detected by the sensors in the various meridians is analysed by the instrument which gives the refractive status of the eye as a display/print out – SPH/CYL/AXIS.

Most of the instruments use the full pupil for refraction. Measurement can be made even in pupil miotic upto 2mm. Area of retina used for refraction is about 30-70° around the fovea.

Hazy media like lens opacity or corneal opacity may
hinder the Autorefractometer reading. These opacities producing visual acuity less than 6/18 or more may end up in ‘error’.

**Advantages**

- User friendly machine – can be handled by an average ophthalmic technician.
- Better patient compliance than in manual refraction since the procedure is fast and there is no inconvenience to the patient. Especially in children and un-cooperative patients, manual refraction needs immense patience.
- In case of oblique astigmatism, determination of axes is very easy.
- Can over-refract spectacles, contact lenses and IOL’s.
- People of all strata of life are generally impressed by computers and machines than manual refraction.

**Disadvantages**

- High initial investment
- We should not be fully dependent on the instrument for our refraction needs. The machine may give all sorts of sphero cylindrical combinations, but we should be judicious in assessing the subjective refraction, before prescribing.
- Calibration errors are common. So keep your instrument well serviced and cross check once in a while with your manual refraction values.
- May optical shops now use autorefractometer for glass prescription and the public is generally attracted towards the same. Unless, an Ophthalmologist oversees the procedure and does a proper ocular examination along with it, other organic diseases like, glaucoma and posterior segment pathologies will be left undiagnosed.

**Recent Advances in ARM’s**

- Hand held, wireless, autorefractometer for convenience and portability.
- Super quick mode with measurement time as low as 0.07 seconds.
- Traditional rotary prism systems being replaced by Duplex Disc Technology.
- Due to the shorter reaching distance in the new hand held models, no assistance is needed to help small children take the correct position and focus on the target. One touch provides a melody that plays to distract patients and provide a relaxed environment for refraction.
- Patients with nystagmus can be measured with the ‘super quick’ measuring mode.
- The minimum pupil diameter (2 to 2.5 mm) and light intensity control for the fixation target permit easy measurement of patients with smaller pupils along with patients who are light sensitive.
- Auto-measuring and auto-finish capability. i.e. the instrument begins automatic readings as soon as the corneal dot passes through the alignment mark and stops by itself as soon as reliable data is obtained. No keys have to be pressed at any time, to take the readings.
- A mire ring is projected on to the corneal surface making it easier and faster to align the system and check for abnormality of the cornea.
- In place of conventional LED’s, newer versions use SLD’s (Super luminiscent diodes) and highly sensitive CCD device for improved image quality of ARM’s.

In refraction, there is no ‘real standard’ for comparison. Manual refraction values can also vary, within a narrow range of power and axes even in expert hands. Such differences can occur in ARMs also.

The message is, the autorefractometer is a valuable companion in our refraction practice but we should be judicious in prescribing a glass from our autorefractometer print out.