



To Evaluate Comparative Values of Non Contact and Applanation Tonometry on Patients of Different Age Groups

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ABSTRACT

TITLE: To evaluate comparative values of non contact and applanation tonometry on patients of different age groups. **PURPOSE:** To Compare two different methods of intra ocular pressure measurement regarding reliability, accuracy and reproducibility of given methods for screening purpose. **MATERIALS AND METHODS:** From the out patient attendance of DEPARTMENT OF OPHTHALMOLOGY in PANDEET DEENDAYAL UPADHYAY GOVT. HOSPITAL AND MEDICAL COLLEGE,RAJKOT, 300 patients were selected at random for this study. Examination of each patient included slitlamp biomicroscope and direct ophthalmoscopic examination. Tonometric readings were taken by Goldmann's applanation tonometer, Non contact tonometer. **RESULT AND DISCUSSION:** In this study the comparative data obtained on applanation and non contact tonometer were compared. noncontact tonometry can be used for screening purpose as it gives reliable values compared to goldmann's applanation tonometer for the pressure ranges between 0-15 mmHg. Non contact tonometry had a tendency to overestimate very high pressures and under estimates at low pressure.

CONCLUSION: Goldmann's applanation tonometry is the more reliable and reproducible method of measuring intra ocular pressure than non contact tonometer.

KEYWORDS : Non contact Tonometry, Applanation tonometry, Outdoor Patients, Intraocular Tension, Tonometry

INTRODUCTION:

Tonometry is the most important parameter in diagnostic, therapeutic and prognostic evaluation of Glaucoma. Recording of intraocular pressure in human attained a scientific momentum with the discovery of Schiotz indentation tonometer, noncontact tonometer and Goldmann's applanation tonometer. Goldmann's applanation tonometer has received a great importance because this method is independent of ocular-rigidity, it is little influenced by variations in corneal curvature and it records the intra-ocular pressure directly by applanating the cornea. In Goldmann's applanation tonometry surface tension of tear film and the force required to bend the cornea cancel each other. Thus, making Imbert - Fick - law applicable to this method. Goldmann's applanation tonometer shows no topographic effect and there by gives reproducible measurements on repeated measurements. Indentation tonometer underestimates the intra-ocular pressure in conditions of low-ocular rigidity while it overestimates it in conditions of high ocular rigidity. Under-estimations of intra-ocular pressure gives falls sense of security which is dangerous because of fear of missing glaucoma. Some workers had pointed out that some of the cases of so called low-tension glaucoma may be the result of such under-estimation. Though goldmann's applanation tonometer is accurate method for measurement of intra ocular pressure, it also carries the risk of infection and corneal aberrations same as schiotz indentation tonometer. Non contact tonometry is based on the principle that time taken to flatten the cornea with puff of air is sensed optically. Non contact tonometry is simple, can be operated by laboratory personnel. This method for measurement of intra ocular pressure is free of infection risk and corneal aberration so can be used for large number of patients. As non contact tonometry gives the fairly accurate results for normal range of intra ocular pressure it can be used for screening purpose. But non contact tonometer fails to give readings in severely distorted cornea and gives false high results due to contraction of extra ocular muscles. Intra ocular pressure can be affected by various factors like, age, race, sex, genetic, ethnicity, diurnal variation, associated systemic diseases like hypertension, neural control, hormonal effects, effect of general anaesthesia and increased episcleral venous pressure. so by controlling or excluding associated risk factors intra ocular pressure measurements can be compared from various aspects. As these methods are different in their principle

as well as different working instrument it is quite difficult to compare them but based on the careful work up on patients and instrumental parameters we can fairly compare these methods for accuracy, reliability, reproducibility as well as for various advantages and disadvantages of given methods. This study was undertaken to evaluate comparative values of applanation and noncontact tonometry on 300 patients of different age groups, selected at random from the out-patient attendance in P.D.U GOVT. HOSPITAL, DEPARTMENT OF OPHTHALMOLOGY during february 2011 to july 2012.

AIMS AND OBJECTIVES:

- 1.To Compare two different methods of intra ocular pressure measurements.
- 2.To study reliability of given methods for screening purpose.
- 3.To study the accuracy of given methods.
- 4.To study reproducibility of given methods.

MATERIALS AND METHODS:

From the out patient attendance of DEPARTMENT OF OPHTHALMOLOGY in PANDEET DEENDAYAL UPADHYAY GOVT. HOSPITAL AND MEDICAL COLLEGE,RAJKOT,300 patients were selected at random for this study. The patients were of the age more than 20 years. Examination of each patient included routine anterior segment examination with slitlamp biomicroscope and direct ophthalmoscopic examination. Tonometric readings were taken by Goldmann's applanation tonometer, Non contact tonometer. Findings were recorded as per the following proforma. Tonometry was performed first with Goldmann's applanation tonometer in sitting position, then with Non contact tonometer. To avoid any discrepancy due to diurnal variations and scleral rigidity due to too long and too short axial length, the time of tonometry was kept between 09:30 hours to 11:00 hours and patients with axial length between 22-25 millimeters were taken in to consideration. Goldmann's tonometer on mounted on slitlamp biomicroscope and weighted Non contact with 1955 calibration tables were used. The same instruments were used throughout the study. The details of the procedure followed are as follows :

GOLDMANN'S APPLANATION TONOMETRY :

The tonometer was fixed on slit lamp. Slit was opened fully, and the

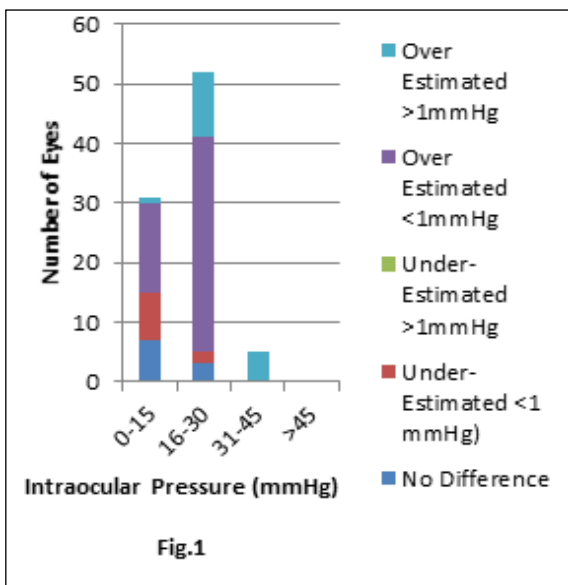
illumination system locked at 60o from the microscope which was kept straight. Blue filter placed in the path of the illuminating beam which was aimed at the black line on the prism. Magnification of the microscope kept at low magnification (10%). The plastic tube (prism) put in its holder and adjusted at 180o . The drum was set at 1.0 gm. force. The patient was seated at the slit lamp; a drop of 4% Lignocaine put in both eyes. The drop was repeated after one minute. A fluorescein strip was placed in the lower fornix. After about 1/2 minute the strip was removed and the patient was adjusted at the slit lamp. Patient was asked to look straight with the other eye. Slit lamp was switched on and the assembly was taken towards the patient. The tip of the prism was made to touch the cornea of the patient. At this stage the limbus was seen illuminated. This was also confirmed by looking from outside. When seen through the right eye piece of the microscope two green semi-circle seen against the blue background. The knob of the drum now adjusted and the semicircles were made to interlock by their inner limbs. The drum was read and the reading was multiplied by 10 to get intra-ocular pressure directly in mm of Hg. If the semicircles were not horizontal then the microscope was raised or lowered until the semicircles becomes horizontal and equal. If these can not be made to interlock, the instrument is probably too away from the eye hence it should be brought nearer. If the semicircles can not be separated, the instrument is too forward and it should be taken before adjusting finally by the knob of the drum. Three such readings were taken for each eye and the average intra-ocular pressure was recorded. First right eye and then left eye were examined. The prism was kept in contact of cornea only for a short period and it was wiped by sterile cotton each time when it was taken away from the eye so that no fluorescein was left on the prism plate. Normal saline swab was used to clean the tip of the prism. Cleaning after use of the tonometer tip with an alcohol soaked sponge, followed by drying for atleast 1-2 minutes before next use is recommended. More stringent recommendations include cleaning the tip with household bleach. The prism of the tonometer is removed and immersed in a 1:10 solution of household bleach for five minutes. This is followed by washing the tip under running water and drying before next use.

NON CONTACT TONOMETRY :

Patient is asked to seat in front of the instrument and keep his/her eyes open with chin on the rest and forehead touching the forehead rest and three readings are taken. Preferably measurements within 3 mmHg are taken into consideration, average of three are noted.

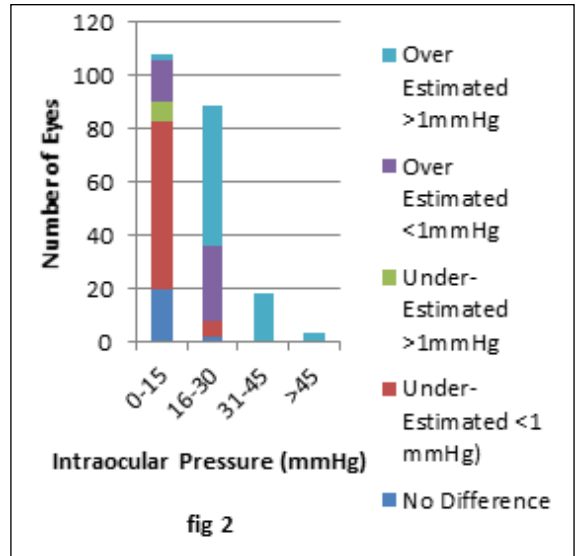
RESULT AND ANALYSIS:

Fig 1 shows comparison of intra ocular pressure measurements by goldmann's applanation tonometer and noncontact tonometer in the patients aged between 41-50 years (88 eyes).



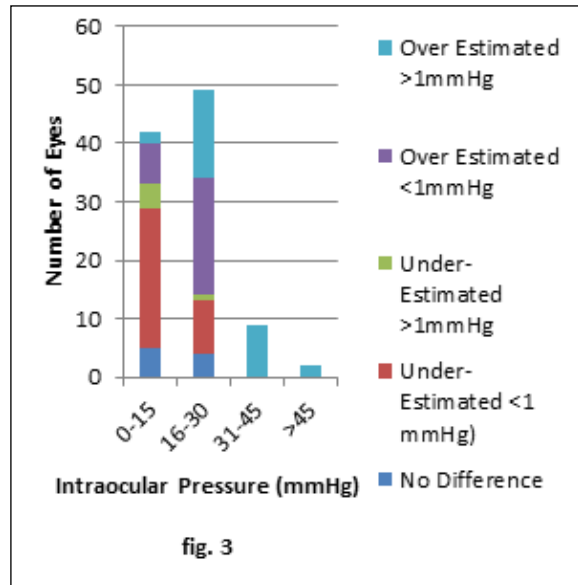
As the age increases non contact tonometry shows slight over estimation of pressures at high side, but within the acceptable limits.

Fig. 2 shows comparison of intra ocular pressure measurements by goldmann's applanation tonometer and noncontact tonometer in the patients aged between 51-60 years (218 eyes).



Large number of patients showing intraocular pressure measurements fall outside the acceptable limits.

Fig. 3 shows comparison of intra ocular pressure measurements by goldmann's applanation tonometer and noncontact tonometer in the patients aged between >60 years (102 eyes).



This table shows non contact tonometry can be useful as screening purpose as it gives reliable values (>60% of measurements) within acceptable limits, which is important for the diagnosis of glaucoma. It shows that it gives over estimated readings for very high intra ocular pressure.

DISCUSSION:

In this study 300 patients of different age groups in males and females were studied and the comparative data obtained on applanation and non contact tonometer were compared. it is found that that noncontact tonometry can be used for screening purpose as it gives reliable values compared to goldmann's applanation tonometer for the pressure ranges between 0-15 mmHg. Though noncontact tonometry had a tendency to overestimate very high pressures and under estimates at low pressure, it is seen that non contact tonometry gives acceptable readings for screening purpose. It has been found

that non contact tonometry fails to give consistent readings, may be due to patients' bias as well as changes with cardiac cycle or due to squinting of eyelids.

CONCLUSION:

Goldmann's applanation tonometry is the most reliable method of measuring intra ocular pressure. Goldmann's applanation tonometer has better reproducibility as compared to noncontact tonometer. Noncontact tonometry is reliable tool for screening purpose, in large number of patients. Non contact tonometry is free of infection risk as there is no contact between instrument and cornea.

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