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Original Research Paper

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

Medical Science

KEYWORDS : SCHIOTZ TONOMETRY, APPLANATION TONOMETRY, OUTDOOR PATIENTS, INTRAOCULAR TENSION, TONOMETRY

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ABSTRACT

TITLE: *To evaluate comparative values of schiotz 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 PANDIT DEENDAYAL UPADHYAY GOVT. HOSPITAL AND MEDICAL COLLEGE,RAJKOT,300 patients were selected at random for this study.Examination of each patient included slitlamp biomicroscpe and direct ophthalmoscopic examination. Tonometric readings were taken by Goldmann's applanation tonometer, Schiotz tonometer.****RESULT AND DISCUSSION:****In this study the comparative data obtained on applantion and schiotz tonometer were compared.Schiotz tonometry under estimates the pressure ranging between 16-30 mmHg and overestimates the pressure ranging between 0-15 mmHg.Schiotz tonometer cause decrease in readings of intraocular pressure due to tonographic effect,while multiple readings have no effect on readings taken by goldmann's applanation tonometer.****CONCLUSION:****Goldmann's applanation tonometry is the more reliable,reproducible, method of measuring intra ocular pressure than schiotz tonometer.*

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 appalantion 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 intraocular 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.Schiotz tonometry is affected by ocular-rigidity, instrumental errors, reading errors of its scale, thickness and curvature of cornea, contraction of extra-ocular muscles and accommodation. Schiotz tonometry also has tonographic effect there by fails to give consistent readings,instead it shows progressively low intra ocular pressure measurement than previous one on repeated indentation on cornea. 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.Intra ocular pressure can be affected by various factors like,age,race,sex,genetic,ethn icity,diurnal variation,associated systemic diseases like hyper tension,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 Schiotz and applanation 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 PANDIT 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 biomicroscpe and direct ophthalmoscopic examination. Tonometric readings were taken by Goldmann's applanation tonometer, Schiotz tonometer. Findings were recorded as per the following proforma.Tonometry was performed first with Goldmann's applanation tonometer in sitting position, then with Schiotz tonometer in supine position. To avoid any discrepancy due to diurnal variations and scleral

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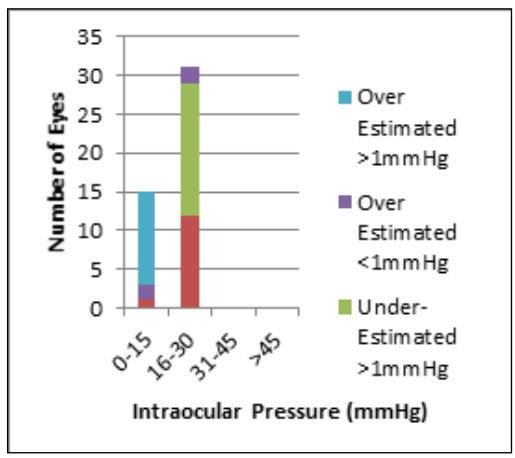
rigidity due to too long and too short axial length, the time of tonometry was kept between 09:30 hours to 11:00 hours and patients with axial length between 22-25 millimeters were taken in to consideration. Goldmann's tonometer on mounted on slitlamp biomicroscope and weighted Schiotz with 1955 calibration 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. Slip 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.

SCHIOTZ TONOMETRY : The patient was asked to lie down in supine position. A drop of 4% Lignocaine was put in each eye. The patient was asked to open his both eyes and look at the ceiling of the room and when this could not fix the eyes to record the tension his one upper limb was stretched and the patient was asked to look at the thumb. Scale reading was noted.It is customery to start with 5.5 gm weight. If the intra-ocular pressure was too high to record by 5.5 gm weights, higher weights were used to record the pressure.A conversion/caliberation table friedenwald (1955) was used.Antibiotic eyedrop was put in both eyes.No pressure should put with the fingers on the eye.Before applying the tonometer it was checked by keeping its foot plate on the test cornea. The scale should read "O".Cleaning of foot plate and plunger was carried out by the spirit swab, every time before putting upon the cornea. It was made to dry up completely before putting the tonometer on the cornea. Sterilization was carried out by putting the footplate and plunger in acetone,ether,absolute alcohol or by heating the footpate in the flame of the spirit.

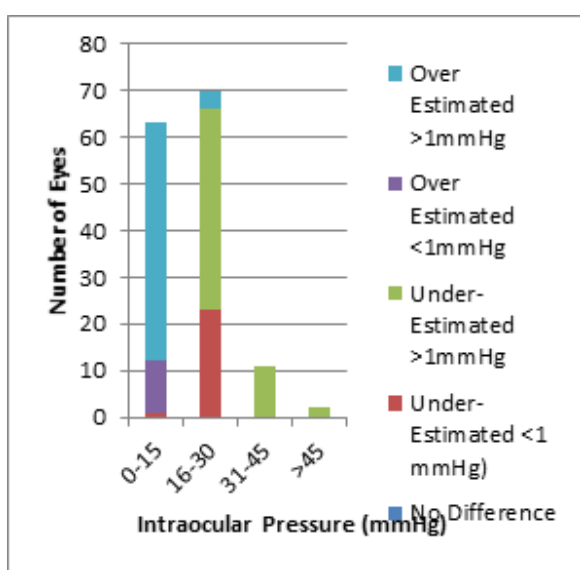
RESULT AND ANALYSIS:

COMPARISON OF INTRA OCULAR PRESSURE MEASUREMENTS BY GOLDMANN'S APPLANATION AND SCHIOTZ TONOMETER IN THE PATIENTS AGED BETWEEN 21-30 YEARS (46 EYES).



It has been observed that schiotz tonometry is less reliable in screening of glaucoma patients as it overestimates the intra ocular pressure the pressure between 0-15 mmHg and under estimates the pressure between 16-30 mmHg, out side the acceptable limits.

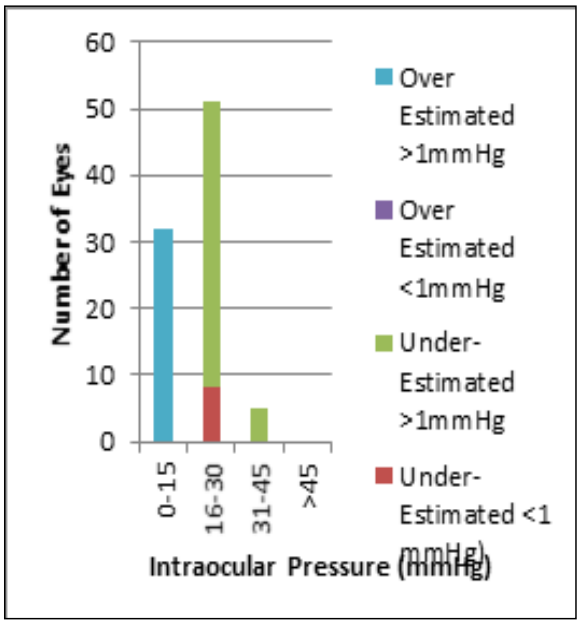
COMPARISON OF INTRA OCULAR PRESSURE MEASUREMENTS BY GOLDMANN'S APPLANATION AND SCHIOTZ TONOMETER IN THE PATIENTS AGED BETWEEN 31-40 YEARS (146 EYES).



in the age group between 31-40 years 55.48% measurements of intra ocular pressure within normal limits while 44.52% measurements of intra ocular pressure either overestimated or under estimated >1 mmHg.

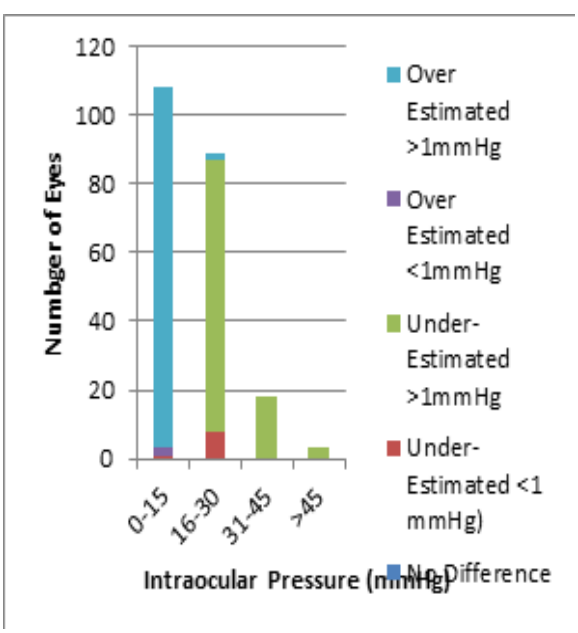
COMPARISON OF INTRA OCULAR PRESSURE MEASUREMENTS BY GOLDMANN'S APPLANATION AND SCHIOTZ TONOMETER IN THE PATIENTS AGED BE-

TWEEN 41-50 YEARS (88 EYES).



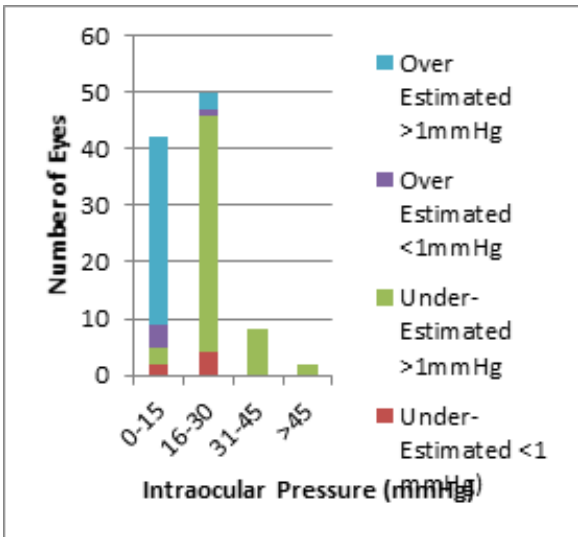
Above fig. shows in the age group of 41-50 yers of age,large number of (90.91%)measurements have either overestimated or underestimated.

COMPARISON OF INTRA OCULAR PRESSURE MEASUREMENTS BY GOLDMANN'S APPLANATION AND SCHIOTZ TONOMETER IN THE PATIENTS AGED BETWEEN 51-60 YEARS (218 EYES).



Patients aged between 51-60 years of age 94.95% measurements are either over estimated or under estimated by >1 mmHg.

COMPARISON OF INTRA OCULAR PRESSURE MEASUREMENTS BY GOLDMANN'S APPLANATION AND SCHIOTZ TONOMETER IN THE PATIENTS AGED BETWEEN >60 YEARS (102 EYES).



In the age group of patients >60 years of age 89.21% measurements are not within the acceptable limits.

DISSCUSSION: In this study 300 patients of different age groups in males and females were studied and the comparative data obtained on applantion,and schiotz tonometer were compared.it is found that Schiotz tonometry under estimates the pressure ranging between 16-30 mmHg and overestimates the pressure ranging between 0-15 mmHg. Schiotz tonometer cause decrease in readings of intraocular pressure due to tonographic effect,while multiple readings have no effect on readings taken by goldmann's applanation tonometer.

CONCLUSION: Goldmann's applanation tonometry is the most reliable method of measuring intra ocular pressure. it has better reproducibility as compared to schiotz tonometer.schiotz tonometer has greater tendency towards under estimation and over estimation of the intra ocular pressure.

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