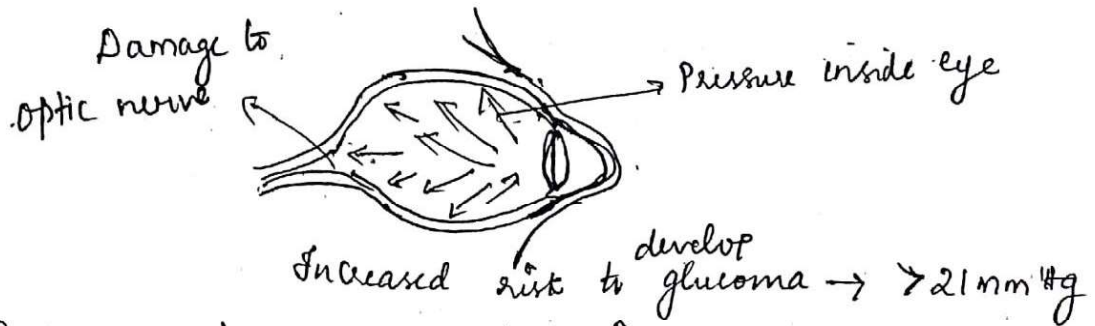


Tonometry

→ Tonometry → It is a clinical technique that provides a measurement of the eye, which includes the combined resistance to deformity of its coats & the intraocular pressure IOP

→ Tonometer → A tonometer is a device that measures the pressure placed on the optic nerves [IOP] by fluid in the eyes



Factors modifying IOP

→ Physiological variations: IOP normally fluctuates 2-5mmHg throughout the day
* with

* with respiration & heart beat

* with time of the day

* with venous pressure

* with arterial pressure

* with the osmotic pressure of the blood

→ Local mechanical factors

* dilation of the pupil

* changes of the solid content of the eye

* pressure from outside

Instrumental tonometry

Contact tonometer

non contact tonometer.

→ Applanation tonometer

- * Goldmann
- * Parkin's, *
- * Tono pen

→ Indentation tonometer

- * Schiotz, Mackay-Marg

Goldmann applanation tonometry

↳ The force necessary to flatten a given area of cornea is measured, concept was introduced by Goldmann in 1954.

↳ It consists of double prism mounted on a standard slit lamp.

↳ Standard area of the cornea of 3.06 mm diameter has flattened.

↳ It is based on Imbert-Fick law.

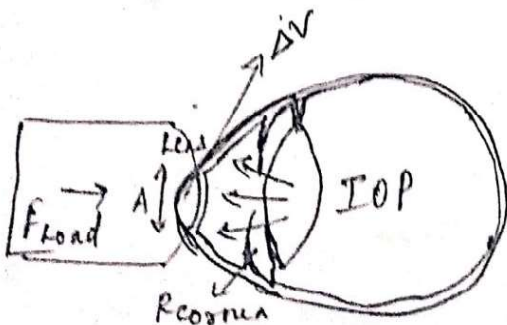
It states that the pressure in a sphere filled with fluid & surrounded by a infinitely thin, flexible membrane, may be measured by the force that just flattens the membrane to a plane surface.

$$P = W/A$$

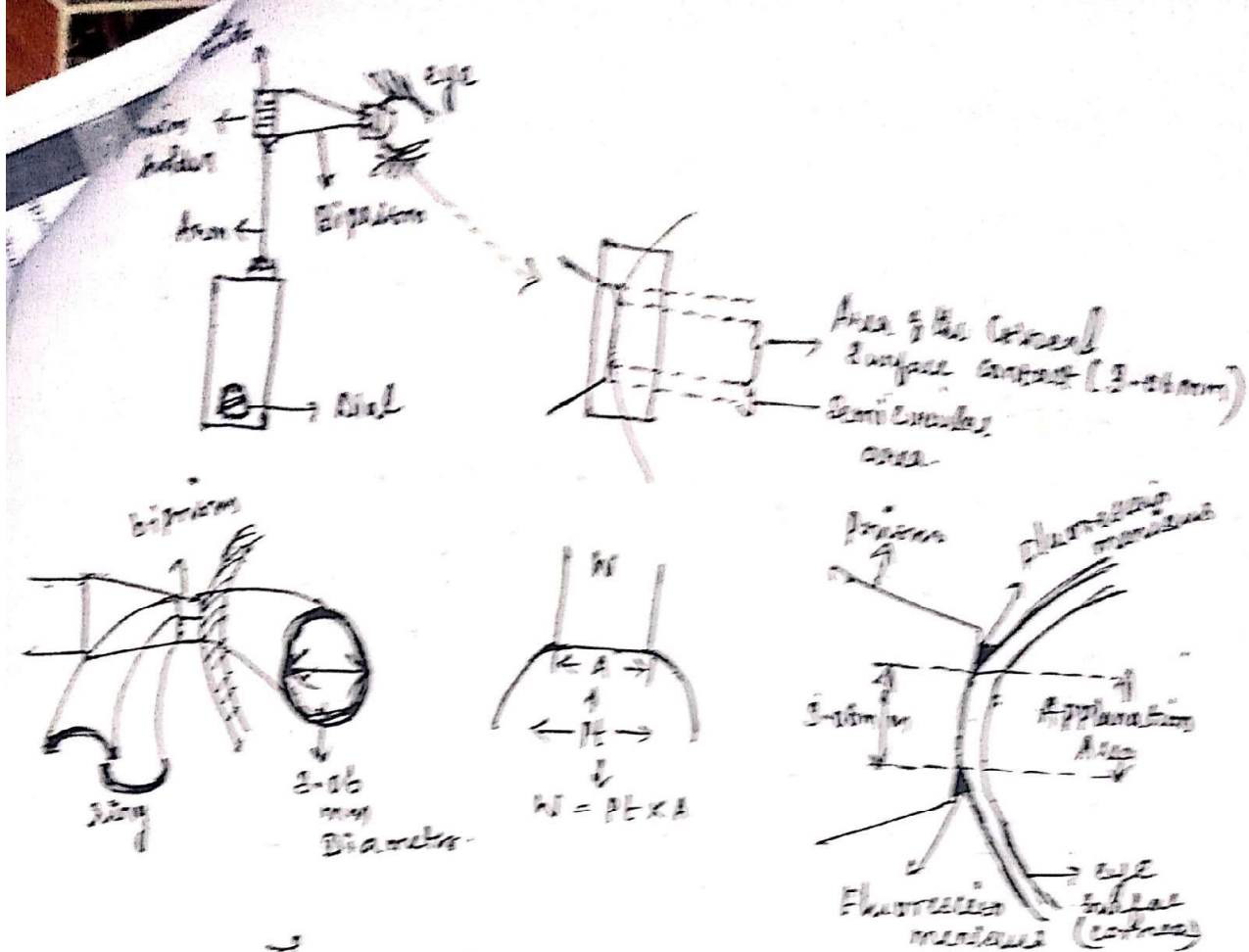
P → Pressure (IOP)

F → Force applied

A → Area.

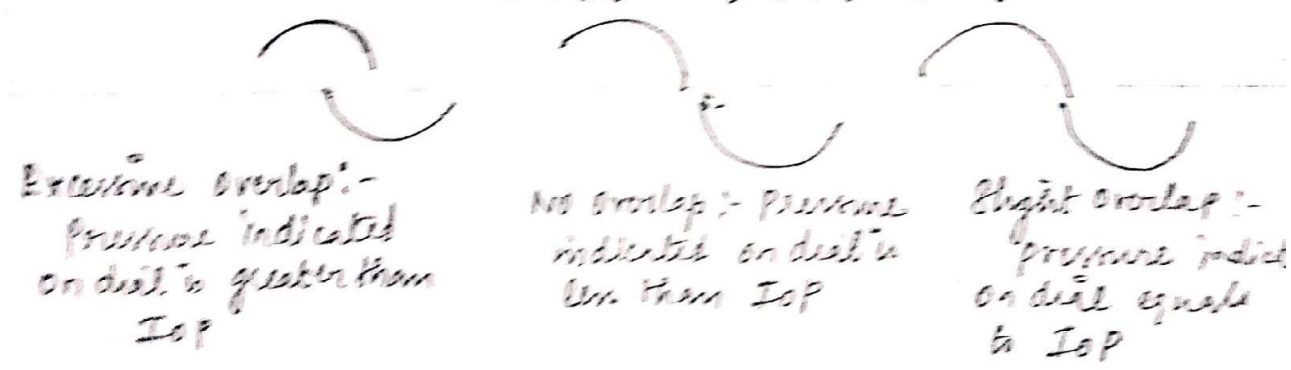


$$IOP = \frac{F_{load}}{Area \times \left[1 + \frac{R_{cornea}}{R_{cornea}} \right]}$$



- The method involves illumination of the biperism binocular head with a blue light (obtained using a cobalt filter) that is used to flatten the anesthetized cornea which has fluorescein in the tear film.
- The scale knob on the side of the instrument is then turned until the inner borders of the two semi-circles of fluorescent tear meniscus visualized through each prism.

Fluorescein Semicircles



Procedure

- ↳ Dry, clean tonometer probe should be inserted
- ↳ slit lamp should be adjusted & patient comfortably positioned
- ↳ Anesthetic topical eyedrops used & place fluorescein strip on cornea
- ↳ room light should be dimmed
- ↳ keep both eyes open & illumination system should be 60° to the lateral side of the eye to be measured
- ↳ cornea & biprism is illuminated by cobalt blue light from slit lamp
- ↳ biprism is then advanced until it just touches the apex of cornea
- ↳ at this point 2 semi circles are viewed.

Errors in the measurement

- ↳ The fluorescein ring is too wide or too narrow
 - * Thin cornea produce underestimate
 - * thick " " overestimate
 - * Inadequate vertical alignment of semicircles leads to overestimate
- ↳ Breath holding, squeezing the lids or examiner touching the lids can all falsely increase the IOP reading.

Perkin's hand held

- probe
- It is same type of goldmann applanation
 - Force is applied by counterbalanced arm and applanated: corneal surface viewed by a magnifying lens situated behind the lens.
 - The illumination system is inbuilt into the instrument
 - It is portable & it can be used with the patient in either upright or supine position.

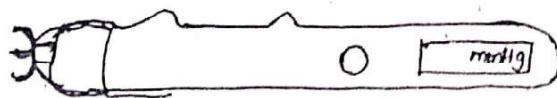
Tono-pen

→ The tonno-pen is a hand-held portable tonometer that determines IOP by making contact with the cornea (central contact is recommended) through a probe tip by causing applanation / indentation of a small area.

→ It is useful for patients with corneal disease & surface irregularity.

→ It has an applanating surface with a tiny plunger protruding microscopically from the center.

→ As it makes contact with the eye, the plunger gets resistance from the cornea & IOP producing a rising record of force by strain gauge



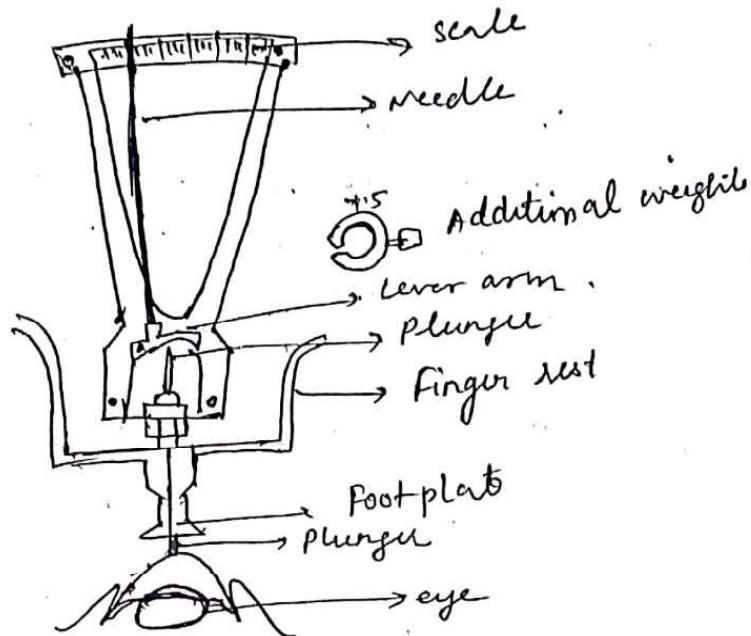
tono-pen

Indentation tonometry.

The principle of indentation tonometry is that a force or a weight will indent or sink into a soft eye further than into a hard eye.

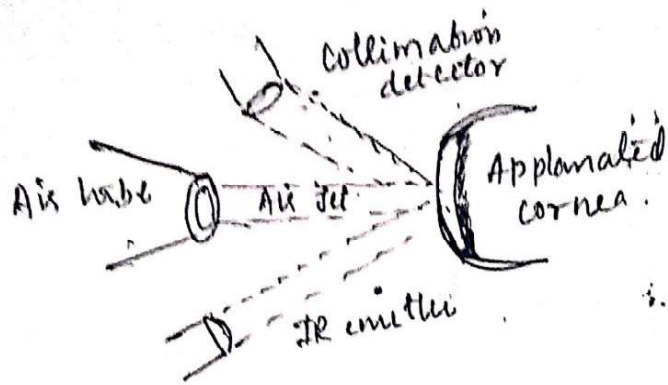
(eg) Schiøtz tonometer.

↳ It consists of a curved footplate which is placed on the cornea of a supine subject.
↳ A weighted plunger attached to the footplate sinks into the cornea in an amount that is directly proportional to the pressure in the eye which is shown by scale attached at the top the plunger.



Non contact tonometry

(eg) Air puff tonometry, → The appplanating force is a column of air which is emitted with gradually increasing intensity. At the point of the corneal flattening, the air column is shut off and the force at the moment is recorded and converted into mmHg.



Slit lamp

↳ It is an instrument designed to examine the eye and adnexa [accessory structures like orbit, extraocular muscles, eyelids]

↳ Operational components :- Binocular microscope and a light source

↳ It provides light in the form of slit to observe various ocular structures

↳ It provides view of external adnexa, external eye, iris, lens & anterior vitreous.

Principle :-

A narrow slit beam of very bright light produced by lamp. This beam is focused onto the eye which is then viewed under magnification with control illumination

Optics :-

→ It works on the same principle of compound

Microscope → Objective lens is towards the patient, whose eyes form the object

→ Objective lens consist of two plano-convex lenses provide a power of +22 D & eyepiece is +10 to +14 D and is towards the examiner