

The art of pupilloplasty and iris reconstruction surgery tips and tricks

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1-Introduction

- **Reconstruction of iris defect** :is very challenging .It requires the talent to restore the visual function as well as the cosmetic appearance of the iris .
- **The rationale** is to restore the missing part of the iris either in the stroma (stromal loss)or in the root (iridodialysis)as well as the functional loss of the iris followed by the reconstruction of well centered pupil (pupilloplasty)

Gain fom Iris repair

- Decrease photophobia and glare(size and centration of a perfect pupil)
- IOP: might decrease in appositional angle closure (ACG ,plateau iris syndrome , irretts Zavalia syndrome)
- Compartmentalisation of AC in EK
- Pupilloplasty prevents recurrent optic capture in glued tilted IOLs

- **Gross anatomy of the iris** :the iris has rough anterior surface and smooth posterior surface. It is divided by the collarete into inner pupillary zone and outer ciliary zone *(slide 5)*
- **Microanatomy of the iris** :It is composed of anterior limiting layer ,iris stroma,anterior epithelium and posterior epithelium *(slide 5)*

- **Vascular network of the iris**:It is responsible for bleeding of the iris seen during trauma .It is composed of **A-Major arterial circle** located at the anterior portion of the CB and **B- Minor arterial circle** interweaves in the iris stroma in a radial matter *(photo in slide 6)*
- **Iris Muscle** :two muscles are located in iris stroma
 - A- Sphincter muscle** located in pupillary zone causes constriction of the pupil (meosis)
 - B- Dilator muscle** located in ciliary zone causes dilatation of the pupil (mydriasis) *(slide 7)*

2-Plan of surgery

- **Plan of treatment** : Preoperative Evaluation , Analysis of the Data and Choice of the surgical technique.*(slide 2)*
- **Preoperative Evaluation**: Proper history taking and slitlamp examination with special focus on the iris pattern ,pupil,AC ,angle and the lens *(slide 3)*
- **Iris defect** can be acquired (traumatic or iatrogenic) or congenital (coloboma or ICE) *(slide 4)*
- **Iris repair** is done in cases with iris defects due to congenital lesion as coloboma ,mydriasis ,U2S ,traumatic iris defects, pinhole pupil for diseased corneal curvature ,compartmentalization of AC in EK *(slide 5)*

- **Iris defect** can take many patterns with variations in size ,shape,color of the iris,number of the defects ,remaining iris tissue and associated conditions
(*Algorithm slide 6*)
- **Surgical plan of the reconstruction** involve iridoplasty , pupiloplasty or both. The choice of the technique depends on the amount of the iris defect ,the remaining iris tissue ,the condition of the pupil , presence of iridodialysis and the etiology of the lesion .*(slide 7)*
- **Surgical repair techniques** :suturing of the iris defect using different techniques or implantation of prosthetic iris device (different types) or both
(*Slide 7*)

3-Basic suture techniques and surgical principle of Iris reconstruction

- **Surgical principles of iris reconstruction** : mobilize as much iris tissue as possible , correction of retroflexion ,release all iridocapsular adhesions and PAS, intraocular suture and knot tying ,reattachment of the iris to the sclera ,pupil repair , closed system and small incision surgery is desirable and iris repair is preferable to use than an iris prosthesis (*slide 2*)
- **Reconstruction techniques** :
A-Iris defects reconstruction :as Modified Seipser Sliding Knot and Single Four-Throw (SFT) Pupiloplasty
B-Iridodialysis Repair :Hang Back technique ,Hoffman pocket ,Sewing Machine Technique
C-Pupil reconstruction :Modified Seipser Sliding Knot ,Single Four-Throw (SFT) Pupiloplasty,Iris Cerclage and Laser pupiloplasty (*slide 3*)
- **Check list instruments and supplies** :Prolene 10/0 on a needle with a cutting tip and tapered body and micrograsping flat toothless forceps are mandatory

Types of Iris repair (video based)

- 1-Pupillary border sutures: (approximate 2 pupillary borders by suturing) as MacCannel suture (*slide 7*)and Single Four-Throw (SFT) Pupiloplasty (*slide 8*) compartmentisation in EK (*slide 9 , 10*)
- 2-Pupillary cerclage without iris atrophy (traumatic mydriasis) (*slide 14*)
 - The hole of the viscoelastic cannula will be the leading manoeuver for the needle without catching any iris tissue
 - Stretching the iris tissue before starting the repair
 - Avoid bleeding from the angle by avoid too much stretching
 - 4 bites in the iris in each quadrant(three quadrants anticlock wise and one quadrant clockwise)
 - Always protect the cornea with cohesive and dispersive viscoelastic
- 3-Pupillary cerclage with iris atrophy (take care of bleeding)*(slide 16)*
 - Avoid stretching the atrophic iris to avoid zippering effect and bleeding from the angle .
 - Use dispersive viscoelastic to stop bleeding
 - Don't tight cerclage until u see no iris defect because additional suture may needed

4-Iridodialysis repair: (slide 20, 21)

- Retroflexion correction is the main key to restore the anatomical shape of the iris and pupil in iridodialysis more than 4 clock hours
- Correct retroflexion is a must before stretching and straightening the remaining iris tissue to avoid taking the iris suture in the wrong surface and position
- Scleral flap done followed by mattress suture is taken
- Safer than sweeping technique

5-Combined Iridodialysis repair + Pupillary cerclage (slide 24)

- Fix the iridodialysis first to the ciliary border then do pupillary cerclage
- We have now two fixing points - the suture of the pupillary cerclage and the suture of the iridodialysis should be fixed alternatively in order to get a well centered pupil

6-Change pupil location (Endodiathermy or suturing & cutter fashioning)(slide 26 , 28)

The endodiathermy will do shrinkage of the iris to the opposite direction and the cutter is used to fashion the pupil

7-Iris prosthesis (in ICE or in ectropion uvea)

- Avoid stretch the ectropion uvea as in retroflexion or antelexion it is different pathology (shrunken iris and fibrous tissue) bec this will lead to bleeding
- Very important to stain the whole capsule in order to put the prosthesis inside the capsule

4-Prosthetic Iris Devices

- The **iris prosthesis** was intended to fill the iris defects to restore some of the functions of the iris
- **Types** :1-Iris Lens diaphragm (Old Style)
2-EndoCapsular Tension Ring –based PID (Old Style)
3-Customized Artificial Iris (Contemporary) free or with polyester meshwork layer

- **Selection of PDI** depend on the phakic status (aphakia or pseudophakia), capsular bag, iris condition and the aetiology of the defect

- **Complications** : depend on type and location of the implant as mild persistent inflammation, macular edema, dislocated or subluxed iris implants, recurrent bleeding from the ciliary body, corneal decompensation, transient postoperative hypotony or moderate increase in intraocular pressure

5-Complications of iris surgery

- **Bleeding** \implies raise IOP, Hemostasis
- **Fibrinous reaction** \implies intraoperative intracameral triamcinolone, postoperative cycloplegic and steroidal/NSAIDS
- **Extension of dialysis** \implies resuture
- **Cheesewiring of sutures** \implies resuture and avoid tightening
- **Erosion of suture material (unembedded knots)** \implies embed the knot, under a scleral flap, hoffman pocket.
- **Pupil migration** \implies resuture
- **Lens touch if phakic** \implies (better avoided)

Tips and ticks to avoid complications

- Pull iris tissue very carefully to understand different stretchable behaviours
- Proper passing of the needle in iris tissue
- Avoid neovascular iriditis or use endodiathermy (some use preoperative intracameral antiVGEF)
- Medical history :check INR, PTT, PTC
- Avoid aspirin intakers, renal dialysis patient, bleeding tendencies.
- Prostate Medication
