



DR Saladin Mugharbel

APPROACH TO PEDIATRIC GLAUCOMA



APPROACH TO PEDIATRIC GLAUCOMA

- INTRODUCTION

glaucoma in children cannot be looked upon
in the same way as glaucoma in adult



APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :


use All options in a logical & optimal sequence



APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :

procedures done early should be planned not to interfere , nor compromise the potential success of subsequent procedures





APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :


each surgical intervention MAY have
accompanying or potential future
complication



APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :

awareness of the need for timely diagnosis and appropriate treatment of strabismus , refractive errors and amblyopia , and media opacities (cornea and lens)



APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :

consider other associated condition and diseases (e.g. retinoblastoma , cataract in rubella , corneal decompensation in aniridia..)



APPROACH TO PEDIATRIC GLAUCOMA

- BASIC PRINCIPLES :

pediatric glaucoma is a FAMILY disease

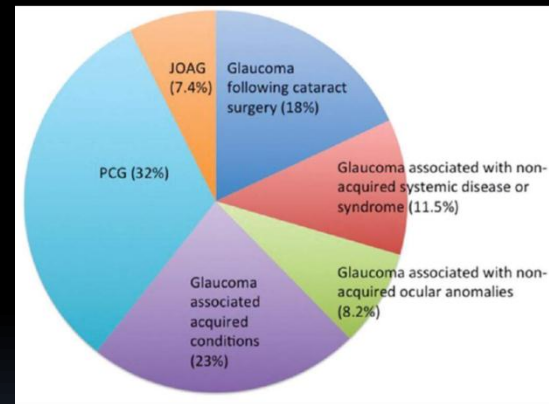
APPROACH TO PEDIATRIC GLAUCOMA

■ Causes of childhood glaucoma :

| Developmental Glaucomas | Secondary (Acquired) Glaucomas |
|---|--|
| <ol style="list-style-type: none"> Primary congenital glaucoma (PCG) <ul style="list-style-type: none"> Newborn primary congenital glaucoma Infantile primary congenital glaucoma Late-recognized primary congenital glaucoma Juvenile open-angle glaucoma (JOAG) Primary glaucomas associated with systemic diseases <ul style="list-style-type: none"> 8q23.3 deletion S Sp deletion syndrome Aicardi-Goutieres syndrome Androgen insensitivity, pyloric stenosis Brachmann-deLange syndrome Caudal regression syndrome Cranio-cerebello-cardiac (3C) syndrome Cutis marmorata telangiectatica congenita Diabetes mellitus, polycystic kidneys, hepatic fibrosis, hypothyroidism Epidermal Nevus syndrome (Solomon S) Fetal hyalantoine syndrome GAPO syndrome Glaucoma with microcornea and absent sinuses Hepatocerebrorenal syndrome (Zellweger) Infantile glaucoma with retardation and paralysis Kniest syndrome (skeletal dysplasia) Linear scleroderma Marfan syndrome Michel's syndrome Moyamoya S Mucopolysaccharidosis Nail-patella syndrome Neurofibromatosis (NF-1) Nevoid basal cell carcinoma S (Gorlin S) Nonprogressive hemiatrophy Oculocerebrorenal syndrome (Lowe) Oculodentodigital dysplasia PHACE syndrome Phakomatosis pigmentovascularis (PPV) Proteus syndrome Rieger syndrome Roberts' pseudothalidomide syndrome Robinow syndrome Rothmund-Thomson syndrome Rubinstein-Taybi syndrome SHORT syndrome Soto syndrome Stickler syndrome Sturge-Weber syndrome Trisomy 13 Trisomy 21 (Down syndrome) Warburg syndrome Wolf-Hirschhorn (4p-) syndrome Primary glaucomas with associated ocular anomalies <ul style="list-style-type: none"> Aniridia <ul style="list-style-type: none"> congenital aniridic glaucoma acquired aniridic glaucoma Axfield-Rieger anomaly Congenital anterior (corneal) staphyloma Congenital hereditary endothelial dystrophy Congenital iris ectropion syndrome Congenital microcoria Congenital ocular melanosis Idiopathic or familial elevated venous pressure Idiotrabecular dysgenesis (iris hypoplasia) Peters' syndrome Posterior polymorphous dystrophy Sclerocornea | <ol style="list-style-type: none"> Traumatic glaucoma <ul style="list-style-type: none"> Acute glaucoma <ul style="list-style-type: none"> Angle concussion Hyphema Ghost cell glaucoma Glaucoma related to angle-recession Glaucoma with intraocular neoplasms <ul style="list-style-type: none"> Arteriovenous fistula Juvenile xanthogranuloma (JXG) Iris rhabdomyosarcoma Leukemia Medulloepithelioma Melanocytoma Melanoma of ciliary body Mucogenic glaucoma with iris stromal cyst Retinoblastoma Glaucoma related to chronic uveitis <ul style="list-style-type: none"> Angle-blockage mechanisms <ul style="list-style-type: none"> Synechial angle closure <ul style="list-style-type: none"> Iris bombe with pupillary block Open-angle glaucoma Trabecular meshwork endothelialization Lens-related glaucoma <ul style="list-style-type: none"> Phacolytic glaucoma Spherophakia with pupillary block Subluxation-dislocation with pupillary block <ul style="list-style-type: none"> Axial-subluxation high-myopia syndrome Ectopia lentis et pupillae Homocystinuria Marfan syndrome Weill-Marchesani syndrome Glaucoma following lensectomy for congenital cataracts <ul style="list-style-type: none"> Infantile aphakic open-angle glaucoma Pupillary block glaucoma Glaucoma related to corticosteroids Glaucoma secondary to rubeosis <ul style="list-style-type: none"> Coxs' disease Familial exudative vitreoretinopathy Medulloepithelioma Refinoblastoma Subacute/chronic retinal detachment Angle-closure glaucoma <ul style="list-style-type: none"> Central retinal vein occlusion Cicatricial retinopathy of prematurity Ciliary body cysts Congenital pupillary iris-lens membrane Laser therapy for threshold ROP Microphthalmos Nanophthalmos Persistent hyperplastic primary vitreous Refinoblastoma Topiramate therapy Malignant glaucoma Glaucoma associated with increased venous pressure <ul style="list-style-type: none"> Cavernous or dural A-V shunt Orbital disease Sturge-Weber syndrome Intraocular infection related glaucoma <ul style="list-style-type: none"> Acute herpetic iritis Acute recurrent toxoplasmosis Endogenous endophthalmitis Maternal rubella infection Glaucoma secondary to unknown etiology <ul style="list-style-type: none"> Isidocorneal endothelial syndrome (ICE) Secondary glaucomas associated with hereditary ocular conditions <ul style="list-style-type: none"> Ectopia lentis disorders Primary angle-closure glaucoma Nanophthalmos Retinoblastoma |

APPROACH TO PEDIATRIC GLAUCOMA

- Causes of childhood glaucoma :
 - primary
 - associated with systemic conditions
 - secondary



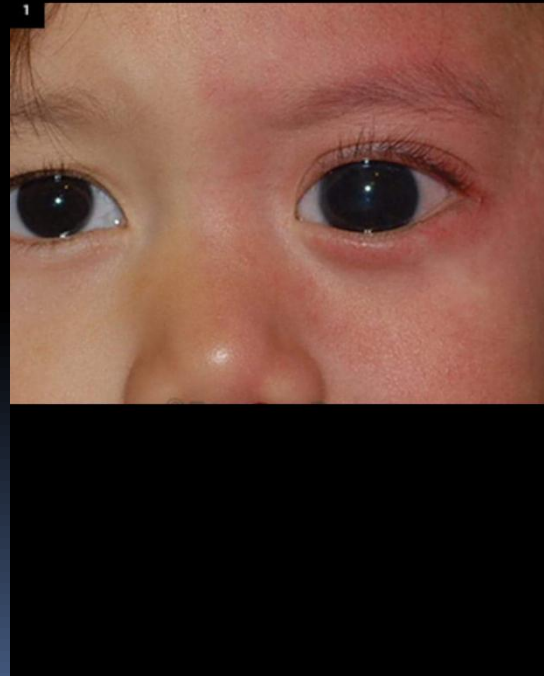
APPROACH TO PEDIATRIC GLAUCOMA

- primary



APPROACH TO PEDIATRIC GLAUCOMA

- Associated with systemic conditions



APPROACH TO PEDIATRIC GLAUCOMA

- Secondary
INFANTILE APHAKIC
GLAUCOMA.....





APPROACH TO PEDIATRIC GLAUCOMA

Examination Under Anesthesia..
(EUA)



APPROACH TO PEDIATRIC GLAUCOMA

■ Examination under anesthesia UAE



Table 4.1 Anesthetics and intraocular pressure in children

| Anesthetics modifying intraocular pressure in children | | | |
|--|-----------------------------------|------------------------------------|------|
| Ether | Bronchial secretion | | >IOP |
| | Bronchoconstriction | | |
| | Valsalva test | | |
| Barbiturates | Difficult to measure exact dosage | | |
| | If insufficient | | >IOP |
| | If excessive | Blood pressure reduction | <IOP |
| | | Respiratory depression | <IOP |
| | Deep anaesthesia | | <IOP |
| | Blood pressure reduction | | |
| Halothane (Fluothane) | Succinylcholine | Paralysis of respiratory movements | >IOP |
| | | Blood pressure increase | |
| | Blood pressure reduction | | <IOP |
| Anesthetics not modifying intraocular pressure | | | |
| Penthrane (Methoxyflurane) | | | <IOP |

First used by Sampaolesi and Carro, 1967, 1969, 1974, 1975 [1-4]

APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE
Equipment for UAE :





APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Goals :

diagnose

classify

identify the etiology

set a baseline

document

monitor



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Seven steps :

- 1-Cornea and Anterior segment
- 2-Intra Ocular Pressure
- 3-Posterior Segment
- 4-Gonioscopy
- 5-Supplemental Examination
- 6-Diagnostic Paradigm
- 7-Summary

APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Cornea and Anterior Segment



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

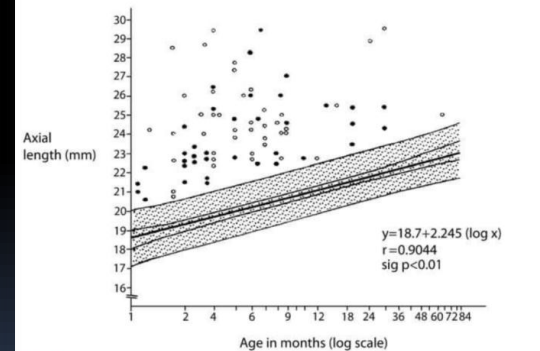
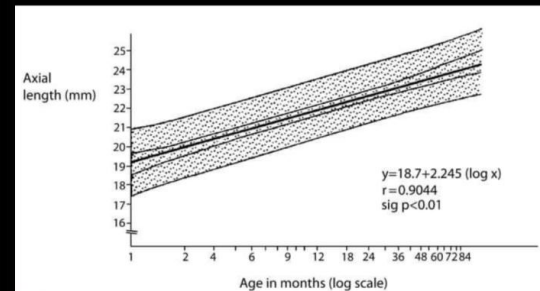
Intra Ocular Pressure
(IOP)

| Age | Minimum | Maximum |
|--------------|---------|---------|
| Below 1 year | 8.4 | 9.4 |
| 1-2 years | 9.4 | 10.2 |
| 2-3 years | 10.4 | 11.1 |
| 3-4 years | 10.9 | 12.0 |
| 4-5 years | 11.6 | 13.1 |
| 5-6 years | 12.2 | 14.2 |

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- Examination under anesthesia UAE

Intra Ocular Pressure
(IOP)



APPROACH TO PEDIATRIC GLAUCOMA

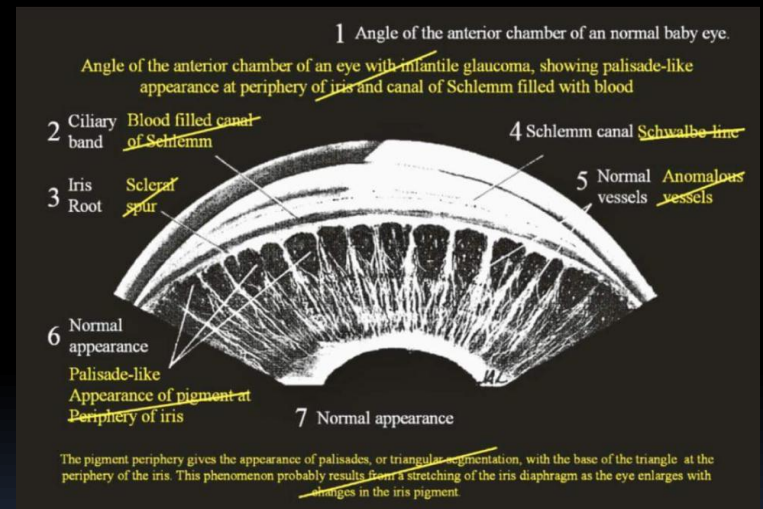
- Examination under anesthesia UAE

Posterior Segment

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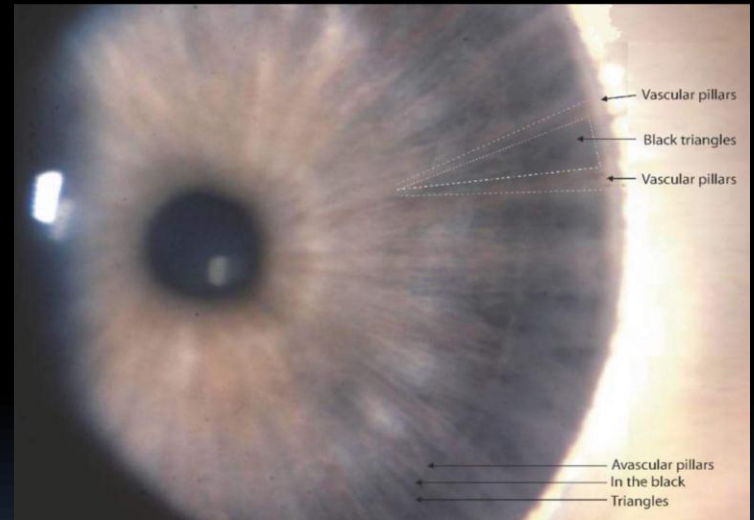
Gonioscopy



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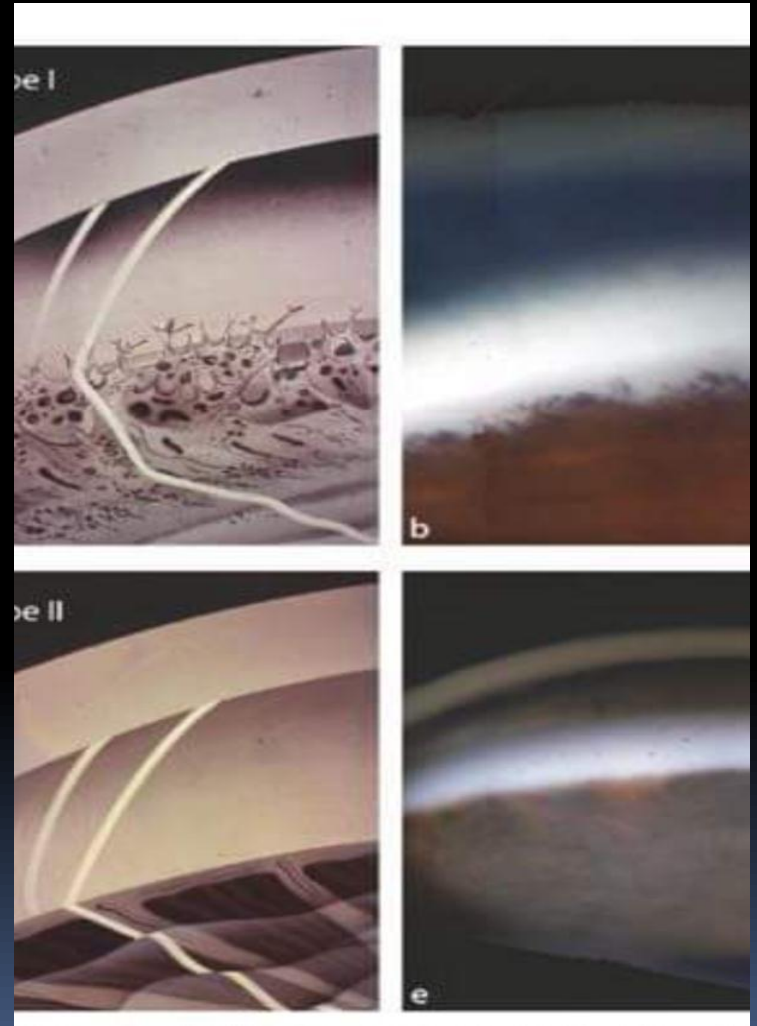
Gonioscopy



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Gonioscopy



APPROACH TO PEDIATRIC GLAUCOMA

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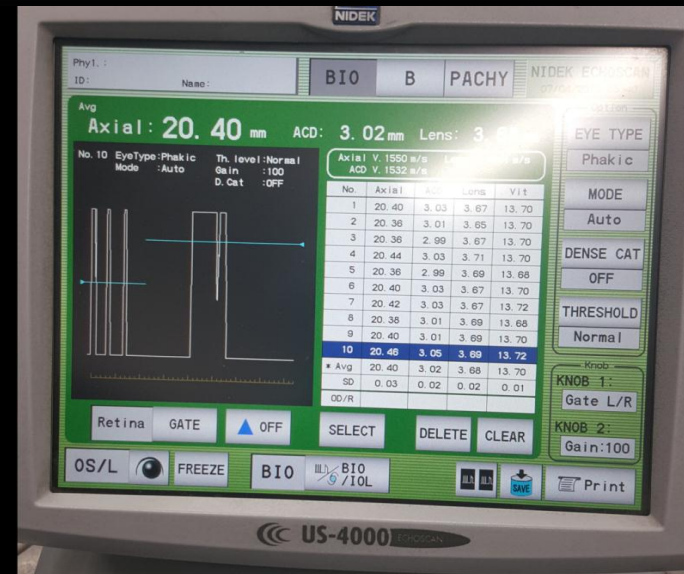
Supplemental
Examination
(axial length)



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Supplemental
Examination
(axial length)



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

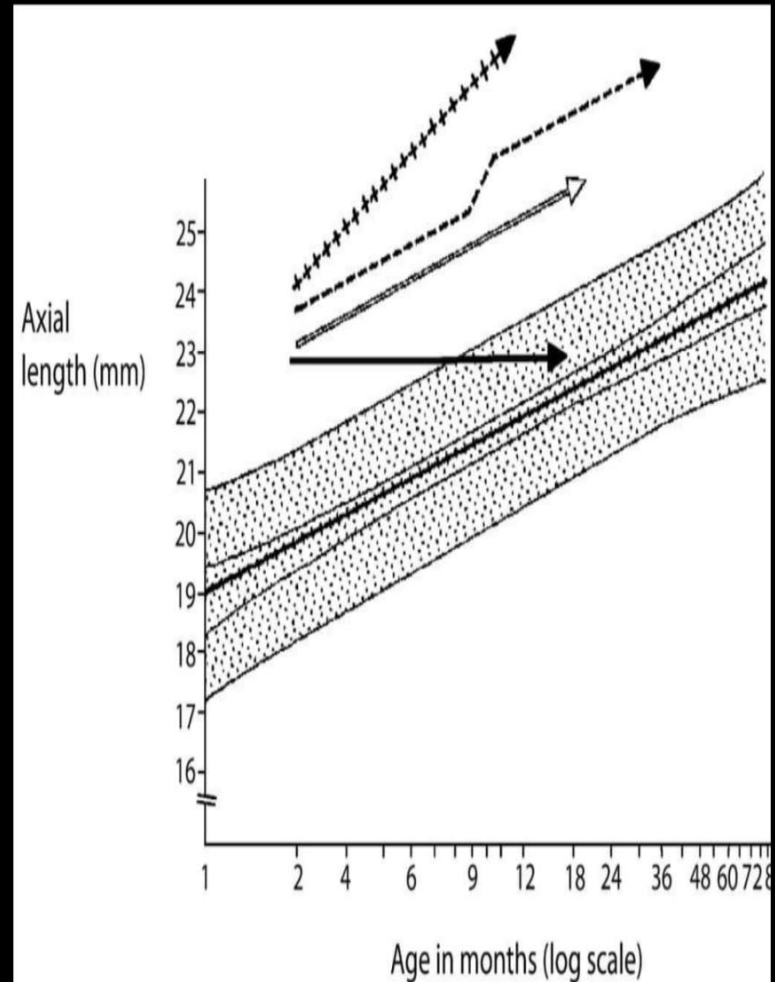
Supplemental
Examination
(axial length)

| Age in months | Y (mm) | 95% confidence interval |
|---------------|--------------|-------------------------|
| | Axial length | Line |
| 1 | 18.7 | 18.2–19.1 |
| 2 | 19.4 | 19.0–19.7 |
| 3 | 19.8 | 19.4–20.1 |
| 4 | 20.0 | 19.8–20.3 |
| 5 | 20.3 | 20.0–20.5 |
| 6 | 20.4 | 20.2–20.7 |
| 7 | 20.5 | 20.3–20.8 |
| 8 | 20.7 | 20.5–20.9 |
| 9 | 20.8 | 20.6–21.1 |
| 10 | 20.9 | 20.7–21.2 |
| 11 | 21.0 | 20.8–21.3 |
| 12 | 21.1 | 20.9–21.3 |
| 18 | 21.5 | 21.3–21.8 |
| 24 | 21.8 | 21.5–22.1 |
| 30 | 22.0 | 21.7–22.3 |
| 36 | 22.2 | 21.9–22.5 |
| 42 | 22.3 | 22.0–22.7 |
| 48 | 22.5 | 22.1–22.8 |
| 54 | 22.6 | 22.2–22.9 |
| 60 | 22.7 | 22.3–23.1 |
| 66 | 22.8 | 22.5–23.3 |
| 72 | 22.9 | 22.5–23.3 |
| 78 | 22.9 | 22.5–23.3 |
| 84 | 23.0 | 22.6–23.4 |

APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

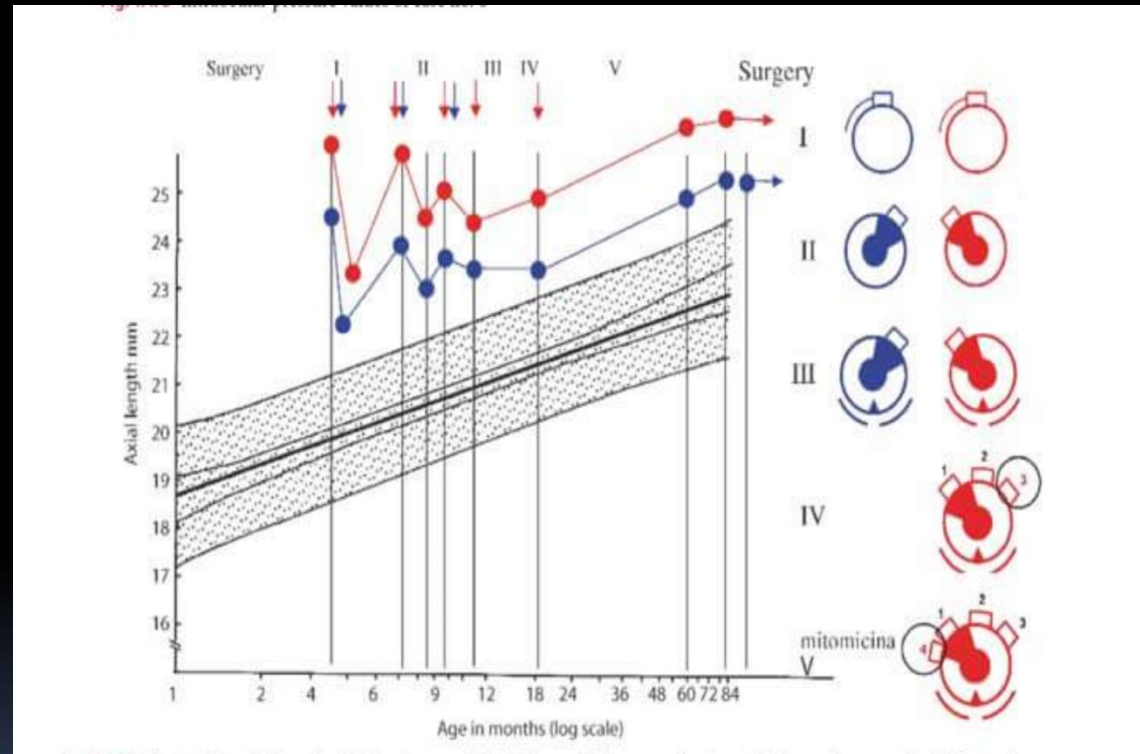
Supplemental
Examination
(axial length)



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

Supplemental
Examination
(axial length)



APPROACH TO PEDIATRIC GLAUCOMA





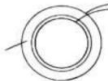

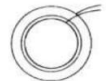



- Examination under anesthesia UAE

Diagnostic Paradigm

APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

EUA Summary

| CONGENITAL GLAUCOMA | | | | |
|---|---|---|--|--|
| Name _____ | Surname _____ | Glaucoma n° _____ | | |
| Age _____ Years _____ Months _____ | Gender _____ | General record n° _____ | | |
| Address _____ | | | | |
| Phone _____ | | | | |
| Referred by _____ | | | | |
| Date _____ | | | | |
| | | OD | OS | |
| DIAGNOSIS | | | | |
| Heredity _____ | | | | |
| General history _____ | | | | |
| Ocular history: Date of onset of symptoms _____ | | | | |
| <hr/> | | | | |
| Axial length | _____ | _____ | | |
| Normal axial length for this age | _____ | _____ | | |
| IOP | _____ | _____ | | |
| Normal IOP for this age | _____ | _____ | | |
| Corneal diameter | _____ | _____ | | |
| Cycloplegia | _____ | _____ | | |
| Anterior segment |  |  |  |  |
| Gonioscopy | | | | |
| Type 1 |  |  |  |  |
| Type 2 | | | | |
| Optic Nerve |  |  | | |
| Peripheral funduscopy | | | | |

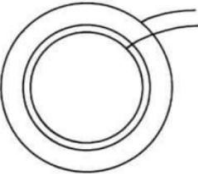

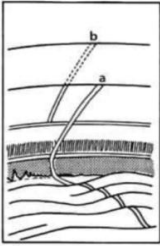
APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

EUA Summary

| SURGERY | Date |
|---------|------|
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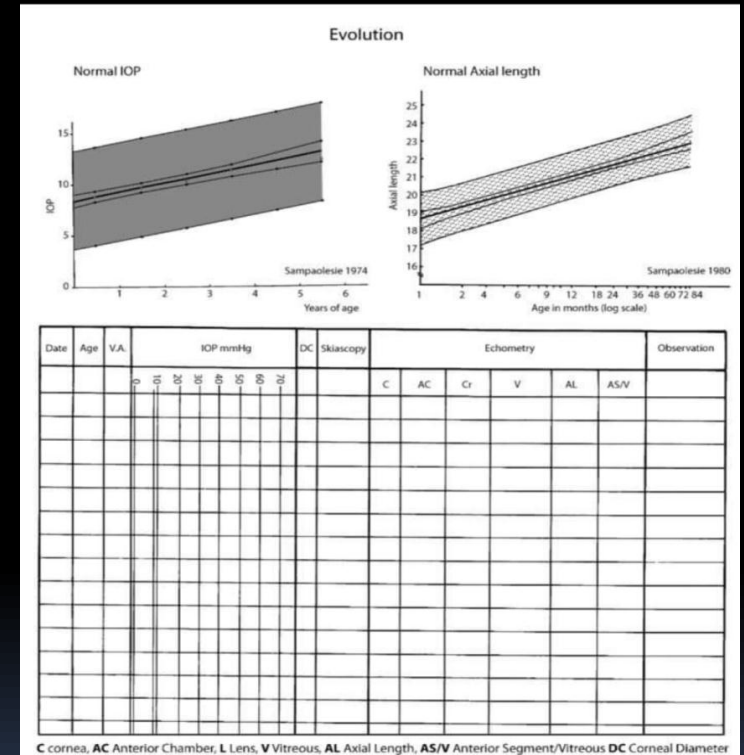
| POSTOPERATIVE EXAMINATION |
|---------------------------|
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| POSTOPERATIVE GONIOSCOPY |
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APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

EUA Summary



APPROACH TO PEDIATRIC GLAUCOMA

- Examination under anesthesia UAE

EUA Summary

| After 6 years of age | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----|------|----------|----|----|----|----|----|----|----|--------|------|-----------|-----------------|---|----|------------------|----|----|------------|--|
| Date | Age | V.A. | IOP mmHg | | | | | | | | Myopia | V.A. | A. Length | Visual Field MD | | | Visual Field CLV | | | HRT: Phase | |
| | | | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | | | | 0 | 5 | 10 | 15 | 20 | 25 | 30 | |
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Date

Summary

APPROACH TO PEDIATRIC GLAUCOMA

- Medical treatment of the pediatric glaucoma

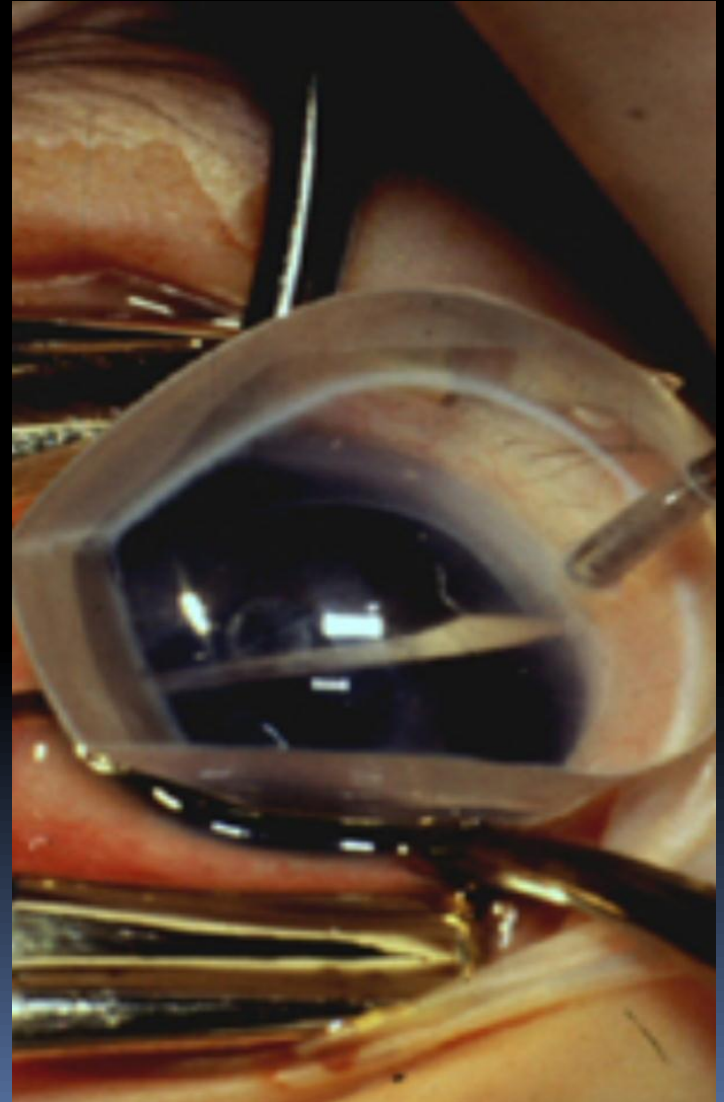


APPROACH TO PEDIATRIC GLAUCOMA

- Surgical treatment of the pediatric glaucoma
 - goniotomy
 - trabeculotomy
 - trabeculectomy
 - trabeculectomy-otomy
 - tube implants
 - cyclodestructive procedures

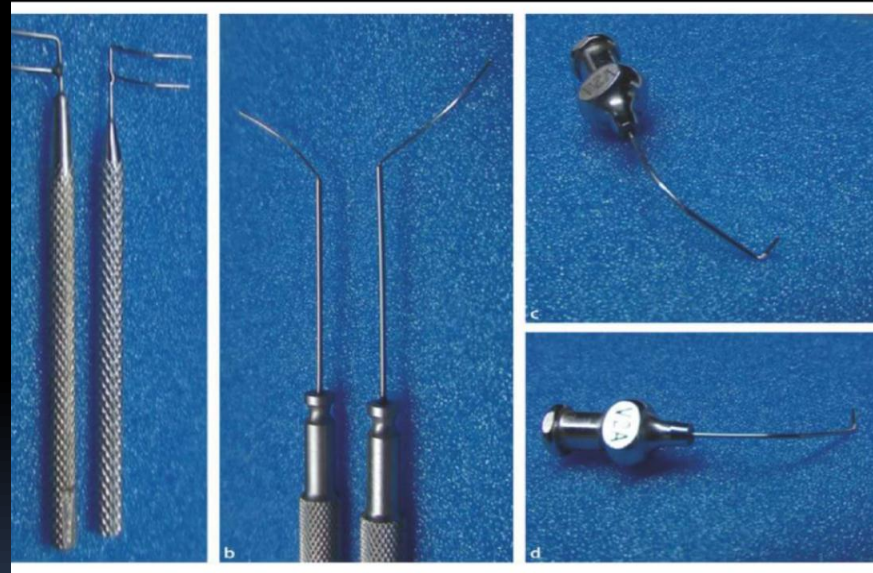
APPROACH TO PEDIATRIC GLAUCOMA

- Goniotomy



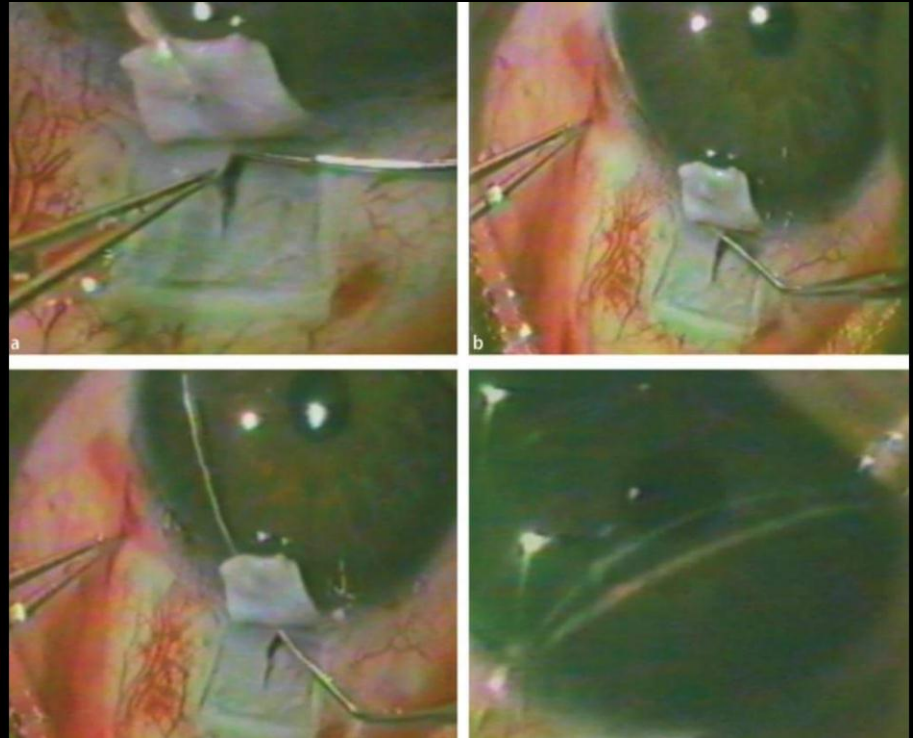
APPROACH TO PEDIATRIC GLAUCOMA

- Trabeculotomy



APPROACH TO PEDIATRIC GLAUCOMA

- Trabeculotomy



APPROACH TO PEDIATRIC GLAUCOMA

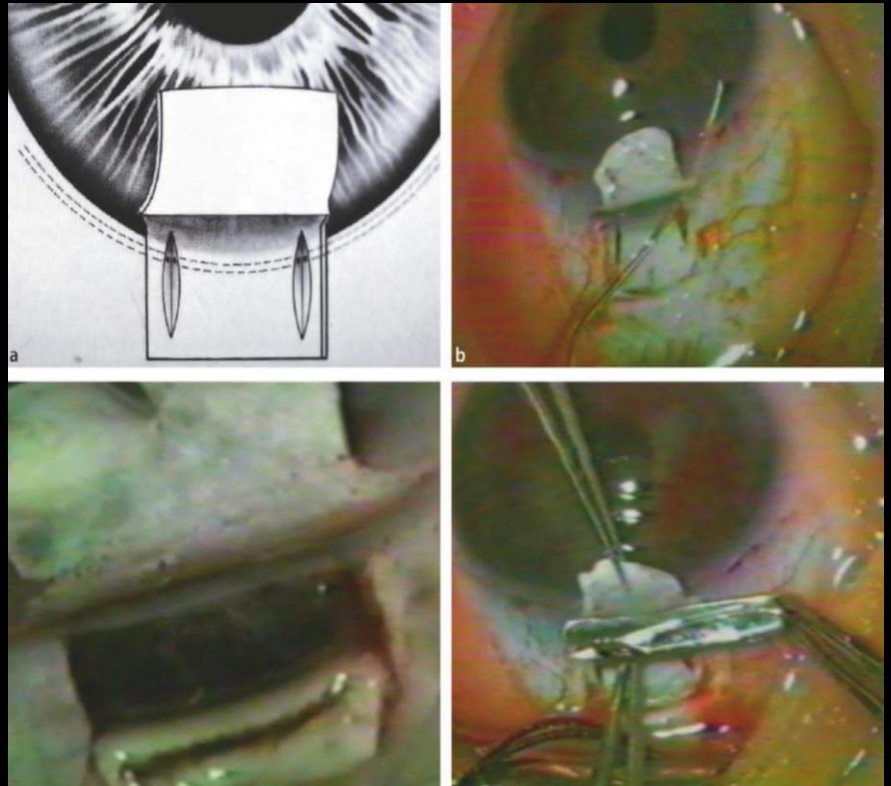
- Trabeculotomy



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APPROACH TO PEDIATRIC GLAUCOMA

- Trabeculectomy



APPROACH TO PEDIATRIC GLAUCOMA

- Tube implants



APPROACH TO PEDIATRIC GLAUCOMA

- Cyclodestructive procedures





APPROACH TO PEDIATRIC GLAUCOMA

- Long Term Resource Planning :
 - Ophthalmologists
 - Instruments and supplies
 - Parents and health planners
 - Doctors , nurses , primary health workers
 - Anesthesia for pediatric patients
- 