

Iris....The Forgotten Part of the Eye

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Heterochromia

- Congenital (AD)
- Acquired

• Melanocytes contain melanosomes which produce melanin.

- Lot: brown
- Moderate: green/hazel
- Low: blue

Heterochromia

- Complete
- Partial/Sectoral
- Central (Cat eyes)

Etiologies

- Waardenburg syndrome
 - Usually autosomal dominant
 - Improper melanocyte differentiation
 - Hearing loss (Melanocytes needed for normal cochlear function)
 - Heterochromia (Can also have bilateral bright blue eyes)
 - Hair hypopigmentation (Patch of white hair)
 - Premature gray hair
 - Broad nasal root

Etiologies

- Glaucoma meds
Prostaglandins

Worse in blue-gray/brown, green-brown, and yellow-brown eyes.

Increase melanin in stromal melanocytes only.

Etiologies

- Inflammation (Such as Fuch's, Posner-Schlossmann)
 - Brown eyes
 - Blue eyes

Etiologies

- Trauma
- Look for iridodonesis and dilated pupil

Etiologies

- Congenital Horner's Syndrome
Disruption of sympathetic stimulation
Iris melanocytes derived from neural crest cells

Etiologies

- Hirschsprung's Disease (Neural crest disorder)
Intestine does not develop properly

Etiologies

- Siderosis (iron deposits from foreign body)
Hemosiderosis (iron deposits from hyphema)
- Heterochromia
Toxic to sphincter

Etiologies

- Glaucoma such as Sturge-Weber (Abnormal migration of melanocytes), ICE, Pigment Dispersion syndrome

Sturge-Weber: Increase in melanocyte activity

ICE

Age related iris atrophy

- Usually more so around the pupillary ruff
- Iris pigment epithelium more resistant to damage
- Pigment can go on endo, anterior lens, and TM
- Miosis, Decrease in light response

Iridioschisis

- Usually in elderly
- Split between anterior and posterior stroma
- Usually inferior
- Shredded wheat
- 50% of the time associated with glaucoma (Ischemia?)

Atrophy from cataract surgery

Iridodialysis

- Separation of iris from CBB

Iridology

- Patterns in iris can determine systemic issues
- Iris is divided in zones that correlate to different body areas (Kidney correlates to lower part of iris)
- Predicts later health problems
- Studies have shown.....

Study

- Dark colored iris = more anxiety, increase in sleep disturbances, experience more pain, less tolerant to heat, more depressed

Benign

Iris Freckles

- Increase in pigmentation of the anterior border layer melanocytes (No increase in number of cells or mass)
- No stromal involvement
- Multiple
- Bilateral
- Never distort the iris architecture
- No associated thickening
- Always flat
- "Spotch"
- No malignant potential (Should never change or grow in size)
- Can get more pigmented over time
- Occurs in about 60% of the population!
- More commonly seen in a lighter iris
- Management: None

Iris Nevus

- Benign proliferation of stromal melanocytes (Composed of spindle cells)
- Blend with stroma
- On the superficial aspect of the iris
- More often solitary but can be multiple
- Can also be diffuse (Associated with ocular melanocytosis)
- Rarely can have a tapioca appearance
- More often unilateral but can be bilateral
- Rough/smooth surface
- Can be pigmented or amelanotic
- Usually flat but can be slightly elevated
- Usually less than 3mm
- 80% are along the inferior iris
- Benign...but does have malignant potential
- Affects 5% of the population

Iris Nevus

- Can change iris architecture (Can cause pupil distortion or sectoral cataract by infiltrating the iris)... Must differentiate from a melanoma
- Also associated with primary epithelial cysts

Iris Nevus

- On ultrasound, iris nevus will have higher reflectivity than an iris melanoma.
- Is the iris pigment epithelium intact?

Iris melanocytoma

- Iris melanocytoma is a variant of an iris nevus but just more deeply pigmented and has a cobblestone appearance.
- High chance of leading to pigment dispersion
(Pigment can break off)
- 5% risk of malignancy
- Rarely can have a necrotic center

Highly reflective

Management of a Iris Nevus

- Typical iris nevus (Looks benign)...

 1. Take Anterior Seg photo
 2. Recheck in 6 months

Management of Iris Nevus

- Suspicious iris nevus (Not sure whether malignant or benign)

 1. Anterior seg photo, gonio
 2. Recheck in 3-6 months
 3. Recheck in 6-9 months
 4. Recheck in 1 year

Management of Iris Nevus

- Bad looking iris nevus (Looks malignant)

 1. Refer!!

Adenoma of the Iris Pigment Epithelium

- Benign (Very rarely can it become an adenocarcinoma which is malignant)
- Rare
- Dark/gray/black (Very heavily pigmented) nodule
- Typically solitary
- Typically small
- Smooth for the most part but can be multi-nodular
- Can enlarge but usually does not
- Does not involve the iris stroma (like seen in iris nevi, iris melanocytoma, and iris melanoma)
- Typically no feeder vessels
- No dilated episcleral blood vessels
- Usually at the peripheral iris (Because in the peripheral can affect the TM which can lead to pigment dispersion/glaucoma)
- Anteriorly displaces the iris stroma which leads to iris atrophy (This allows better view of the adenoma). First noticed when young vs. old??
- Under-diagnosed
- Treatment: Monitor as you would with a suspicious nevus

Leiomyoma

- Rare
- Benign
- Usually noted in females
- Originates from smooth muscle (Can originate from the sphincter or dilator muscle)
- Solitary
- Typically amelanotic
- Can be vascular
- Hormones play a role in formation due to similar appearance of uterine leiomyoma
- Difficult to distinguish from an amelanotic melanoma (Transillumination may help as it transmits more light...appears brighter)
- Treatment: Monitor

Juvenile Xanthogranuloma

- Typically seen in infants/children (Usually seen <3 years old)
- Dermatologic condition (Inflammatory etiology)
- Benign
- Lesions typically seen on head/face (firm, well demarcated, multiple raised papulonodules that are tan, red, yellow, orange are noted)
- Almost always unilateral when involving the iris
- On the iris, multiple yellowish nodules are noted (Can actually lead to heterochromia)
- Can be vascular (**Most frequent cause of spontaneous hyphema in children as these lesions are fragile/weak)
- Can have an uveitis
- Link with NF-1, Epilepsy, Niemann-Pick disease (lipid metabolism issue), and Juvenile myelomonocytic leukemia
- Nodules can be seen in other areas in the eye (Second most common area is the eyelid)
- Treatment: Topical/Systemic/Intra-vitreal steroid may help

Lisch Nodules

- Melanocytic iris hamartomas (overgrowth of tissue)
- Benign
- Multiple
- Small (<2mm)
- Sharply defined
- Dome shaped
- Smooth masses on stromal surface
- Tan/brown
- Bilateral
- Seen in almost all NF-1 patients (Café-au-lait spots, prominent corneal nerves, S-shaped ptosis, optic nerve gliomas, multiple neurofibromas)

Koepe/Busacca Nodules

- Busacca Nodules → In peripheral iris, whitish-yellow in color usually
- Koepe Nodules → At pupillary ruff, smaller, more common, typically more pigmented
- Accumulation of inflammatory cells
- If nodules are found in the angle...Berlin's
- An indication of a granulomatous iritis but Koepe nodules can also be seen in non-granulomatous iritis
- "Mutton-Fat" KPs
- Think
 1. Sarcoids (Most common)
 2. VKH (Vogt-Koyanagi-Harada Syndrome)
 3. Toxocariasis
 4. TB
 5. Sympathetic Ophthalmia
 6. Leprosy
 7. Syphilis
 8. Lyme Disease
 9. Fuch's Heterochromia Iridocyclitis

Treatment: Once the underlying iritis is taken care of, the nodules should go away

Pigmented granules on iris due to pigment dispersion syndrome

- Pigment granules on iris within furrows
- Bilateral
- Brown (even if light iris)
- Posterior pigment layer of the iris rubs up against the lens zonules due to backward bowing of the peripheral iris (Reverse pupillary block)
- Kruckenberg spindle (The more dense this is, the more likely pigment granules will be on the iris)
- Pigment in anterior chamber
- Radial slit defects in the mid peripheral iris which will eventually lead to iris atrophy. An irregular/larger pupil will develop over time.
- Pigment on on posterior capsule (Zentmeyer's line)
- Pigment on zonules
- Gonio shows wide open angles with heavily pigmented TM

Iris nodules secondary to Iris Nevus Syndrome /Cogan-Reese Syndrome

- ICE (Iridocorneal syndromes)
- Corneal endothelium grows over the anterior chamber angle and iris
- Abnormal endothelium will eventually contract
- Can lead to secondary angle closure glaucoma
- Fine, beaten-metal appearance to endothelium
- Usually unilateral
- Females
- Iris is flattened
- Loss of iris crypts
- Matted or smudged appearance to the iris
- Corectopia/Pseudopolyopia/PAS are less likely
- Iris atrophy is variable (50% don't have it)
- Cogan-Reese Syndrome: Iris nodules represent buds of normal stroma ("Mushroom patch")
- Iris Nevus syndrome: Thought to be actual nevi.

Iris Mammillations

- If the only finding, this is an incomplete expression of ocular melanocytosis. This has not been found to be associated with uveal melanomas
- Can also be associated with NF-1, Axenfeld-Rieger's, and Peter's anomaly

Iris Cyst (Primary)

Pigment Epithelial Cyst

- Unilateral
- Usually solitary
- Dark/Brown
- Globular
- Usually in the inferior temporal quadrant
- Abnormal/localized bulge under iris ("Ball under carpet")
- Transparent/Translucent (key!!!)
- Minimal to no growth
- Pupil is able to dilate normally
- Can be at the pupillary border, mid zone, or iris root
- Overlying iris may atrophy
- Cysts can collapse and reform into multiple, irregular cysts (iris flocculi)
- Can be dislodged and can float in the anterior chamber (Can get stuck to the angle or endo)
- Treatment: Watch

Stromal Cyst

- Similar to a pigment epithelial cyst but is usually within the stroma.
- Less common
- Appears more translucent/fluid filled
- Tends to enlarge more quickly when compared to a pigment epithelial cyst
- More likely to lead to a secondary glaucoma or corneal decompensation
- Most will need to be removed (Aspiration and alcohol irrigation)

Secondary Cyst

- Ingrowth of surface epithelium
- Etiologies
 1. Parasites
 2. Tumors
 3. Miotics (Will typically be bilateral and smaller...can prevent with phenyl 2.5%)
 4. Trauma/Surgery (Two most common reasons)

Brushfield spots

- Iris stromal hyperplasia surrounded by hypoplasia
- Usually noted in lighter irises
- Small white/grayish spots in mid-peripheral iris
- Slightly elevated
- Bilateral
- 90% of patients will have Down's syndrome
- If similar lesions are found in a normal patient (Called Wolfflin nodules...24%)...These nodules are more in the peripheral iris (Connective fibers)

Malignant

Iris melanomas

- Makes up 5% of uveal melanomas
- Malignant melanocytic neoplasm (from iris stroma)...Composed usually of spindle B cells (most common)
- More common in blue/grey eyes
- M=F
- Usually occurs in 5th or 6th decade of life
- If melanoma happens when patient is young think..
 1. Nevus of Ota
 2. Dysplastic cutaneous nevi (Hereditary development of nevi...increased risk of melanomas)
 3. Familial melanoma
 4. NF-1
- Typically from a pre-existing iris lesion
- Very few are aggressive (Less than 5% metastasize)
- 80% involve the inferior iris (sun exposure)
- Prognosis is typically good especially if it is caught early

4 types of iris melanomas

- Solitary (pigmented vs. non-pigmented)
- Ipsilateral hyperchromic heterochromia (Diffuse growing intrastromal melanoma...type of ring melanoma)
- Tapioca (Presents with multiple surface nodules...Glisten)
- Trabecular meshwork melanoma (Confined to the TM as a ring melanoma)

Risk Factors

- Greater than 3mm in diameter
- Greater than 1 mm in thickness
- Lesion is not transparent
- Surface vascularity (Easier to see in non-pigmented lesions)
- Feathery margins
- Pupil distortion
- Localized cataract
- Increased IOP
- Pigment on endo (Pseudo-Krukenberg spindle)
- Iritis
- Band keratopathy
- Hyphema
- Feeder vessels
- Pupil does not dilate normally
- Pigment in sclera adjacent to melanoma
- Documented growth (#1 sign of malignancy)

Iris melanomas

- Must make sure there is no involvement of the CBB
- CBB tumors typically start behind the iris
- Look for dilated episcleral vessels (Sentinel blood vessels)...Can see with iris melanomas but more so in CBB melanomas
- Can be superior/inferior
- Can be a ring melanoma as well

Iris Metastasis

- Usually patient already has a systemic malignancy
- Usually amelanotic (pink/yellow lesions)
- Multiple nodules
- Fast growing
- Presents with an iritis
- Can get a hyphema, NVI
- Pseudo-hypopyon (Consists of tumor cells)
- Prostate/lung cancer: males
- Breast cancer: females

Retinoblastoma

- Multifocal iris nodules with iritis is noted
- Most common primary intra-ocular malignancy
- Usually seen before age 3
- Leukocoria
- Strabismus
- Increase in IOP
- Orbital inflammation
- Retinal tumor

Leukemia

- ☐ Can get iris infiltration which presents as nodules
- ☐ Hyphema
- ☐ Heterochromia
- ☐ Pseudo-hypopyon
- ☐ Iritis
- ☐ Associated with most types of leukemia (Acute lymphoblastic the most common)
- ☐ Poor survival rate if iris nodules are noted (less than 3 months)