tumor /tu·mor/ (too´mer)
also called neoplasm, a new growth of tissue characterized by progressive, uncontrolled proliferation of cells. The tumor may be localized or invasive, benign or malignant. A tumor may be named for its location, for its cellular makeup, or for the person who first identified it.


Tumor Definition

• Eyelid Tumors
• Iris / Ciliary Body / Choroidal Tumors
  • Retina / ONH and Pigment Epithelium
• Conjunctival Tumors

Ocular Tumors

Squamous Cell Carcinoma

Basal Cell Carcinoma

Lecture Outline

• Choroidal Nevus
• Choroidal Melanoma
• Congenital Hypertrophy of the RPE
• Choroidal Metastasis
• Melanocytoma
• Combined Hamartoma of the Retina & RPE
• Choroidal Hemangioma
• Choroidal Osteoma
• Retinal Astrocytic Hamartoma
• Retinoblastoma
Ocular Anatomy

Retinal Anatomy

Cirrus HD-OCT Healthy Macula

Melanocyte vs Melanosome

CHOROIDAL NEVUS

- Most common intraocular tumor
- Proliferation of choroidal melanocytes
- Present in ~ 7.9% of Caucasians
- Growth is rare after puberty

Choroidal Nevus
As we age:
• Nevus increase in number and thickness
• Pigment changes
• Metaplasia
• Drusen / lipofuscin

Choroidal Nevus

• Nevus are less than 2mm in thickness
• No known relationship to sunlight exposure
• Have indistinct borders
• May undergo malignant change into melanoma

Choroidal Nevus

Typically do not cause visual symptoms
• Signs of Suspicion
  • Vision changes
  • > 2 mm in thickness
  • Orange pigment
  • Proximity to optic disc
  • Subretinal fluid

1 in 8845 transform into melanoma

Clinical Findings

Population by Race for the US: 2012
RACE
Total population . . . . . . . . . . . . 313,914,040 100.0%
Caucasian . . . . . . . . . . . . . . . . . 244,852,951 78.%

Source: quickfacts.census.gov

Nevoma?
• T= thickness
• F= subretinal fluid
• S= symptoms
• O= orange pigment
• M= tumor margin touches disk

To Find Small Ocular Melanoma

• No risk factors (<4%)
• 1 risk factor (36%)
• 3 risk factors (50%)
• 5 risk factors (70%)

Documented growth - means everything
Using helpful hints = Ultrasound hollow, Halo
Nevus vs Melanoma?

Special Testing

OCT
- Can detect retinal edema, subretinal fluid, retinal thinning and RPE detachment
- Helpful in determining presence of drusen

FA
- Findings depend on the amount of pigment within nevus and the overlying RPE
- Hypofluorescence due to blockage of choroidal filling
- Hyperfluorescence of surface drusen

Treatment & Management

- Baseline fundus photography
- Consider OCT if location permits
- Consider B-Scan if suspicious
- Yearly dilated fundus examination

CHOROIDAL MELANOMA
Choroidal Melanoma

- Accounts for 90% of all uveal melanomas
- Cells undergo neoplasia, reproducing at a faster rate than usual
- Typically large
  - Although 30% are less than 3 mm thick

Clinical Findings

- Orange pigment
  - May be amelanotic
- Look for subretinal fluid
  - 91% vs 14% of nevi
  - Intermittent blurred vision or flashes secondary to fluid shift
  - Fluid = significant risk of metastasis

Retinal Arterial Macroaneurysm
**Presentation of Melanoma**

- Asymptomatic
- Systemic well
- Flashes
- Scotoma
- VF defect
- Vitreous hemorrhage
- Pain is rare

**Risk Factors of Melanoma**

- Caucasian ethnicity
- Light colored eyes (blue)
- Fair skin
- Propensity to burn when exposed to UV light
- Cutaneous nevi or freckles
- Iris nevi
- Welders

**Quadrant Uveal Melanoma in 8100 patients**

- Superior 22%
- Macula 4%
- Temporal 28%
- Inferior 22%
- Nasal 21%
- Diffuse 3%

Shields CL, et al. Uveal melanoma analyses in 8100 consecutive patients. Report 1

**Special Testing**

- OCT
  - Can detect sub-retinal fluid
  - Has been shown to detect early seeding
  - Helpful in monitoring response to treatment
- B Scan
  - Acoustically hollow
  - Choroidal excavation with orbital shadowing
  - Classic mushroom appearance (less common)
  - Can identify extraocular extension
- FA
  - No pathognomonic pattern
  - Typically, mottled fluorescence during arteriovenous phase, followed by leakage and staining

**Sentinel Vessels**

**Intrinsic Blood Vessels**
Collaborative Ocular Melanoma Study

- Organized and funded in 1985 to address issues related to the management of choroidal melanoma, > 4000 patients, 65% pts eligible
- Primarily to study the overall survival of patient following treatment
  - Small melanomas < 2.5 mm in height
  - Medium melanomas 2.5 – 10.0 mm in height
  - Large melanomas > 10.0 mm in height
- Secondary outcomes = metastasis-free survival, years of useful vision

Risk factors for metastasis

- Thickness > 2 mm
- Symptoms: Flashes, floaters, loss of vision
- Proximity to the optic nerve
- Documented growth

Uveal Melanoma

- 10 year mortality for uveal melanoma
  - Large 50%
  - Medium 25%
  - Small 12%
- Pattern of metastasis
  - Uveal: hematogenous
  - Cutaneous: lymphatic
- Most common sites of metastasis for uveal melanoma
  - Liver 89%
  - Lung 29%
  - Bone 17%
  - Skin / Subcutaneous 12%
- Median survival after dx of metastasis - 6 months

Using fluorescence in situ hybridization and molecular assay techniques, several genetic abnormalities in uveal melanoma were found on chromosomes 1, 3, 6, and 8
- Monosomy 3
  - Found in up to 50% of uveal melanomas
  - Imparts a worse prognosis.
  - In small melanoma it provokes the argument for earlier treatment than observation.

Role of Cytogenetics
Interesting Case...
CONGENITAL HYPERTROPHY OF THE RETINAL PIGMENT EPITHELIUM

Common benign lesion

Focal area in which the RPE cells are taller and more densely packed with melanosomes

Clinical Findings

- Discrete margins, typically near the equator
- Lacunae are common
- Multiple lesions may be confined to one sector of the fundus – bear tracks

Congenital Hypertrophy RPE

- These lesions are not true tumors
- No growth
- No subretinal fluid
- Ultrasound will show flat lesion
- No intrinsic vessels
Familial Adenomatous Polyposis (FAP)
- AD inheritance
- Adenomatous polyps throughout rectum & colon
- Starts to develop in adolescence (15-40 yrs)
- If untreated – all pts will develop colorectal cancer

Systemic Association

>80% of patients with FAP have atypical CIBPE lesions

Treatment & Management

- Typically remains stationary
- May occasionally increase in diameter or spawn an elevated nodule that may represent adenoma or adenocarcinoma

CHOROIDAL METASTASIS

Most common site for uveal metastases -90%
Estimated incidence of 30,000 cases/year
Choroidal melanoma 2,500 cases per year
- Primary site
  - Breast (women)
  - Lung (men)

Choroidal Metastasis

Clinical Findings

- Creamy-white, placoid choroidal lesion
- Fast growing
- Usually found in posterior pole
- Exudative RD common
- Tumors may metastasize elsewhere

Lung Metastasis

- Most common site for uveal metastases -90%
- Estimated incidence of 30,000 cases/year
- Choroidal melanoma 2,500 cases per year
- Primary site
  - Breast (women)
  - Lung (men)
Breast Metastasis

Choroidal Metastasis

Metastatic Breast Cancer

OCT
- Dome shaped elevation of retina and RPE with adjacent subretinal fluid
- Can detect retinal edema, RPE thickening and RPE detachment

B Scan
- Shows diffuse choroidal thickening
- Moderately high internal acoustic reflectivity

FA
- Shows early hypofluorescence and diffuse late staining

Special Testing

Treatment & Management

- Observation
- Radiotherapy
- TTT
- Systemic therapy
- Enucleation

Ocular metastases are the most common ocular malignancies
- Estimated incidence of 30,000 cases per year
- Choroidal melanoma 2,500 cases per year

Choroidal Metastasis

Ocular metastases are the most common ocular malignancies
- Estimated incidence of 30,000 cases per year
- Choroidal melanoma 2,500 cases per year
Breast cancer is the most common tumor to metastasize to the eye - followed by lung cancer.

85% of patients with breast cancer metastases will have a known history of breast cancer.

Breast cancer metastases tend to be bilateral and multiple.

40% of these patients have a brain metastasis.

Metastatic Tumors

Breast cancer in 2010:
- (< 1%) new cancers in men
- 192,400 (27%) new cancers in women

Metastasis from breast cancer occurs in 25% of women at a median of 5 years. 3 years if ocular metastasis.

The most common location is the lung, bone, lymph nodes and liver.

Metastatic Tumors

Lung cancer metastasis rarely bilateral and multifocal.

They often produce pain.

Lung cancer metastasis 70% of patients don’t know they have cancer.

Chest x-ray very important.

Metastatic Tumors

MELANOCYTOMA

Benign melanocytic uveal tumor.

Composed of large, plump magnocellular nevus cells that are heavily pigmented.

Can present in all age groups and races.
- African-Americans
- Females

Melanocytoma

Patients are usually asymptomatic.

Adjacent to or within the optic nerve.

Black in color with feathery margins.

Visual field defect may be present.

APD may be present.

Clinical Findings
Melanocytoma

- Shows hypofluorescence of deep vessels due to blockage
- The disc margin may stain in late phases

Treatment & Management

- No systemic association
- Typically stationary
- 2% of cases develop into melanoma
- No treatment is recommended

Combined Hamartoma of the Retina & RPE

- Grey pigmentation with superficial gliosis
- Secondary retinal wrinkling and vessel tortuosity
- Lesions can be
  - Juxtapapillary
  - Peripapillary
  - Within posterior pole

Clinical Findings

- Can be asymptomatic
- Absence of retinal detachment, hemorrhage, exudation or vitreous inflammation

OCT

- Disruption of the internal limiting membrane
- Disorganization of involved retina
- Visualization of subretinal surface

FA

- Shows hypofluorescence of deep vessels due to blockage
- The disc margin may stain in late phases

COMBINED HAMARTOMA OF THE RETINA & RPE

- Rare, benign tumor
- Likely congenital
- Involves retina, RPE and overlying vitreous
- Typically presents in late childhood or early adulthood
- Strabismus
- Blurred vision
- Metamorphopsia
- Loss of vision
Systemic Association

Neurofibromatosis
- Type 1
  - Café-au-lait spots
  - Neurofibromas
  - Lisch nodules
  - Short stature
  - Scoliosis

Neurofibromatosis
- Type 2
  - Acoustic neuromas
  - Hearing loss
  - Balance problems
  - Cataracts

Special Testing

OCT
- Shows retinal disorganization and elevation with overlying ERM
- Ability to monitor macular changes 2° to traction

B Scan
- Can be used to rule out compressive lesions
- May be unable to pick up depth of hamartoma
- Findings not characteristic

FA
- Rarely diagnostically important
- Findings are characteristic

Treatment & Management

Patients are monitored annually for
- Growth of lesion
- Vision changes secondary to macular traction

Consider annual OCT of macula

Ask pertinent history questions in regards to NF-1 and NF-2

Refer for vitrectomy with membrane peel in cases where vision is significantly affected

Choroidal Hemangioma

Mass of vascular channels within choroid

Circumscribed vs. Diffuse [Sturge-Weber]

Symptoms in adulthood secondary to RD

CIRCUMSCRIBED
- Orange/red mass with indistinct margins
- Usually peripapillary
- Acoustically solid lesion
- Subretinal fluid or macular edema

choroidalsites.com
**Choroidal Hemangioma**

**Sturge-Weber Syndrome**
- Congenital hamartomatous malformations
- May affect
  - Eye
  - Skin
  - CNS
- Motor seizures – 85%
- Mental retardation – 60%
- Facial cutaneous venous dilation (port-wine stain) present in 96%

**Systemic Association**
- Congenital hamartomatous malformations
- May affect
  - Eye
  - Skin
  - CNS
- Motor seizures – 85%
- Mental retardation – 60%
- Facial cutaneous venous dilation (port-wine stain) present in 96%

**Special Testing**
- OCT
  - Acute leakage shows subretinal fluid with intact photoreceptor layer and normal retinal thickness
  - Chronic leakage shows loss of photoreceptors, retinoschisis, and retinal edema
- B Scan
  - Acoustically solid lesion
  - High internal reflectivity
- FA
  - Rapid spotty hyperfluorescence in the early arterial phase
  - Diffuse intense late hyperfluorescence

**Treatment & Management**

**Diffuse**
- Observation
- Amblyopic therapy
- Laser photocoagulation
- Irradiation
- Retinal detachment surgery
- Enucleation secondary to neovascular glaucoma

**Circumscribed**
- Transpupillary thermotherapy
- Photodynamic therapy for secondary retinal detachment

**CHOROIDAL OSTEOMA**
Choroidal Osteoma

- Benign ossifying tumor of the choroid
- Composed of mature bone
- Young females
- Benign – may grow
- VA < 20/200 in 56-58% after 10 yrs

Clinical Findings

- Orange-yellow lesion
- Typically unilateral
- Well-defined
- Usually juxtapapillary
- Vision loss 2° to
  - Subretinal Fluid
  - Neovascularization
  - Photoreceptor loss

Special Testing

- OCT
  - Inner retina preserved
- B Scan
  - Highly reflective anterior surface
  - Orbital shadowing
- FA
  - Irregular, diffuse mottled hyperfluorescence in the early and late phases
  - Neovascularization may be present

Treatment & Management

- No systemic association
- No malignant potential
- CNVM may develop

Retinal Astrocytic Hamartoma

- Vascular and glial tumor of the retina
- Rare and benign
- No threat to vision
- Frequently seen in tuberous sclerosis
Clinical Findings

- May be multiple or bilateral
- Can be calcified
- Can be
  - Endophytic
  - Vitreous
  - Exophytic
  - Subretinal

Systemic Association

- Solitary lesions may be found in normal individuals
- Tuberous Sclerosis
  - 50% of patients have astrocytomas
  - Multiple/bilateral
  - Rare genetic disease
  - Benign tumors grow on skin, brain, kidneys, and heart

OCT

- Inner retinal thickening and disorganization with a gradual transition to normal retina
- Retinal traction (27%)
- Intratumoral cysts (67%)
- Adjacent edema (47%)

FA

- Hyperfluorescence without leakage

Special Testing

Treatment & Management

- Usually relatively stable
- Can show progressive growth
- Rare cases – exudative retinal detachment and neovascular glaucoma

RETINOBLASTOMA

- The most common primary, intraocular malignancy in childhood
- Results from malignant transformation of primitive retinal cells before final differentiation.
- Seldom seen after age 3

Retinoblastoma
Retinoblastoma

- Heritable
  - germline
  - 70% of cases
  - Pinealblastoma
- Non-heritable
  - somatic
  - 30% of cases

Retinoblastoma – life threatening disease

Most common intraocular malignancy in children / dx=18 month
300 new cases of retinoblastoma diagnosed each year in the US

Initial Features:

- Leukocoria 70%
- Strabismus 25%
- Other (VA) 5%

~15% will present with iris neovascularization
Hyphema may also be present

Leukocoria

- Retinoblastoma
- Coats disease
- Congenital Cataract
- Coloboma
- Toxocariasis
- ROP
- PPHV
- Retinal Detachment

Special Testing

Treatment & Management

In 75% of cases - enucleation is performed
In 25% of cases - conservative treatment is administered
Retinoblastoma Treatment

- Intravenous chemoreduction (carboplatin, etoposide, vincristine)
- Subconjunctival carboplatin
- Transpupillary thermotherapy
- Cryotherapy
- Laser photocoagulation
- Plaque radiotherapy
- External beam radiotherapy
- Intra-arterial chemotherapy (IAC)

International Classification of Retinoblastoma

- **Group A**: Small RB < 3 mm size
- **Group B**: Larger RB > 3 mm size
- **Group C**: Contained seeds
- **Group D**: Diffuse seeds
- **Group E**: Extensive > 50% globe, NVI, Opaque media

Recurrences = within 1st year

LYMPHOID TUMORS

Lymphoid Tumors

- Primary Intraocular
- Uveal

Primary Intraocular Lymphoma

- Proliferation of B lymphocytes
- Accounts for 65% of cases of intraocular lymphoma
- 90% of the time it is bilateral
- Increased incidence in immunosuppressed patients

Clinical Features

- Symptoms = unilateral floaters, blurred vision, red eye or photophobia
- Patchy yellow lesions
- Secondary vitreous cells - “clumps”
- Primarily affects the retina and/or optic disc
Primary uveal lymphoma effectively managed with oral chlorambucil: a case report.


Treatment & Management

- Radiotherapy – if tumor is confined to the eye
- Intravitreal methotrexate
- Systemic chemotherapy

Uveal Lymphoma

- Uveal lymphoma = systemic
- Typically non-Hodgkin B-Cell lymphoma
  - T-cell lymphoma
  - Hodgkin disease
  - Other forms of lymphoma

Clinical Features

- Usually unilateral
- Yellow-orange lesions
- Can occur as a solitary mass
- Vitreous is usually clear
- Secondary exudative retinal detachment

Systemic chemotherapy

- Whole-eye irradiation
- Plaque radiotherapy

LEUKEMIA
Leukemia

- Abnormal proliferation of white blood cells
- Ocular involvement typically seen in the acute form
- Most patients have known systemic disease
- Usually a sign of severe disease

Clinical Features

- Diffuse or patchy thickening of the retina and choroid
- Retinal hemorrhage
- Optic disc infiltration
- Vitreous cells

Ocular involvement in 80% of patients

Treatment & Management

- Management of systemic disease
- Ocular radiotherapy

choroidal nevus
choroidal melanoma
retinoblastoma
choroidal osteoma
choroidal hemangioma
astrocytic hamartoma
choroidal metastasis
choroidal hemangioma
retinoblastoma
choroidal melanoma
choroidal osteoma
lymphoid tumor
References


The End!

Thank you

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