Fine Needle Aspiration of the Eye: A New Frontier

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McKee Cytology Seminar
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Objectives

• Review the anatomy and histology of the eye

• Discuss sampling methods for lesions of the eye

• Present interesting cases seen at MUSC
  • Review key points of each diagnosis
  • Give follow up on patient outcomes
Anatomy & Histology
Sampling Methods
Sampling Methods

• Skin
  • Scraping or FNA

• Cornea or conjunctiva
  • Brushing, scraping, impression cytology

• The aqueous
  • Paracentesis

• Iris and ciliary body
  • FNA

• The vitreous
  • Aspiration during vitrectomy and washout

• Retina and choroid
  • Biopsy or FNA
Case 1
History of Present Illness:
• 74 year old man
• Referred to Ophthalmology for a 2 month history of decreasing vision and pain in the left eye

Physical Exam:
• Granulomatous inflammation of the left eye only
• Pigmented iris nodules appearing to be inflammatory
• Found to have elevated intraocular pressure

Assessment & Plan:
• Anterior chamber tap performed and specimen sent for cytology
• Prescribed topical ocular hypotensives, prednisone and atropine
Past Medical History

• Diagnosed with adenocarcinoma of the lung in November 2013
  • Presented with several months of cough, shortness of breath and headaches
  • Found to have a RUL mass with fissural/bronchial thickening on chest CT
  • Positive paratracheal lymph node

• Initially good response on chemotherapy, then developed liver, bone and brain metastases, now with 2 new suspicious lesions on brain MRI

• Currently on second clinical trial
Lung Biopsy
Lung Biopsy

• Lung, left, CT guided FNA
  • POSITIVE FOR MALIGNANT CELLS CONSISTENT WITH ADENOCARCINOMA
  • Groups of malignant cells are present with round to oval nuclei, focally prominent nucleoli and intracytoplasmic mucin vacuoles, in keeping with adenocarcinoma.

• Lung, labeled as “left lung tissue”, core biopsies
  • ADENOCARCINOMA OF PUMONARY ORIGIN, ACINAR PATTERN
  • Immunostains:
    • TTF-1: Nuclear positive
    • Napsin-A: Cytoplasmic positive
  • Tumor measures 1 cm in greatest linear extent
Eye, Aqueous Fluid
Eye, Aqueous Fluid

- NEGATIVE FOR MALIGNANT CELLS

- Pigmented retinal cells and macrophages are present.
Follow Up

- Diagnosed with anterior granulomatous uveitis with elevated IOP and glaucomatous atrophy
  - Poor visual prognosis for left eye
- Chest CT not compatible with sarcoid
- Consult glaucoma service for management of elevated IOP in right eye
Case 2
History of Present Illness:
• 84 year old man
• Presented to ED complaining of left eye pain, redness, decreased vision and photophobia
• 2 day sensation of having sand in his eye after putting steroid drops in the wrong eye
  • Corneal transplant and cataract surgery in right eye 2 months ago
• Progressive pain and vision loss

Past Medical History:
• Left corneal transplant 2 years ago
• Remote history of nail trauma to the left eye causing pupil abnormality
• Prostate cancer, hypertension, hypothyroidism
Assessment and Plan

- Endophthalmitis of unclear etiology
- Ultrasound:
  - Significant vitreous debris that is freely mobile on dynamic ultrasound, compared with minimal vitreous opacities of the right eye
  - Elevated intraocular pressure
- Admit to Ophthalmology service
- Plan for intravitreal tap
- Inject antibiotics
- Work up source of endogenous etiologies:
  - Blood and urine cultures
  - CXR and echocardiogram
  - ID consult
Eye, Fluid
Eye, Fluid

• SEE ADDITIONAL FINDINGS

• Predominately blood and bacteria are present only.
• Please correlate with concurrent microbiology results.
Follow Up

- Endophthalmitis purulent
  - *Streptococcus mitis* susceptible to vancomycin
- No endogenous source found, work up negative
- Continues to have 7/10 pain and dense vitreous debris on ultrasound
  - Has lost light perception in left eye
- Recommend enucleation, patient declines
- Continue topical antibiotics and steroids
Case 3
History of Present Illness:
• 86 year old woman
• Presented to the ED complaining of vision changes in her left eye
• Vision changes started 1-2 weeks ago, but now feels like a curtain came down over her eye and she cannot see above it

Physical Exam (left eye):
• Visual acuity: 20/800
• Visual fields: Total superior temporal, superior nasal deficiencies
• Fundus exam: “mac-off” retinal detachment; superonasal speckled pigmentation with elevated and lumpy choroid; inferior, nasal retinal detachment

Assessment & Plan:
• No acute intervention
• Plan for evaluation with ophtho oncology first for possible neoplasia
Past Medical History

• Ophtho:
  • Glasses
  • Amblyopia left eye (20/400 vision at baseline)
  • Cataract left eye
  • Posterior chamber intraocular lense right eye

• Medical:
  • Breast cancer in 1995, s/p lumpectomy and radiation therapy
  • Normal pressure hydrocephalus s/p shunt
  • Chronic atrial fibrillation fib s/p Lariat procedure
  • Also: osteoporosis, hyperlipidemia, hypertension and depression
Interval Workup

- Choroidal mass lesion in left eye with associated mac off retinal detachment
  - CT chest - multiple new pulmonary nodules consistent with metastases - unknown primary
  - CT orbits - enhancing nodularity consistent with choroidal metastases
  - B scan (ocular ultrasound) with multifocal choroidal lesions

- DDx:
  - Primary concern: Choroidal metastasis
  - Secondary possibilities: Primary choroidal tumor or peripheral exudative hemorrhagic chorioretinopathy (PEHCR)

- Recommend choroidal biopsy to aid in determining primary tumor
Fluid, Left Eye Choroidal Mass
Fluid, Left Eye Choroidal Mass

• POSITIVE FOR MALIGNANT CELLS

• Scattered single and small loosely cohesive groups of atypical cells with hyperchromatic nuclei, occasional binucleation and prominent nucleoli and delicate cytoplasm are present. The cells show plasmacytoid and spindle appearance. The differential diagnosis includes primary choroid melanoma and metastatic carcinoma.
EBUS

- Lymph node, 10L, FNA
- Lymph node, 11L, FNA
- Bronchial Washing, RLL
- Bronchial Brushing, RLL
- Transbronchial biopsy x 3, RLL

Negative for malignant cells
Follow Up

• Scheduled to have a CT guided FNA of the 2.6 cm right lower lobe lung lesion
Case 4
History of Present Illness:
• 77 year old man
• Presented to his ophthalmologist in July 2016 with a 3-4 week history of decreased vision in the left eye and floaters, gradually worsening

Physical Exam:
• Left ciliary body mass with mushroom shape (10 x 12 x 9 mm) and low internal reflectivity and spontaneous venous pulsations on ultrasound
• Outside CT chest, abdomen and pelvis showed no evidence of metastatic disease

Assessment & Plan:
• Clinically felt to be choroidal melanoma
• Options given for plaque brachytherapy or enucleation
Eye, Fluid
Eye, Fluid

• POSITIVE FOR MALIGNANT CELLS

• Hypercellular aspirate of malignant cells with enlarged, hyperchromatic oval nuclei, occasional binucleation, prominent nucleoli and vacuolated cytoplasm are present singly and in cohesive groups in a background of acellular debris.
Follow Up

• Patient opted for plaque brachytherapy
• Had plaque in place for 4 days
• Excellent response, vision preserved
Plaque Brachytherapy

- Delivers a highly concentrated radiation dose to the tumor with relatively less radiation to surrounding healthy tissues.
- Radiation sources used for brachytherapy come in the form of small “rice-sized” radioactive seeds, attached within a gold or steel bowl called a plaque.
- Dose of radiation delivered is determined by the type, number and strength of the seeds used and length of time of the implant.
  - Iodine-125, palladium-103 or ruthenium-106.
- Placement and removal of the plaque is performed in the operating room.
  - Specialists will attach the plaque to the wall of the eye, covering the base of the intraocular tumor.
Case 5
History of Present Illness:
• 53 year old woman
• Presented with a 6 month - 1 year progression of vision loss and pain in the left eye
• Saw an eye doctor 1 year ago who diagnosed her with floaters. 6 months ago she feels like the vision began to decline with increasing pain 3 months ago
• Reports taking large amounts of Advil to help with the pain. Long smoking history. Denies any other medical problems.

Physical Exam:
• B-scan (ocular ultrasound) and Optos photos (high resolution images of the fundus) revealed a large intraocular mass
• Afferent pupillary defect and vitreous hemorrhage on exam

Assessment & Plan:
• Pan-imaging (CT head, chest, abdomen, pelvis) to look for source
• If extra-ocular sources are ruled out, lesion is most concerning for melanoma
• Treatment options include enucleation or plaque brachytherapy
  • Because of the size and limited potential for vision, clinician recommends enucleation
• Will proceed with biopsy to establish tissue diagnosis prior to therapy
Eye, Left, FNA
Eye, Left, FNA

• POSITIVE FOR MALIGNANT CELLS CONSISTENT WITH MELANOMA

• Cellular aspirate of medium sized cells with oval nuclei, prominent nucleoli and delicate cytoplasm with focal pigment present in a background of proteinaceous material, in keeping with the clinical impression of melanoma.
Eye, Left, Enucleation
Eye, Left, Enucleation

- Histologic type: MALIGNANT MELANOMA
  - SPINDLE CELL MELANOMA
- Tumor site: Choroid
- Tumor size: 0.7 cm
- Procedure: Enucleation
- Laterality: Left
- Involvement of other ocular structures: None
- Growth pattern: Solid mass
- Scleral involvement: None
- Margins: No melanoma at margin
Follow Up

• Patient doing well
• Wearing an eye patch for 5 days
• Percocet for pain
Case 6
History of Present Illness:
• 66 year old woman
• Experienced sudden onset right sided frontal headache with associated ptosis, blurred vision, nausea and non-bloody vomiting in June 2016
• Nothing found at the time, thought to have retinal detachment
• Headaches persisted and led to brain MRI
  • Revealed an enhancing 6 mm lesion in the inferior aspect of the left frontal lobe
• Subsequent CXR and CT of chest/abd/pelvis
  • Showed a 3.0 x 2.7 cm solid mass lesion in the left upper lobe of the lung

Past Medical History:
• Hyperlipidemia
• Osteoporosis
• 20 pack year smoking history

Assessment & Plan:
• EBUS for LUL lung mass sampling
• PET scant
• Discuss at tumor board
EBUS

- Lymph node, 4L, FNA
- Bronchial Brushing, Left
- Transbronchial biopsy x 6, LUL

Atypical cells
Interval History

• Persistent headaches, disproportional to 6-8 mm brain mass seen on MRI
• Referred to Ophthalmology
• Orbital MRI
  • Demonstrated the ring enhancing mass within the inferior left frontal lobe and a 1.4 cm mass involving the retinal surface of the right globe with associated retinal detachment and hemorrhage, both compatible with metastatic disease
• Treatment options include chemotherapy, radiotherapy, local plaque brachytherapy
  • Given size of tumor external beam radiation to the right eye was recommended
• Offered to perform a needle biopsy if needed for diagnostic assistance
Eye, Fluid
Eye, Fluid

• POSITIVE FOR MALIGNANT CELLS CONSISTENT WITH METASTATIC ADENOCARCINOMA

• Numerous malignant cells with enlarged, hyperchromatic nuclei, prominent nucleoli and a moderate amount of cytoplasm are present arranged in cohesive sheets and tight clusters, consistent with metastatic adenocarcinoma of lung origin.

• Immunocytochemical stains were performed on the cell block and the results are as follows:
  • CK 7: Positive.
  • TTF-1: Positive.
  • Napsin A: Positive.
  * p40: Negative.
  * CK 5/6: Negative.
  * Mart-1: Negative
Follow Up

- Underwent Gamma Knife radiation for brain metastasis at MUSC
- Underwent external beam radiation therapy for choroidal metastasis in Georgetown
- Right eye erythema and pain associated with treatment
- Overall, doing well with good response to treatment
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Thank you!

Questions?