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Ophthalmic Pathology Update

Fine needle aspiration biopsy of ophthalmic tumors ☆

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Abstract

A majority of intraocular tumors can be diagnosed based on clinical examination and ocular imaging studies, which obviate the need for diagnostic ophthalmic fine needle aspiration biopsy (FNAB). Overall, diagnostic accuracy of ophthalmic FNAB is high but limited cellularity can compromise the diagnostic potential of ophthalmic aspirate samples. The role of ophthalmic FNAB is limited in retinal tumors. Orbital FNAB should be considered in the evaluation of lacrimal gland tumors, orbital metastasis, and lymphoproliferative lesions. Negative cytologic diagnosis of malignancy should not be considered unequivocal proof that an intraocular malignancy does not exist. With improved understanding of genetic prognostic factors of uveal melanoma, ophthalmic FNAB is gaining popularity for prognostic purposes in combination with eye conserving treatment of the primary tumor. In special clinical indications, ancillary studies such as immunohistochemistry and FISH can be performed on ophthalmic FNAB samples. Assistance of an experienced cytopathologist cannot be overemphasized.

Keywords: FNAB, Cytology, Uvea, Melanoma, Metastases

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Introduction

Fine needle aspiration biopsy (FNAB) of ophthalmic tumors is being increasingly performed.[1–5] In this article we discuss indications, techniques, complications, and the limitations of the ophthalmic FNAB.

History

Although relatively recently accepted in the evaluation of ophthalmic tumors, FNAB of tumors has a long history.[6–11] The first intraocular biopsy was performed by Hirschberg in 1868.[2,12–17] In 1979, Jakobiec published a major report on the use of FNAB for the diagnosis of intraocular tumors.[18] Since then others have reported on safety and reliability of ophthalmic FNAB[19–25] with adequacy rates of 88–95%.[23,26]

Technique and instrumentations

The technique and instrumentation for FNAB vary depending upon the involved tissue (retina, choroid, subretinal space, vitreous, and aqueous),[27,28] suspected diagnosis, size, location, associated retinal detachment, and clarity of the media.[25,29–35,5]

Most frequently used needles for ophthalmic FNAB are of 25–30 gauge (Fig. 1).[5] Likelihood of insufficient samples may be lower with a 22 gauge needle[36] and higher with a 30 gauge needle.[37] Some authors have recommended bending the needle tip to 90 degrees and entering the tumor tangentially rather than radially.[35] A prototype needle with a short bevel and mm graduations has also become available.[38] Specifically designed intraocular forceps to retrieve tumor sample through retinotomy (Essen Forceps) allows histological and immunohistochemistry typing.[39]

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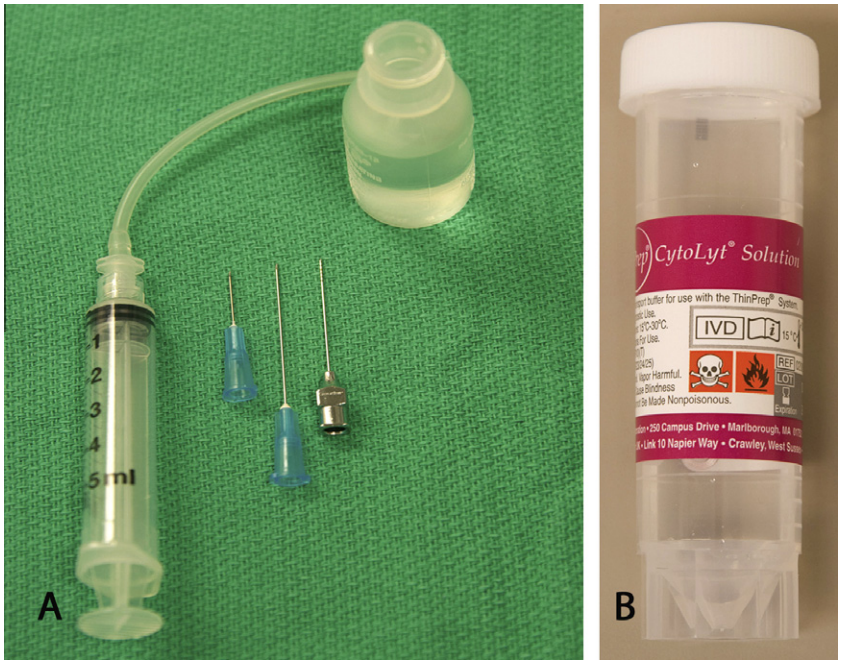

Figure 1. A short 25 gauge needle attached to short tubing is inserted through the scleral bed into the tumor and aspiration performed (**A**). The aspirate sample is placed in a preservative solution, such as CytoLyt® and the needle rinsed to optimize cell yield (**B**). Reproduced with permission from: Singh AD, Pelayes DE, Brainard JA, Biscotti CV. History, indications, techniques and limitations. Monographs in clinical cytology 2012; 21: 1–9.[5]

Iris tumors

In the case of iris tumors the entry is through the anterior chamber.[40] A 26–30 gauge needle is swept over the surface of the lesion aspirating about 0.5 ml of the aqueous humor.[40] Direct insertion of the needle into the tumor may increase the cellular yield.[41] Complications such as persistent hyphema, prolonged hypotony, lens damage or endophthalmitis are rarely observed (<1%).[41]

Ciliary body and pre equatorial tumors

Tumors located in the ciliary body or anterior choroid are approached trans-sclerally. A 3-mm square scleral flap to a depth of approximately 80% is fashioned. A short 25 gauge needle attached to short tubing is inserted through the scleral bed.

Post equatorial tumors

Posterior choroidal tumors are most accessible by a trans-vitreal approach. A 25–30 gauge needle attached to a 5 ml syringe by a short tubing is introduced into the mid vitreous cavity through parsplana 4 mm behind the limbus. The meridian of insertion is selected based upon the location of the tumor. The needle can be guided into the tumor either under indirect ophthalmolscopic control or a microscope depending upon the surgeon's preference.[35] Ultrasonic guidance is rarely used in the presence of a clear media.[18] The needle tip is inserted into the tumor avoiding major retinal or tumor vessels. Gentle aspiration is performed by pulling the plunger. Once the suction force has balanced out the needle is withdrawn along the path of insertion.[35] Localised subretinal and/or vitreous hemorrhage is controlled by applying pressure at the entry site by a cotton tipped applicator.[33,35–37] If the globe softens, balanced salt solution can be injected into the vitreous cavity.

Sample handling

At our institution, we use the ThinPrep® processing system for ophthalmic FNAB samples. We place all material in Cytolyt® solution for ThinPrep processing (Fig. 1).[42] The sample in Cytolyt® is then subjected to one or more centrifugation and concentration steps (Fig. 2).[42] The pellet obtained is resuspended in a cell preservative solution, PreservCyt® for automated processing. The ThinPrep® processor mixes the sample and then, using a gentle vacuum, collects cells on a filter in a monolayer. This filter is then inverted and its cellular contents transferred to a microscope slide. This method optimizes cell yield and preservation and standardizes slide preparation for interpretation in this setting of limited material. If abundant aspirate material is obtained, paraffin-embedded cell block can be processed. While we rarely perform immunostains on preparations other than a cell block, some authors have reported successful immunohistochemical analyses on thin layer cytology preparations.[25,42–44]

Indications

The major indication for ophthalmic FNAB is when clinical examination and ancillary testing fail to establish an accurate diagnosis.[23,25,43,45] Potential scenarios include those with atypical clinical presentation, dense media opacity, possible uveal metastasis without known primary tumor, and patients requesting histopathologic confirmation before undergoing recommended therapy such as enucleation.[35] In our experience, ophthalmic FNAB is an effective technique to confirm a clinical diagnosis of malignancy including uveal metastasis and uveal melanoma.[5,21]