Surgical Technique

Endoillumination (chandelier) and wide-angle viewing-assisted fine-needle aspiration biopsy of intraocular mass lesions

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Fine-needle aspiration biopsy (FNAB) of intraocular mass lesions is an important intervention in the presence of diagnostic difficulty. FNAB of intraocular mass lesions is also likely to become more commonly recommended for prognostication of tumors such as choroidal melanoma. The most commonly described approach for tumor localization and visualization during FNAB is transillumination and indirect ophthalmoscopic viewing. Herein, we report endoillumination (chandelier) and wide-angle viewing assisted, microscope-based approach for FNAB in two patients using two port minimally invasive vitreoretinal surgical approach. The submission is supported by a video demonstration. The entire procedure was completed under the microscope. Adequate sample was obtained. In the first patient, the inflammatory nature of the lesion was confirmed though magnetic resonance imaging had been reported as melanoma. In the second patient, a clinical diagnosis of amelanotic melanoma was confirmed. Endoillumination-assisted FNAB of intraocular mass lesions is easier to learn and more precise and hence carries lesser risks.

Key words: Biopsy, chandelier, endoillumination, fine-needle aspiration, intraocular mass

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Fine-needle aspiration biopsy (FNAB) is a useful method of obtaining tissue samples for histopathological, immunohistochemical, cytogenetic, and other studies. FNAB is also the most commonly used method of biopsy.[1] Tissue biopsy is the only method of having a confirmed diagnosis with hundred percent sensitivity and specificity.

Obtaining tissue for histopathological diagnosis becomes necessary in the presence of atypical lesions, unusual presentation, and persisting diagnostic uncertainty. Almost 2.4%–10% of intraocular mass lesions diagnosed based on clinical judgment alone or in conjunction with noninvasive methods have a different and often benign histopathological diagnosis.[2,3] Even when atypical and unusual lesions are excluded from the study, the diagnostic ability in the absence of tissue biopsy is <100%.[4]

The most widely described methods of FNAB in literature currently are based on two methods of tumor localization, transillumination, and visualization with indirect ophthalmoscopy. These methods have a long learning curve and inherent limitations. FNAB using these techniques are, hence, likely to make the procedure less appealing, less precise, and increase the possibility of complications during the learning curve. One of the reasons for the limited use of intraocular biopsy has been attributed to concerns about serious eye complications.[5] We, herein, describe a safer approach for FNAB using chandelier-assisted endoillumination and wide-angle viewing. Characteristics of the two patients who underwent this procedure between November 2015 and February 2016, and their results are also described. On PubMed search, we failed to obtain any article highlighting the approach for FNAB described by us.

Case Reports

Case 1

A 30-year-old male presented with history of blurred vision in his left eye of 6 months duration. He denied any systemic history and had been referred to our center with a diagnosis of intraocular melanoma based on an magnetic resonance imaging (MRI) report of the orbit. On systemic examination, he was found to have no abnormality. On ocular examination, his best-corrected visual acuity was 6/6 and 3/60 in the right and the left eye, respectively. Ocular adnexa, ocular motility, ocular surface, and anterior segment were found to be normal in both eyes. In particular, there was absence of cells and keratic precipitates in the affected eye. Few cells were seen in the retrolental space; however, on fundus examination, the right eye did not reveal any abnormality. In the left eye, there was a solitary, globular mass lesion about eight disc areas in size and located at the equator along the 4 o'clock meridian. The margins were well defined, the color was creamy yellow, and there was dilatation of the overlying blood vessels. Significant exudation was present over a wide area around the lesion [Fig. 1a]. However, there was no exudative retinal detachment. Optical coherence tomography

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revealed neurosensory detachment and intraretinal cystoid changes [Fig. 1b], and ultra-widefield angiography (Optos) revealed intense hyperfluorescence overlying the mass along with diffuse perivascular hyperfluorescence [Fig. 1c]. On ultrasonography (USG), the mass appeared as a dome-shaped lesion with moderate, nonhomogeneous internal reflectivity. Angle kappa was absent. Since imaging features were highly suggestive of an inflammatory pathology, the patient was given a course of oral corticosteroids (1 mg/kg), tapered over 8 weeks. With this treatment, there was reduction in the central macular thickness [Fig. 1d], but the overall nature of the mass remained unchanged [Fig. 1d]. Due to this unsatisfactory response to corticosteroids and initial MRI reporting as choroidal melanoma, we faced a diagnostic dilemma. To obtain a confirmation on whether the lesion was inflammatory or neoplastic in nature, transvitreal FNAB was planned. The method used for FNAB was two-port 23G minimally invasive vitreosurgical (Alcon) system. 23G chandelier light source and Reinverting Operating Lens System (ROLS) (Volk) wide-angle contact lens system were used for endoillumination and internal viewing, respectively. This permitted excellent direct visualization of the choroidal mass under the operating microscope. FNAB of the mass was successfully completed using a 24G 1-inch needle inserted into the vitreous cavity through the second 23G cannula opening [Video 1]. The sample obtained was adequate for histopathological examination. Cytospin smears on Giemsa staining revealed only inflammatory cells. No pigment or other features of melanoma was identified. Hence, the diagnosis of melanoma was ruled out.

Case 2

A 60-year-old patient was referred to our center with a diagnosis of an intraocular mass during routine eye examination. He had no significant past systemic or ocular history and was asymptomatic at presentation to us. He had a visual acuity of 6/6 and 6/9 in the right and the left eye, respectively. On ocular examination, the right eye was normal. In the left eye, slit-lamp biomicroscopy was within normal limits. On the indirect ophthalmoscopic evaluation of the fundus, there was an elevated, whitish, relatively avascular mass about 6 disc areas in diameter located at the 11 o'clock meridian adjacent to the ora serrata [Fig. 2a]. On ocular ultrasonography, the mass had low-moderate internal reflectivity, and angle kappa was absent. A clinical diagnosis of possible amelanotic melanoma was made. During systemic workup, he was found to have a calcified granuloma in segment VII of the right lobe of the liver on abdominal USG, calcified granulomas in the right upper lung field on contrast-enhanced computed tomography chest and a homogenously enhancing lesion in the left eye on ^{18}F-fluorodeoxyglucose positron emission tomography-computed tomography. Due to the relative rarity of amelanotic melanomas in our population and the presence of granulomas in other regions of the body, the diagnosis remained unclear. Hence, FNAB of the mass was planned and undertaken under the operating microscope using two ports (hybrid 25G + 23G) system. 25G cannula was used to insert chandelier endoillumination, and 23G cannula was used to insert a 24G needle. The sample obtained was adequate, and cytospin smears showed spindle-shaped cells with prominent nucleoli and no pigment. These features were confirmative of an amelanotic melanoma [Fig. 2b].

Discussion

At our center, we perform intraocular biopsy only when there is a strong diagnostic dilemma. In contrast, centers wherein the facilities for cytogenetics and molecular prediction capabilities

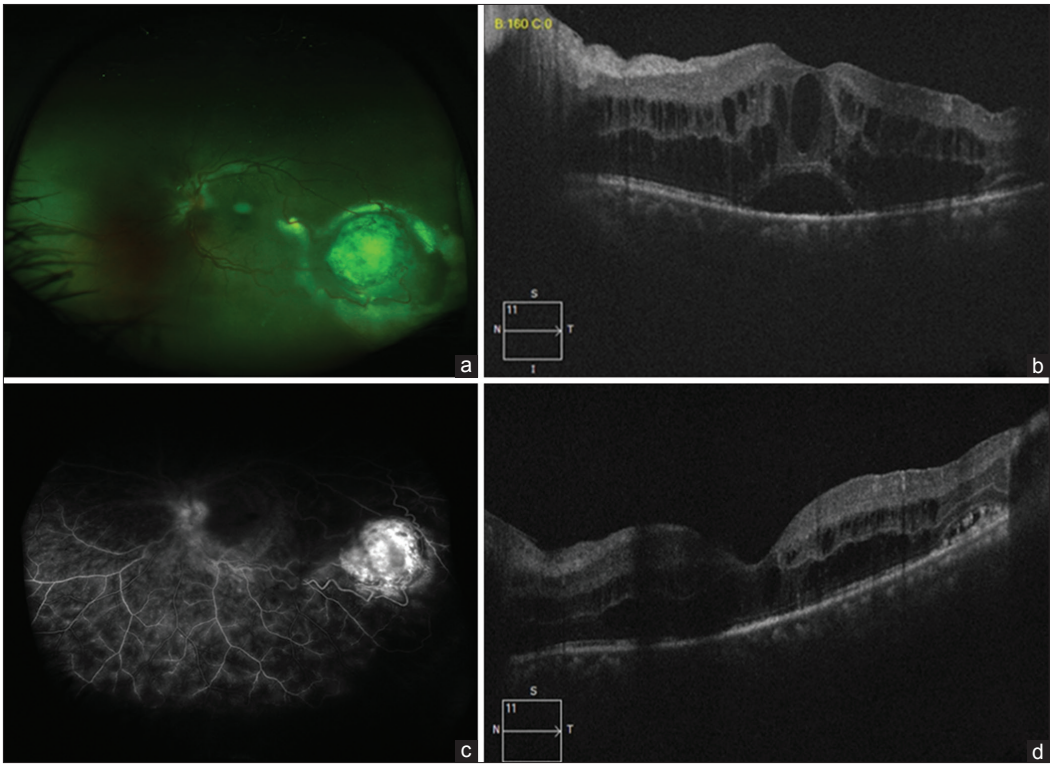

Figure 1: Widefield color imaging with Optos shows a globular mass lesion in the inferotemporal quadrant with surrounding exudation (a). Swept-source optical coherence tomography reveals the presence of neurosensory detachment and cystoid edema (b). Fluorescein angiography shows mild optic disc leak and diffuse perivascular leak along with staining of the mass lesion (c). Following a course of oral steroids reduction in macular edema is evident (d)

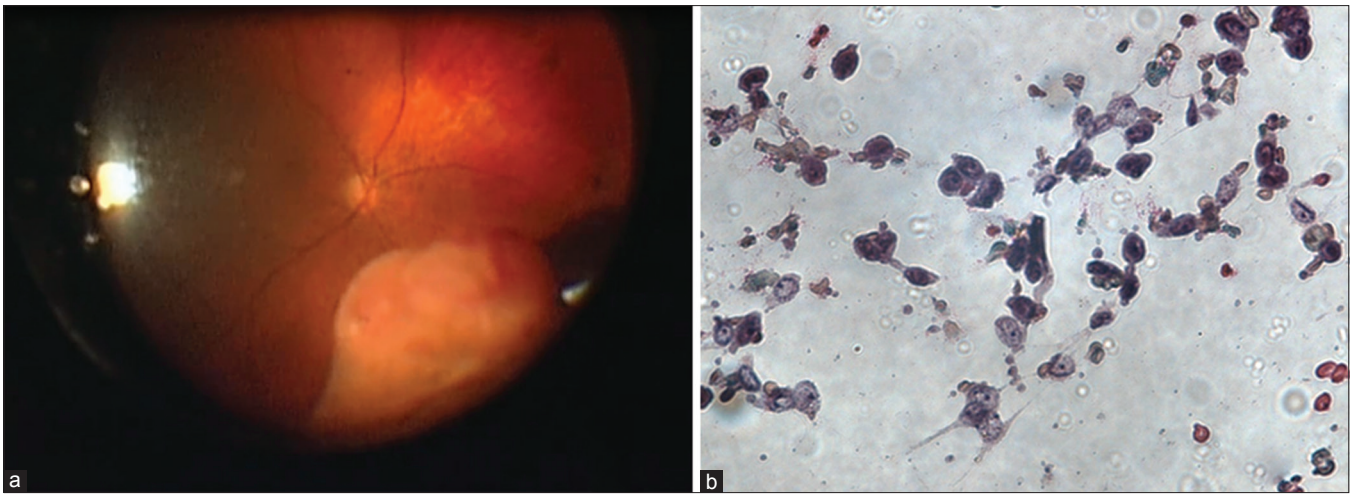

Figure 2: Intraoperative picture taken just before the biopsy shows an amelanotic mass in the superior peripheral region (a). Histopathological examination (Papanicolaou smear) of the fine-needle aspiration biopsy specimen shows spindle-shaped cells with prominent nucleoli, but no pigment (characteristic of amelanotic melanoma) (b)

to inform patients about the metastatic potential of melanomas is available, FNAB is offered routinely to all patients.[6,7]

FNAB for intraocular mass lesions is still a strongly debated topic. There are some who strongly favor its relatively liberal use and others who hold strong reservations against its routine use. However, the utility of FNAB in providing clinching evidence when clinical evaluation and imaging approaches fail is well established and also exemplified by the cases reported herein. In addition, the coming decade is likely to see patients being offered treatment options based on the cytogenetic and molecular results obtained from FNAB of their lesions.[8] Hence, the role of FNAB would significantly increase and would become a needed skill for all retina and tumor specialists to be able to perform.

The currently used approaches for FNAB of intraocular mass lesions are the transvitreal approach and transcleral approach. In transcleral approach, a still widely used method for localization of the tumor before FNAB is transillumination.[6] For transvitreal approach, the preferred method to visualize the tumor still seems to be indirect ophthalmoscopy.[9] Both these approaches have a long learning curve. This is likely to not only result in more FNAB-associated complications such as intraocular hemorrhages, retinal detachment, and scleral perforation but to higher possibility of imprecise and inadequate tissue sampling.

In contrast to the above techniques, FNAB using small-gauge two port chandelier illuminations and wide-angle viewing is likely to be better accepted, safe, and precise for most surgeons and patients. This is because all retina surgeons are already well trained in the use of minimally invasive vitreoretinal surgery under the operating microscope and they are unlikely to need any additional learning to perform FNAB. In addition, as the aspirating needle passes through the cannula, and there is no direct contact with the scleral tissue, risk of tumor seeding is also reduced.

Conclusion

In conclusion, we emphasize that in the coming decade, FNAB of intraocular lesions is likely to become more widespread due to advances in management based on cytogenetic and molecular analysis of tissue specimens. There is, hence, a need to have an FNAB skill, that is, safe, precise, and easy to acquire. Endoillumination and wide-angle assisted approach to FNAB described herein has the potential to fulfill these necessities.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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