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# THE ROLE OF CYTOLOGY IN VITREOUS FLUID ANALYSIS

Pathology

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## ABSTRACT

**BACKGROUND :** To describe findings in vitreous fluid samples in routine cytology practice. Methods: This is a retrospective review of a series of 56 patients having a total of 56 vitreous fluid cytology determinations.

**RESULTS :** Twenty Nine of the 56 patients (51.7%} have cytologic results highly suggestive of a specific disease process. These include one case of malignant small round cell tumor, one case of fungal endophthalmitis; one case of bacterial endoopthalmitis. There are no vitreous fluid cytology determinations falsely positive or falsely negative for malignancy in this series. Neutrophils, lymphocytes, and histiocytes were the predominant vitreous fluid cell type in the case of an inflammatory process.

**CONCLUSION:** The cytologic examination of vitreous fluid has been shown to be a valuable modality for diagnosing intraocular disease.

## KEYWORDS

cytology, uveitis, vitreous

## INTRODUCTION :

Intraocular diseases encompass inflammatory/infectious diseases, and tumors. Determining the cause of intraocular inflammation has important implications both for treatment and prognosis of uveitic diseases. Vitreous fluid cytology can be used as a diagnostic tool in cases of clinically undiagnosed uveitis or uveitis with an atypical clinical course, suspected infectious endophthalmitis or suspicion of intraocular malignancy. Other ancillary testing techniqes such as microbiological analysis, flow cytometry and interleukin (IL) measurement can also be used as a valuable tool that can lead to a final clinical diagnosis in most cases.[1]

Despite the importance of the cytological examination of vitreous fluid as a diagnostic tool, these samples are uncommon in most cytopathological practices. Specific vitreous diseases are thus rarely encountered in the routine practice of cytopathologists. Moreover, the vast majority of cytological studies have focused on the distinction between chronic uveitis and primary intraocular lymphoma. Only a few studies have described nonneoplastic cytology and routine cytology of vitreous samples.[2]

We present a review of all of the vitreous cytological samples evaluated over a 3-year period. The objective of the study was to evaluate the use of vitreous humor as a diagnostic procedure for intraocular diseases.

## METHODS:

The cytologic findings with respect to the clinical data, the anatomical findings, and the final diagnosis in 56 cases that underwent intraocular cytologic examinations during august 2014- august 2017 were evaluated. The samples were centrifuged and prepared using standard protocol. For cytologic examination, the Papanicolaou stain, Giemsa and hematoxyllin stain were used. Additionally special stains for organism or pigment were used in some cases.

## RESULTS:

The mean age of the patients was 41.48 years and ranged from 1 month old newborn to 80 years. The male-to-female ratio was 2.29 (39 males/17 females). The medical records were reviewed for age, sex, clinical presentation, clinical diagnosis, ancillary studies, treatment and clinical follow-up. The most frequent indication was endophthalmitis and uveitis (including bacterial infection, fungal infection, and helminthic infection) and were suspected in 29 cases (51.7%) based on clinical evaluation. Metastatic endoopthalmitis and traumatic uveitis were the next most common indications for vitreous fluid cytology in 7 (12.5%) and 8 (14.3%) patients respectively. Retinal detachment was suspected in 6 (10.7%) patients and 3 patients were [1]also suspected to be of diabetic retinopathy with vitreous hemorrhage. Other rare indication were suspected lymphoma in 2 patients followed by Coats's disease in 1 patient.

The cytological evaluation included the identification of the predominant cellular component and the presence of other cellular components such as neutrophils, lymphocytes, eosinophils, giant cells and granulomas, or specific intraocular structures such as lens fragments,etc.

Majority of the cases were acellular/hypocellular on cytological examination(27, 48.21%) with 3 cases showing presence of amorphous material conforming to lens fragment. 20 cases( 35.7%) showed neutrophilic vitritis, out of which fungal hyphae of aspergillosis and positive staining for Nocardia was established in two cases. Lymphocytes were the predominant cellular component in 8 (14.3%) cases. One case of a 8 year old girl child was given positive for malignancy and reported as malignant small round cell tumor.

## DISCUSSION

Vitreous Humor is a lucent extracellular gel, with a complex composition of type II collagen, protein, hyaluronic acid, and water, filling the posterior segment of the eye, between the lens and retina. Normally, the number of cells is very low; they are predominantly present in the cortex and consist of the hyalocytes and glial cells.[1] Cytology can be of help to recognize the pathologic changes determining intraocular disease. The cytopathologist should be familiar with the cytomorphology of normal cell populations present in the vitreous fluid, and knowledge of intraocular anatomy is required to perform the cytological diagnosis of intraocular diseases. Cytologic evaluation of vitreous fluid is not only easily performed but also often yields valuable diagnostic information, particulariy in cases of intraocular malignant neoplasms and to support a diagnosis of inflammatory infectious and non infectious vitritis.[2] Our data support these conclusions. In our 56 patients, we had no determinations falsely negative or falsely positive for malignancy.

The normal cytological profile of vitreous humor is not well characterized. The interpretation of cellularity, cell types and cellular predominance can thus be difficult for cytopathologists For a long time, vitreous fluid has been deemed to be almost acellular and contain only a few resident cells called hyalocytes. In our study, majority cases were acellular/hypocellular.

Moreover, hyalocytes are difficult to identify because their morphological description is mainly based on electron microscopy and due to lack of specific antibodies. They lack the expression of CD68 and express CD64, CD168, CD45, CD163, vimentin and α-smooth muscle actin. However, these immunolabels are not completely specific to hyalocytes as they also stain other cells types that can be found in vitreous fluid.[3]

Also cytology is not sufficiently sensitive for the diagnosis of a nonneoplastic inflammatory process. In our study, as in previous

studies, the cytological findings were most often nonspecific, with neutrophil or lymphocyte predominance. In some cases, cytology allowed the etiology of the inflammation to be established as hyphae of Aspergillus and Nocardia were observed in only one case each. Lens fragments suggestive of lens-induced uveitis were found in 3 cases. Asteroid bodies were not seen in any case.

Literature states that in particular, the diagnosis of intraocular malignant lymphoma tends to be delayed, because it mimics chronic uveitis. Therefore, intraocular malignant lymphoma is referred to as "masquerade syndrome". Thus, Vitreous humor cytology has been used to distinguish between intraocular malignant lymphoma and benign diseases.[4] However in this series no case of lymphoma was reported.

## CONCLUSION:

An early diagnosis and treatment of intraocular diseases is necessary to maintain an acceptable degree of quality of life. Routine practice cytology of the vitreous fluid is performed in many and varied situations that are most often nonneoplastic. Vitreous fluid cytology helps confirm intraocular inflammatory process and vitreous haemorrhage. When neoplasia is suspected, preoperative communication between the ophthalmologist and the cytopathologist is required to ensure appropriate and timely treatment. In nonneoplastic cases, cytology is mostly nonspecific and helps to rule out malignancy. In some cases, cytological findings can help to provide an unsuspected diagnosis. In spite of its limitations, cytology is therefore a useful adjunct to vitrectomy.

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