Anterior chamber paracentesis to improve diagnosis and treatment of infectious uveitis in South Africa

E Schaftenaar, K A Lecuona, G S Baarsma, C Meenken, G M G M Verjans, J A McIntyre, R P H Peters

Infectious uveitis is a significant cause of blindness in South Africa, especially among HIV-infected individuals. The visual outcome of uveitis depends on early clinical and laboratory diagnosis to guide therapeutic intervention. Analyses of aqueous humor obtained by anterior chamber paracentesis direct the differential diagnosis in infectious uveitis. However, although safe and potentially cost-effective, diagnostic anterior chamber paracentesis is not common practice in ophthalmic care across Africa. We draw attention to this important procedure, which could improve the diagnosis and prognosis of infectious uveitis.

Unrecognised uveitis was reported to result in significant visual impairment among Ugandan HIV-infected individuals. Visual impairment in these cases could possibly have been prevented if the condition had been recognised early. Secondly, if uveitis is diagnosed clinically, the presumed cause may be incorrect as the diagnosis is based on the patient’s history and clinical and ophthalmological characteristics. Clinical features have poor predictive value for diagnosing the cause of uveitis, and do not distinguish well between infectious and non-infectious origin. Moreover, in cases of infectious uveitis, clinical features are poorly predictive of the causative pathogen, because different pathogens may present with similar clinical characteristics. Based on diagnostic testing in almost a quarter of patients presenting with uveitis in studies from The Netherlands and South Africa (SA), the initial clinical diagnosis was adjusted and treatment altered. An exception may be uveitis caused by Mycobacterium tuberculosis where the patient’s history (e.g. recent history of pulmonary tuberculosis) or specific retinal findings (e.g. granuloma) are strongly indicative of infection by this organism. However, tuberculosis cannot always be ruled out solely on the basis of clinical symptoms. Thirdly, empirical treatment of infectious uveitis is difficult because of the wide range of potential uveitogenic pathogens that require targeted treatment (Table 1). Finally, HIV-infected individuals are at an increased risk of specific opportunistic ocular infections (e.g. cytomegalovirus retinitis). Manifestations of infectious uveitis are often atypical, with immunosuppression resulting in a lower degree of inflammation, even in advanced uveitis, compared with HIV-uninfected individuals. This makes clinical identification of the triggering pathogen in HIV-infected individuals particularly challenging.

Diagnostic analysis of aqueous humor

The clinical diagnosis of infectious uveitis is increasingly supported in Western countries by analysis of ocular fluid obtained through diagnostic anterior chamber paracentesis and aspiration of aqueous humor (Fig. 1). This is a well-documented procedure that is routinely performed in other aspects of ophthalmological care, e.g. management of acute elevation.
Table 1. Clinical management of the most common pathogens in infectious uveitis

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viruses</strong></td>
<td></td>
</tr>
<tr>
<td>HSV and VZV</td>
<td>Topical and oral or intravenous antivirals (e.g. acyclovir), topical corticosteroids (e.g. prednisolone acetate eyedrops), and intravitreal antiviral agents (e.g. ganciclovir)</td>
</tr>
<tr>
<td>CMV</td>
<td>Intraocular and/or intravitreal antiviral agents (e.g. ganciclovir)</td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
</tr>
<tr>
<td>Mycobacterium</td>
<td>Routine treatment for extrapulmonary tuberculosis and topical steroids (e.g. prednisolone acetate eyedrops)</td>
</tr>
<tr>
<td>tuberculosis</td>
<td></td>
</tr>
<tr>
<td>Treponema pallidum</td>
<td>Intravenous antibiotic treatment (e.g. penicillin G or ceftriaxone)</td>
</tr>
<tr>
<td><strong>Protozoa</strong></td>
<td></td>
</tr>
<tr>
<td>Toxoplasma gondii</td>
<td>Oral antimicrobial regimens (e.g. pyrimethamine) and systemic steroids (e.g. prednisolone)</td>
</tr>
<tr>
<td>Onchocerca volvulus</td>
<td>Oral ivermectin</td>
</tr>
</tbody>
</table>

Note: This table serves as a general guideline for the clinical management of infectious uveitis. Management of these conditions may differ dependent on local guidelines and availability of drugs.

HSV = human simplex virus; VZV = varicella zoster virus; CMV = cytomegalovirus.

Anterior chamber paracentesis in uveitis

Anterior chamber paracentesis is a safe procedure that can be performed in a consultation room with a slit-lamp. Only a few non-serious complications occurred, including traumatic hyphaema (5 cases/1 000 procedures), referring to bleeding in the anterior chamber that may cause blurred vision, but usually resolves spontaneously or is easily treatable with topical eyedrops (e.g. topical steroids); similarly, injection of air into the anterior chamber (4 cases/1 000 procedures) may cause blurred vision, but is usually self-limiting.

Uveitis is a serious condition resulting in severe visual impairment and even blindness if not treated promptly and adequately. In SA, referral from lower levels of healthcare to a regional ophthalmology unit for further management and initiation of (empirical) treatment is indicated. However, even in these units treatment outcomes may be poor owing to the low predictive value of the patient’s history and clinical characteristics for identifying the cause of the uveitis.

Anterior chamber paracentesis, aspiration and analysis of aqueous humor provide a valuable diagnostic procedure that optimises treatment and subsequent prognosis and poses a very limited risk. We believe that this procedure could be performed in most settings, because a well-trained ophthalmic nurse could perform anterior chamber paracentesis safely in situations where qualified ophthalmologists are not available.

Paracentesis is easier to perform than cataract surgery, for which ophthalmic nurses are trained in African countries such as Malawi that lack ophthalmologists. In addition to skills development, strengthening laboratory infrastructure is warranted. Validation of existing diagnostic assays and provision of other resources required to analyse aqueous humor for the most common uveitogenic pathogens should be considered across SA. Furthermore, logistic systems such as a cold-sample transport chain require optimisation to ensure a short turnaround time and maximum clinical impact of this diagnostic test. Providing such a diagnostic service...
would be cost-effective, reducing unnecessary use of expensive antimicrobial drugs and avoiding blindness and its associated socioeconomic costs.[15]

**Conclusion**

We seek to draw attention to the so far unmet need for this valuable diagnostic procedure and to encourage discussion among healthcare providers regarding introduction of anterior chamber paracentesis in the routine work-up of patients with uveitis in SA. Ultimately, these efforts should result in the development of clinical guidelines and a training programme that includes anterior chamber aspiration. This would improve clinical management of uveitis and reduce the burden of avoidable visual impairment and blindness.

**Authorship.** ES: literature search, design, figure, table and writing; KAL: writing; GSB: literature search and writing; CM: writing; GMGMV: literature search, design, figure, table and writing. All the authors have seen and approved the content of this article.

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