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# Intraocular Pressure Changes in Long-term Presumed Trematode induced Granulomatous Anterior Uveitis

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## Abstract:

**Introduction:** There are several reasons for pediatric anterior chamber granulomas. Presumptive parasite infection is cited as a recently identified cause of AC granuloma. This condition is more common in children's eyes in rural areas who have been exposed to canal water. It is characterized by one or more anterior chamber (AC) nodules that resemble pearls. It can also be linked to subconjunctival nodules, corneal opacity, keratic precipitates, or anterior chamber reaction.

**Aim of the study:** To outline the long-term intra-ocular pressure sequelae in children diagnosed with presumed parasitic anterior chamber granuloma and received treatment.

**Subjects and Methods:** A retrospective study that included 84 patients (87 eyes) diagnosed with granulomatous anterior uveitis attributed to being caused by presumed trematode infection and received the appropriate treatment, separated into three groups: A) Medical treatment. B) Treated with periocular steroids. C) Surgical treatment. Involvement of anterior and posterior segment complications has been documented and reported.

**Results:** The median age of the patients was  $11\pm 1$  year with an average of 7-12 years. The median IOP measurement was  $15\pm 1$ . There was no statistically significant difference regarding IOP.

**Conclusions:** Even after obtaining the proper therapy, presumed trematode-induced anterior chamber granuloma has long-term consequences on the anterior and posterior segments that jeopardize visual acuity. So, we should observe all patients after perceiving appropriate treatment including IOP measurement.

**Keywords:** Anterior uveitis; Intra-ocular pressure; canal water.

## 1. Introduction

Pediatric anterior chamber granulomas have various causes. A newly described cause of AC granuloma is attributed to presumed parasitic infection.

Once exposed to canal water, children's eyes in rural settings are more susceptible to this condition, which is characterized by one or more anterior chamber (AC) nodules that

resemble pearls, it may be associated with subconjunctival nodules, corneal opacity, keratic precipitates or Anterior chamber reaction [1, 2].

It looks like the illness is endemic to Egypt and has spread far throughout the Nile basin. The precise species of helminths can now be found thanks to molecular diagnostic procedures including real-time PCR, sequencing, and BLAST (Basic Local Alignment Search Tool) analysis. Many different ways of medical and surgical treatment have been tried on those patients, the surgical management showed significant resolution of inflammation and disappearance of granuloma better than medical treatment [3].

Despite increasing reports on characterization, pattern, and treatment of

the disease, there are scarce publications on its complications and sequelae that may affect the visual outcome. Some cases developed complications such as a rise in intraocular pressure, complicated cataracts and posterior synechiae [4]. One of the most common causes of uveitis diminution of vision is macular edema, which may be missed due to media haze secondary to posterior synechiae, vitritis or cataract formation [5]. Also, cases left with unresolved granuloma for a long duration showed permanent corneal scars with significant visual acuity affection. Diffuse thickening and edema of the ciliary body were found in UBM in many cases as same as a hyperreflective lesion (granuloma) was found in some cases [6].

## 2. Subjects and Methods

### 2.1. Subjects

Our retrospective case series study included 83 patients (87 eyes) between 5 and 12 years old consecutively selected (every subject meeting the criteria of inclusion is selected until the sample size is achieved). Included patients had been collected from the outpatient clinic at the Ophthalmology Department of Fayoum

University. The study was conducted from 1st of January 2022 till 1st of January 2023.

### *Inclusion criteria*

Patients diagnosed with granulomatous anterior uveitis attributed to being caused by presumed trematode infections and received either medical or surgical treatment

### ***Exclusion criteria***

- Patients having active inflammation within three months.
- Individuals with granulomatous uveitis due to reasons other than suspected trematode infections, or those with a history of ocular trauma.
- Patients with inadequate data.

### **2.2. Methods**

These patients were separated into three groups by treatment modality:

**Group A:** Individuals who underwent medicinal treatment (steroids) in the form of cycloplegics (3 drops/day) and prednisolone eye drops (5 drops/day to be reduced progressively according to improvement)

**Group B:** Patients who received Peri-ocular steroids in the form of posterior sub-Tenon injection of Triamcinolone acetonide under local anesthesia 0.2-0.3ml (two injections with one-week intervals).

**Group C:** Patients who underwent anterior chamber wash surgery did so under general anesthesia, with utmost aseptic precaution. A

micro-surgical knife (keratome 3.2mm) was used to make the corneal incision, which was then followed by the injection of visco-elastic to reform the anterior chamber, the removal of the granuloma from its attachment to the root of the iris and cornea using either OVD dissection or capsule-rhexis forceps, vannis, or retina 23g curved scissor, or by OVD dissection.

### ***Evaluation***

The patients who were recruited had their medical records examined. Age, gender, location of residence, and the moment the eye symptoms started were all recorded along with demographic information, with a focus on prior river swimming, if it was done. To rule out the possibility of any other related systemic granulomatous illness, a pediatrician was consulted for a comprehensive assessment of each patient. Full blood count, stool sample collection, specialized tests to rule out other granulomatous infections, and radiographic studies in chest radiography were sought as part of the laboratory workup. A rebound system (I care tonometer, ic100, Finland) with a Goldman application tonometer was used to measure intraocular pressure (IOP).

### 3. Results

This retrospective study included 87 eyes with distinctive AC granulomas, separated according to treatment modality into three groups:

- **Group A:** Included 50 eyes who received medical treatment.
- **Group B:** Included 12 eyes who received peri-ocular injection.

- **Group C:** Included 25 eyes who underwent surgery.

Eighty-seven eyes of 83 patients were included in the study as having anterior chamber granuloma, 82 patients were males and 1 patient was female with a median age of 11+1 years in a range of 7-12 years as shown in **Table 1**. There was no statistically significant difference between the three studied groups for age and sex distribution.

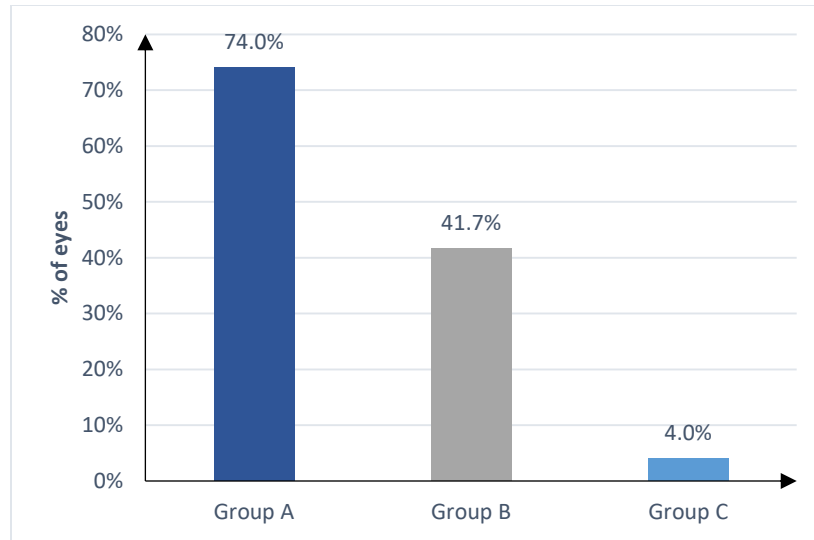
**Table 1: Demographic data of the studied groups**

	Variables	Group A (n=50)	Group B (n=12)	Group C (n=25)	P-value
Age (years)	Median (IQR)	11 (9.25 – 12)	11 (10.25-12.75)	12 (11 – 13)	0.083
	Range	7 - 21	10 - 16	6 - 17	
Sex	Male	49 (97.9%)	12 (100%)	25 (100%)	0.691
	Female	1 (2.1%)	0 (0%)	0 (0%)	

Data are presented as frequency (%) unless otherwise mentioned, Statistical significance at  $p < 0.05$ .

The average time to the presentation of recurrence is after a median of 8+/-2 months from treated first attack as 37 eyes of the medical group had recurrent attacks of anterior granulomatous uveitis, 5 eyes of the periocular group had recurrent attacks but only one case of the surgical group had a

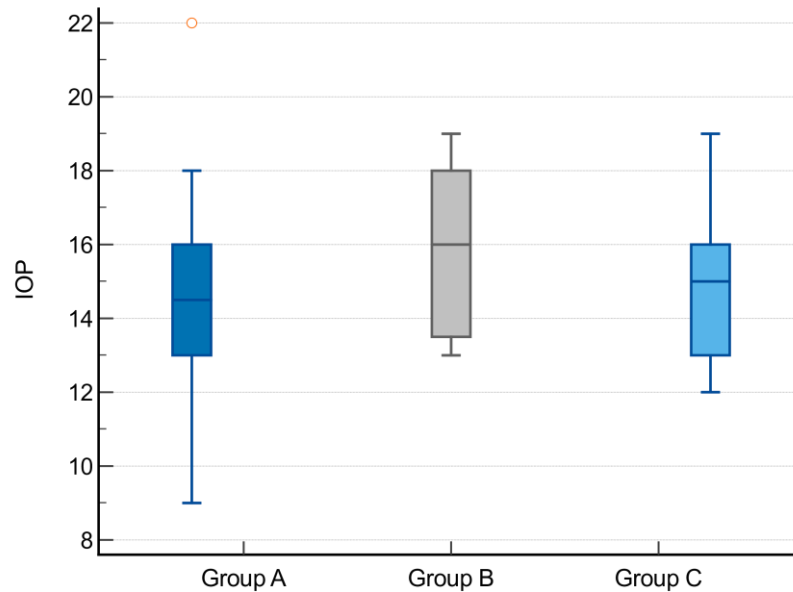
recurrence. The duration of symptoms was significantly longer in group C. The recurrence rate was significantly higher in group A with a rate of 37 (74%) in group A, 5(41.7%) in group B, and one case (4%) in group C,  $p < 0.001$ . as shown in **Figure 1**.



**Figure 1:** The granulomas recurrence rate of the studied groups.

The median Intraocular pressure (IOP) measurement was 15+/-1. There was no statistically significant difference

regarding IOP ( $p = 0.381$ ) as shown in **Figure 2.**



**Figure 2:** IOP results of the studied groups.

## 4. Discussion

The major source of water supply in Egypt is the River Nile with a resident agricultural community in its Valley and Delta, children in the current research were selected from adjacent places like Fayoum, Beni-Suef and Giza. Children from other neighboring governorates around the Nile River have been missing. It seems that this illness is native to Egypt and spreads via rivers [7].

With a distinctive appearance of anterior uveitis characterized by one or more white nodules in the anterior chamber that may eventually form a retro-corneal vascularized membrane, this condition is particularly common in juvenile eyes, especially those that have come into contact with water canals. Either the immune system's response or direct harm from the parasite and its toxic byproducts might be the cause of the inflammation in the eye. Many different medical and surgical treatments have been tried on those patients; in a follow-up of three months, 97% of those who underwent surgical AC wash showed significant resolution of inflammation and disappearance of granuloma better than medical steroids [3]. The inflammation responds favorably if identified early and treated appropriately.

87 eyes from 83 patients—82 of whom were men—were included in this research. All

of the patients had previously had a bath in a water canal. Due to societal restrictions, it is less frequent for females to play in ponds or take public baths during the day. However, it is typical for boys in rural regions, in particular, to go swimming in river water throughout the day. Similar findings were reached by other publications from Egypt and India, which found that all patients with AC granulomas were in contact with water canals and that most of them were male [8]. Since all of the patients were younger than 16, this may have something to do with their weakened immune systems and increased risk of infection from bathing in tainted water, compared to adults.

Numerous efforts have been made to identify the source of these nodules. Rathinam and colleagues have suggested that *Procerovumvarium*, a trematode of fish-eating birds widespread in India and other far-east nations, may have accidentally infected humans [9]. Rathinam et al.'s 2002 confirmation of the trematode-infection theory for this kind of uveitis was based on molecular data (DNA from AC granulomas and environmental cercaria were found to match). Similarly, recent research by Amin 2017 employing PCR analysis of the trematode DNA found that findings from

molecular testing in 6 of 14 samples, done in Egypt, were positive [1, 8].

Given the increasing number of parasite agents being discovered as possible sources of similar outbreaks, it seems that the worldwide prevalence of pediatric waterborne parasitic AC granulomas will only increase [10].

Local ophthalmologists are faced with the choice of treating the inflammatory focus directly or avoiding potential long-term consequences. In contrast to Amin et al.'s study, which found that 16% of the study eyes had complications like cataracts, glaucoma, correctopia, phthisis, or retro-corneal scarring, El Hefny et al. reported that the incidence of associated complications was 100% for localized anterior or posterior synechiae, 30% for retro-corneal opacities, and 30% for cataracts [8]. Furthermore, according to different research, just 10% of the eyes in that investigation had problems. Additionally, El Nokrashy et al. (2022) research evaluating posterior segment problems in children with uveitic cataracts discovered that complex cataracts, vitritis, and choroidal thickening are the most prevalent issues [10].

Our findings were consistent with those of Sadek et al. (2020), who found that the outcomes of surgical therapy outperform those of medicinal treatment [3]. The risk of

recurrence in eyes treated with medicinal steroids was found to be quite significant, at 74%. This is because of residual granulomatous particles connected to the ciliary body or retro-corneal after medical steroid therapy. But during surgery, we remove the granuloma entirely from its connection to the cornea and iris root. We then aspirate the anterior chamber with irrigation to remove any remaining particles.

This reduces the likelihood of any granulomatous particles remaining in the anterior chamber and lowers the probability of recurrence after surgery in comparison to non-surgical therapy. El Nokrashy et al. (2022) observed furthermore that antiparasitic therapy alone (praziquantel+metronidazole) is helpful for small granulomas, whereas surgical aspiration is a useful adjuvant treatment for big granulomas [10]. The safety and effectiveness of using argon laser photocoagulation of the pearl-like nodules in the AC by destruction or thermal ablation of the nodules in the AC, which are associated with the trematode larvae or adult worm, were reported previously [11]. This method eliminated the antigenic stimulant of the relapsing granulomatous anterior uveitis. (11) It is necessary to include preventive actions. To prevent the emergence of all these dangers in our children's eyes, public health education and knowledge of the recognized

risks of exposure to canal waters should be enhanced, particularly in endemic regions.

### Conclusion

More environmental investigation is to further identify the risk factors for this problematic pathogen identify subtypes of

helminths and possible preventive measures in the given endemic areas and outline the best management. Public health education and raising awareness of the recognized risks associated with canal water exposure are important, particularly in endemic regions.

### Ethical approval and consent to participate:

Before commencement, the research was granted clearance by the ethical committee of Fayoum University Hospital at its 90th session on September 1, 2022, under approval number M562. The processes were followed in compliance with the relevant laws and guidelines, and written informed consent was taken from all patients or their guardians before recruitment in the study after explaining the

objectives of the work. written informed consent was taken from all patients or their guardians before recruitment in the study after explaining the objectives of the work.

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**Competing interests:** The authors declare no conflicts of interest.

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