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Short Communication

Challenges in Diagnosing Microspherophakia in a Pediatric Patient

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INTRODUCTION

Microspherophakia (MSP) is a rare condition of the crystalline lens characterized by increased anteroposterior diameter and reduced equatorial diameter [1]. It is theorized that underdeveloped zonules of Zinn do not exert enough force on the lens to form the typical oval shape [1,2]. Although classically present in Weill-Marchesani (WMS) syndrome [3], microspherophakia can be associated with a number of other systemic or ocular conditions including Marfan's syndrome [2,4], iridocorneal endothelial syndrome [5] and Axenfeld-Rieger syndrome [6] (Table 1). Non-syndromic cases of MSP are rare. Both autosomal recessive and autosomal dominant heredity have been reported [7–9]. Since 1901, isolated MSP disease was described in different ethnic groups, mostly in the Asian continent and North Africa [10]. Prevalence of microspherophakia is unknown but prevalence of WMS is estimated at 1:100 000. A specialized lens clinic in India found that 1.2% of children who presented for lens abnormalities had microspherophakia [11]. Mechanism of MPS also remains unclear. Mutations of the latent TGF β-binding protein 2 (LTBP2) gene have been reported in some cases [3-6]. The LTBPs are a family of proteins that show important structural homologies with the fibrillins. LTBP2 is expressed in the trabecular mesh work and ciliary processes, with a high expression in the lens capsule/lens epithelium layer and it is thought to have a role in the regulation of elastic fiber assembly [10]. Another gene incriminated in cases of isolated MPS is ADAMTS17 which is part of the same family of metalloproteinases as ADAMTS10, the main gene associated with WMS syndrome [12]. Clinical manifestations of MSP include high myopia that can be a combination of lenticular and axial myopia [7]. Zonular instability can lead to lens subluxation and secondary angle closure glaucoma. Patients will usually present for loss of vision or acute eye pain. The triad of angle-closure glaucoma, shallow anterior chamber, and myopia are highly suggestive of MPS. Treatment will differ depending on the presentation with lensectomy being the mainstay. Here we describe an unusual case of isolated microspherophakia in a pediatric patient that presented for esotropia and required ultrasound biomicroscopy (UBM) to aid in diagnosis.

A 2-year-old Hispanic male was referred for evaluation of esotropia. The patient was able to fixate and follow bilaterally. A40 PD esotropia was noted with full extraocular movements. Intraocular pressures were elevated by palpation. Anterior segment examination revealed peripheral band keratopathy and multiple anterior synechiae bilaterally (Figure 1 a,b). Pupils were small, fixed, and failed to dilate impeding the view of the posterior pole. An examination under general anesthesia (EUA) revealed intraocular pressures (IOP) of 40 and 31 mmHg in the right and left eye respectively. Axial lengths were approximately 26 mm OU.

B scan ultrasound ruled out posterior tumor and vitreous inflammation. Initially, chronic anterior uveitis with secondary chronic angle closure glaucoma was suspected. Steroid and pressure lowering drops were initiated. However, systemic work-up for uveitis and rheumatologic evaluation were both negative. On subsequent EUA, UBM with a 50 mHz probe (Sonomed, Lake Success, NY) was performed to evaluate the anterior segment for potential etiologies of angle closure. Shallow anterior chambers with closed angles and iridocorneal adhesions were visualized (Figure 2a). The lenses were small, spherical and appeared to be pushing the iris forward.

Microspherophakia was suspected. Surgical exploration was performed on the left eye first, confirming this diagnosis (Figure 2b). Lensectomy with posterior capsulotomy and anterior vitrectomy were performed. The right eye underwent the same procedure one month later. At a 4-month post-operative visit, the IOPs were 23 and 13 mmHg in the right and left eye respectively. The anterior chambers were of moderate depth. Visualization of the posterior pole revealed cup to disc ratios of 0.8 OD and 0.7 OS. The patient was started on pressure lowering drops in his right eye.

Subsequent Genetics evaluation revealed an abnormal skull shape, up turned nose, long philtrum and slight prognathism. Cafe au lait spots were noted on the extremities. There was no history of consanguinity. A single nucleotide polymorphism array was recommended to evaluate for a possible chromosomal abnormality but the parents deferred this work-up.

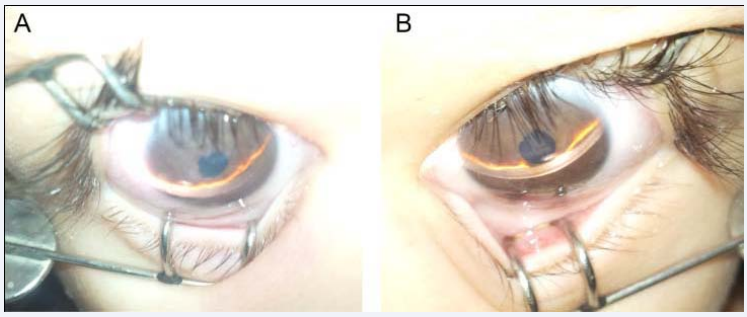

Figure 1 Photograph of the patient's right (Figure 1a) and left (Figure 1b) eyes during examination under anesthesia performed at presentation. Examination demonstrated bilateral mild corneal edema, peripheral band keratopathy, a diffusely shallow anterior chamber and areas of irido-corneal touch.

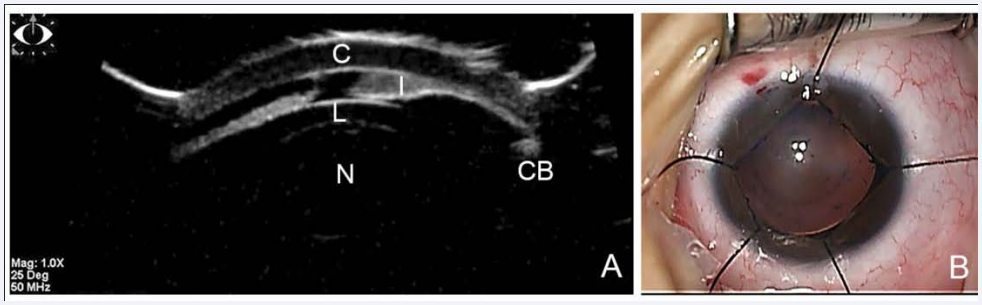

Figure 2 Evidence of microspherophakia.
(a) Ultrasound biomicroscopy of the left eye showing a very shallow to absent anterior chamber with the lens (L) pushing the iris (I) towards the cornea (C) and forming pupillary block . Increased anteroposterior diameter of the lens was noted. These findings were suspicious for microspherophakia. The nucleus (N) of the lens looked denser and globular (CB, ciliary body).
(b) Intraoperative picture of the left eye, after enlarging the pupil with iris hooks, showing visibility of the equator of the lens inferiorly and temporally which indicates a small equatorial lens diameter. The nucleus of the lens was denser and the lens had a steep anterior curvature centrally which indicates an increased antero-posterior diameter. These findings were consistent with microspherophakia. Similar ultrasound and surgical findings were noted in the right eye.

Table 1: Entities that is associated with microspherophakia and the incidence of microspherophakia in these entities.

Entities associated with microspherophakia	Incidence of microspherophakia
Systemic	
Weill-Marchesani [3,18]	74 to 94%
Marfan's syndrome [2,4]*	N/A
Lowe's syndrome	N/A
Homocystinuria [19]	N/A
Alport's syndrome [20]	N/A
Microspherophakia-metaphyseal dysplasia [21]	1 family
Axenfield-Rieger syndrome [6]	1 case report
Klinefelter's syndrome [22]	N/A
Chondrodysplasia punctata [23]	1 case report
Metaphyseal dysplasia [21]	1 family
Cri du chat syndrome [24]	1 case report
Local	
Aniridia [25]	2.4%
Iridocorneal endothelial syndrome [5]	1 case report
Megalocornea [10]	2 families
Optic disc colobomata [26]	1 case report

* Microspherophakia has mainly been reported in the severe neonatal form of Marfan's

Our patient did not exhibit the features of the syndromes mentioned in Table 1 and was suspected to be an isolated case of MPS. In particular, he did not have short stature, brachydactyly, joint stiffness and cardiovascular anomalies that are features of WMS. To our knowledge this would be the first report of microspherophakia in his panic population but the diagnosis of MPS can be a challenge, particularly in the pediatric population where a good examination and the use of auxiliary testing are limited. It is possible that other similar cases may have been misdiagnosed as primary angle closure glaucoma or as uveitis with secondary glaucoma despite the absence of active inflammation; therefore, the use of UBM technology can be very helpful in distinguishing this challenging diagnosis.

Microspherophakia can lead to secondary glaucoma via either acute pupillary block mechanism or chronic angle closure. Patients may also have developmental anomalies of the drainage angle [13]. A retrospective review by Senthil, *et al.,* found that 51% of 159 eyes with microspherophakic had glaucoma [2]. Few patients benefitted from laser iridotomy and a large number ended up necessitating surgical intervention. Lensectomy has been reported to lead to successful lowering of IOP [2,14].

This case report highlights the utility of UBM in the evaluation of angle closure glaucoma in children. UBM, In this case of a uveitis masquerade, was instrumental in identifying

the correct diagnosis of microspherophakia. This imaging technology uses ultrasound waves to produce two-dimensional cross-sectional images of the anterior segment [15]. It provides morphologic details regarding the anterior chamber angle, iris, ciliary body, zonules and lens. It has previously been valuable in cases with congenital microcoria [16]. In pediatrics patients, it has been reported in the assessment of corneal diseases, ciliary body tumors, and congenital cataracts [15,17]. In this challenging case of small, fixed pupils, ultrasound biomicroscopy allowed for visualization of the anterior segment anatomy which ultimately leads to an accurate diagnosis of microspherophakia requiring subsequent surgical management.

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ROLE OF THE SPONSOR

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