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Approaches to Low Vision Care in Patients with Uveal Coloboma: An African Perspective

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Introduction

Low vision is defined as visual impairment that cannot be corrected by medical or surgical treatment or conventional optical devices and that interferes with activities of daily living.[1] Visual impairment remains a major public health concern globally and is particularly prevalent in Africa, where an estimated 26.3 million individuals live with visual impairment, including 20.4 million with low vision and 5.9 million who are blind.[2] Among children, the burden is substantial, with studies reporting high prevalence rates across school-aged populations.

In Africa, causes of low vision include uncorrected refractive error, cataract, glaucoma, corneal opacity, and retinal disease, often exacerbated by limited access to eye care services.[3] In children, low vision is most commonly associated with uncorrected refractive error, congenital cataract, corneal scarring, optic nerve anomalies, albinism, and inherited retinal disorders.[4] Childhood low vision has significant functional, educational, and psychosocial consequences, affecting academic performance, independence, family dynamics, and overall development.

One cause of low vision in children in Africa is ocular coloboma, a congenital malformation resulting from incomplete closure of the fetal fissure leading to absence of normal ocular tissues. Uveal coloboma may involve the iris, ciliary body, retina, and optic nerve, often causing significant visual impairment.[5] The reported incidence of ocular coloboma ranges from approximately 0.5–0.7 per 10,000 live births, although the condition may be underdiagnosed in many low-resource settings due to limited access to specialized ophthalmic care and referral pathways.[6] In some cases, ocular coloboma may occur in association with systemic anomalies,

highlighting the importance of a comprehensive clinical evaluation. Brachymetatarsia, a congenital shortening of the metatarsal bone, most commonly affecting the fourth metatarsal, can result in gait abnormalities, discomfort, and psychosocial challenges. This case report describes the low vision management of an African adolescent with uveal coloboma.

Case Report

Initial Visit

A 14-year-old Black African female high school student presented to Evangelical Church Winning All Eye Hospital in Kano, Nigeria, with complaints of reduced distance and near vision in both eyes, photophobia, and mild ocular irritation. She had no prior history of spectacle correction and no known family history of blindness. She was referred for a comprehensive low vision assessment.

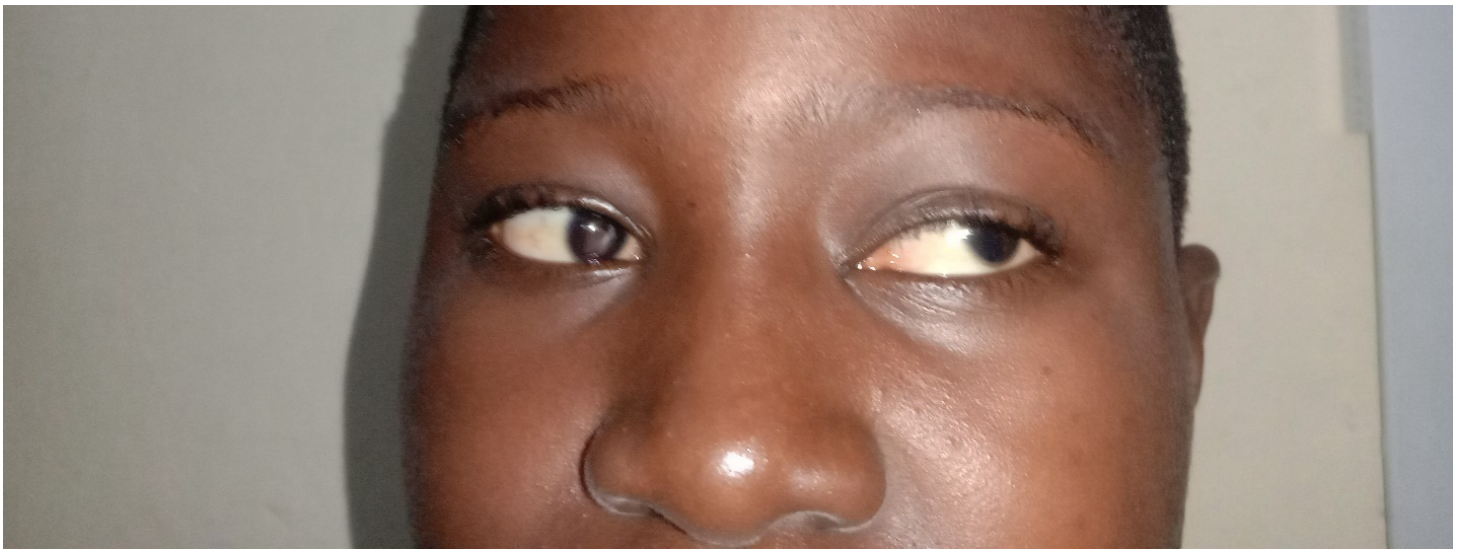

Figure 1. Anterior segment photograph demonstrating a key clinical feature of iris coloboma, characterized by an inferonasal defect in the iris resulting in an irregular pupil shape. This is visible in the right eye.

Presenting visual acuity was 20/1200 in the right eye and 20/200 in the left eye. Slit-lamp examination revealed microcornea and an inferonasal iris coloboma. No clinically significant lenticular opacity or other media abnormality was observed. Bilateral conjugate horizontal jerk nystagmus was present in primary gaze and increased mildly in lateral gaze. Ocular motility examination suggested a left hypertropia in left gaze, consistent with the clinical photograph (Figure 1). Fundus photography demonstrated a chorioretinal coloboma involving the optic disc and extending inferiorly; the macular region appeared relatively spared on clinical examination (Figure 2). Optical coherence tomography was not available at the time of examination. General physical examination revealed bilateral brachymetatarsia (Figure 3). Although the coexistence of these two clinical findings may be suggestive of a syndromic association (e.g., Bardet–Biedl syndrome or Cat Eye syndrome), no additional systemic abnormalities were identified on clinical examination to support a syndromic diagnosis, and its relationship to the ocular findings remains uncertain.

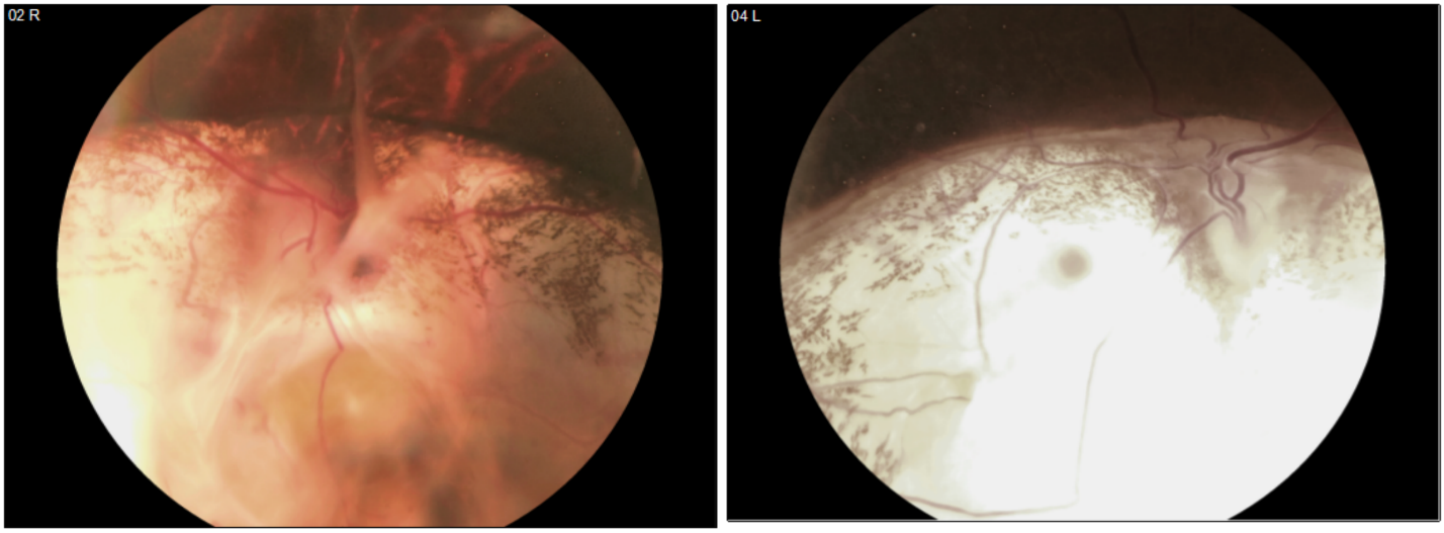

Figure 2. Widefield fundus images of the right (R) and left (L) eyes showing a well-demarcated chorioretinal coloboma involving the posterior pole of each eye, with areas of retinal thinning and altered vascular pattern.

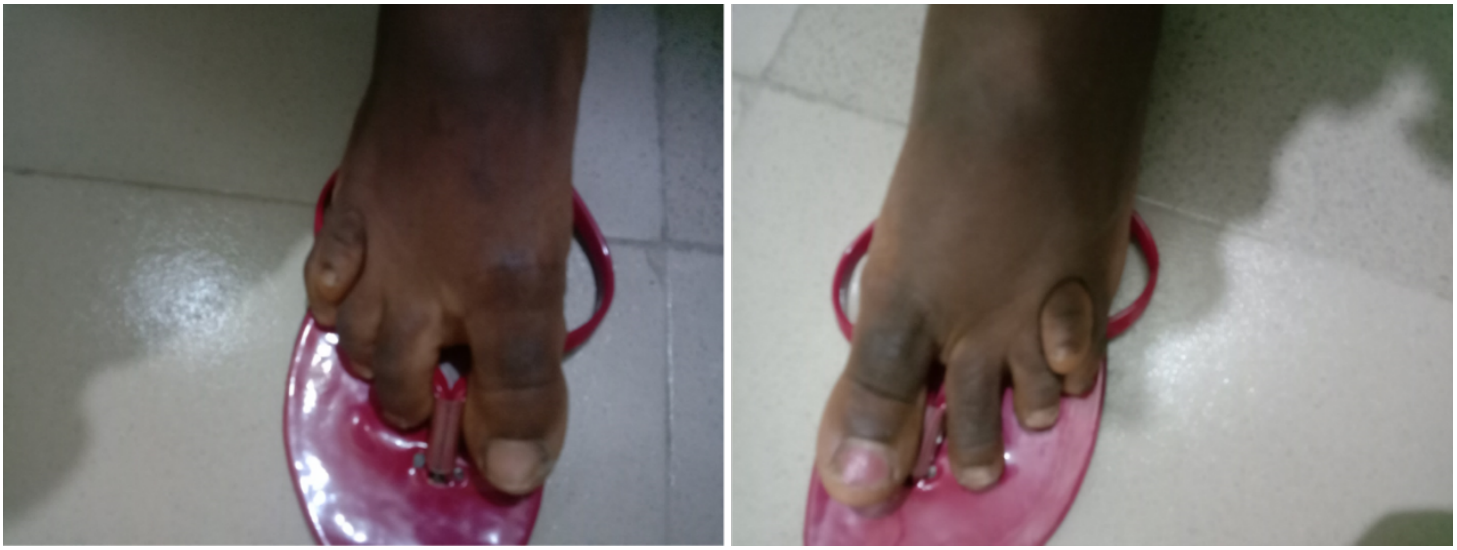

Figure 3. Clinical photographs of both feet demonstrating malformation involving the fourth metatarsal, with associated digital shortening and structural abnormality.

Based on the ocular findings, a diagnosis of uveal coloboma was made. Distance visual acuity measured 1.78 logMAR (20/1200) in the right eye and 1.0 logMAR (20/200) in the left eye. Near visual acuity was 5.0 M at 8 cm in the right eye and 1.6 M at 17 cm in the left eye, corresponding to the patient's spontaneous reading distance during assessment. Cycloplegic refraction revealed identical refractive errors in each eye (−1.50 DS/−6.00 × 90). Pelli–Robson contrast sensitivity measured 2.25 in the right eye; testing in the left eye was unreliable due to the presence of nystagmus.

Trial Phase

The trial phase began with an educational session involving the patient and her brother, focusing on the nature of uveal coloboma, its visual implications, and the goals of low vision rehabilitation. Counseling emphasized

that, although structural abnormalities may limit conventional visual improvement, functional vision can often be enhanced through appropriate magnification and rehabilitation strategies.

Near magnification planning was based on the measured near visual acuity of 5.0 M at 8 cm in the right eye and 1.6 M at 17 cm in the left eye. In accordance with functional low vision principles, magnification planning was based primarily on the better-seeing eye (left eye). The test distances of 8 cm and 17 cm reflected the patient's spontaneous working distances during near acuity assessment.

Required magnification was estimated using the equivalent ratio method, comparing the patient's measured acuity with the target print size of 0.8 M for comfortable academic reading. This calculation yielded an estimated magnification of approximately 2X, corresponding to an equivalent viewing distance of approximately 8.5 cm and a calculated viewing power of about +11.75 D.

For distance tasks, presenting visual acuity measured 1.78 logMAR (20/1200) in the right eye and 1.0 logMAR (20/200) in the left eye. Based on a functional target acuity of 0.18 logMAR (20/30), which is generally adequate for classroom board viewing, the equivalent ratio approach indicated that approximately 6X magnification would be required for distance enhancement.

Training Phase

Near vision rehabilitation was initiated using the estimated addition derived during magnification planning. Using a trial frame, the patient read from a Bailey–Lovie near chart while maintaining a working distance of approximately 11–15 cm. Reading performance was evaluated based on accuracy, speed, and comfort, and lens power was progressively adjusted to determine the minimum effective magnification. A +6.00 D reading spectacle used at a 13 cm working distance was selected as it provided the best balance between reading fluency, field of view, and comfortable working distance.

Distance rehabilitation was performed using a 6X monocular telescope over the left eye. Testing with a Bailey–Lovie logMAR chart confirmed that this magnification achieved a visual acuity of 0.18 logMAR (20/30) despite the presence of nystagmus. Training focused on improving device alignment, stabilization, posture, and lighting to facilitate effective use of both near and distance aids for academic tasks.

Prescription & Outcome

During initial telescope trialing, the patient achieved a distance visual acuity of 0.18 logMAR (20/30). With improved focus, alignment, and brief device familiarization, use of a monocular 6X telescope further improved distance acuity to 0.00 logMAR (20/20).

For near tasks, although the calculated near addition was approximately +11.75 D based on acuity and target print size, this served only as an initial estimate. A +6.00 D spectacle magnifier was ultimately prescribed, achieving 0.8 M near acuity at a 13 cm working distance while providing better reading fluency, field of view, and a more comfortable working distance.

Photochromic lenses were prescribed to reduce photophobia and improve visual comfort. Non-optical interventions included high-contrast writing materials, mobile application magnifiers, and a reading stand to

improve posture and near-task performance. Education was also provided on relative distance magnification, classroom accommodations, and conservative management of brachymetatarsia.

Discussion

This case underscores the importance of a structured low vision rehabilitation approach in pediatric patients with congenital ocular anomalies such as uveal coloboma. Although refractive correction did not significantly improve visual acuity, a finding commonly reported in structural ocular abnormalities[3,5], the use of photochromic lenses was clinically appropriate to enhance contrast sensitivity and reduce photophobia. This aligns with evidence that optical management in coloboma should emphasize functional vision rather than acuity alone.[7]

Magnification devices were prescribed based on functional task performance rather than calculated magnification values.[8] The selection of the minimum effective magnification (6X telescope) provided sufficient distance clarity while minimizing cognitive and physical demands associated with higher magnification.[9] Non-optical interventions, including the use of a reading stand, were essential for optimizing ergonomics and preventing secondary musculoskeletal strain, an often overlooked aspect of pediatric low vision care.[7]

Classroom accommodations such as preferential seating and contrast enhancement align with inclusive education frameworks for learners with visual impairment.[8] Reliance on family members and limited school collaboration reflect persistent challenges in low vision service delivery in many African settings, where multidisciplinary and educational support is often inaccessible.[9,10]

Management of brachymetatarsia was conservative, involving accommodative footwear and cushioned socks. Surgical correction was discussed but deferred due to financial limitations and restricted orthopedic availability, highlighting gaps in multidisciplinary care and healthcare access. Oral supplementation of lutein, zeaxanthin, alpha-lipoic acid, and bilberry was prescribed to support posterior segment health through antioxidant and neuroprotective effects.[11,12] While supplements do not reverse structural anomalies, they may support retinal function and reduce oxidative stress in at-risk patients.[11-13]

This degree of astigmatism in this case would be considered highly amblyogenic in a pediatric patient. However, the lack of significant visual acuity improvement following refractive correction in this case suggests that the reduced vision was more likely attributable to the underlying structural ocular abnormality than to refractive error alone.

Despite scheduling 3 follow-up visits over 3 weeks, the patient did not return, reflecting common barriers in low vision rehabilitation in Nigeria, including cost, transportation, and limited caregiver support. This underscores the need for comprehensive context-sensitive rehabilitation during the initial visit in low-resource settings.[14]

Certain clinical assessments that could further characterize the ocular findings were not available at the time of examination. Optical coherence tomography was not performed, and cornea diameter measurements were not obtained. Although ocular motility examination suggested left hypertropia, the exact magnitude of the deviation was not measured. In addition, genetic evaluation was not conducted to explore possible syndromes, although no other systemic features suggestive of a genetic syndrome were identified on clinical examination. Despite

these limitations, the clinical findings were sufficient to guide low vision rehabilitation and provide significant functional improvement for the patient.

Conclusion

Low vision management is essential for improving daily function and quality of life in pediatric patients. This case demonstrates the benefit of a comprehensive, individualized approach combining optical and non-optical interventions in a 14-year-old girl with uveal coloboma and brachymetatarsia, resulting in meaningful visual and functional improvement.

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Statement of Ethics

The patient gave written consent to publish the data. The report does not include personal information that could identify the patient directly or indirectly. All medical interventions have been carried out according to the latest protocols of therapy. Reporting and writing are all in compliance with the Declaration of Helsinki.

Conflict of Interest Statement

The authors declare no conflicts of interest related to this topic.

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