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Update

Recent guidelines in prescription of glasses in children: What is new

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Introduction

Timely and accurate spectacle prescription in children plays a crucial role in preventing long-term visual impairment and ensuring healthy visual development. During the sensitive period of visual maturation, uncorrected refractive errors can lead to amblyopia, hinder academic performance, and delay key developmental milestones. Unlike adults, children may not articulate their visual discomfort effectively, which often delays diagnosis and intervention. Moreover, prescribing glasses in the pediatric population is inherently more complex, requiring the use of cycloplegic refraction, adherence to age-specific refractive norms, and a nuanced evaluation of the child's visual needs, likely compliance, and suitability of the spectacle frame. A lapse in clinical judgment or delays in prescription can result in irreversible visual deficits, adversely affecting not just the child's vision but also their learning capacity, self-confidence, and future economic opportunities. This article explores the fundamental principles and the latest updates in pediatric spectacle prescription, highlighting the challenges and offering guidance for effective clinical practice.

Challenges in pediatric spectacle prescription

Pediatric spectacle prescription involves navigating both physiological and behavioral challenges. Unlike adults, children are often unable to provide reliable subjective input, making objective techniques like cycloplegic retinoscopy essential for accurate diagnosis[1]. Unfortunately, in many high-volume or resource-limited clinical settings, cycloplegia is underutilized, leading to missed latent hyperopia and inaccurate prescriptions. Age-based refractive norms must also be carefully considered, especially when deciding how much hyperopia or astigmatism to correct. Furthermore, compliance is a significant concern. Factors such as poor frame fit, lack of parental awareness, aesthetic concerns, and socioeconomic constraints frequently affect whether a child continues to wear prescribed glasses. A delayed diagnosis of refractive errors and missed critical window for amblyopia prevention may cause a child to suffer lifelong visual impairment, affecting their educational attainment and employment prospects in adulthood[2].

What is new

While the foundational practices in pediatric refraction – such as the use of cycloplegic agents and emphasis on binocular vision – remain constant, recent shifts in children's visual habits and epidemiology have necessitated updates in prescription guidelines. Increased engagement in near work, the growing use of digital devices, and the improved survival rates of preterm infants, including those with retinopathy of prematurity (ROP), have contributed to a changing refractive profile in children, with a noticeable rise in myopia cases[3,4]. In addition, with increased parental awareness and screening programs the more amblyogenic and difficult to detect cases of anisometropia, and astigmatism too report to the ophthalmic clinic early. In response, new consensus guidelines have emerged to refine clinical practice, promote standardization, and minimize variability among practitioners.

Key considerations in pediatric spectacle prescription

Multiple variables influence the decision to prescribe spectacles in children. Age plays a pivotal role; younger children have a greater potential to emmetropize, and unnecessary overcorrection might impede this natural process, whereas undercorrection may risk amblyopia[5]. Visual acuity assessment, preferably monocularly should always be attempted with age appropriate tests: preferential looking techniques such as Teller cards or LEA paddles for infants, LEA symbols or HOTV matching cards for toddlers aged 2.5 to 4 years, and Snellen's chart for older children. Accommodation should be assessed using pre-cycloplegic retinoscopy to uncover latent hyperopia or pseudomyopia. The presence of strabismus also significantly influences prescription strategy. A cover-uncover test detects deviations but in a less cooperative child even putting a tranluscent occluder infront of one eye can reveal ocular

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misalignment. Signs like objection to occlusion and fixation preference point towards amblyopia. In orthotropic patients, a 10-prism-dioptre fixation test can be used to rule in amblyopia. Refractive errors such as high hyperopia, anisometropia, and significant astigmatism serve as critical red flags for amblyopia risk[6]. While autorefractors are often used for convenience, they tend to overestimate myopia and underestimate hyperopia in children and should therefore should not be relied upon[7].

Cycloplegic agents: a context-driven approach

Cycloplegic refraction continues to be gold standard for assessing true refractive status in children. It paralyzes the accommodative mechanism, revealing latent hyperopia and aiding in accurate spectacle prescription[8].

The choice of cycloplegic agent should be tailored to the clinical context and the individual child's needs. Cyclopentolate 1% is considered good cycloplegic for most pediatric patients due to its effective cycloplegia and moderate duration of action, typically lasting around 24 hours and may sometimes need 2 applications[9]. It should be avoided in children with delayed milestones and history of seizures and homatropine used instead.

Tropicamide alone, which causes good dilatation is not a good enough cycloplegic for children[10].

Atropine, with its logistical drawbacks like prolonged recovery time, necessitating examination few days after administration and severe side effects is reserved for special situations such as treating accommodative spasm, pseudomyopia, or for penalization in amblyopia therapy[11].

Effective cycloplegia with minimal side effects and moderate recovery time can be achieved in children with dark irides by using tropicamide in combination with cyclopentolate. This combination is fast acting and almost as effective as atropine.

Interpreting cycloplegic refraction: to prescribe or not?

The detection of a refractive error on cycloplegic refraction does not automatically warrant prescription. Instead, the decision must be informed by three guiding questions:

1. Is the refractive error amblyogenic?
2. Is the error significant for the child's visual needs, considering age and stage of visual development?
3. Could the refractive error be contributing to or exacerbating strabismus, if present?

These considerations help determine the functional importance of the refractive error and make it possible to prescribe glasses even if there is no subjective response from the child[12].

Ocular examination essentials

A complete ocular examination must precede any prescription. When a slit-lamp examination is not possible, a torchlight exam can suffice for anterior segment evaluation. A thorough fundus examination is mandatory to rule out any posterior segment pathology that could affect visual acuity or mimic refractive errors[13].

Cycloplegic acceptance: a judicious tool

Cycloplegic acceptance – testing the child's visual acuity using cycloplegic refraction – can be a helpful tool for fine-tuning prescriptions. It is especially useful in cases of myopia and astigmatism, including confirmation of cylindrical axis in compound myopic astigmatism[8]. However, in cases of hyperopia, cycloplegic acceptance should be approached with caution to avoid overcorrection. A useful tip in practice is to perform acceptance testing before dilation if hypermetropia is detected on dry retinoscopy, thereby reducing the need for a follow-up visit.

Prescription guidelines: clinical judgement over rules

Various organizations, including the American Association for Pediatric Ophthalmology and Strabismus (AAPOS), the American Academy of Ophthalmology (AAO), and Indian entities such as AIOS (All India Ophthalmological Society), have published updated guidelines for pediatric spectacle prescriptions. These are consensus-based recommendations rather than strict rules. Clinical judgement should always guide the decision. In younger children, a higher threshold is acceptable due to the potential for emmetropization. However, the presence of amblyogenic factors warrants early and full correction, even at lower thresholds. Aso, in children with developmental delays, treated retinopathy of prematurity (ROP), or syndromic associations, earlier and more aggressive correction of even borderline refractive errors is common practice[13].

Prescription decision-making: a framework

The framework for prescribing spectacles in children involves assessing amblyogenic risk, determining the functional significance of the refractive error, and evaluating any associated strabismus[13,12]. Age-specific recommendations include:

- **Myopia:** Observation is acceptable in infants with less than 4-5 diopters. A refractive error

greater than 5D warrants early correction, and syndromic associations, retinal dystrophy, etc. should be ruled out. For toddlers, as the distance viewing needs increase – prescription is recommended if myopia exceeds 3 diopters. In school-age children, full correction is advised to support distance vision and academic performance. The aim is to prescribe the lowest minus power needed for best visual acuity[13].

- **Hypermetropia:** In children under 2 years, correction is considered at or above +5.00 D, while in older children, the threshold reduces to +4.50 D. Children with esotropia require full cycloplegic correction, whereas a slight under-correction may be acceptable in orthotropic children to support natural emmetropization[14]. A quick cover-uncover test should be performed to rule out intermittent esotropia in these patients, and a short course of homatropine eye drops may help first-time wearers adapt to their glasses.
- **Astigmatism:** Correction is warranted when the cylindrical error exceeds 1.50 D, especially in oblique or unilateral cases, which are more amblyogenic[15]. Full cylindrical correction is usually well tolerated in young children. It is important to rule out allergic eye disease and keratoconus. In unilateral cases, eyelid conditions such as ptosis or hemangioma should be considered[16]. Proper fitting and centration of spectacles are extremely important, as bent frames can alter the axis of cylindrical correction. These issues should be checked at every visit and repaired promptly if found.
- **Anisometropia:** Full correction is essential in cases of anisohyperopia greater than 1.00 D and anisoastigmatism above 1.50 D, given the high risk of amblyopia[17]. Contact lenses may be considered in cases of high anisometropia for better cosmesis and binocular vision.

Role of strabismus in refractive error management

Ocular deviation significantly influences the approach to spectacle prescription in children. When **esotropia** is present, the general principle is to fully correct the refractive error, particularly hyperopia, to reduce accommodative effort and help align the eyes. This full correction is essential for promoting binocular vision and preventing or treating amblyopia[18].

For myopia, full correction is typically prescribed as under correction can lead to blurred distance vision and hinder academic performance. In cases of hyperopia, the strategy varies with age. For children under five years, full cycloplegic correction is usually given to prevent amblyopia and support visual development. In children older than five years, a more individualized approach is used – clinicians aim to prescribe the maximum plus power that the child can comfortably tolerate, balancing between emmetropization and visual clarity. Astigmatism is generally corrected fully, based on the cycloplegic refraction, to provide clear, stable vision and minimize distortion. In children with a high accommodative convergence to accommodation (AC/A) ratio, a near addition (bifocal or progressive lenses) may be beneficial, especially when esotropia increases with near fixation[19].

For **exotropia**, full correction of myopia and astigmatism is advised. In some cases, a slight over-minus correction may be prescribed to stimulate accommodative convergence and help control the deviation[20]. Small hypermetropias in the presence of normal vision can often be ignored, however hypermetropia associated with reduced vision, a prescription is given, but undercorrection may be considered to avoid overplus-induced blurring and to allow some degree of natural emmetropization, especially if the child is older and not amblyogenic.

Special situations and considerations

Myopia control strategies – Given the global rise in myopia, especially among urban and school-aged populations, managing myopia progression has become a critical aspect of pediatric refractive care. Current consensus – including that of the World Society of Paediatric Ophthalmology and Strabismus (WSPOS) – discourages the practice of undercorrection in myopia, as it may exacerbate progression. Similarly, traditional interventions such as progressive addition lenses (PALS) and peripheral hyperopic defocus lenses have shown limited efficacy. More promising interventions include Defocus Incorporated Multiple Segments (DIMS) lenses, Highly Aspherical Lenslet (HAL) lenses, and pharmacological measures such as low-dose atropine[21]. The combination of optical and pharmacological strategies should be tailored to the child's age, rate of progression, and parental preferences.

Certain clinical situations demand special attention. Children who have undergone cataract surgery require single vision lenses with a near addition initially and bifocals later as their near visual demands grow. Children with neurological or genetic conditions such as Down syndrome or cortical visual impairment benefit from +3 to +4 D glasses or bifocals to offset their reduced accommodation. In cases of albinism or aniridia, tinted glasses can enhance contrast sensitivity and reduce photophobia, improving functional vision.

Spectacle fitting and follow-up

A well-fitting pair of glasses is crucial for ensuring both visual benefit and long-term compliance. The frame should be well-centered, snug, and free from issues such as bent temples or displaced lenses. Follow-up visits are essential to monitor progress and ensure compliance. A typical follow-up schedule may include an initial review at 3 to 6 weeks to assess fit and compliance, another at 8 to 12 weeks to evaluate for amblyopia onset or ocular deviation, and subsequent visits every 3 to 6 months to reassess refraction and adjust treatment as needed.

Parental counselling and compliance

Effective parental counselling is central to successful spectacle use in children. Common myths – such as the belief that glasses weaken the eyes-should be proactively addressed. Parents should be educated about the importance of consistent wear, the necessity of long-term follow-up, and the critical role of spectacles in preventing irreversible visual loss. Future options such as contact lenses or refractive surgery for older children can also be discussed to provide a sense of long-term vision planning.

Conclusion

Pediatric spectacle prescription represents a delicate blend of optical science, developmental understanding, and collaborative care. Cycloplegic refraction, adherence to age-specific thresholds, consideration of strabismus, and the judicious use of evolving technologies are key to ensuring the best possible visual outcomes. Early and appropriate interventions not only prevent visual impairment but also empower children to succeed academically, socially, and professionally, laying the foundation for a lifetime of functional independence.

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