Consensus Criteria

National consensus statement regarding pediatric eye examination, refraction, and amblyopia management

Rohit Saxena, Pradeep Sharma, Santhan Gopal[1] and the Pediatric Ophthalmology Expert Group[#]

Childhood blindness causes significant social and economic burden. Even though pediatric eye care has gained priority under Vision 2020, it continues to come under the purview of tertiary care centers due to lack of knowhow and facilities at primary and secondary level. Currently, India does not have standard guidelines on pediatric eye examination, refraction, and amblyopia management and therefore these are being managed inadequately or inappropriately. In view of this, an expert group of pediatric ophthalmologists from across the country met under the aegis of All India Ophthalmological Society, and deliberated to reach a consensus on the correct method of pediatric eye examination, treating refractive error in children and managing amblyopia. The purpose of the consensus statement was to enable all ophthalmologists to have a broad set of guidelines, which can form the basic framework for managing common pediatric eye conditions, in most ophthalmic setups. The consensus statement is divided into three broad categories: Pediatric eye examination, pediatric refraction, and amblyopia management. The pediatric eye exam subsection discusses the recommended clinical history, which should be taken and the essential components of an ophthalmic examination including pediatric vision assessment. Additionally, it discusses the role of special tests and investigations such as imaging and electrophysiology. The section on pediatric refraction emphasizes the correct use of cycloplegia and prescribing glasses in the Indian context. The final section on amblyopia management presents the various options of treating amblyopia and provides standard guidelines for the use of occlusion therapy and its weaning over time.

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Childhood blindness is apriority in the Vision 2020-Right to Sight initiative, as it results in significant social and economic burden.[1] Preventing or treating childhood blindness has a significant impact in terms of "blind years" avoided and gained productivity. Common causes of childhood blindness in India are refractive errors, pediatric cataract, glaucoma, corneal blindness, congenital anomalies, ocular trauma, and retinopathy of prematurity[2-6] Most of these diseases can be easily avoided or treated by correct diagnosis based on a reliable eye examination and timely management.[1,7]

Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, [1]Kamala Nethralaya, Bengaluru, Karnataka, India

[#]Dr. A K Khurana, Dr. Anirudh Singh, Dr. Ankur Sinha, Dr. Arun Samprathi, Dr. Aswini Kumar Behera, Dr. Digvijay Singh, Dr. Elizabeth Joseph, Dr. Gaurav Kakkar, Dr. Jitendra Jethani, Dr. Jyoti Matalia, Dr. Kalpit Shah, Dr. Kamlesh, Dr. Lav Kochgaway, Dr. Meenakshi Swaminathan, Dr. Milind Killedar, Dr. Muralidhar Rajamani, Dr. Namrata Sharma, Dr. P K Pandey, Dr. Pradeep Agarwal, Dr. Pradeep Sharma, Dr. Ramesh Kekunnaya, Dr Rajesh Sinha, Dr. Rebika Dhiman, Dr. Rohit Agarwal, Dr. Rohit Saxena, Dr. Santhan Gopal, Dr. Shailesh G.M., Dr. Shubhangi Bhave, Dr. Subhash Dadeya, Dr. Sudarshan Khokhar, Dr. Sujata Guha, Dr. Suma Ganesh, Dr. Sumita Agarkar, Dr. Swati Phuljhele, Dr. Vinita Singh, Dr. Yogesh Shukla

Correspondence to: Dr. Rohit Saxena, Department of Ophthalmology, Squint and Neuro-Ophthalmology Services, Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, Ansari Nagar, New Delhi - 110 029, India. E-mail: rohitsaxena80@yahoo.com

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Despite being prioritized, pediatric eye care services are inadequate in India. While there should be one pediatric ophthalmology service center for every 10 million population as per WHO, this ratio is estimated to be 0.63 for every 10 million population in India.[8] As shown in a recent study, children form a significant proportion of patients at a tertiary eye care hospital, which has been attributed to the lack of pediatric specific services at primary and secondary healthcare level.[9] While, there is a need for trained pediatric ophthalmologists at tertiary eye care institutions, there is a greater need to impart education regarding pediatric eye examination and cycloplegic refraction to general ophthalmologists and optometrists around the country.[10] This will ensure that common conditions such as refractive error and amblyopia that need early and effective therapy to prevent visual impairment are tackled at the primary care level.

Guidelines and preferred practice patterns for pediatric eye examination formulated by organizations, such as the American Academy of Ophthalmology and World Society of Pediatric

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Ophthalmology and Strabismus, may not be applicable to India given its limited resources and lack of trained manpower.[11,12] To create guidelines that are appropriate for Indian conditions, there was a need to generate a national level expert consensus regarding the protocols for pediatric eye examination, pediatric vision screening, refraction, and amblyopia therapy. Pediatric ophthalmologists from across India met in New Delhi under the aegis of All India Ophthalmological Society, to share their experiences and discuss challenges in order to arrive at a consensus regarding examining a child's eye, performing refraction and managing amblyopia.

Methods

The expert panel of ophthalmologists consisted of 34 members, each of whom has either been fellowship trained in pediatric ophthalmology or predominantly manages pediatric eye conditions in their practice. The members were given a list of topics which would be discussed in the meeting, beforehand, and were instructed to come prepared with their thoughts on these issues. The consensus meeting was divided into three sessions focusing on pediatric eye exam, pediatric refraction, and amblyopia management respectively. A presentation on each of the broad topics was made by three group leaders (Digvijay Singh, Ankur Sinha, and Rohit Saxena) whereby the existing knowledge and global practice patterns were projected. The rest of the expert panel then gave their views on each of the items presented and the moderators (Pradeep Sharma, K Santhan Gopal, and Rohit Saxena) guided the discussion. After each member had presented their views, the moderators collated the thoughts and the final opinions, where a clear consensus was reached, were recorded. In case of opposing views or lack of a clear consensus, the moderators and group leaders undertook further discussion and evaluated literature to help arrive at a consensus. In case no consensus could be arrived despite this, the majority participants' view was considered with a footnote mentioning the view of the dissident expert members. At the end of the meeting, the complete consensus statement was presented in a recap and subsequently a written document was circulated among a few experts for ratification.

The final consensus statement is elucidated below and is divided into three parts: Pediatric eye examination, pediatric refraction, and amblyopia management.

Results

Pediatric eye examination

It is often not possible to perform a comprehensive eye examination in children such as in adults. However, the expert panel concurred that the pediatric eye exam should include the following:

History

A carefully taken history is essential and is often sufficient to reach a diagnosis, guide investigations, and highlight warning signs of a severe pathology. The informant should preferably be the person with whom the child spends maximum time (generally the mother). Important points in pediatric history include:

- Antenatal history to rule out TORCH (rashes, fever, etc.) infections[13]
- Perinatal history including details of delivery, whether preterm, birth weight, cry at birth, and institutional care (NICU stay)
- Systemic history including developmental milestones, history of seizures, neuropsychological symptoms, history of cerebral palsy, and Down's syndrome
- Ocular history including history of misalignment of eye, rubbing of eyes, watering, photophobia, white reflex in the eye, or any other ocular complaints
- Family history including history of consanguinity and history of ocular illness in parents or siblings
- Other history including history of any known allergy, any medication use, immunization status, and previous consults.

Ocular examination

A torch, a direct, and an indirect ophthalmoscope are the minimum necessary instruments for examining a child. The child should ideally be examined when he/she is comfortable, awake and alert, preferably on the mother's lap or shoulder (for small children). Diffuse light should be used for examination as the bright light can startle a child and make any further evaluation difficult. Toys, pictures, candies, mobile phones, or anything that catches the child's attention can be used for examination. Fundus and anterior segment examination can be best performed when the child is asleep or sedated. Examination under anesthesia may also be needed in selected cases. Comprehensive eye examination should include:

- Vision assessment (binocular and uniocular) by age-appropriate methods of vision screening. Methods of vision assessment in a child have been discussed later in the article
- External examination should include looking for oculofacial anomalies, head posture, and a torch-light examination of the external ocular structures like lids, lacrimal system, cornea, conjunctiva, sclera, and iris. Head posture can be best assessed by observing a child, and his interaction with parents
- Ocular motility can be assessed using toys and objects that will get a child's attention. Hirschberg test or a cover test may be performed in suspected cases of ocular misalignment. It is important to differentiate pseudo-strabismus from true strabismus. Presence of nystagmus may be an indicator of poor vision possibly due to some congenital ocular pathology
- Pupillary examination should include the assessment of size, shape, color of iris, inter-eye asymmetry in pupil size, and pupillary reactions (direct and consensual light reflex and relative afferent pupillary reflex). Asymmetry in pupil size or abnormal pupillary reflexes may be suggestive of an underlying CNS or ocular pathology, thus necessitating an urgent referral
- Distance direct ophthalmoscopy should be evaluated in a darkened room to look for the red reflex (Bruckner's reflex). Absence of red reflex or a markedly diminished reflex, presence of a white or yellow reflex (leukocoria), or asymmetry of the red reflexes are all considered abnormal and are important indications of underlying pathology[14]
- Slit lamp biomicroscopy (whenever applicable and possible) should be performed for detailed ocular examination
- Dilated fundus examination should be done for every child to evaluate the posterior segment
- Age-appropriate cycloplegic refraction using retinoscopy should be performed in all cases

- Stereoacuity assessment (optional) can be done at least once in cooperative patients[15,16]
- Assessing intraocular pressure is not required in children unless glaucoma is suspected (e.g., presence of buphthalmos, epiphora, photosensitivity, and corneal clouding) or steroid therapy is given. Depending on the age and cooperation of a child, it may be done using the noncontact tonometer or rebound tonometer or under sedation/anesthesia with the help of a Perkin's tonometer or tonopen.[17]

Methods of pediatric vision screening and criteria for referral

Vision screening is the most important aspect of pediatric eye examination. It can be challenging in preverbal children and ophthalmologists often have to rely on indirect means of assessing vision. These include fixation patterns, pupillary light reflexes, and attitude toward the environment. Fixation reflex is present at birth in most infants and develops in all by 3 months of age. Central, steady, and maintained fixation with free alternation is suggestive of good and equal vision in both eyes. Fixation preference or resistance in occluding one eye implies poor vision in the fellow eye. Visual evoked response (VER) is an objective method of assessing the visual pathway and is helpful in infants or uncooperative children with developmental delay. Teller's and Cardiff acuity cards, HOTV, and Lea symbols may also be used, if available. Subjective visual assessment is preferred over instrument-based screening (VER), wherever possible. In schoolgoing children vision assessment is simple and can be performed by using Snellen chart at 6-m distance or LogMAR chart at 4-m distance.[18] Table 1 summarizes the various indications for referral to a pediatric ophthalmologist for comprehensive eye examination at a higher center.

Timing of examination and screening

Pediatric vision screening and eye examination should be timed to maximize the detection of ocular morbidities and be able to provide timely intervention. Table 2 gives the guidelines for vision screening and comprehensive eye examination in children.

Special Note: The screening criteria for retinopathy of prematurity (ROP) in the Indian context differ from those in the west. Currently, screening for ROP is recommended in infants with either a birthweight less than 2000 g, or a gestational age less than 34 weeks or a gestational age between 34 and 36 weeks but with risk factors (such as a) cardiorespiratory support, b) prolonged oxygen therapy, c) respiratory distress syndrome, d) chronic lung disease, e) fetal hemorrhage, f) blood transfusion, g) neonatal sepsis, h) exchange transfusion, i) intraventricular hemorrhage, j) apnea, k) poor postnatal weight gain) or Infants with an unstable clinical course who are at high risk (as determined by the neonatologist or pediatrician). For infants with gestational age less than 28 weeks or birthweight less than 1200 g should be first screened at 2–3 weeks after delivery.[19]

Special examination/tests

Color vision

Color vision screening is not mandatory; however, given an opportunity it should be done in children at least once during their school years.

Visual fields

Visual field testing is not routinely required. Confrontation visual field testing may be performed in children, if a defect is suspected. The peripheral visual field of younger children can be assessed by observation for refixation to the field of gaze in which an object of interest has been presented. Quantitative visual field testing may be attempted when indicated. Reliability may be a concern, particularly in children below 8 years of age, although performance may improve with practice.

Imaging

Imaging in pediatric age group is indicated only in certain special situations.

- Face photography may be needed to document and follow changes of facial or ocular structural abnormalities. If taken

Table 1: Indications for referral to a pediatric ophthalmologist or higher center

Method	Indication for referral	Recommended age					
		Birth-6 months	6-12 months	1-3 years	3-4 years	4-5 years	Every 1-2 years (after 5 years of age)
Red reflex test	Absent, white, dull, opacified, or asymmetric	+	+	+	+	+	+
External inspection	Structural abnormality (e.g., ptosis)	+	+	+	+	+	+
Pupillary examination	Irregular shape, unequal size, poor or unequal reaction to light	+	+	+	+	+	+
Fix and follow	Failure to fix and follow	Cooperative infant ≥3 months	+	+			
Corneal light reflection	Asymmetric or displaced		+	+	+	+	+
Instrument based vision screening	Failure to meet screening criteria			+	+	+	+
Cover test	Refixation movement				+	+	+
	Worse than 20/50 either eye or 2 lines of differences between the eyes				+	+	+
Distance visual acuity (monocular)	Worse than 20/40 either eye					+	+
	Worse than 3 of 5 optotypes on 20/30 line, or 2 lines of difference between the eyes						+

Adapted from American Academy of Ophthalmology Preferred Practice Patterns 2018[11]

with a flash, the corneal reflexes can help to check for ocular alignment and differentiating pseudo from true strabismus
- Anterior segment photography through a slit lamp for cataract and other anomalies
- Corneal topography to detect early changes related to keratoconus
- Fundus photography may be needed for ROP screening and evaluation of torsion
- Rarely, OCT-based image analysis may be needed for optic nerve head assessment or abnormal retinal pathology.

Visual Evoked Response

VER is an effective test for vision screening of infants and children with developmental delay, though it should be interpreted with caution. Generally, the test has to be done after sedation using flash stimulus through VER goggles. It is particularly useful in cases with normal ocular findings where cortical visual impairment is suspected. The test is not freely available and cannot be considered as part of a comprehensive pediatric eye exam.

Pediatric refraction

Pediatric refraction is challenging since children have strong accommodation, are often uncooperative, and have a dynamic ocular system due to growth.[20] There are no standard guidelines for refraction and prescription of Indian pediatric patients and most ophthalmologists rely on their clinical experience. The consensus on pediatric refraction is summarized below.

Timing of refraction

All children should undergo vision assessment (and refraction if vision is suspected to be subnormal on screening) at least once before the child starts going to school, i.e., at 3-4 years of age (preschool screening). Early refraction is indicated in symptomatic cases, i.e., difficulty to identify faces from distance, history of frequent falls, watching television, or mobile closely, and in certain clinical settings like history of any ocular surgery particularly congenital cataract, premature birth, perinatal insult or developmental delay, strabismus, and family history of high refractive errors. Pediatricians should be sensitized for timely referral to an ophthalmologist for the same as a high refractive error may lead to squint or amblyopia besides adversely affecting normal growth and development of the child.

Method of refraction

The gold standard in pediatric refraction is a good retinoscopy. In the recent past, various handheld and portable autorefractors are available, however, while they may be useful screening tools, the accuracy is often questionable in toddlers and infants. Schoolgoing children cooperate well on the autorefractor and it may be used with appropriate cycloplegia.[21] Refraction without cycloplegia may be used for screening but is not recommended for final prescription in view of variability in refractive error.[22]

Use of cycloplegia

Atropine, homatropine and cyclopentolate are commonly used cycloplegics in children and are often used interchangeably. Various studies in Indian eyes have shown that there are differences between the cycloplegic efficacy of these medications, with atropine and cyclopentolate having the strongest action followed by homatropine.[23,24] Table 3 describes the consensus on age-appropriate use of these cycloplegics. An important point to keep in mind is that proper cycloplegia should be achieved and this may be verified by performing dynamic retinoscopy (while child looks at a distance and near object) which should reveal a constant value.

Table 2: Timings for vision screening

	When
Neonates	At discharge
High risk cases*	Within 1 month
Birth-3 years	Vision screening by an ophthalmologist at least once
3-5 years	Comprehensive eye examination by an ophthalmologist at least once
5-8 years	Comprehensive eye examination by an ophthalmologist at least once

*High risk cases- Premature, low birthweight, Down's syndrome, etc.

Table 3: Age-appropriate cycloplegia

Condition	Cycloplegic
Presence of esotropia	
Till 5 years	Atropine 1% eye ointment
>5 years	Atropine 1% eye ointment/Cyclopentolate 1% eye drop/Homatropine 2% eye drop
No strabismus	Atropine 1% eye ointment/ Cyclopentolate 1% eye drop/ Homatropine 2% eye drop

Atropine is the cycloplegic of choice in case of esotropes less than 5 years of age as it is essential to annul the accommodative component of esotropia. Atropine sulfate ointment in a concentration of 1% should be applied in the size of dry grain of rice, three times a day for three days prior to the day of refraction. Atropine drops are usually avoided as the risk of systemic absorption and systemic side effects is higher. In age group more than 5 years and in orthophoric patients any one of the three cycloplegics could be used. However, the side effects of these drugs must be kept in mind and the parents should be forewarned before prescribing them.

Ocular side effects seen with cyclopentolate drops are ocular irritation, lacrimation, allergic blepharo-conjunctivitis, conjunctival hyperemia, and increase in intraocular pressure. Systemic side effects include irritability or drowsiness, ataxia, disorientation, incoherent speech, restlessness and visual hallucinations. Atropine eye ointment can cause contact dermatitis of the lids, allergic conjunctivitis, and keratitis. Systemic complications associated are dryness of secretions, fever, skin rash, irritability, tachycardia, and convulsions. Side effects of homatropine are similar to but less severe than those of atropine.

Prescribing spectacles

There are different practices in different parts of the country about the minimum refractive error to be prescribed. Table 4 provides the national consensus for minimum refractive correction in infants and young children.

After having assessed the refractive error in a child, the next step is to appropriately prescribe glasses with a good

Table 4: Minimum refractive correction to be prescribed in infants and young children

Condition	Refractive errors (diopters)		
	<1 year	1-2 years	2-3 years
IsoAmetropia			
Myopia	≥-3D	≥-3D	As per refraction
Hyperopia (no manifest deviation)	≥+4D	≥+4D	≥+4D
Hyperopia with esotropia	≥+1.5	≥+1.5	≥+1.5
Astigmatism	≥3D	≥2D	≥2D
Anisometropia (without strabismus)			
Myopia	≥-3D	≥-3D	As per refraction
Hyperopia	≥+2D	≥+1.5D	≥+1.5D
Astigmatism	≥2.5D	≥2D	≥2D

Table 5: Recommendation for type of materials to be used for spectacles for children

Frame

Characteristic- Break-resistant, light, colorful, preferably with nose pads, elastic head bands for infants
Materials- titanium (ideal), plastic materials (cellulose acetate, polyamide), silicon-based rubber frames (light and pliable) Soft ear support, elastic band to prevent peeping over the frame. Other metal frames for e.g., those with nickel can cause allergic reactions

Lens

Characteristic- Impact-resistant, thin, light, scratch free, UV protection, high index (preferably)

Materials	CR39	Polycarbonate	Trivex	High-index plastics
Impact resistance	Good	High	High	Very High
Refractive index	1.498	1.586	1.532	1.6-1.74

acceptance. Table 5 describes the ideal design and materials for making glasses for children.

Prescription in special conditions:

- *Prescription in pseudophakes and aphakes*: Refractive error as assessed by retinoscopy should be prescribed immediately irrespective of age in pseudophakes and aphakes. Only near glasses are sufficient in children upto 2 years and thereafter with the added demand for distance vision bifocals are to be prescribed. Occlusion/patching is needed in unilateral pseudophakes/aphakes or bilateral cases with unequal vision
- *Gross developmental delay, Down's syndrome or mental retardation*: Refraction and prescription according to retinoscopy can be given as early as 6 months of age
- *Retinopathy of prematurity (ROP)*: Myopia tends to progress in cases of ROP and prescription can be given according to retinoscopy as early as 6 months
- *Intermittent exotropia*- Myopia correction can be given as per the recommended guidelines mentioned in Table 4. Overcorrection upto -0.5D can be done in children >3 years
- Esotropia- Hyperopia of ≥+1.5D must be prescribed in children with esotropia. Overcorrection can be done provided vision does not fall below 6/12. Bifocals are needed in cases with high AC/A ratio. Weaning of glasses should start at the age of 7 years depending on the retinoscopy but a close watch on esotropia is needed, and weaning is stopped or reversed if esotropia recurs with glasses on weaning.

Myopic children should be advised to reduce screen time and time spent on near activities (such as reading) and increase outdoor activities.[25]

Follow up of a case of refractive error

For children less than 3 years of age, refraction needs to be repeated at least once every 6 monthly, while for older children it should be done on a yearly basis.

Amblyopia

Amblyopia is defined as reduced best corrected visual acuity in one or both eyes which are structurally normal or where the structural abnormality of the eye or the visual pathway does not explain fully, the reduction in best corrected visual acuity. It is usually a result of formed visual deprivation (due to media opacity or image blur) or abnormal binocular interaction. These abnormal visual experiences are usually in early childhood, typically before the age of visual maturation (which is around 7 years). Based upon the possible causative factor, amblyopia can be classified as strabismic, refractive (anisometropic or bilateral refractive error), visual deprivation, or mixed type. It is associated with significant morbidity in terms of life-long poor vision and its adverse effects on quality of life, if not treated early. The current prevalence of amblyopia ranges from 0.8% to 3.3%.[9]

Basic work-up

The history and examination of a case of amblyopia is similar to that described above in the pediatric eye examination segment. The minimum workup should include the parameters described in Table 6. After completion of workup, amblyopia should be diagnosed based on the criteria mentioned in Table 7.

Treatment

As the child grows and attains visual maturation, the success of amblyopia therapy decreases. Also, the success of amblyopia therapy is multifactorial, depending on the age of onset, cause, severity, and outcome of previous treatment (if any). All children irrespective of their age of presentation and presence of co-existing ocular abnormality should be offered appropriate amblyopia therapy. Caregivers and older children should be made aware of the preferable treatment modality which should be discussed and its implementation encouraged.

Depending upon the cause of amblyopia, the treatment should be planned. There are various modes of treatment published in the literature, some of the options include:

- Optical correction
- Patching or occlusion therapy
- Pharmacological penalization
- Optical penalization (translucent or opaque lenses and filters)
- Dichoptic stimulation
- Nonconventional methods like acupuncture
- Active Vision Therapy
- Surgery.

The consensus on amblyopia therapy is as under:

Optical correction

Correction of refractive errors (if any) is the first step in treatment of amblyopia. Proper optical correction should be prescribed, after performing a cycloplegic refraction in children [as described in Table 4].

Occlusion therapy

There are various methods of occlusion therapy being practiced, some of them being application of opaque patch over the skin directly, application of opaque patch over the glasses, application of rubber patch on glasses, pirate patch, occlusion contact lenses. This panel recommends application of opaque adhesive patch directly over the skin for occlusion. The choice of patch could be either ones that are commercially available or home-made (with the help of gauze and micropore tape). Occlusion therapy may be administered either full time (all waking hours) or part time (2-6 hours, either continuous or split patching).[26,27] For full-time patching, the frequency of patching of the better eye depends upon the age of the patient, older the patient, greater the number of days of occlusion of the sound eye before alternating with the amblyopic eye, for a day, to prevent occlusion amblyopia. An example of an age -based schedule for occlusion therapy is given in Table 8. Traditionally, full-time patching is supposed to increase the visual acuity faster as compared to part-time patching;, however, recent studies have shown both to have equivalent final outcomes. Full-time patching may be a better mode of therapy in preschool children though it carries more risk of occlusion amblyopia than part-time patching.

Part-time occlusion is better accepted by schoolgoing children. It is recommended that the caregivers/parents fix the number of hours at a single stretch of time so that there is no variation in proper administration of a pattern of part-time occlusion. The mode and schedule of occlusion therapy should be individualized.

Pharmacological penalization

Atropine ointment 1% is the recommend agent in the dosage of twice a week in the better eye; however, the dosing schedule may be as per the discretion of the treating ophthalmologist.[28] Atropine drops may be associated with systemic absorption and adverse effects, hence should not be used. Non desirable effects include reduced vision of better eye (similar to occlusion amblyopia), photosensitivity, allergy, and anticholinergic side effects. It may be used, when despite the best efforts and explanation about the occlusion therapy, there is noncompliance or nontransient, nonresolving allergic issues associated with patching.

Optical penalization

The results have not been promising in treatment of amblyopia. Translucent filters, ground glass, or stick on tapes on glasses alone are not effective in treatment of amblyopia, however they can be used for maintenance and weaning off of the occlusion therapy.

Surgery

Operative procedure to clear media opacity like cataracts, subluxated lens, nonclearing vitreous hemorrhage, and corneal opacity,. which can hamper the amblyopia treatment need to be taken up as early as possible. Refractive surgery to correct anisometropia, in anisomteropic amblyopia is not advocated by the panel in general, however it may be of limited use in certain cases.[29]

Active vision therapy

The child should be encouraged to use the amblyopic eye for visually demanding tasks in the form of reading/writing, drawing, watching television/video games, along with occlusion of better/normal eye. This not only increases compliance as it acts as an encouragement to the child but may help as an

Table 6: Minimum work up for a case of amblyopia

1. Visual acuity of either eye (in case the child can read)
2. Fixation of either eye to be noted and recorded
3. Glow of either eye to look for gross refractive error and media clarity
Refraction and cycloplegic refraction
5. Worth Four Dot test
6. Cover and Cover-uncover test, with a note of presence of strabismus if any
7. Bruckner's red reflex test
8. Bagolini's striated glasses test
9. Fundus Examination

Table 7: Diagnostic criteria for Amblyopia

Criterion for unilateral amblyopia	Findings
Resentment to monocular occlusion	Asymmetric resentment-points toward poor vision in contralateral eye
Fixation preference	Failure to initiate or maintain the fixation through the blink may point toward poor vision in the eye
Preferential looking charts	>2 octave inter-ocular difference
Best corrected visual acuity on Optotypes	>2 line inter-ocular difference on LogMAR chart
Criterion for Bilateral Amblyopia	**Findings**
Best corrected visual acuity on Optotypes	Age <4 years; BCVA <20/50 in either eye Age >4 years BCVA <20/40 in either eye

Table 8: Example of an age-related schedule of occlusion therapy

Age (completed in years) of patient at the beginning of therapy	Number of days normal/ better eye patched	Number of days amblyopic eye is patched	One cycle of patching in number of days
1	1	1	2
2	2	1	3
3	3	1	4
4	4	1	5
5	5	1	6
6 and >6	6	1	7

adjuvant to occlusion. Minimum 1 hour daily activity should be prescribed along with occlusion therapy.[30,31]

Medical therapy

Medical therapy in the form of levodopa-carbidopa or citicoline is not recommended as a standalone treatment. The degree of benefit on using these to complement occlusion therapy is questionable and they are not recommended for routine use.[32]

Dichoptic stimulation therapy

Dichoptic stimulation therapy is found to be promising especially for mild to moderate amblyopia and is under evaluation for more evidence before it can be used as an alternative to occlusion.

Planning the amblyopia treatment

It is important to note the grade of amblyopia, type of amblyopia, and age of the patient before planning the treatment. All children irrespective of age should be offered treatment, more so in case of refractive amblyopia as even older children and young adults have been found to have benefit of treatment in certain cases.

Proper and careful refractive correction is essential in all types of amblyopia treatment. In case of large anisometropia or refractive error, contact lenses may be the choice of refractive rehabilitation. Spectacle or optical adaptation time of approximately two to four weeks should be given to establish baseline best corrected visual acuity before starting the patching. However, patching can be started along with prescription of glasses if amblyopia is dense or repeated visits are difficult. All children undergoing amblyopia therapy need to reassessed and re-refracted under proper cycloplegia at repeated intervals. For children less than 3 years of age, refraction needs to be repeated at least once every 6 monthly, while for older children it should be done on a yearly basis.

Dichoptics and optical penalization may be used in mild amblyopia or in cases of maintenance of amblyopia therapy, e.g., in cases where the patient has completed the amblyopia therapy and is waiting for strabismus surgery or in cases where the ophthalmologist fears recurrence of amblyopia.

Occlusion therapy should be initiated in all forms of amblyopia. Regular follow up should be done, generally once every 4-6 weeks for children on full-time occlusion and 6-8 weeks for children on part-time occlusion. Infants should be followed up every 15 days. Occlusion therapy is continued till the vision in both eyes equalizes or no further improvement is seen over two visits at least one month apart despite good compliance. After successful treatment of amblyopia with patching, maintenance patching or weaning of patching should be done in view of possible recurrence of amblyopia.[31] Tapering/weaning of occlusion therapy entails reducing the number of days of occlusion, e.g., 6:1 patching pattern is reduced to 5:1, then 4:1 and so forth, on each visit 4-6 weeks apart (for full-time occlusion) or full-time occlusion may be shifted to a part-time occlusion of 6 hours daily and then tapered off as a part-time occlusion. Part-time occlusion can be tapered from 6 hours daily to 4 hours daily on two consecutive visits 8-10 weeks apart, then 2 hours daily for next two follow-up 8-10 weeks apart. Children should be followed up 6-12 monthly even after full recovery of amblyopia till the age of 9 years.

If squint is present, surgical correction should preferably be planned when the vision is equal in both eyes or the maximum possible visual acuity is achieved in the amblyopic eye after therapy.

In bilateral and symmetrical amblyopia (ametropic or visual deprivation), the need for occlusion is to be assessed based on other factors like presence of constant strabismus, significantly smaller size of the eye, and unilateral significant astigmatism. In cases where there is no significant difference in both the eyes, only optical correction is required and alternate patching does not play a role.

In cases of amblyopia, resistant to occlusion therapy, addition of active vision therapy or medical therapy such as levodopa-carbidopa may be tried.

The cases where there is no improvement after institution of amblyopia therapy for 2-3 consecutive visits, the diagnosis of amblyopia needs to be reconsidered, and a re-look into the refractive status or revision of diagnosis may be needed.

Conclusion

The purpose of these guidelines is to establish uniformity in the practice of pediatric vision screening, ocular examination and refraction at primary, secondary and tertiary eye care levels, and provide clinical indicators for referral to a higher center. In the presence of good synergy at all eye care levels and well-developed referral pathways, these practice patterns will enable the ophthalmologist to provide efficient pediatric eye care services and timely intervention for avoidable or preventable causes of blindness.

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Conflicts of interest

There are no conflicts of interest.

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