Chapter

Clinical Evaluation of Horizontal Pediatric Strabismus and the Management Challenges

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Abstract

Pediatric strabismus is not uncommon. Poor knowledge and religious and cultural practices result in inattention to the child's need and stigmatization. Horizontal strabismus consisting of esotropia and exotropia constitutes the common types presenting. Childhood ocular deviations are associated with uncorrected refractive errors, diseases causing obstruction of the visual axis such as cataract, and intra ocular tumors commonly retinoblastoma. In parts of the developing world, there is poor documentation and recollection of medical events at family and community levels. Squint in a child is not a painful dramatic condition that can prompt quick action from the parents or caregiver. There is generalized inequity in access to health care. Pediatric ophthalmic services are at best in developmental stage, and purpose design service centers are quite few. Neglect of the causes and timely treatment of amblyopia can retard child's development resulting in dependency and aggravation of poverty circle. A comprehensive approach to management of childhood eye diseases including strabismus is desirable in the low income developing countries. Provision of health insurance as a citizen's right will reduce most of the health challenges.

Keywords: horizontal, strabismus, challenges, management, low income

1. Introduction

Strabismus is defined as deviation from normal position of alignment resulting in the eyes pointing in different directions [1]. From the historical perspective existed, the concept that there is spasm of the bodies which move the eye balls and there is oblique tendency of the muscles [2]. Ocular movement is controlled by six muscles comprising the four recti muscles (superior, inferior, medial, and lateral) which arises from the annulus of Zinn [3]—a fibrous structure which is fused to the optic nerve and foramen and the two oblique muscles [4]. The medial rectus takes a course close to the medial orbital wall, while the lateral rectus course is close to the lateral orbital wall before they reach their respective points of insertion. Primary action of medial rectus is adduction and lateral rectus abduction. The two are called the horizontal recti muscles. The superior and inferior recti muscles are called vertical muscles. The superior rectus muscle ran a course anteriorly above the eye ball, over the insertion of the superior oblique forming an angle of 23° with the visual axis. The primary function of superior rectus is

elevation, secondary action is intorsion, and tertiary action is abduction. The inferior rectus passes anteriorly above the orbital floor and below the eye ball to which it is inserted at 23° to the visual axis. In the primary position, the main action of inferior rectus is depression, secondary action is extortion, and tertiary action is adduction. Superior oblique arises from the orbital apex above the annulus of Zinn, courses anteriorly close to the superior medial orbital wall. It becomes tendinous as it passes through the trochlear—a cartilage-like structure attached to the superior nasal orbital part of the frontal bone. The muscle tendon turns backward and inserted in the posterior medial quadrant of the eye ball under the superior rectus muscle forming a 51° angle with the visual axis [5]. In primary position, the action of superior oblique is intorsion, secondary action is depression, and tertiary action is abduction. Inferior oblique muscle originates from the periosteum of the maxillary bone behind the orbital rim and lateral to the entrance of the lacrimal fossa. It then passes laterally, superiorly, and posteriorly below the inferior rectus, under the lateral rectus and inserted into the posterior lateral quadrant of the eye ball. In the primary position, its primary action is extortion, secondary action is elevation, and tertiary action is abduction. The spiral of Tillaux describes the distance in millimeters from limbus to the insertion point of the four recti muscle: superior rectus (7.7 mm), lateral (96.9 mm), inferior (6.5 mm), and medial (5.5 mm). The lateral rectus is supplied by the abducent nerve, superior oblique by trochlear nerve, and the oculomotor nerve supplies all the rest (superior/medial/inferior recti and inferior oblique). Extra ocular muscles are supplied by muscular branches of the ophthalmic artery. The larger medial muscular branch supplies the inferior/medial recti and inferior oblique, while the lateral muscular branch supplies the lateral/superior recti, superior oblique, and the levator palpebrae superioris muscle. Eye movements can be uniocular (ductions) or binocular (versions). Movement of the eye nasally is called adduction, temporally abduction, downward infraduction, and upward supraduction. Nasal rotation of the superior corneal meridian is called intorsion or incycloduction, while temporal rotation is termed extortion or excycloduction. An agonist is the primary muscle involved in moving the eye in a given direction. A synergist is the muscle in the same eye that acts with the agonist to produce a given movement. An antagonist is a muscle in the same eye that produces action opposite that of the agonist. According to Sherrington's law [6] of reciprocal innervation, increased innervation and contraction of a given extra ocular muscle is associated with decrease innervation and contraction of its antagonist. Conjugate binocular eye movements which ensure the eyes move in the same direction are called versions; disconjugate movements which make the eyes move in opposite directions are called vergences. By this notation, right gaze is dextroversion, left levoversion, upward sursumversion, and downward deorsumversion. Rotating the eyes such that such that the superior pole of both corneal meridians is turned to the right is called dextrocycloversion, when to the left levocycloversion. Yoke muscles are two muscles in separate eyes that are prime movers for any given position [7]. All the muscles have respective partners that they work simultaneously to produce binocular movement. According to Hering's law [8] of motor correspondence, equal and simultaneous innervation goes to yoke muscles to produce binocular movement in desired direction. Convergence arises when the two eyes move nasally from any initial position, and divergence is when they move temporally from relative initial position. Nasal rotation of the vertical pole of both corneal meridians is incyclovergence, while temporal rotation is excyclovergence. The relative position of the eyes at rest is that of divergence, hence tonic convergence maintains the position of the eyes during wake period. The synkinetic near reflex consists of accommodation, convergence, and miosis. There is consistent increase in accommodative convergence (AC) for each diopter

of accommodation (A) [9]. When the accommodative convergence/accommodation (AC/A) ratio is high, excess convergence could result in esotropia when viewing near objects. Voluntary convergence can consciously be induced as part of the near synkinesis. Proximal convergence can be produced based on the psychological awareness of nearness of the object. Bitemporal retinal image disparity stimulates fusional convergence which insures the image of an object is projected on corresponding retinal points. Conversely, fusional divergence could occur as an optomotor reflex to align the eyes so that images fall on corresponding retinal points. Retina stimulation is perceived as light coming from a specific visual direction in space. Retinal correspondence is said to occur when light stimulates two points in both eyes which share a common visual direction. Corresponding retinal points share a common relationship with the fovea in both eyes, and such relationship is described as normal retinal correspondence (NRC) [10]. Anomalous retinal correspondence (ARC) occurs when two points in the retina of both eyes do not share similar relationship with the fovea. Normal fovea and extra foveal NRC result in binocular single vision. Similarly, points in both eyes with similar fixation/orientation appear singly so far as they fall on a point that passes through the optical center of each eye and fixation point (Vieth-Muller circle). The process of cortical image unification of objects that fall on corresponding retinal points is called fusion. Retinal images are fused in the cortex when they are similar in shape, size, and clarity. Fusion has sensory, motor, and stereopsis components. The sensory part deals with relationship of the retinal points in the two eyes, while motor fusion is vergence movement that ensures retinal image fall and is maintained on corresponding points. Stereopsis is said to occur when disparity in image size is big enough not to permit cortical fusion but not enough to cause diplopia. Stereopsis is a binocular perception of depth that adds to quality of vision and three dimensions.

2. Visual assessment in children

The techniques of assessing vision in children are tailored to fit the patient's age. It is often challenging and tasking irrespective of the age and requires gaining the trust of the child and the parent. The clinic environment should to some extent fit ideal setting to do so. This is frequently not available in some low income countries as few pediatric ophthalmic clinics are purposefully designed. Frequently, the same make soft clinic area is used for all purposes. The CSM (Central, Steady, and Maintained) criterion can be used for preverbal children. This involves determining the location of the corneal reflex which should be central in a normal child while mono-fixating with the contra lateral eye occluded. The location of the reflex should be central in both eyes as uncentral position is abnormal. The fixation should be steadily (S) maintained with the light in stationary position and when moved in other directions. Fixation should be (M) maintained in both eyes, and failure in one eye may indicate the presence of amblyopia. A child would elicit avoidance movement when the seeing eye is occluded and can be indifferent when occlusion involves an amblyopic eye. Illiterate "E" chart "game" can be used to assess vision in preschool children. HOTV test can be used as it employs matching of objects placed on the distant display and a hand held version that enables the child to indicate similar images. Children of school age can have vision tested with Snellen's chart which has the drawback of crowding of letters that make its use limited in those with amblyopia. Various picture charts are developed showing objects that are commonly seen in the locality instead of trains and busses that may be unfamiliar to children in the developing world.

2.1 Light reflex test

Light reflex tests consist of the Hirschberg and Karimsky. The Hirschberg test measures the extent of decentration of the corneal reflex, and 1 mm of decentration is equivalent to 7° or 15 prism diopters. When the light reflex is at pupillary margin, there is (15°), mid iris is (30°), and at limbus (45°) of deviation, respectively. The Krimsky test uses corneal reflex from both eyes and a prism is placed before the fixating eye and adjusted till alignment is achieved. The test is ideally performed at near gaze position. To a lesser extent, Bruckner's test [11] can be used to detect (without quantifying) the presence of a squint. Light from an ophthalmoscope is shone directly into both eyes, and the reflection from the deviating eye is brighter than in the fixating eye. The light reflex tests can be affected by angle kappa (the angle between the anatomical and visual axis of the eye). In normal situations, the fovea is usually temporal to the pupillary center making the corneal reflex slightly nasal (the resulting positive angle Kappa that appears like an exodeviation), and this can affect the light reflex test though it has no impact on cover tests.

2.2 Cover tests

Cover tests are employed to assess misalignment. Monoocular test such as cover-uncover is used to distinguish heterophoria from heterotropia. When one eye is covered, the uncovered eye moves to take up aligned position, and the movement is reversed when the cover is removed. The test is based on the principle that breaking up of binocular vision during the test leads to adjustment in alignment in those with phorias. In the presence of manifest squint, the test is started with a deviated eye, and at the end, it is noted that the deviation is maintained by the index or contra lateral eye. Alternate cover test is done to determine and quantify the extent of deviation whether latent or manifest by the placement of a prism is in front of the eye. The base of the prism is placed opposite the direction of the deviation. The amount of deviation is measured with prisms as the cover is moved from one eye to another till alignment is achieved. Simultaneous prism and cover test can be employed to determine extend of manifest deviation when both eyes are uncovered [12].

2.3 Dissimilar image test

Dissimilar image tests involve making the images appear dissimilar in both eyes. The principle is that in the normal eye, the image falls on the fovea, while in the deviating eye, it falls elsewhere in the retina. A patient sees the images appearing somewhat homonymously in esotropia and crossed in exotropia. The Maddox rod consists of parallel cylinders that convert a point source of light into a straight line that is at right angle to the arranged cylinders. In normal situation of orthophoria, a person looking at a distant pointed light source with the rod placed before one eye would see a straight line (with the eye wearing the Maddox rod) and a point source of light (with the other eye). The light spot will appear to be at the center of the line. Maddox rod can be used to measure horizontal and vertical deviations. The relationship of the line relative to the spot of light determines the type of deviation. To quantify the deviation, a prism can be placed before the deviating eye till the state or orthophoria is achieved with the spot of light superimposed on the middle of the line. Cyclo deviations can also be measured with double Maddox road [13].

2.4 Dissimilar target test

This test involves making the eyes to be exposed to different targets at the same time and measuring the extent of deviation with one eye fixating then the other. Patients with esotropia will have crossed fixation and exotropes homonymous diplopia. The Lancaster red-green test consists of red-green goggles that can be reversed, red/green slit projector, and a ruled screen with many small squares. With red lens on the right, the patient is requested to superimpose the green slit, and the goggles are reversed to run the test again. This test is done in patients with diplopia from incomitant squint and may not apply to children who rarely present with this type. The mayor amblyoscope is calibrated to measure the extent of vertical, horizontal, and torsional deviations when the patient look through and superimpose dissimilar targets.

2.5 Historical perspective

Children require an adult who may be a parent, sibling, or other relations to accompany them to the hospital. The mother is the person closest to the child and in better position to offer more reliable information on the ocular condition of the patient. However due to religious and socio cultural practices, it is not unusual to see grandmothers and other relations who have minimal knowledge are made to accompany the children to the clinic. In vast rural communities, there is virtually no documentation of medical illness and recollection of what happens in the past is quite vague. Coverage of antenatal care by orthodox methods is largely poor with cost, distance, and attitude of healthcare providers constituting a barrier. Squint and other ocular conditions that are not associated with dramatic pain or debility may not attract attention warranting prompt medical care. There is varied individual and community perception of squint based on cultural and religious beliefs resulting in poor awareness of the cause and availability of treatment often leading to social stigmatization [14]. There is poor perception of strabismus in community that could partly be due to poor knowledge of the condition [15]. Deviating eye may be considered as an act of creation by God. In some communities, there is taboo and superstition attached to it resulting in stigmatization and ostracism. In the United States, an estimated 4% of children have strabismus [1]. In sub-Saharan Africa, population prevalence statistics are at best scarce, and the exact extent is likely to be known. A study involving thousands of elementary school children showed that esotropia and exotropia occurred in 0.14% of the population [16]. The prevalence varies between countries and the type of study conducted ranging from 0 to 2% in Ghana [17], 1.1% in Ethiopia [18], 0.5% in Tanzania [19], and 1.22% in Cameroons [20]. As much as is realizable, it is important to determine the onset, description of the type, laterality, variation with time, and duration of the deviation. Key knowledge includes determining whether it affects one eye or alternates. Any associated ocular features such as leucocoria to suggest secondary causes like cataract and retinoblastoma [21]. The clinician should obtain the history of previous spectacle prescriptions or ocular surgery performed. There may be a positive family history of similar symptoms and where available photographs could provide further clues in the patient's evaluation.

2.6 Definition and classification

Strabismus is a Greek term which simply means ocular misalignment. Manifest deviations that are detectable when both eyes are opened are called tropia and

may present as a constant or intermittent deviation involving one eye or both eyes. Latent deviations are termed phorias and detectable only when one eye is covered so that the vision is monocular. In phorias, the misalignment is minor and corrected by cortical adjustment of the extra ocular muscles. Deviations are said to be comitant when they are the same in amplitude and degree of misalignment in all directions of gaze. Incomitant deviations vary in degree and amplitude with direction of gaze. Horizontal deviations could be nasal termed as esotropia or temporal exotropia. Other less common deviations in childhood include vertical (hyper deviation or hypo deviation) and torsional (incyclodeviation or excyclodeviation). Deviation could also manifest as a combination of the above. Pediatric strabismus can be infantile or acquired. Risk factors for infantile strabismus include a positive family history among first and second degree relatives, maternal alcohol ingestion in pregnancy, maternal smoking [22], genetic disorders (such as Crouzon's and Down's syndromes), prematurity and or, low birth weight, congenital ocular defects, and cerebral palsy. Causes of acquired strabismus include refractive error (particularly hyperopia), head injury that could include birth trauma, and neurological conditions (such as cranial nerve palsy involving nerves 3, 4, 6, and spina bifida).

2.7 Infantile esotropia

Esodeviations can be described as a latent or manifest convergent ocular misalignment. The latent type (esophoria) is negated by the fusional mechanism of the brain. Intermittent esotropia is the type that is to some extent controlled by fusional mechanism, and deviations manifest under conditions of stress or fatigue when the fusional mechanism becomes obviated. Esotropia noted within the first 6 months of life is termed infantile (or congenital) and in most instances is present in an otherwise normal child. Although the etiology is unclear, Worth's concept postulates a deficiency in cortical in the brain, while Chavasse postulates a possible mechanical cause [23], and thus cure can be achieved by eliminating the deviation in infancy. In developed countries where health documentation is the norm, a positive family is often present, while in sub Saharan Africa, such information is rarely obtained. Children with esotropia elicit alternate fixation, those with large angle deviation uses the adducted eye to fixate on objects in the contra lateral visual field (crossed fixation). The deviation is large and often greater than 30 prism diopters. Quite frequently the patients tend to have demonstrable inferior oblique overreaction in over 50% [24].

2.7.1 Management of infantile esotropia

The assessment of degree and extend of deviation are important in addition to cycloplegic fundal examination to rule out other secondary causes of misalignment such as a cataract or retinoblastoma. There may be a need to examine and refract the child under anesthesia. This warrants clinical examination by a pediatrician in addition to laboratory tests such as electrolytes and urea, and hemogram and hemoglobin electrophoresis as sickle cell disorder is frequent in SSA. Cycloplegic refraction often reveals a hyperopia of not more than two diopters, though in some instances, patients may be myopic or have astigmatism. It is necessary to correct any detected refractive error fully and promptly. In most instances, surgical correction is required preferably within the first 24 months of life. Early surgery is aimed at reducing deviation as much as could be achieved and obtaining orthotropia. This would enable better alignment and achieving fusion [25], characterized by favorable cosmetic appearance, improved peripheral fusion, and central suppression.

2.8 Acquired esotropia

This includes accommodative [26], nonaccommodative, and nystagmus associated esotropia. Accommodative esotropia presents between second and third year of life and is associated with activation of the accommodation reflex. It is characteristically intermittent at onset and later becomes constant and there may be associated amblyopia. In aged children, diplopia may be elicited before the onset of facultative suppressive scotoma. This type of esotropia has a hereditary component and could be precipitated by illness or trauma. Refractive accommodative esotropia is associated with hypermetropia, accommodative convergence, and insufficient fusional divergence. The esotropia is equal for both far and near fixation. Treatment involves cycloplegic refraction and dispensing of full correction to ensure good outcome [27]. Parental counseling to ensure constant use of spectacle correction is important in achieving compliance. Children who manifest non-accommodative component or fail to regain fusion with glasses may require surgery.

2.9 Accommodative esotropia

The accommodative synkinetic reflex consists of accommodative esotropia, convergence, and miosis. The age of onset range ages between 6 months and 7 years; it is intermittent at onset, and later becomes constant; symptoms may be precipitated by trauma or illness; and often there is associated amblyopia and is of hereditary nature.

2.10 Refractive accommodative esotropia

This type of esotropia is associated with uncorrected hyperopia, accommodative convergence, and fusional divergence insufficiency. Accommodation is stimulated due to existing hyperopia to obtain better retinal focus. Accommodative esotropia accounted for 18% of 7000 school children is examined [16]. Esotropia could manifest early [28], and the extent of deviation is the same for far and near. The amount of hyperopia is about +4 diopters, and the degree of deviation is in the range of 30–40 prism diopters. The aim is to do a cycloplegic refraction and offer full correction to be worn at all times. Counseling of the parents is important as treatment may not completely eliminate the deviation. Indication for surgical correction includes failure to attain fusion and presence of nonaccommodative component of the deviation.

2.11 Esotropia with high accommodative convergence/accommodative ratio

This type of esotropia can be refractive or nonrefractive. In hyperopia, excess convergence can result with accommodation for near objects. The degree of esotropia is more for near than distance vision. There is a detectable difference in extent with varied distance of accommodation. Nonrefractive accommodative esotropia can occur with normal levels of hyperopia, astigmatism, and myopia. Refractive esotropia with high AC/A can occur with hyperopia, and when associated with myopia or emmetropia, it is described as nonrefractive accommodative esotropia. Partially, accommodative esotropia could arise from decompensation of fully accommodative esotropia or an esotropia that develop subsequent accommodative component.

2.12 Management of esotropia with high AC/A

Bifocals are prescribed for treatment of nonrefractive accommodative esotropia. Flat top executive types of bifocal are preferred with power of +3.00 diopter sphere. The caregiver needs to be advised on consistent use and patient monitored

to achieve restoration of fusion and stereopsis. The goal is to attain fusion with less than 10 prism diopters of residual esotropia for near vision with patient wearing the correction. Relative high AC/A has been observed even with bifocals use over time period [29]. Other measures include use of long-acting anticholinesterases such as 0.125% ecothiopate iodide drops. The treatment should commence with maximum dose and tailored based on response. Anticholinesterases have complications arising from depletion of pseudocholinesterases leading to increased susceptibility to depolarizing muscle blockers such as succinylcholine. Surgery can be performed to correct the esotropia instead of the earlier listed modalities. The normal trend with hyperopia is that it increases about the age of 5–7 years. Partially, accommodative esotropia is treated with full cycloplegic refraction and prescription of full correction. There is often a need for concurrent treatment of associated amblyopia.

2.13 Nonaccommodative acquired esotropia

This type of esotropia presents between the ages of 1 and 5 years. It may acutely present the following disruption of binocular vision from amblyopia treatment or after ocular injury. There may be associated underlying neurological disease or malignancy [30]. When clinical neurological assessment is normal, binocular vision is restored with prisms or surgery.

2.14 Sensory deprivation esotropia

This arises from occlusion of the visual axis from other ocular condition such as cataract [31], corneal opacity, glaucoma [32], and retinoblastoma [21]. This requires prompt removal of the underline cause wherever possible and treatment of any resulting amblyopia.

2.15 Surgical esotropia

Surgical esotropia is also referred to as consecutive esotropia. This form of esotropia arises as a result of surgical correction of exotropia (perhaps due to overcorrection). The deviation may improve spontaneously and when it this doesn't happen, prisms are used to correct it. The presence of abduction deficiency should raise suspicion of a slipped lateral rectus muscle [33], and patient may require transposition procedure.

2.16 Near synkinetic reflex spasm

The near reflex has accommodative, convergence, and miosis components. There may be a manifest cycle of esotropia and orthotropia. The cause may not necessarily be organic and could be due to psychological factors. The patient has no demonstrable abduction paralysis. Cycloplegic refraction and prompt correction lead to improvement, and in the presence of hyperopia, the patient may require bifocal correction.

2.17 Incomitant esotropia

This deviation varies in severity with the position of gaze and is due to abducent nerve paralysis. Cross fixation can be mistaken for this type of esotropia. In the absence of strabismic amblyopia, the vision in both eyes is comparably normal. Sixth nerve paralysis is rare at infancy, and its presence in childhood should raise the suspicion of an intracranial mass. Therefore, full neurological screening including brain CT scan and MRI is needed. Infectious causes such as meningococcal and tuberculous meningitis are more common causes in SSA. Treatment involves

correction of any associated hyperopia, patch therapy for amblyopia, and use of membrane (Fresnel-press on) prism. Those with underlying medical condition should be treated in collaboration with respective specialists.

2.18 Exotropia

Divergent squints can be latent (exophoria-negated by the fusional mechanism) or manifest (exotropia). Exophorias can be demonstrated by breaking the fusional mechanism (uniocular occlusion as in cover test). Exophoria is often small, and there may not be a need for treatment unless an exotropia develops.

2.19 Intermittent exotropia

This is the most common type of exodeviation and can be latent or intermittent and usually present before the age of 5 years. The deviation is associated with fatigue, stress, and periods of relative inattention. Initially, the deviation tends to be greater for distance (intermittent distant exotropia—IDEX) than near, and later, the extent is similar irrespective of relative object's position. The disparity could be due to high AC/A ratio or tenacious proximal fusion which arises from slow relaxation of the fusional mechanism, thus limiting conversion of exophoria to exotropia. Progression to constant exotropia is common though there is usually no associated amblyopia. Management involves assessment using the Newcastle control score [34]. Good control is defined when exotropia manifests only with cover test with resumption of vision without blink/refixation. Fair control is defined when exotropia manifests after cover test and fusion resumes with blinking or refixation. Poor control is defined as spontaneous manifestation of exotropia and remaining for extended period. The degree of deviation is assessed at a distance using prism and cover test. Patients' with high AC/A will have less deviation with +3.00 diopters. Intermittent esotropia can be classified based on observed differences in prism and alternate cover tests for near and distance. In the basic type, the deviation is the same for distance and near. In divergence excess, the deviation is greater for distance than near, and convergence insufficiency is present when the deviation is greater for near than distance. Nonsurgical management involves providing appropriate refractive correction in patients with myopia, astigmatism, or hyperopia. Minus lenses of 2–4 diopter sphere can be used to stimulate accommodative convergence and delay surgery. Part time patching (4–6 h daily) and alternate day patching can produce some improvement which can be used before surgery. Some clinicians advocate orthoptic treatment consisting of training for diplopia awareness and fusional convergence. Base in can be used as short-term treatment as their long-term use is associated with reduced fusional convergence amplitude. Surgery should be considered when deviation is present more than half of the time and consists of bilateral recession of lateral rectus muscle, or recession of one lateral rectus with ipsilateral medial rectus resection. Bilateral lateral rectus recession could result in postsurgical (consecutive) esotropia usually of less than 15 prism diopters and may require treatment with press-on prism if persistent beyond 4 weeks of postoperative period. Without evidence of slipped muscle, observation over a few months of period is advocated as spontaneous resolution is common. A review has shown that despite the absence of natural history data of IDEX, unilateral surgery appears to be more effective than bilateral surgery [35].

2.20 Other types of exotropia

This includes constant exotropia that could arise from decompensated intermittent or sensory manifest exotropia and can be treated with similar surgical

procedure as intermittent exotropia. Infantile exotropia typically present within the first 6 months of life is usually associated with neurological anomalies. Sensory exotropia could arise from disease causing uniocular visual deprivation such as cataract, corneal opacity, gross retinal anomalies, and optic nerve atrophy. Convergence insufficiency esotropia is not common in children.

2.21 Amblyopia

Amblyopia is defined as the reduction of best-corrected visual acuity of one or both eyes that cannot be attributed exclusively to a structural abnormality of the eye. It develops during childhood and results in the interruption of normal cortical visual pathway development and is characterized by a difference in best-corrected visual acuity of two or more lines between the eyes [36]. A study in Asia, Latin America, and Africa indicated a prevalence of 1.52 per 1000 children [37]. In amblyopia, there is reduced visual acuity and contrast sensitivity due to the abnormal processes in the visual cortex [38]. The causes of amblyopia include uncorrected refractive error, strabismus, and obstruction of the visual axis. There is the traditional view that treatment should commence before the age of 8–9 years, and a study suggests that the treatment can extend into early adulthood as the ability of the brain to adjust (plasticity) extends to such period [39]. Treatment involves correction of refractive errors with guidance on consistent use of the prescribed glasses. Children with conditions giving rise to occlusion of the visual axis (cataract, corneal opacity) should have the cause removed without delay. The patients with strabismus should be accessed, and appropriate treatment measures should be instituted. Patching therapy is indicated to encourage the weaker eye take up fixation and realign with the visual cortex. There are various regimes based on hours per day or, alternate days. It is of importance to monitor the child by both clinician and caregiver to assess progress. Penalization can be employed as alternative to patching, and it involves the use of atropine eye drops to blur images in the better eye, thus encouraging the child to use the so-called weaker eye [40].

3. Conclusion

Childhood strabismus strabismus, presenting unit challenges, is evaluation and management. There is poor recollection of medical history and often children are not accompanied to the hospital by their biological parents. Poor knowledge results in misconception and stigmatization of children with squint. Religious and cultural practices coupled with inequity in access to health care could result in amblyopia, thus retarding the child's development.

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Conflict of interest

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