POSITION PAPER

PAEDIATRIC EYE CARE

March 2011

Introduction

The context in which eye care for children is available and the personnel providing the care varies across European countries. In some countries paediatric eye care is exclusively provided by ophthalmologists, in others by physicians or other health care professionals, and in others again care is predominantly provided by primary care optometrists who refer on to specialized colleagues, hospital-based optometry, orthoptic and ophthalmology colleagues as appropriate. The latter model is prevalent in the UK where the primary care optometrist is well placed to offer free, local, accessible, high quality paediatric services within the community through the National Health Service.

The principal reason for providing eye examinations for young children is to identify those whose visual development is not following normal patterns, those who require spectacle correction, or who have, or are at risk of, developing amblyopia or strabismus. Whilst it is important to detect pathology and other, less common visual deficits or anomalies, the most common visual deficits accessible to treatment or amelioration are amblyopia, strabismus and uncorrected refractive error.

It has been estimated that children obtain about 80% of their information about the world through the sense of vision. For successful learning it is therefore essential that every child achieves the best vision of which he/she is capable. In Europe about 6% of typical children starting school will have visual deficits and amongst children with special needs, the figure may be ten times higher. There is growing evidence of the detrimental impact on educational achievement of uncorrected refractive errors, including hypermetropia.

The examination

As part of a comprehensive paediatric eye examination the optometrist should assess the following (note that the assessments are not in order of importance or in the order in which they would be performed in an examination, since both of these will depend of the individual case);

- **History and symptoms:** The child's visual and medical history, ensuring that previous ocular treatment is noted as well as whether the child has any particular developmental or medical history. Children with developmental disability, those born prematurely and those with family history of strabismus, amblyopia and early spectacle wear are at increased risk of visual deficits. Any parental concerns regarding the child's vision, ocular health or general development should be considered.

- **Ocular motor balance:** The child's ocular motor balance (with and without habitual correction) should be evaluated with both distance and near fixation if possible. The cover

test is the 'gold standard' and requires little cooperation from the patient. For very young children distracted by the covering of one eye, the Hirschberg test (which uses the alignment of the corneal reflexes) may be substituted. The 20 prism dioptre base out test for motor fusion is a valuable additional test of binocular function. The extent of binocular convergence in response to a near target should be assessed. When a child is found to have a binocular vision or ocular motility anomaly, further tests should be instigated to determine the extent of the condition. The next step may involve onward referral to specialist services (e.g. hospital eye services, orthoptics, specialist optometrists).

- **Examination of internal and external eye, pupil responses and ocular motility:** The child's ocular health should be examined for signs of pathology and neurological deficits.

The techniques used and the relevance of the findings obtained for the latter do not differ significantly when testing an infant or child compared to testing an adult. The aspects of the eye examination outlined below are likely to require some modification of technique and/or the use of additional, specialist equipment.

- **Refractive error:** An assessment of refractive error is an essential part of any eye examination and this ought to include the use of a cycloplegic agent such as Cyclopentolate HCl (0.5 or 1.0%) at least at the initial assessment. Where it is not possible for the optometrist to use cycloplegic refraction, alternative non-cycloplegic, methods of determining refractive error are available (e.g. Mohindra or 'near' retinoscopy). In the hands of an experienced practitioner the Mohindra technique has been shown to provide a valid estimate of refractive error.

- **Accommodation:** Failure to sustain accommodative demands during close work (including puzzles and play as well as reading and writing) has important implications for learning. It is important that accommodative function is assessed routinely. Whilst we know that most children have high levels of accommodative amplitude, there are a significant minority of children for whom this is not the case. In particular, children with developmental disability commonly fail to accommodate accurately and have been shown to benefit from bifocal prescriptions.

  Accommodative function can best be evaluated in paediatric optometry using objective methods (e.g. dynamic retinoscopy) which do not rely on the child's subjective response. Information about accommodative facility is valuable when considering refractive error and the need for spectacle correction or other forms of treatment.

- **Vision/visual acuity:** Due to immaturities in both the physiology and anatomy of the visual pathways the infant has poor vision at birth which improves rapidly with age, particularly during the first six months of life. Although near adult levels of visual acuity can be demonstrated by electrophysiological measures early in life, adult levels of visual acuity are generally reached by about 5-6 years of age when assessed using the letter matching or naming techniques most commonly used in optometric practice. The practitioner needs to be aware that acuity results are highly dependent on the test used as well as on the child's age and confidence. He/she should be familiar with the norms for each test used.

  Whatever the actual acuity level, interocular acuity differences are rare beyond early infancy and signal an anomaly in visual development.

  It is important that optometrists use the most appropriate and most robust test of vision according to the child's age and ability. For the younger child (less than two years), a preferential looking test of visual acuity is likely to be the most appropriate test (e.g. Teller acuity cards for infants, Cardiff acuity test for the toddler age group). When the child is able to name or match pictures or letters it is important to progress to using these more sensitive and rigorous tests of visual function (e.g. Kay Picture test, Lea Symbols, Keeler LogMAR

crowded test, Sonksen LogMAR test). The use of LogMAR scoring and 'crowded' or linear presentation in acuity tests is the 'gold standard' since it improves the sensitivity of such tests in identifying differences or changes in visual acuity between eyes or with treatment. Near visual acuity is an important measure when assessing children's visual status and should not be overlooked.

- **Stereopsis:** By demonstrating the presence of stereoscopic function the practitioner can rule out gross amblyopia and manifest strabismus (other than microtropia). Perhaps the most useful tests (e.g. Lang stereotest, Frisby stereotest) are those that do not involve the child wearing red/green or polarising filters for testing as these can be an added distraction, particularly when testing a pre-school child. Failure to demonstrate stereopsis in a child over six months of age is a concern and should be investigated and considered alongside other findings from the eye examination.

- **Colour vision:** When testing male children for the first time, an assessment of colour vision is useful using a test appropriate for the child's age and ability (e.g. paediatric Ishihara and HRR tests, Colour Vision Testing Made Easy test). The practitioner should bear in mind that girls can have a colour defect too, although prevalence among females is much lower.

Prescribing spectacles: The considerations for prescribing spectacles to young children are somewhat different to those used when prescribing to older children and adults, when decisions are generally made based on symptoms or evidence of reduced vision that improves with spectacle correction. In paediatric optometry this is not always the case and, in addition to the information gathered about the child's visual function (visual acuity, accommodative function, ocular motor balance etc), normal refractive development and the implications of abnormal patterns of development must be understood in order to make sensible decisions about prescribing.

Several research studies have shown us that in infancy babies demonstrate a broad spread of refractive errors, with the majority of babies being moderately hyperopic. With increasing age the distribution of refractive errors becomes narrower as more babies become emmetropic (or nearly emmetropic). The process by which this shift occurs is known as emmetropisation. Whilst astigmatism and anisometropia may be found in young babies, persistent astigmatism and anisometropia are not the norm. Both the emmetropisation process and binocular vision status must be taken into consideration when prescribing for children.

Failure of emmetropisation is a risk factor for strabismus and amblyopia. Children who remain significantly hyperopic ($\geq$ +3.50D in any meridian) beyond infancy are more likely to be amblyopic and strabismic and there is evidence to suggest that spectacle correction can reduce this risk. There is also some evidence that academic performance, visuoperceptual skills development and aspects of cognitive, attention and motor skills are poorer in uncorrected hyperopic children.

Dispensing spectacles: When refractive correction is prescribed, it is important that spectacles are dispensed appropriately. This includes ensuring an optimum fit of spectacle frame, with appropriate fitting at the bridge to ensure spectacles maintain their position on the nose and sit in the desired position in front of the eyes. Lenses also require careful centration, and it is especially important to consider both horizontal and vertical centration when aspheric lenses are dispensed.

Reporting findings: The practitioner should be aware of parental concerns and worries, and, of course, children's fears and explain what is happening during the test. He/she should be prepared to spend some time at the end of the test explaining the outcome and the next steps. A written report is often valuable, as parents might find it difficult to take in a lot of information during the consultation. Likewise, information to medical practitioners of any abnormal findings, and other professionals involved with the child (including speech and language therapists and teachers) should be considered if vision is reduced, spectacles are prescribed or other findings impact on daily life or learning.

Vision Screening

Throughout Europe, many countries have some kind of 'vision screening' in place for young children. This is in contrast to the full eye examination described above and is aimed primarily to detect amblyopia. Vision screening usually consists of a test of monocular acuities and a check for gross, manifest strabismus. In Sweden & Norway, pre-school vision screening is undertaken when the child attends for other general health checks, with an excellent reported coverage of 99%. In the UK, current government policy states that orthoptic-led vision screening should take place at 4-5 years of age. However, many parts of the UK do not currently have vision screening pathways in place, due in part to the lack of qualified screening personnel and financial pressures within the National Health Service.

The evidence to support the necessity of screening for amblyopia is limited, despite a strong clinical opinion that amblyopia should be identified and treated. The detrimental effects of amblyopia are poorly understood, but monocular visual loss is a significant risk factor for bilateral visual impairment in later years through accident or pathology affecting vision in the 'better' eye.

In the UK, optometrists are not an integral part of vision screening, and the extent of optometric involvement in other European countries is unclear. However, in areas where vision screening programmes do not exist, optometrists in primary care are well placed to both identify amblyopia and fully investigate visual status including the presence of uncorrected refractive error.

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