

Guidelines for the Management of Amblyopia

1. Introduction

a. Background

Guidelines for the management of strabismus and amblyopia were published by the Royal College of Ophthalmologists in 2000. Since that time, a number of studies have been published which have added to our knowledge of amblyopia and its management and it is appropriate to revisit the previous advice.

b. Definition

Amblyopia is an impairment of vision arising from dysfunction of processing of visual information caused by degradation of the retinal image during a sensitive period of visual development¹⁻³. Amblyopia causes a range of abnormalities of visual function. It is not the cause, but the effect of another pathology, commonly refractive error, strabismus and early onset cataract. Amblyopia may be completely or partially treated by modulation of visual input during a sensitive period of visual development which may vary depending on the specific cause of the amblyopia.

c. Aim of these guidelines

The aim of these guidelines is to summarise the existing evidence pertaining to the diagnosis and treatment of amblyopia and to indicate how this evidence should influence clinical practice.

2. Methods

a. The Guideline Development Group

The Guidelines were developed by the Paediatric Subcommittee of the Royal College of Ophthalmologists which includes paediatric ophthalmologists, orthoptists, an ophthalmic epidemiologist, optometrist and an advisor from the voluntary sector.

b. Gathering the evidence.

A medline search was conducted using amblyopia as a key word. All studies were assessed using a framework based on guidance from the Scottish Intercollegiate Guidelines Network (SIGN) and recommendations made were graded as follows:

A Based on at least one randomised controlled trial

B Based on the availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

C Based on evidence of expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality.

Good practice points

Recommended best practice based on the clinical experience of the guideline development group and informed by feedback from stakeholders.

Draft guidelines were circulated to the British Paediatric Ophthalmologists email discussion group, to members of the British and Irish Orthoptic Association.

3. Summary of Recommendations

- LogMAR tests of vision should be used where possible.
- Amblyopia treatment should only be instituted for children whose vision falls below the normal range for age
- Significant refractive errors should be corrected
- Improvement in acuity following refractive correction should be allowed to plateau prior to treatment with occlusion or atropine – this may take 16 – 22 weeks
- The choice of atropine or occlusion treatment should be discussed with parents
- 2 hours patching per day is effective for amblyopic defects from 0.2 to 0.6 LogMAR (6/9 to 6/24 Snellen)
- 6 hours patching per day is effective for acuities below 0.6 LogMAR (6/24 Snellen)
- Failure of acuity to improve with patching or atropine treatment should prompt re-refraction and re-examination of the fundus
- Deterioration of acuity during treatment in the absence of an ocular cause should prompt consideration of neuroimaging

4. Epidemiology

Amblyopia is common, with prevalence estimates of between 1 and 3%^{4,5}. It is the most frequently treated disorder in paediatric ophthalmic and orthoptic practice. Amblyopia may be caused by stimulus deprivation, strabismus, refractive error or a combination of these. Amblyopia is usually unilateral, but in cases of bilateral high refractive error or bilateral ocular pathology, such as cataract, may be bilateral.

The rationale for treatment of unilateral amblyopia is to optimise visual

function and binocular vision, to maximise employment opportunities and to try to provide a useful “spare eye” in the event of trauma or pathology in the normal eye.

The commonest risk factors for amblyopia are constant strabismus and asymmetrical refractive errors. Any ocular or orbital pathology which affects the clarity of the ocular media, or affects ocular growth can also cause amblyopia.

5. Diagnosis

The diagnosis of amblyopia is not straightforward because of the difficulties in testing vision in small children and uncertainties about the contribution made to any visual abnormality by refractive error and ocular pathology.

It is important to recognise that a finding of reduced visual acuity in a child is not a diagnosis of amblyopia. Amblyopia is only found in the setting of a causative factor such as strabismus or refractive error. If no obvious amblyogenic factor is found on examination then either the reliability of the visual acuity measurement should be questioned, or subtle ocular pathology such as optic nerve hypoplasia or macular disease should be considered.

The diagnosis of amblyopia is based on a reduction in best corrected visual acuity. In order to be certain that this is the case, the acuity testing procedure and refraction must be accurate, and the age related norms of the vision test used known.

The mean visual acuity using LogMAR tests in 4 to 5 year old children is 0.087 (approx 6/7.5) +/- 0.10 log units for crowded and -0.010 (approx 6/6) +/- 0.10 log units for uncrowded LogMAR tests⁶.

6. General Principles of Management of Amblyopia

a. Background

For more comprehensive reviews see⁷⁻⁹. Amblyopia is treated by modulating the visual input into the amblyopic eye. In the case of stimulus deprivation amblyopia, the cause of the visual deprivation, for example ptosis or cataract, needs to be dealt with. Significant refractive errors need to be corrected. Any remaining visual deficit may be treated by obscuring or degrading the visual input to the fellow eye. Commonly used methods are patching (occlusion), instillation of atropine drops and occasionally, occlusive contact lenses.

The bulk of amblyopia management is carried out by the parents or carers of children with the condition. Occlusion treatment for amblyopia is time consuming and unpleasant for both parents and children, making lack of compliance a frequent problem¹⁰. Occlusion treatment is not, however,

associated with measurable psychological distress using standard instruments which measure this^{11,12}. It is important that parents, and children if they are old enough, are given clear information and advice about the condition and the treatment plan. Parents and children must be given the opportunity to make genuine and informed choices about whether to treat amblyopia at all, the modalities of treatment to be used, and when treatment should be discontinued¹³, based on knowledge about the potential outcomes of treatment and the risks of persistent amblyopia where possible. The attitude of professionals involved should be supportive and not judgmental.

a. Correction of Refractive Error

✓ The degrees of refractive error which are thought capable of inducing amblyopia are summarised in table 1. That is, consideration should be given to prescribing for this degree of refractive error even in the presence of normal visual acuity. In the presence of reduced visual acuity or strabismus, it may be necessary to correct lesser degrees of error.

Table 1.

Type of Error	Subtype	
Anisometropia (Asymmetric)	Hyperopia	1.50
	Astigmatism	2.00
	Myopia	2.00
Symmetrical	Hyperopia	4.50
	Myopia	3.00

Grade A

In the case of refractive amblyopia, a progressive improvement in acuity for up to 16 - 22 weeks has been shown in some patients after refractive correction, prior to implementation of other measures^{14,15}. In other words, patching or other amblyopia treatment may be delayed while progressive improvements in visual acuity occur with refractive correction alone.

b. Patching

Patches with an adhesive rim, stuck directly onto the periorbital skin of the eye with the better acuity, are the most commonly used. Because they cover the child's good eye, they limit their visual ability to the level of the amblyopic eye. They are easy for a child to remove, and may cause allergy. As it is the parents or carers who will have to deal with the distressed, uncomfortable, visually impaired child who is wearing the patch, it is clearly important that

they are both convinced of the need for treatment and appropriately motivated to carry it out. Giving older children a stake in their own treatment, for example with the use of patching diaries with stickers, helps. The active, unreasonable toddler who poses the biggest challenge.

Allergy, to the constituents of the patch or the adhesive is uncommon and may be dealt with by sticking the patch on the spectacle lens, trying a different type of patch, for example a hypoallergenic brand or by using atropine instead.

Patches can also be stuck onto spectacle lenses, but this gives the child the opportunity to look round them. Extension patches slide over the spectacle lens and have a side piece which helps prevent the child looking around the patch, but are cosmetically obtrusive. Translucent material such as blenclerol is more cosmetically acceptable, but will not completely obscure vision in the covered eye, limiting its efficacy in the treatment of severe amblyopia.

i. How much patching?

For some types of early onset amblyopia, where there is a continuing amblyogenic stimulus, such as a unilateral congenital cataract (where despite removal of the cataract the lack of accommodation puts the eye at a disadvantage compared to its fellow), reasonable levels of visual acuity can only be achieved by intensive, long term patching¹⁶.

Regimes for unilateral congenital cataract initially consisted of full time patching from removal of the cataract up until the age of seven, with short breaks to try to prevent induced amblyopia in the normal eye. While these regimes were shown to result in good acuity in some cases, this was at the expense of severely disrupting binocularity and most patients had large angle divergent and vertical strabismus. Wright showed that it was possible, with lesser amounts of occlusion, especially in the first year of life, to achieve binocularity in some patients¹⁷.

Subsequent regimes of occlusion for unilateral congenital cataract have made use of improved visual acuity tests for infants and have shown that good acuity is achievable¹⁸, however the burden of long term occlusion remains substantial.

For children with amblyopia detected later, usually due to strabismus or refractive error, less patching is usually required. Recent studies have helped to clarify how much patching is necessary.

Grade A

The US Pediatric Eye Disease Investigator Group (PEDIG) have tested two patching regimens for the treatment of moderate (20/40 to 20/80) amblyopia in 3 to 7 year old children: 2 hours vs 6 hours per day (plus 1 hour per day of near visual activities during patching)¹⁹. Visual acuity in the amblyopic eye improved a similar amount in both groups.

In a further study of severe (20/100 to 20/400) amblyopia, no significant

difference was found in the visual outcome in the amblyopic eye following full time (all but 1 hour per day) compared to 6 hours patching per day (each combined with at least 1 hour of near visual activity during patching)²⁰. Both studies reported significant rates of residual acuity deficit following 4 months of treatment.

c. Atropine

Grade A

Atropine is used in the treatment of amblyopia to blur vision in the normal eye. It has been shown to be as effective as patching in the treatment of moderate (20/40 to 20/100) amblyopia in children aged from 3 to 7²¹, and to be well tolerated²². Residual visual defects in the amblyopic eye were commonly seen in both atropine treated and patched groups 2 years following enrolment²³. It is not necessary for fixation to swap to the amblyopic eye for atropine to be effective. This may be due to blurring of higher spatial frequencies in the atropinised eye.

Blur is correspondingly greater in eyes with hypermetropic refractive errors as these can no longer be physiologically corrected for by accommodation. This can be used to augment the effect of atropine by reducing any hypermetropic correction in the normal eye (penalisation).

The advantages of atropine are that the treatment is not cosmetically obtrusive, and that compliance is not an issue once the drops or ointment are instilled. The disadvantages are that it is less easy to monitor for occlusion amblyopia and that systemic side effects, such as flushing, hyperactivity and tachycardia, may occur, particularly in children with Down's syndrome.

Grade A

Using atropine drops only once daily at weekends is as effective as atropine used every day in the treatment of moderate amblyopia²⁴.

d. Follow up

In general, children should be reviewed within 3 months of commencing amblyopia treatment with glasses or patching/atropine. In children wearing glasses, treatment with patching/atropine can be deferred until no further improvement occurs.

Once treatment with patching/atropine is commenced, review should take place on at least a 3 monthly basis, and should be more frequent in smaller children who are having higher doses of patching.

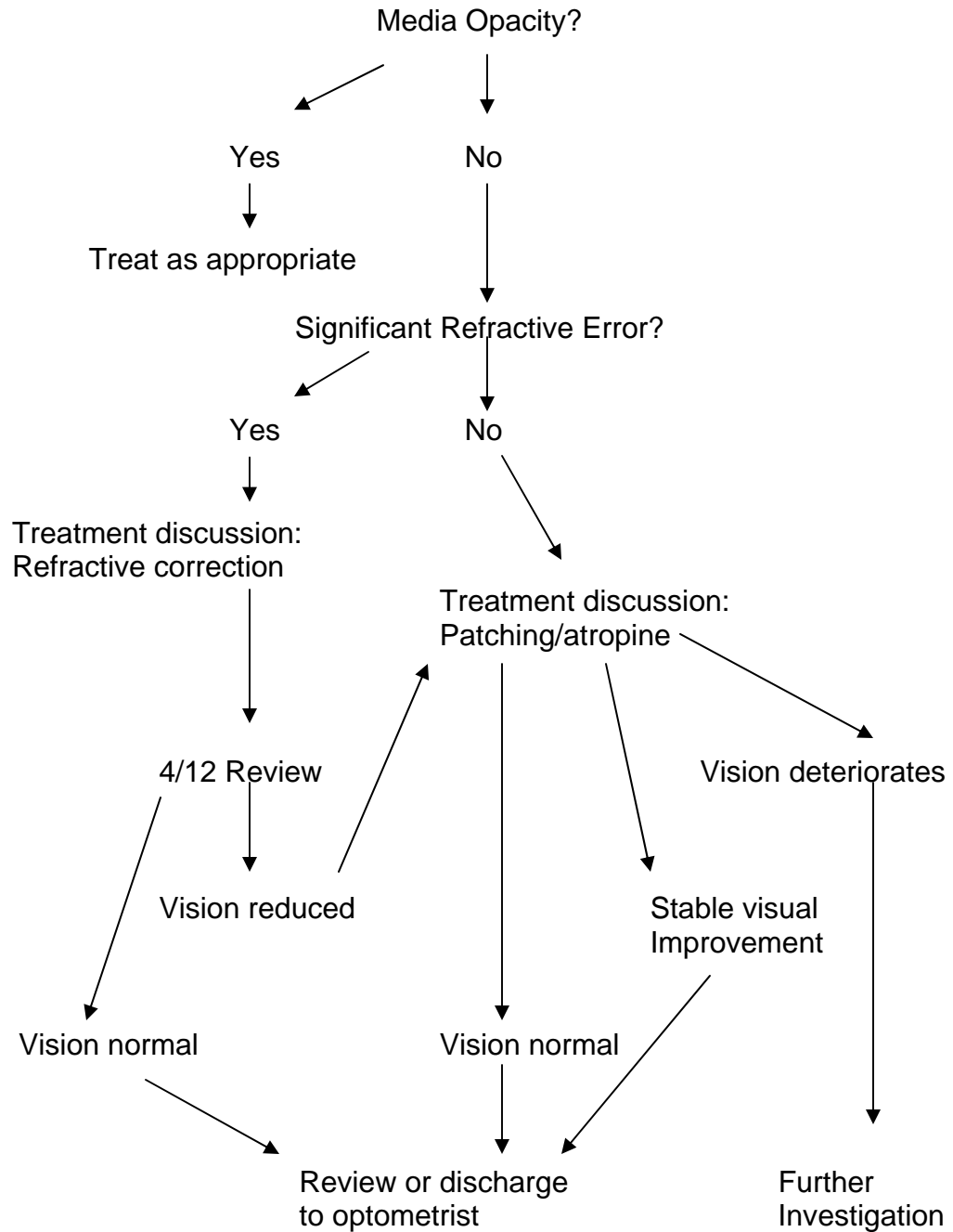
Atropine should be offered as a treatment option at the outset of treatment, and should be considered in children who have difficulty complying with patching.

Once visual acuity in an amblyopic eye has been stable for 2 consecutive 3 monthly assessments, consideration should be given to tailing off treatment.

Around 25% of successfully treated amblyopic children experience a recurrence within the first year off treatment²⁵. There is a suggestion that the risk of recurrence is greater when patching is stopped abruptly. Many children will have a residual visual deficit despite compliance with treatment.

✓ Failure of visual acuity to improve within 6 months of the commencement of amblyopia treatment should prompt re-refraction and re-examination of the fundus, looking in particular for optic nerve hypoplasia and subtle macular pathology. Progression of visual deficit during treatment, in the absence of obvious ocular pathology, raises the possibility of progressive cerebral pathology and should prompt appropriate examination, and if necessary, neuroimaging.

Summary of Amblyopia Management



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