Research

The management of amblyopia in children: the results of a national survey of orthoptists

Abstract

Background: Amblyopia is the most common cause of monocular visual loss and an important cause of avoidable blindness. It is usually diagnosed in young children and the condition is reversible, although if left untreated significant visual impairment can occur. Conventional treatment methods involve refractive adaptation followed by patching or atropine therapy and it is well documented that good compliance is key to successful treatment. Although many studies and reviews have been published on amblyopia treatment, there are no national guidelines to assist management.

Aims: To report the results of a national survey of orthoptists, to outline methods of treatment in clinical use and whether this reflects the published evidence base, and to determine the scale and management of non-compliance.

Methods: A literature review was conducted using Medline and the Cochrane Database Of Systematic Reviews. A survey was performed by the British and Irish Orthoptic Society and the responses analysed.

Results: A total of 340 questionnaire responses were collected. Analysis revealed that clinical practice varied widely and, in many cases, did not reflect the evidence from published studies on the management of amblyopia and non-compliance. Non-compliance was estimated to be 0–10% in most practices surveyed.

Discussion: This article uses the evidence base available to create guidelines to assist orthoptists in the management of amblyopia in children and proposes a management strategy for non-compliance.

Amblyopia is the most common cause of monocular visual loss in children and young adults, and is an important cause of avoidable blindness. In most cases it occurs due to strabismus or refractive error, which results in the affected eye becoming ‘lazy’, impairing development of the visual pathways. It is usually diagnosed in young children and is reversible, but if left untreated, significant visual loss may occur. It is an important topic as successful treatment is vital for ensuring good visual acuity (VA) in later life. Conventional treatments include refractive adaptation, followed by patching or pharmacological occlusion using atropine. It is well documented that good compliance is key to successful treatment.

Non-compliance is difficult to manage and a wide variety of techniques are used to tackle it, including intensive occlusion programmes or admission patching for the most severe cases.

Despite the enormity of the problem and the widespread use of patching and atropine, there are no national guidelines from the National Institute for Health and Care Excellence (NICE) or the Royal College of Ophthalmologists regarding amblyopia management.

This article aims to review the evidence base for patching and atropine, and to investigate current clinical practice to propose guidelines for amblyopia management. In addition, it will investigate compliance with amblyopia treatment and suggest guidelines for the management of non-compliance.

Methods

A literature search was conducted through the Cochrane Database of Systematic Reviews using the search term ‘amblyopia’. This revealed eight papers, one of which was used. A further search was performed through Medline using the search terms ‘amblyopia’, ‘patching’ and ‘atropine’.

A questionnaire was created online and sent out as part of the British and Irish Orthoptists Society newsletter to 1314 members. Of these, 843 opened the email and 681 followed the link to read the newsletter. A total of 340 responses were collected over a 2-week period in June–July 2013 and the results analysed using Excel. For this study, moderate amblyopia was defined as a VA of 0.3–0.6 logMAR and severe amblyopia defined as a VA >0.7 logMAR.

Results

Firstline treatment for amblyopia

In response to the survey, 99% of orthoptists said they would use patching as a firstline treatment for amblyopia. Twenty-nine respondents said they would offer patching and atropine equally in the first instance. The number of orthoptists in the UK who practise in this way is likely to be higher, but as this particular response was not an option in the survey we have only captured those who specifically commented on it. The results show that patching is more commonly used than atropine as a firstline treatment; however, a Cochrane review in 2009 concluded that they were equally effective for treating moderate amblyopia (0.3–0.6 logMAR) (Li and Shotton, 2009). VA improved equally at both

Anna Bienkowska
University of Bristol,
Senate House, Tyndall Avenue, Bristol, UK

Ann Starbuck and Amanda Churchill
Bristol Eye Hospital,
Lower Maudlin Street, Bristol, UK
6 and 24 months and this suggests that atropine could be used as a first line treatment for the management of moderate amblyopia. This result was maintained at 10 years of age, indicating long-term effectiveness of both treatments (Pediatric Eye Disease Investigator Group (PEDIG), 2008).

Secondline treatment for amblyopia

Sixty seven percent of orthoptists reported that a second line treatment was required in 0–10% cases (Figure 1). Atropine was used as a second line treatment by 94% of orthoptists surveyed, although many responses noted that second line treatments were dependent upon methods that had been tried previously and the reason for initial treatment failure.

The percentage of cases where a second line treatment is required can be used as an estimate of the scale of non-compliance, suggesting that non-compliance is relatively uncommon. However, in reality, many other factors may cause a second line treatment to be used.

To investigate the scale of non-compliance, the Monitored Occlusion Treatment of Amblyopia Study (MOTAS) (Stewart et al, 2004a) used dose occlusion meters on 94 participants to measure patch wear and found that only 48% were compliant with prescribed patching regimens. However, the monitor makes patch wear more unpleasant, which may have confounded the issue.

The Randomised Occlusion Treatment for Amblyopia Study (ROTAS) (Stewart et al, 2004b) also used occlusion dose monitors to compare compliance with 6 and 12 hours prescribed patching. They found that monitored patching time for the group prescribed 6 hours was 4.19+/-.1.7 and 12 hours 5.89+/-.1.3.

Significantly better compliance was noticed with fewer hours of patching and the authors concluded that there is little point in prescribing high doses as patients are unlikely to comply.

Frequency of appointments

Frequency of appointments was investigated and the results showed that 76% of orthoptists see patients undergoing patching every 2 months, while patients undergoing atropine are seen every 2–4 weeks by 60% (Figure 2 and Figure 3).

Eighty percent of respondents thought that frequency of appointments impacted on compliance, although it is unclear why there is a discrepancy between appointments of those undergoing different treatments. One explanation might be that atropine is most commonly used as a second line treatment for those cases where patching failed, and that frequent appointments are given to check compliance and give parental support. Many clear benefits of frequent appointments were noted but several orthoptists reported that, although they would like to see patients more often, clinic capacity issues prevented this.

Methods used to improve compliance

Over 80% of orthoptists reported using reward charts, coloured patches and patching in school in their initial management (Figure 4). Many additional methods of improving compliance were reported (Figure 5) and, undoubtedly, orthoptists create and tailor their own methods based on their clinical experiences. However, it is interesting to note that although a variety of different methods were used, the themes of motivation and education were encompassed by all, highlighting their importance.

The role of education in improving compliance

The survey found that education was seen as the most important factor for improving compliance. More specifically, importance was placed on a full
explanation to the family at the beginning of treatment about amblyopia and details about the treatment (Figure 6).

The availability of written information has been reported to be important for improving compliance. The survey found that 77% of orthoptists give information leaflets to parents and a further 14% offer them to children as well as parents. It is noted that information is not necessarily read or understood even if it is offered, and that the attractiveness and production of such leaflets is crucial.

The survey shows that written information is rarely offered to children. However, Tjam et al (2012) found that an educational cartoon explaining without words why the child should wear their patch improved electronically measured compliance in 3–6 year olds. This was particularly effective in those whose first language was not English. Improvements were also seen in attention, speed of visual recovery and length of treatment course.

**Treatment regimens**

There are no national guidelines detailing treatment regimens. This survey did not investigate specific treatment regimens, but extensive studies have been conducted in this area and reported in the literature. A review of these are summarised in Table 1 and Table 2.

Both the MOTAS study (Stewart et al, 2004a) and the PEDIG (Wallace et al, 2006) have shown that a period of refractive adaptation or 16–18 weeks before commencing treatment with either patching or atropine is important and results in improved VA in many cases.

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**Figure 4. Methods used to improve compliance**

**Figure 5. What other methods do you think are important in improving compliance?**

**Figure 6. What other factors do you think are important in improving compliance?**
Holmes et al (2003) and Stewart et al (2004a) have shown that age has an impact on response to treatment. Stewart et al (2004a) found that children under the age of 4 years respond better to treatment than those aged 6 or older. Holmes et al (2003) found that, for moderate and severe amblyopia, children aged 3–7 years responded better to treatment than those aged 7–13 years.

Management of non-compliance
Managing non-compliance can be very challenging. In children, one method is admittance to a day unit, usually for several days during one week for educational input and observation and encouragement of patching. This was the method previously used locally, but due to a re-organisation of services this is now no longer offered. To determine how effective this technique was, we reviewed the notes of all children ‘admitted’ for patching over a 15-year period. Of the 4 children admitted, VA was improved in 3 children after 4 days of treatment on the day unit. Following admission, 3 children continued to show improvement in acuity. One was re-admitted for patching. Evidence of successful outcomes has been reported with a programme that includes a short, intense period of admission +/- daily telephone support for the parents (Bradshaw, 2013) at the Royal Bournemouth and Christchurch Hospital.

More work in this area would be helpful to devise a cost-effective protocol that could be widely adopted by orthoptists. In the meantime, we fully support either admission patching or shorter, intensive occlusion programmes to manage amblyopia in non-compliant children.

Discussion
Of the 1314 members who were sent the survey, 340 responded, representing a response rate of 26% of all orthoptists in the UK and Ireland registered with the British and Irish Orthoptic Society. A limitation of the study is that the results may not truly reflect the views and practices of the whole profession, and there may be an element of bias.

The survey revealed that there are discrepancies between the evidence base and clinical practice in the first-line management of amblyopia. Despite published evidence showing equal effectiveness between patching and atropine for moderate amblyopia, patching is used more often as an initial treatment. The survey did not distinguish between the management of different depths of amblyopia and it would be useful to determine whether asking this specifically would influence the responses.

Several studies have shown that children feel stigmatised and can lose self-confidence when wearing a patch, and that compliance and patient satisfaction are improved with atropine. Weekend atropine was shown to be as effective as daily atropine for moderate and severe amblyopia, and is less costly and more practical for patients. A full history and examination will reveal the few children in whom atropine is contraindicated. A better understanding of the reason why atropine appears to be less popular than patching among UK orthoptists would be helpful to determine whether it is due to prescribing difficulties in community clinics or to misinformation about the frequency of adverse reactions.

<table>
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<tr>
<th>Study</th>
<th>Method</th>
<th>Outcomes</th>
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<tr>
<td><strong>Moderate amblyopia</strong></td>
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<tr>
<td>Holmes et al, 2003</td>
<td>2 vs 6 hours patching, children aged 3–7 yrs</td>
<td>VA after 4 months treatment was the same in both groups</td>
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<td><strong>Severe amblyopia</strong></td>
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<tr>
<td>Wallace et al, 2006</td>
<td>2 hours patching vs control group, children aged 3–7 yrs with moderate to severe amblyopia</td>
<td>Greater improvement seen in the patching group. Similar for moderate and severe. Some improvement seen with optical correction alone</td>
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<tr>
<td>PEDIG, 2008</td>
<td>2 hours patching, children aged 3–7 yrs – near vs distance activities</td>
<td>Severe amblyopia may respond to 2 hours of patching</td>
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<tr>
<td>Holmes et al, 2003</td>
<td>6 hours vs all day patch wear, children aged 3–7 yrs</td>
<td>Equal improvement in VA after 4 months treatment</td>
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<td><strong>Not categorised</strong></td>
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<tr>
<td>MOTAS (Stewart et al, 2004a)</td>
<td>2 vs 6 hours patching, children aged 3–8 yrs with monitored occlusion</td>
<td>Equal improvement. Higher dose associated with faster response, overall outcome not altered</td>
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<tr>
<td>ROTAS (Stewart et al, 2004b)</td>
<td>6 vs 12 prescribed hours patching, children aged 4–7 yrs with monitored occlusion</td>
<td>Concordance for high doses poorer than for medium doses</td>
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<td>Repka et al, 2004</td>
<td>Daily vs weekend atropine in 3–7 year olds</td>
<td>Similar results in both groups</td>
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<td>Li and Shotton, 2009</td>
<td>Daily vs weekend atropine</td>
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<tr>
<td><strong>Severe amblyopia</strong></td>
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<tr>
<td>Repka et al, 2009</td>
<td>Trial 1: Weekend atropine with plano lens vs weekend atropine with full spectacle correction in children aged 3–6 yrs; Trial 2: Weekend atropine vs 2 hours daily patching in children aged 7–12 yrs</td>
<td>Augmentation with plan lens did not affect outcome. Patching was not significantly more effective than atropine. Weekend atropine was effective</td>
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Non-compliance was reported as an infrequent problem in this survey. Education was highlighted as being the most important factor in improving compliance. Although this was focused on parental education, there is evidence to show that education of children is also important and more effort should be made to include children in this, even though many of them will be very young. Leaflets with pictures and no words could be used for young children and adults who are illiterate or who cannot understand written English.

Frequency of appointments was thought to be a key factor in promoting compliance; however, a variation in frequency was seen between patients undergoing patching and atropine. This could be because patients undergoing atropine treatment are more likely to have had trouble with patching compliance and are being more closely monitored. Other factors that must be considered are the cost of more frequent appointments and the available capacity of the local orthoptic service. If non-compliance cannot be managed by switching to a second-line treatment an intensive/admission programme should be tried along with further education and parental support.

The literature review identified the need for 16–18 weeks of optical adaptation for those children with a refractive error before commencing occlusion treatment. There is also much evidence linking treatment intervention at an earlier age and improved visual outcome. From the evidence base we recommend starting patching or atropine as soon as possible after diagnosis for those without a refractive error and after 16 weeks optical adaptation for those requiring prescription glasses.

Conclusions
The following simple guidelines were devised using the results from this study to assist orthoptists in their management of a child diagnosed with amblyopia.

Guidelines for the management of amblyopia
- Initial management of amblyopia should involve 16–18 weeks of optical correction for children requiring prescription glasses
- Either patching or atropine may be used as a first-line treatment for moderate amblyopia unless atropine is contraindicated
- Patching
  - For moderate amblyopia 2 hours daily patching
  - For severe amblyopia 2–6 daily hours patching
- Atropine
  - For moderate and severe amblyopia, weekend atropine should be prescribed
- Two educational leaflets, one for parents and one for children, should be created. There should be an opportunity for parents to go through this with a nurse or orthoptists at the beginning of treatment.

Guidelines for the management of non-compliance
- Appointments should be more frequent and families should see the same orthoptist throughout their treatment if at all possible
- Admission patching or intensive occlusion programmes in conjunction with further family education and support should be used for children in whom poor compliance is impairing their visual acuity. HOP

Conflict of interest: none declared

References/further reading