Research Article

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ARCHIVES OF MEDICINE

2015
Vol. 8 No. 1:1

Amblyopia Detection and Treatment across Poland-Results of a Questionnaire

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Citation: Gotz-Wieckowska A, Siwiec-Proscinska J, Dmitriew A, et al. Amblyopia Detection and Treatment across Poland-Results of a Questionnaire. Arch Med. 2015, 8:1

Abstract

Title: Amblyopia detection and treatment across Poland - results of a questionnaire

Background: Amblyopia continues to be a major health problem today and there is a strong rationale for treatment. Our aim was to determine the pattern of detection and treatment of amblyopia in Polish children.

Methods and Findings: A 25-item questionnaire was designed to evaluate treatment practices in children with amblyopia and strabismus. A total of 60/200 questionnaires (30%) were completed by ophthalmologists and analyzed. For the timing of the first ophthalmic exam in a child with strabismus/amblyopia/hyperopia in family history, 38% of respondents recommend as early as possible, 28% in the 6th month of life and 21% in the 12th month of life. For treating amblyopia in patients under 3 years of age (besides optical correction), 62% of respondents suggested patching and 34% atropinization. For patients over 3 years of age with severe amblyopia (VA worse than 0.1 -decimal equivalent of Snellen fraction) (apart from spectacles), respondents selected: patching (41%), atropinization (21%), visual exercises (22%), other methods (15%). Respondents showed preference of full day patching in severe amblyopia and half-day patching in moderate amblyopia.

Conclusions: We found a large proportion of Polish ophthalmologists already follow amblyopia treatment guidelines that would be considered evidence-based, incorporating the results of recent randomized clinical trials and observational studies such as those conducted by the Pediatric Eye Disease Investigator Group. We hope that trend will significantly increase after the society congresses and in the future we can state that the Polish amblyopia treatment pattern follows current PEDIG guidelines to prevent serious visual impairment.

Keywords: Anisometropia, Atropinization, Hyperopia, Patching, Strabismus

Received: November 03, 2015; **Accepted:** November 14, 2015; **Published:** November 23, 2015

Introduction

Amblyopia continues to be the most common cause of monocular vision loss in children and young adults. Its prevalence may differ by race and ethnicity. In adults amblyopia has been estimated to range from 1-5% [1-3], with 25% of amblyopic patients having best corrected visual acuity worse than 0.3 (decimal equivalent of Snellen fraction) [4]. The necessity of treating amblyopia was questioned [5], but the presence of amblyopia in one eye increases the risk of bilateral blindness caused by injuries or age related macular degeneration [6,7]. There is also evidence that the presence of amblyopia might be an obstacle in job selection [8]. Therefore inadequately treated, or untreated, amblyopia continues to be a major health problem today and there is a strong rationale for treatment.

Recent research performed by the Pediatric Eye Disease Investigator Group (PEDIG) has suggested that treatment of lower intensity, than historically prescribed, may be sufficient for successful treatment of most children with amblyopia. Current treatment recommendations, based largely on PEDIG studies (for all kinds of amblyopia, except deprivation amblyopia), involve treating first with spectacles alone [9,10], expecting approximately a quarter of children to respond, and then treating

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with 2 hours of daily patching [11] or twice weekly atropine drops [12] or a Bangerter filter [13]. If a child does not respond to these lower intensity regimes, then increasing or switching treatment is reasonable [14,15].

The purpose of the study was to evaluate the current treatment patterns among Polish pediatric ophthalmologists and general ophthalmologists dealing with children.

Methods

A 25-item questionnaire was designed to evaluate treatment practices in children with amblyopia and strabismus. The questionnaire was mailed to 200 ophthalmologists across Poland, forthcoming participants of XXI Congress of Polish Strabismus Society and was also available for download at the website of the XXI Congress of Polish Strabismus Society.

The instructions specified that the questions pertained to anisometropic, strabismic and mixed amblyopia and not to deprivation amblyopia.

The study was not conducted on humans, the paper was based on a voluntary and anonymous survey among ophthalmologists, not among patients. The ophthalmologists were asked to give their written opinion about treatment modalities on the basis of their own experiences and knowledge. No personal human data, e.g. examinations results were analyzed in this paper. That is why this design of the study does not require ethical approval and the study adheres to local legislation (Bioethics Committee at University of Medical Sciences in Poznan).

Results

Sixty (30%) of the 200 questionnaires were completed and analyzed.

For the timing of the first ophthalmic exam in a child with strabismus or amblyopia or hyperopia in their family history, 38% of respondents recommend as early as possible, 27% in the 6th month of life, 21% in the 12th month, 9% in the 2nd and 5% in the 3rd year of life. For a child who has strabismus for the most of the day, 88% of respondents recommend an immediate visit, 10% in the 6th month and 2% in the 12th month of life.

For evaluating refractive error in children, 17% of respondents recommend cycloplegic autorefraction, 3% retinoscopy and 77% consider both methods useful. 3% used another method.

Visual acuity charts most commonly used were Snellen charts (38% of responses), Letter E charts (25%), LEA symbols (17%), Allen pictures (7%), Kay pictures (5%), Landolt test (5%) and others (3%). The logMAR charts were routinely used for children over 3 years of age only by 14% of respondents.

For stereoacuity tests 48% of ophthalmologists use the Titmus stereotest, 30% TNO test, 19% Lang test, 1% Frisby stereotest and 2% use other stereotests.

For severe amblyopia (VA worse than 0.1), 38% of respondents considered no maximum age beyond which they would not treat amblyopia, whereas 3% do not undertake a treatment in patients over 5-8 years of age, 22% don't treat children over 9-12 years, 26% don't expect improvement in patients over 13-16 years. 8% state that the sensitive period lasts until 17 years of age, and 3% consider patients individually.

For moderate amblyopia (VA 0.1-0.5), 53% of respondents considered no maximum age for the treatment, whereas 3% do not treat children over 5-8 years, 9% do not treat patients over 9-12, 19% would not treat children aged 13-16, 10% would not treat patients over 17 and 6% consider patients individually.

If there was a large strabismus angle associated with amblyopia, 46% of ophthalmologists recommend surgery after finishing amblyopia therapy, whereas 32% scheduled surgery first. 22% individualize the treatment plan.

When no improvement of VA occurs with prescribed treatment, 25% of respondents would order electrophysiology first, 23% would order neurologic consultation first, 50% would order both, and 2% would order other tests.

For asymptomatic hyperopia, the average amount of hyperopia for which respondents would prescribe spectacles was 3.5 D (range 2.0-5.0 D) in patients under 3 years of age, 2.8 D (range 1.0-4.75 D) in children aged 3-6 years, and 2.1 D (range 0.5-4.0 D) over 6 years.

For asymptomatic astigmatism, the average astigmatism for which respondents would prescribe spectacles was 1.7 D (range 1.0-3.0 D) in patients under 3 years of age, 1.4 D (0.25-3.0 D) in children ages 3-6 years, and 1.1 D (0.25-2.0 D) in older patients.

For treating amblyopia in patients under 3 years of age (besides optical correction), 62% of respondents suggested patching, 34% atropinization, 4% other methods.

For amblyopia in patients over 3 years of age with severe amblyopia (VA<0.1) (apart from spectacles), our respondents selected patching (41%), atropinization (21%), visual exercises (22%), penalization (13%), prisms (2%). 1% of respondents suggested other treatment. For the specific patching regimens in patients over 3 years of age with severe amblyopia, 39% of respondents indicated full-time patching for 6 weeks and then a follow-up examination, 31%-6 hours per day patching for 6 weeks and then a follow-up examination, 30% suggested other regimes.

For patients over 3 years old with moderate amblyopia (VA 0.1-0.5) (apart from spectacles), 95% of ophthalmologists recommend patching, 36% atropinization, 57% visual exercises, 30% penalization, 11% Bangerter foil, 4% prism. In this patients group, 61% of respondents recommend half-day patching and then a follow-up after 3 months, 14% 2 hours per day patching with the same follow-up and 25% suggested other regimes.

In all groups no one recommended acupuncture, L-DOPA precursors or homeopathy.

For methods to prevent infants from removing eye patch, the majority (78%) did not recommend anything, 11% suggested one-finger gloves and 11% suggested other ideas.

Atropine was ordered by 61% of respondents when no effect of patching occurred (due to lack of cooperation) and 20%

recommended atropinization depending on age of a patient, 15% decided depending on the amblyopia severity, 4% ordered atropine in other situation.

Our respondents prescribed atropine once a day every day (41%), twice a week (34%) and once a week (12%). The rest indicted a different schedule.

93% of ophthalmologist recommend near visual activities with 41% of providers considering them crucial during treatment and 52% evaluating them as helpful.

Specific visual exercises were recommended in children over 3 years of age. 78% recommended precise visual tasks, 36% formal pleoptic exercises, 11% targeting exercises, 8% localizing exercises, 6%, orthoptic exercises, 2% Campbell visual stimulator, and 2% the cheiroscope.

Regarding perceived efficacy of patching vs. atropinization in severe amblyopia treatment, 63% of respondents considered patching more effective, 33% thought both methods were comparable, and 4% of respondents felt atropinization was more effective.

Regarding moderate amblyopia, due to anisometropia, with no strabismus and no previous therapy, 48% of respondents suggested optical treatment alone and follow-up after 3 months, 42% of respondents ordered patching along with spectacles and follow-up in 3 months, and 10% of ophthalmologists had other recommendations.

Discussion

Overall, we found a large proportion of questioned Polish ophthalmologists already follow amblyopia treatment guidelines that would be considered evidence-based, incorporating the results of recent randomized clinical trials and observational studies such as those conducted by the Pediatric Eye Disease Investigator Group.

In many countries there is a preschool screening program to detect amblyopia, for example, in Canada and the Netherlands, preverbal screening tests are performed. This kind of population-wide screening requires huge financial support and some authors have questioned the utility of this strategy [5,16,17]. Nevertheless, in some countries, screening for amblyopia has been associated with a decrease in amblyopia frequency (2% to 0.2% in Sweden [18], 1.7% to 0.1% in Israel [19]). Even if widespread screening is not employed, it seems reasonable to perform a complete ophthalmic examination in high risk children with a family history of amblyopia, hyperopia or strabismus during the first year of life [20], as it is a critical time for normal visual development [14]. Undoubtedly there is an important role for pediatricians, because they can educate parents regarding the desirability of a full examination for high risk children. Thirty-eight of our respondents suggested an ophthalmic examination should be performed as soon as possible in these children, despite the lack of evidence-based guideline. The presence of constant strabismus in infant should always be an indication for immediate ophthalmic examination and 88% of our respondents indicated that this would be their preferred practice.

A critical component of treatment of a child with possible amblyopia is detection of significant refractive error. Early correction of refractive error allows optimal VA [21], may prevent strabismus [22,23] and decrease learning problems [24]. 77% of respondents use retinoscopy and autorefraction to evaluate refraction.

Careful evaluation of visual acuity is needed to diagnose amblyopia. 38% of our respondents used the Snellen chart, although at some levels the optotypes are not crowded [14], the steps are not in a logarithmic progression, and there is a different number of optotypes at each level. It is also important to change optotype to prevent children from memorizing them. The PEDIG studies use HOTV optotypes for children age 3 years to <7years, in the Amblyopia Treatment Study Protocol [25,26], defining the visual acuity as the smallest level on which 3 of 4 optotypes can be identified. For children aged 7 years and older an electronic version of the EDTRS chart was used in PEDIG studies [27]. Even though many authors find logMAR charts important, only 14% of our respondents use them. The failure to use these specific charts with crowded optotypes, with the same number of optotypes at each level, may result in errors in diagnosing amblyopia.

Stereoacuity may improve with amblyopia treatment [28] and its accurate measurement is desirable. In PEDIG studies, the Preschool Stereoacuity Test was used. Such random dot tests are more discriminatory than contour tests. Our respondents commonly use the Titmus test (a contour test) (48%) and the TNO test (a random dot test) (30%).

One of the most commonly discussed topics related to amblyopia treatment is the age at which therapy is ineffective. Many authors have previously suggested that the best treatment results are possible before 5th year of age [29,30]. Recently, numerous studies have revealed that treating amblyopia in children over 10 years of age can be effective. Some authors have reported visual acuity improvement in amblyopic eye of an adult patients after fellow eye injury [31,32]. It therefore seems reasonable to undertake a treatment trial of every amblyopic patient, especially if they have had no previous amblyopia therapy [33,34]. In Poland, similarly to German-speaking countries, severe amblyopia is defined as VA worse than 0.1, while in many English language publications, severe amblyopia is often defined as VA worse than 0.2 [35]. That it why we asked about treatment in patients with VA worse than 0.1. The opinions of our respondents differed with regard to treatment of severe amblyopia. 38% of them prescribe therapy in every patient with severe amblyopia and 53% of respondents expect improvement in initial VA between 0.1-0.5, no matter how old the patient is. Based on PEDIG studies it seems reasonable to offer a treatment trial in every patient under 18, particularly if they never had treatment for amblyopia [34].

During amblyopia treatment, the ocular alignment may change. Based on PEDIG studies, over 50% of patients with at least 8 prism diopters (PD) of heterotropia improved their eye alignment during amblyopia treatment without surgery. Orthophoria was obtained in 14% of patients [36]. Other authors suggest that it is still reasonable to perform strabismus surgery, before amblyopia treatment is finished [37,38]. Among our respondents, 46%

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indicated that surgery would not be recommended until amblyopia treatment is finished.

In cases where visual acuity did not improve during amblyopia treatment, it is necessary to exclude organic disease. 50% of respondents ordered electrophysiology examinations combined with neurologic consultation, 25% start with electrophysiology alone.

Another issue is the threshold above which to start correction of refractive errors. Many authors suggest that early optical correction results in better long-term visual acuity and less strabismus [2,4,23,24]. On the other hand it is suggested that correction of refraction errors higher than +3.0 D slows down the emmetropization process [24]. Wright suggested correction of bilateral refractive errors with the following thresholds: >5.0 D hyperopia, >3.0 D myopia, astigmatism >2.5 D, hyperopic anisometropia of>1.5 D, myopic anisometropia of >3.0 D and astigmatic anisometropia of >1.5 D [39]. Clark [40] recommended correction of bilateral hyperopia >4.0D, myopia of >3.0 D, astigmatism of >1.5 D, hyperopic astigmatism of >0.75 D, myopic astigmatism of >2.0 D and anisometropic astigmatism of >0.75 D. The American Academy of Ophthalmology suggests correction in children aged 2-3 with hyperopic anisometropia ≥ 1.5 D, astigmatic anisometropia ≥ 2.0 D, myopic anisometropia ≥-2.0 D, in symmetric hyperopia ≥ 4.5 D and myopia ≥ 3.0 D [14]. According to our respondents, average amount of hyperopia requiring correction is 3.0 D in children under age 3, 2.5 D in children aged 3-6 and 2.1D in patients over 6 years of age. Average amount of astigmatism needing correction is 1.7 D in children under age 3, 1.4 D in children aged 3-6 and 1.1 D in patients over 6.

We posed separate questions related to amblyopia treatment in children under and over age 3. Most ophthalmologists are not eager to prescribe atropine in preverbal patients because of the possible risk of inducing amblyopia in the fellow eye, particularly when VA cannot be followed with optotype charts. In children less than 3 years of age, 62% of our respondents prescribed occlusion therapy and 34% atropinization. In patients over 3 years of age with severe amblyopia 41% prescribe occlusion and 21% atropinization.

Pleoptic exercises have essentially been abandoned in recent decades. The last large case series referring to pleoptic exercises came from the 1970s [41]. There are more recent reports from the Polish literature, but studies were performed on small, non-randomized groups [42].

Undoubtedly occlusion is considered by many as the primary therapeutic approach in amblyopia treatment. Occlusion of the better eye in patients with severe amblyopia is difficult to achieve for long periods of time. In this context, recent publications which show similar therapy effects of 12 hours vs. 6 hours patching regime have high clinical significance [43]. Among our respondents 39% prescribed 12 hours per day occlusion regime and 31% prescribed 6 hours per day of occlusion. The PEDIG group also studied prescribing 2 hours vs. 6 hours occlusion in patients with moderate amblyopia and results were comparable [44]. In moderate amblyopia 61% of our respondents still recommend half-day occlusion, 14% suggest 2 hours per day patching and 25% recommend another patching regimen.

There might be difficulties in keeping the eye patch on in older children, however some solutions to this problem have been suggested [45]. Most of our respondents did not recommend any additional method of preventing children from removing the eye patch.

Regarding substituting patching with atropinization, 61% of respondents prescribe atropine when patching is not effective, 20% decide dependent on the age of the child, 15% decide dependent on the severity of the amblyopia. According to the PEDIG studies, both methods are similarly effective [46,47]. Atropinization is better accepted by patients and their family [48,49]. Atropine side effects are rarely described [47,49].

We also asked about atropine dosage in amblyopia treatment. 41% prescribed atropine once a day every day, 34% twice a week, 12% once a week. Based on the PEDIG studies, weekend atropine is similarly effective to atropine used once a day [1].

In many publications the role of near work in amblyopia treatment was highlighted, but earlier studies were non-randomized and involved small groups of patients [50,51]. Randomized studies showed no statistical difference in treatment efficacy between patching with near vs. distance activities [52]. Most - 93% of our respondents used near visual activities.

In the modern literature it is hard to find publications showing the effectiveness of pleoptic exercises in amblyopia treatment, however they are indicated by many ophthalmologists. Pleoptic exercises may be recommended as a reaction to parental pressure for alternative treatments [41,53]. The majority of respondents recommended precise visual activities (78%), pleoptic exercises (36%), targeting exercises (11%), orthoptic exercises (6%) and others (4%).

Another finding from the PEDIG studies was the comparable efficacy of patching and atropinization in severe amblyopia treatment. The PEDIG group also found that the use of weekend atropine was most effective in patients aged 3-6 and in children aged 7-12 [54]. In previous prospective studies, atropine was used every day [49]. Most (63%) of our respondents considered patching as the most effective, 33% indicated they thought both methods as comparable, and 4% of respondents indicated atropinization as more effective.

In our last question we asked about treatment of patients with moderate amblyopia with anisometropia, without strabismus and with no previous treatment history. 48% of respondents recommended optical correction and follow-up in 3 months, 42% suggested patching with spectacles and follow-up in 3 months. Treatment results in anisometropic amblyopia may depend on many factors: age of a patient, anisometropia level [55]. Children with high myopia are often excluded from previous studies [9].

One weakness of our study was the relatively low (30%) response rate to our questionnaire. Although our data give a sense of the prevailing practices across Poland, we cannot be sure that they are truly representative of the majority of treating physicians.

Conclusions

Our study suggests that although a proportion of ophthalmologists in Poland are following an evidence-based approach to treating anisometropic, strabismic or mixed amblyopia, some of our respondents are not doing so. We do not have data on whether the differences in approaches are due to lack of familiarity with the most recent literature or due to firmly held beliefs in previous treatment methods. Acceptance and widespread implementation of evidence-based medicine is a world-wide challenge, and the barriers to this process are worthy of further study.

Authors Contribution

AGW designed study, analyzed results and prepared manuscript. JSP designed study, analyzed results, prepared manuscript, worked as corresponding author. AD edited manuscript, helped in data interpretation. MS gathered data, conducted mathematical data analysis. AJ gathered data, conducted mathematical data analysis. ED gathered data, conducted mathematical data analysis. All authors read and approved the final manuscript.

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