The negative impact of amblyopia from a population perspective: untreated amblyopia almost doubles the lifetime risk of bilateral visual impairment

Josefin Nilsson

Van Leewen *et al*'s work provides valuable data, moving us closer to determining whether preschool vision screening can be justified

Ten years ago, a systematic review on the effectiveness of preschool vision screening for amblyopia and related target conditions was published in the UK, the Snowdon and Stewart-Brown report.¹ After summarising the scientific evidence available at the time, the authors came to the following conclusion: purchasers are advised against implementing preschool vision screening programmes and providers should consider discontinuing them. The response from the paediatric ophthalmology community was, of course, massive, and a lively international discussion ensued. Even though the initial currents in the debate were quite harsh towards the conclusion of the report and even towards the authors, in retrospect we should be very grateful that it was published. In the last few years, we have had the pleasure of reading an impressively large number of well-designed scientific studies, significantly moving forward our knowledge about diagnosis, screening and treatment of amblyopia, as well as challenging some old "truths" (for a recent summary, see Holmes and Clarke²).

However, data on the negative impact of amblyopia from a population perspective have not been as abundant. One of the main problems identified by The Snowdon & Stewart-Brown Report was the lack of evidence showing that the target conditions (amblyopia, significant refractive error and non-cosmetically obvious squint) are disabling if left untreated. In discussing the rationale for preschool vision screening programmes, more results on possible associations between amblyopia and increased lifetime risk of visual impairment, as well as quality of life/utility measures for unilateral amblyopia, are required. The paper by van Leewen *et al*, published in this issue of the BJO (see page 1450), is therefore an important contribution.³ In a world with limited economic resources

and ever-growing expenses for medical services, we will most likely see an increasing demand for evaluation, evidence of benefit and proof of cost-effectiveness for government-financed screening programmes.

In a paper on the cost-effectiveness of screening for amblyopia published in 2004, König and Barry⁴ conclude that the risk of losing the better eye would not alone justify vision screening. The numbers used for their calculations come from a study by Rahi *et al*⁵ where the projected lifetime risk of vision loss (worse than 6/12) for an individual with amblyopia is reported to be 1.2%. Van Leewen *et al* report the lifetime risk of bilateral visual impairment (BVI) to be as high as 18% for those with amblyopia (compared with 10% for non-amblyopic subjects), and that individuals with amblyopia on average spend an extra seven months with BVI. The numbers reported by van Leewen *et al* are considerably higher than those reported by Rahi *et al*. The two studies differ in methodology, which may explain these differences. The study by Rahi *et al* was a surveillance study, while The Rotterdam Study was population-based. Moreover, the Rotterdam Study includes older age groups in whom the risk is higher. One cannot help but wonder if the conclusion from König and Barry⁴ would have been different using the numbers presented by van Leewen *et al*.

In discussing the cost-effectiveness of screening and treatment for amblyopia, the possible functional disability related to unilateral amblyopia must also be taken into consideration. In economics, utility is a measure of relative happiness or satisfaction. Utility measures are preference-based estimates of health-related quality of life. These measures are increasingly being used in economic evaluations of healthcare interventions. In the last 5 years, a number of studies

have been published on cost-utility analyses of treatment and screening for amblyopia,⁴⁻⁸ all with the limitation that utility/quality of life measures were not included,⁸ or derived from studies on individuals with impaired vision due to causes other than amblyopia.⁴⁻⁶ There is reason to believe that amblyopia may be very different from other ophthalmic diseases. Individuals with acquired visual disorders, many of which are progressive, previously have had healthy eyes and normal vision. Moreover, in many ophthalmic diseases, there are additional visual problems such as reduction of visual field and reduced colour vision, which those with amblyopia do not have. There is a clear need for objective studies on the possible relationship between unilateral amblyopia and functional disabilities. In such studies, comparisons should be made between three groups: (1) normal controls, (2) non-treated amblyopes, and (3) amblyopes after successful treatment. Cost-utility studies assume that those with successfully treated amblyopia have the same utility value as normal controls. If it is shown that amblyopia is related to some kind of disability or loss of utility, then it is important to establish whether successful treatment reduces this disability or utility loss. At the recent 2007 ARVO meeting, Webber *et al* presented a study on the effect of amblyopia on motor and psychosocial skills in children.⁹ The study compared normal controls with children who had been diagnosed and treated for amblyopia, the latter group consisting of both successfully and non-successfully treated subjects. The results showed those with amblyopia to have poorer fine motor skills compared with control subjects. This finding was not related to interocular difference in visual acuity, suggesting that successful treatment does not restore normal function.

Van Leewen *et al* should be praised also for presenting results on the numbers needed to treat (NNT). NNT is defined as the number of patients who need to be treated in order to prevent one unfavourable outcome. According to their data, 12.5 individuals with amblyopia need to be successfully treated to prevent one case of BVI. This number is well in line with other healthcare interventions,¹⁰ such as calcium and vitamin D supplementation to prevent fractures in older people (NNT 15) or statin treatment post-myocardial infarction to prevent major coronary events (NNT 11).

In order to evaluate if preschool vision screening is worth while from a population point of view, several issues need to be clarified.¹¹ First, the lifetime risk associated with untreated amblyopia

must be established, both in terms of increased risk of bilateral visual impairment and in terms of quality of life. Second, the total cost of screening and treatment, and the actual benefit of a screening programme to the population,^{12,13} must also be assessed. As of today, we do not have all of the information required, but van Leewen *et al.*'s work has provided us with very valuable data, moving us closer to determining whether preschool vision screening can be justified.

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Congenital rubella

Congenital rubella syndrome: the end is in sight

Scott R Lambert

Rubella vaccination programmes offer hope in eradicating congenital rubella syndrome in developing countries

Rubella is usually a mild febrile illness associated with a rash, lymphadenopathy, conjunctivitis, malaise and arthralgia. In 1941, an Australian ophthalmologist, Norman Gregg, first reported the association between congenital cataracts and a rubella infection during pregnancy in an article entitled "Congenital cataract following German measles in the mother".¹ This condition is now referred to as congenital rubella syndrome (CRS). It occurs as a result of a maternal rubella infection during the first trimester of pregnancy when organogenesis is occurring and is most commonly associated with hearing impairment (60%), congenital heart disease (45%), microcephaly (27%) congenital cataracts (25%) and mental retardation (13%). During the early 1960s, there was a worldwide pandemic of CRS. In the United States alone, 20 000 children were born with CRS between 1962 and 1965. In 1969, a live attenuated rubella vaccine was licensed in the US, and widespread vaccination of children was initiated. As a result, CRS has almost been eradicated from the US. Between 2001 and 2004, there were only 4 reported

cases of CRS in the US, of which 3 were born to mothers who had immigrated to the US.²

In 2003, the Pan American Health Organization set a goal of eradicating rubella from the Western Hemisphere by 2010. Forty-three of the 44 member countries of the Pan American Health Organization have now instituted rubella vaccination programmes.³ With childhood vaccination programmes, the first dose is usually given at age 12–15 months and the second dose either at the time of school entry or in the early teen years. While all industrialised countries now have rubella-vaccination programmes, less than one-half of developing countries have rubella-vaccination programmes. Neither of the two most populous countries in the world, China and India, with a combined population of 2.5 billion people, has a rubella vaccination programme. It is estimated that 100 000 children are born each year in the world with the CRS.⁴ In order for a childhood vaccination programme to be successful, more than 80% of children need to be vaccinated in order to achieve herd immunity. It has been recommended by the World Health

Organization (WHO) that women of childbearing years also be vaccinated when a childhood vaccination programme is initiated in a country. Inadequate childhood vaccination programmes are believed to actually increase the risk of contracting rubella among women of childbearing years. In countries with childhood vaccination programmes, the seronegativity rate for rubella among women of childbearing years can be as low as 1%, whereas in countries without vaccination programmes, the seronegativity rate can be as high as 50%.^{5–10}

In India, CRS is the second leading cause of non-traumatic childhood cataracts exceeded only by hereditary cataracts.¹¹ The visual outcome of children with cataracts secondary to CRS is generally quite poor. In a recent report from India, 50% of children with bilateral cataracts secondary to CRS remained legally blind following cataract surgery.¹² The poor visual outcomes were ascribed to amblyopia, glaucoma, cornea opacities, optic atrophy and pupillary membranes. The poor visual outcomes were particularly tragic, since more than 50% of these children had a hearing impairment.

In its surveillance of CRS, the WHO distinguishes between: suspected cases of CRS, clinically confirmed cases of CRS and laboratory confirmed cases of CRS.¹³ The WHO defines a suspected case of CRS as an infant less than 1 year of age with heart disease and/or suspicion of deafness and/or one or more of the following ocular findings: leucocoria, decreased vision, nystagmus, strabismus, microphthalmos or buphthalmos. WHO defines a clinically confirmed case of CRS as an infant with two or more of the following findings confirmed by a physician: cataract, congenital glaucoma, pigmentary