Ageing and visual field data

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New editorship

New editorship

Harminder S Dua, Arun D Singh

Even *BJO* editors have a term office and when that runs out change is inevitable. We take on the editorship of this prestigious, truly international journal with some trepidation, anxiety and considerable excitement, in the full knowledge that one day we will pass on the baton to a future generation, as others have done before us, in this timeless relay in which the winner must be the *BJO*. In its present form, the *BJO* is a tribute to the generations of editors and publishers that have served it and accorded it the status it enjoys today. We gratefully acknowledge the efforts of Professors Creig Hoyt and Andrew Dick who have handed us a thriving and flourishing journal and we are determined to keep it that way.

Change always brings in its wake some turbulence. In the transition period some turbulence will indeed be felt and noted whist we try to adapt to the changing professional and academic environment. The major strength of the *BJO* is its global appeal based on wide clinical coverage encompassing all subspecialties within ophthalmology and visual sciences including manuscripts with a regional or national emphasis.

With a worldwide print circulation of close to 2500; with local editions in five countries totalling 1500 further prints and online translations of abstracts in Portuguese and Chinese, the *BJO* now has an established international status. This is reflected in the more than 3000 submissions received annually from every continent. Our new editorial board mirrors this international bias. The editorial board comprises of section editors with enhanced responsibilities and with a collective expertise covering all aspects of ophthalmology and visual sciences.

A new section on ''Education'' will appear including instructional and educational material. Many case reports that have considerable educational value will be included here under the heading ''How it happened''. ''How to do it'', ''How to interpret'', ''How it works'' and other similar contributions will be both solicited and welcomed from our readers. New devices, drugs and techniques will be included under ''Innovations'' and we propose to publish at least one major review in each issue. Translation will be extended to the Spanish language with the appointment of two Spanish translation editors.

We hope to maintain a direct contact with our subscribers, contributors, readers and reviewers by encouraging direct email contact with us or members of the editorial board on any issue pertaining to the journal. Together we will make it stronger.

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Ageing

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Knowledge is sparse

No human function lasts forever. The progressive and inevitable decay of both sight and hearing, perhaps the two noblest human senses, is a good example of how the insults of time affect us all, in spite of modern medical advances. Research groups throughout the world are continually searching for ways to extend the average lifespan, allowing humans to live even well beyond the age of 100. This scientifically aided extension of life is not without consequences, especially if the natural deterioration processes underlying different human organs are not seriously considered. The sense of vision serves as a good example of this. It has been calculated, based on both histological (counting the optic nerve axons) and functional (data from different perimetric techniques) studies,[1–8] that every human being loses on average approximately 5000 to 9000 optic nerve fibres per year (fig 1). Progressive retinal nerve fibre layer thinning has also been shown with modern imaging techniques.[9 10] Considering that a normal optic nerve is composed of one million to one and a half million optic fibres, upon reaching the hypothetical age of 200 a very limited number of retinal ganglion cells and nerve fibres would remain. This would probably lead to a condition of ''physiological'' blindness, unless truly effective neuroprotective agents were available at that time.

Philosophical and ethical considerations aside, the influence of ageing on vision, but more specifically on visual field (VF), is quite important for a variety of reasons: (1) accurate normative age corrected parameters are needed to establish whether or not VF test results from subjects differing in age are within normal limits, thus avoiding false interpretations; (2) several ocular diseases that progressively affect the VF, such as chronic glaucoma, typically occur at an advanced age and thus knowing the influence of physiological visual function decay becomes diagnostically imperative; (3) other age related factors (such as fatigue, subject reliability, quickness of reflex, senile miosis, progressive lens opacity, etc) play an important part in VF testing, and should be extensively known and always taken into consideration.

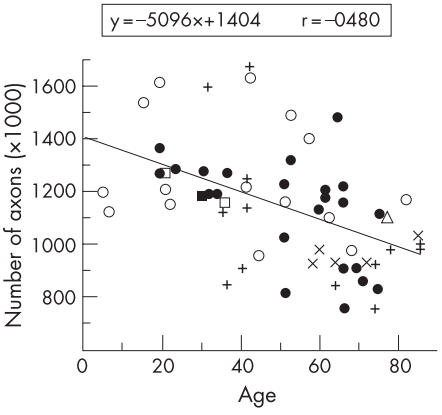

Figure 1 Number of axons in 60 normal optic nerves, plotted against age. These data were pooled from seven clinical studies: open circle, Balaszsi *et al*[1]; cross, Johnson *et al*[2]; closed circle, Jonas *et al*[3]; open triangle, Kupfer *et al*[4]; closed square, Oppel[5]; open square, Potts *et al*[6]; multiplication sign, Quigley *et al*[7]. (Adapted from Frisén[8].)

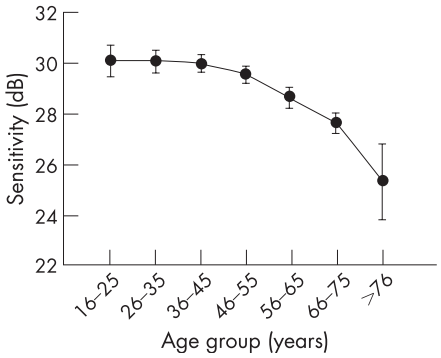

Figure 2 Distribution of mean sensitivity by decade. (Adapted from Spry and Johnson[12].)

To date, there are only a few published studies that assess the influence of ageing on VF data. Most of these papers are based on cross sectional studies and consider patients with progressive diseases like glaucoma. The limit of these studies is the difficulty in determining whether or not the worsening of VF parameters is due to advancing of age, ocular disease progression or a combination of both. More than 20 years ago, Haas *et al*[11] reported that the differential light sensitivity begins to decline in youth and continues to gradually decrease throughout life at a rate of 0.58 dB per decade.[11] Spry and Johnson analysed 562 eyes from clinically normal subjects who had previously been recruited for other studies.[12] The rate of mean sensitivity loss was 0.43 dB/decade before 53.4 years, and 1.02 dB/decade after that age (fig 2). Interestingly enough, this study showed that the linear age coefficients used in several VF devices tend to overestimate sensibility changes due to age in younger subjects, whereas they underestimate them in older subjects, thus missing early defects in the first group and overcalling them in the latter.

An additional point that needs to be clarified is whether or not all perimetric techniques are affected to the same extent by age. Six different methods of VF testing were considered to address this issue in a recent study.[13] In considering the three most currently used methods, short wavelength automated perimetry (SWAP) showed the largest age effects, followed by frequency doubling technology (FDT), and lastly by standard automated perimetry (SAP). This information should be kept in mind when interpreting VF data from different testing techniques.

In this issue of the *BJO*, Rudolph and Frisén[14] report an interesting longitudinal study based on a group of neuro-ophthalmic patients with non-progressive VF defects caused by chiasmal syndromes (***see pages 1276–8***). This paper is based on a different cohort of subjects, in comparison with studies involving typical glaucoma patients with defects that tend to progress over time. Patients were tested using high-pass resolution perimetry (HRP), a non-conventional VF testing method that is thought to selectively analyse the parvocellular visual pathway by means of special ring-shaped targets of increasing size till perception.[15] It has been previously demonstrated that HRP minimum angle of resolution and retino-cortical neural channels (corresponding to retinal ganglion cells and respective axon projections to the brain) are closely related, thus providing very important information on structural damage based on functional data.[16 17]

The authors report findings based on 28 patients who did not show significant deterioration in both normal and abnormal field areas over a median follow-up period of 9 years. As the authors stated, these unexpected results were difficult to explain. Although the follow-up period was quite long, it may be insufficient to adequately show the relation between age and HRP sensitivity. A persistent learning effect may partially explain the apparent lack of threshold deterioration over time in some patients. The authors show, however, that when a cross sectional representation of data is used, plotting HRT minutes of arc against age, a typical age related deterioration is evident. It is important to note that these results somewhat differ from SAP, which is currently the gold standard for VF testing. Studies with SAP in patients with glaucomatous damage have shown high variability in defective VF areas.[18] As previously stated, the characteristics of glaucomatous defects significantly differ from neurological VF defects. Moreover, SAP seems to underestimate age related ganglion cell loss when compared to HRP.[8] Further studies are definitely needed to show whether these discrepancies are due to different types of defects and/or to the different techniques used. Longitudinal studies based on extensive follow-up results of normal subjects and patients with different ocular and neuro-ophthalmic diseases would be of pertinent clinical interest. These types of studies, however, entail considerable practical difficulties. The article by Rudolph and Frisén paves the way as an exciting incentive for researchers to move forward in this intriguing and underdeveloped topic.

In closing, one of the main goals of modern medicine entails stopping or slowing down the detrimental effects of ageing on human functions. While the hunt for the fountain of eternal youth continues, science should not only be directed at halting deterioration, but also at helping humans to cope and accept inevitable age related changes, allowing them to age gracefully over time.

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