

## Retinopathy

### Is the severity of DR predictive of cognitive impairment?



Deborah Broadbent,  
Director of Diabetic  
Eye Screening,  
Royal Liverpool  
University Hospital,  
Liverpool

**T**2D has been shown to be an independent risk factor for the development of Alzheimer's disease, and this may be explained by a common metabolic pathway. This line of thought has been extended by the authors to consider whether there might be similar microvascular changes

occurring in the retina and brain, and whether the level of diabetic retinopathy (DR) could therefore be used to predict the development of cognitive impairment.

A number of previous studies have already considered the possibility of an association between DR and cognitive impairment (the stage of cognitive dysfunction between normal ageing and dementia), with conflicting results. The interesting paper by Crosby-Nwaobi et al (summarised alongside) sought to investigate whether the degree of cognitive impairment became greater with increasing severity of DR. Perhaps surprisingly, they demonstrated that patients with no or minimal retinopathy showed more cognitive impairment than those with severe DR (proliferative DR [PDR]).

Analysis of the data showed that the two retinopathy groups were significantly different in terms of visual acuity, HbA<sub>1c</sub>, treatment regimes and complication rates, as would be expected. They also found a significant difference between the groups in terms of educational attainment, which was greater in the people who had only completed primary school education (23% of the no/minimal DR group compared to 11.8% in the proliferative DR group). On regression analysis, education level, ethnicity and

visual acuity were found to be significant factors. The cohort was unusual in that 50% of the participants were of black African or Caribbean origin, although black ethnicity was evenly distributed between the two groups. Participants from minority ethnic groups showed significantly lower mean cognition scores than the Caucasian participants. However, a sub-analysis of the Caucasian patients alone, also found lower cognition in the no/minimal DR group compared to the PDR group.

The authors concluded that the inverse relationship between retinopathy status and cognition scores suggested that there was no common pathological process between DR and cognition, but then went on to speculate as to whether the result could be explained by a protective effect of high glucose on the brain. They suggested that the brain (or at least the parts of the brain that govern cognition) may prefer high glucose levels, whereas it is well-recognised from large randomised controlled studies in both T1D and T2D, that the severity of DR is directly related to poor glycaemic control.

The authors considered a number of limitations to the study, including the danger of ascribing causal links, rather than associations, between variables, the effects of selection bias, and in particular the exclusion of individuals with mental illness, dementia and stroke. It is a shame the authors did not record and discuss whether participants had evidence of age-related macular (AMD) degeneration, given recent interest in the link between AMD and Alzheimer's disease.

This paper makes a very interesting and thought-provoking read and is recommended even though it would appear not to prove its own hypothesis.

### DIABETES CARE

### DR is inversely correlated with cognitive impairment

Readability	✓✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓

**1** Previous evidence suggests that diabetic retinopathy (DR) may be associated with the onset of cognitive impairment in people with diabetes. It has been hypothesised that microvascular disease such as that observed in DR could be implicated in the pathogenesis of cognitive impairment.

**2** The authors investigated whether the severity of DR correlated with the extent of cognitive impairment in a cohort of 380 participants with T2D who took part in a population-based eye-screening programme.

**3** In total, 252 people had no/mild DR and 128 individuals were diagnosed with proliferative diabetic retinopathy (PDR). Variance between participants was due to ethnicity (16%), educational level (7.3%) and retinopathy status (6.8%).

**4** Those with no/mild DR achieved lower cognitive impairment scores on the Addenbrooke's Cognitive Examination-Revised test (adjusted mean  $\pm$  standard error [SE] 77.0  $\pm$  1.9) compared to those with PDR (82.5  $\pm$  2.2;  $P < 0.001$ ).

**5** Mini-Mental State Examination (MMSE) scores revealed that 12% of people with no/mild DR had positive results for dementia compared to only 5% of people with PDR.

**6** The authors concluded that an inverse relationship exists between cognitive impairment and DR severity (adjusted  $R^2 = 0.415$ ;  $P < 0.001$ ). This suggests that microvascular disease might not be involved in the pathogenesis of cognitive impairment in people with diabetes.

Crosby-Nwaobi RR, Sivaprasad S, Amiel S et al (2013) The relationship between diabetic retinopathy and cognitive impairment. *Diabetes Care* 30 Apr [Epub ahead of print]

### DIABETOLOGIA

### Bi-yearly versus annual screening

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

**1** A retrospective cohort study was performed to identify whether people taking part in the Scottish Diabetic Retinopathy Screening (DRS) programme could transition from annual to bi-yearly retinopathy screening.

**2** At 2 years, individuals who did not have retinopathy at two consecutive screens had the lowest probability for developing referable background or proliferative retinopathy. People with T1D had a probability of  $< 0.3\%$  and those with T2D had a probability of  $< 0.2\%$ .

**3** The authors concluded that if people with the lowest chance of developing background retinopathy were offered bi-yearly screening, 40% fewer people would have been screened in 2009.

Looker HC, Nyangoma SO, Cromie DT et al (2013) Predicted impact of extending the screening interval for diabetic retinopathy. *Diabetologia* 56: 1716–25

## BMC RES NOTES

### Diabetes and uveitis: Increased complication rate?

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

- The authors conducted a longitudinal, retrospective case review to investigate the visual outcomes of 36 people with diabetes (T1D=1, T2D=35) and uveitis.
- Participants were followed up for a mean period of 4.4 years. Cataracts were detected in 22 eyes, glaucoma in 17 eyes, and cystoid macular oedema in 10 eyes.

**3** Diabetic retinopathy (DR) was observed in 38 (65.5%) eyes. A total of 29 eyes displayed non-proliferative disease and 9 had proliferative disease. During the follow-up, DR progressed to the proliferative stage in 7 eyes.

**4** Active uveitis ( $n=10$ ) was associated with a mean HbA<sub>1c</sub> of 80 mmol/mol [9.5%], whereas people with quiescent uveitis had a lower mean HbA<sub>1c</sub> of 67 mmol/mol [8.3%] ( $P=0.01$ ).

**5** The authors concluded that individuals with diabetes and uveitis may have an increased complication rate and suboptimal glycaemic control.

Oswal KS, Sivaraj RR, Murray PI et al (2013) Clinical course and visual outcome in patients with diabetes mellitus and uveitis. *BMC Res Notes* 29 Apr [Epub ahead of print]

## OPHTHALMIC EPIDEMIOLOGY

### What factors prevent people from receiving DFEs?

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

- Dilated fundus examinations (DFEs) can reduce the risk of vision loss by detecting early diabetic retinopathy and prompting timely intervention. The aim of this study was to analyse which factors prevent people with diabetes

from receiving an annual DFE.

**2** The authors analysed data from 432 697 individuals who took part in the national 2009 Behavioral Risk Factor Surveillance System survey.

**3** Multivariable logistic regression revealed that eight significant variables were correlated with the likelihood of receiving a DFE. These included age, insulin therapy, diabetes education, income, education status, health insurance, mental health and previous history of foot examinations.

Paksin-Hall A, Dent ML, Dong F, Ablah E (2013) Factors contributing to diabetes patients not receiving annual dilated eye examinations. *Ophthalmic Epidemiol* 10 May [Epub ahead of print]

## DIABET MED

### Trends in diabetes-related blindness over a decade

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

- The authors sought to determine the incidence and prevalence of blindness attributable to diabetic retinopathy and maculopathy in a cohort of people with and without diabetes from Fife, Scotland, between 2000–2009.

**2** The mean incidence of diabetes-related blindness was 42.7 (standard deviation [SD] 24.2; 95% CI, 25–60) per 100 000 per year for 2000–2009 in the population with diabetes, compared to 64.3 for 1990–1999 ( $P=0.062$ ). In the population with diabetes, the prevalence of blindness on 31 December 2009 was 167 per 100 000 compared to 210 per 100 000 on 31 December 1999.

**3** The authors concluded that the prevalence of blindness due to diabetes had decreased in their study population between 2000–2009.

Hall HN, Chinn DJ, Sinclair A et al (2013) Epidemiology of blindness attributable to diabetes in Scotland. *Diabet Med* 10 May [Epub ahead of print]

## DIABETES METAB RES REV

### VPT as a potential screening method for detecting DR

Readability	✓✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓

**1** Vibration perception threshold (VPT) is an effective screening tool for diabetic peripheral neuropathy (DPN). Many studies have reported an association between DPN and diabetic retinopathy (DR).

**2** To investigate the screening value of VPT for detecting severe DR, a prospective cohort study was performed to analyse the relationship between VPT and DR.

**3** A total of 955 participants with T2D underwent fundus photography and were divided into three groups including no diabetic retinopathy (NDR;  $n=654$ , 68.48%), non-sight-threatening diabetic retinopathy (NSTDR;  $n=189$ , 19.79%) and sight-threatening diabetic retinopathy (STDR;  $n=112$ , 11.73%).

**4** VPT values increased as the severity of retinopathy became greater. Compared to participants in the NSTDR and NDR groups, VPT values were significantly higher in the STDR group (both  $P<0.01$ ).

**5** A positive association was detected between VPT, blood glucose levels, diabetes duration and the severity of DR (all  $P<0.01$ ). In those with VPT levels over 25 V, the prevalence of STDR was significantly increased compared to individuals with VPT values between 16–24 V ( $P<0.01$ ).

**6** The results indicated that VPT values over 18 V were threshold for elevated STDR risk (odds ratio [OR]=4.20; 95% CI, 2.67–6.59).

**7** The authors observed a significant relationship between VPT and the severity of DR, suggesting that VPT could be a potential screening method for DR.

Shen J, Hu Y, Liu F, Zeng H et al (2013) Vibration perception threshold for sight-threatening retinopathy screening in type 2 diabetic outpatients. *Diabetes Metab Res Rev* 8 May [Epub ahead of print]

“Active uveitis ( $n=10$ ) was associated with a mean HbA<sub>1c</sub> of 80 mmol/mol [9.5%], whereas people with quiescent uveitis had a lower mean HbA<sub>1c</sub> of 67 mmol/mol [8.3%] ( $P=0.01$ ).”