Why does it all matter?

Phil Gardner BARS Chair

It goes without saying that patients are at the heart of everything we do in diabetic eye screening. From clinics, grading sessions and MDTs to administration, failsafe and QA visits, every process we undertake, every phone call and letter, every hour spent booking appointments and chasing up DNAs, GP practices and HES departments; every SOP that gets rewritten, every report that's run and every IT issue we battle with and overcome – all of it is carried out with the same ultimate goal: to ensure that people with diabetes receive the safest, most effective and highest quality care we can provide.

Over the past decade I've met a lot of people who work in diabetic eye screening and I'm constantly amazed by the lengths they go to in order to achieve that goal. With very few exceptions, people working in DES do so not because they want to make money, but because they want to make a difference. They care about the patients and are determined to do their best for them.

The words of Emmeline and Sara on the opposite page are testament to that, and they're far from alone. BARS may be limited in resources, but our aim is to use what we have to support those of you working in diabetic eye screening, whether that be through conference bursaries, educational resources or events such as the upcoming Spring Failsafe Forum. Following last summer's BARS Council Elections, we now have four new members on council who, along with all BARS Councillors, have volunteered to give up their time free of charge to do this. Their motivation is similar to most people working in DES: to make a difference. And by doing what we can to support retinal screening staff, BARS can help to achieve that common goal of improving patient care.

One of the keys to providing such high quality care is, in my opinion, to appreciate things from the patient's perspective. One of the most popular speakers at recent BARS Conferences was Simon O'Neill from Diabetes UK, who spoke from personal experience about the challenges of living with diabetes. At last year's conference in Bristol, we heard from Léonie Watson who lost her sight to diabetic retinopathy in her mid-20s, and gave a moving and honest account of that experience.

I had first approached Léonie in 2015, following publication of her story on the BBC News website, and it took three years of perseverance for us to get her along to the BARS Conference! But it was worth the wait. Without so much as a PowerPoint slide, Leonie transfixed the entire room for more than half an hour, with 93% of delegates rating her talk as 'Excellent' and the remaining 7% opting for 'Good'. The value of that insight she gave us into her experience was clearly recognised by the audience, with a number of people commenting that it would make a genuine difference to the way they do their job.

Understanding why a particular patient has DNA'd, or why they've spoken or behaved the way they have, will always be difficult. But the more we hear their perspectives, the easier it may become. On Léonie's recommendation, I'm pleased to say that we've recently booked Robin Christopherson to speak at this year's conference in Liverpool. Robin is blind and received an MBE in last year's New Year's Honours List for his services to digital inclusion, working and speaking around the world to promote awareness of the need for technology to be inclusive for people with sight impairment and other disabilities. His talk will provide a different, yet equally valuable, perspective on the experience of those living with sight loss.

Registration for this year's conference is now open, with details available on the **BARS** website at **www.eyescreening.org.uk**. Previous presentations, including Simon O'Neill's talk from 2016 and links to Léonie Watson's own account of her story are available by following the links on the Conferences page.

2018 bars Conference feedback

I don't want this to sound like an Oscar acceptance speech, but I would like to thank everyone involved in regards to my attendance to this year's BARS conference. I would like to thank my managers at Doncaster Diabetic Eye Screening Programme for their continuous support and allowing me time out of clinic to attend. Also, I would like to thank the BARS council for awarding me one of the bursary places. I can honestly say that I have never actually won anything so I was very surprised when I received the email. Unfortunately, I was the only member from my programme to attend any of the BARS conferences and in doing so I am currently working on a presentation to share the information from the conference to my team. However, I am struggling because it is hard to put on paper/screen how much of a brilliant experience I have had.

I can honestly say that I wasn't bored at any point, and that the conference was jam packed full of interesting content and I was extremely enjoyed listening to the speakers that attended. The workshop I attended that demonstrated OCT, Wide field imaging and SLB was absolutely brilliant and very informative – hats off to everyone who can quickly and successfully perform SLB clinics, (I had a go – it was very difficult)!

Finally, I would also like to thank everybody I met at the conference, as mentioned above I attended alone and as I'm sure anyone reading this could imagine, I was quite nervous. I really shouldn't have been, everyone I met was extremely pleasant and friendly. I have met some truly inspirational people and have loved picking their brains about their screening processes. If you are looking at attending the next conference, or maybe even applying for the bursary place you really should and I would recommend it, you won't be disappointed. Thanks again everyone, I will hopefully see you in Liverpool!

Emmeline Webb
Diabetic Retinal Screener/Photographer
Doncaster & Bassetlaw NHS Teaching Hospitals

How to describe the BARS experience? I could reel off the menus & meeting plans, the glittering array of presenters & attendees and prattle off a whole load of facts & figures - and pretend to understand them. But I'd rather be honest and confess that for the first half of the conference, I was completely overwhelmed. Beyond the open-armed "We've saved a seat for you!" welcome from West Sussex's Alison Byatt (a godsend for a solo-first-timer), I was deflated to be reminded how much I don't know about eye screening.

I'm from a non-hospital background. In my interview for Office Manager at the Brighton & Sussex DESP, the beguiling Nick White made "steep learning curve" sound like a good thing; my innocent acceptance of the challenge haunts me to this day. Indeed, two years later, sat at the esteemed BARS conference in Bristol, I still felt utterly lost listening to the wise and experienced speaking passionately about the technical and the medical – detail of which is still beyond me.

Then there was Nick Barclay. A senior Screener Grader from Surrey who spoke directly to me (cue dramatic uplifting music & plot twist). He verbalised how hard eye screening can be, but how our strong desire to help patients results in some amazing experiences, big-saves and a great deal of pride in the work that we do. And it snowballed from there. Once I shook off the feeling of being an imposter and realised that not even all the screeners understood what some of the speakers were saying (!) I could then focus on - and delight in - the abundance of CARING people in this room and in this field. From the first-hand experience of Leonie Watson who didn't attend screening and lost her sight, to a man who's seen it all – retiring Professor Paul Dodson - we were reminded of the PEOPLE we are trying to help and the difference we make. Throw in some fresh pathway possibilities and technical advancements, and before you know it, I was in the middle of an inspiring experience! Furthermore, a couple of well-steered focus groups reminded me how important administration teams are to the puzzle. We're not the lackeys that run around for more important people; we are the first contact! We are the ones who can encourage the uninitiated & uncomfortable to attend an appointment.

The opportunity to trade tales of wisdom and woe is invaluable. I'm only partially ashamed to admit that I have started about a dozen projects inspired by my counterparts from around the country; hoping to have completed at least 3 before the next conference! To lay claim to a religious experience (despite Phil Gardner's beatific smile) might be a stretch, but it is with great thanks to my colleagues who got me that far and of course to the people at BARS who have filled me with ideas for innovation and improvement – which is what we all aspire to in this constantly evolving puzzle.

Sara Gordon
Office Manager, Brighton & Sussex DESP

Benign Retina and Choroid Tumours

Zine Elhousseini MD FRCOPhth and **Susanne Althauser** MD FRCOPhth Royal Free London NHS Foundation Trust

Introduction

Diabetic screeners are usually the first line professionals to pick up advanced diabetic retinopathy. Alongside these findings, screeners can pick up a multitude of other retinal conditions, some are serious and visually significant such as Retinal Vein Occlusion, Full Thickness Macular Holes and Age-Related Macular degenerations. While other lesions with little or no impact on the vision but none the less might require periodic monitoring such as peripheral retinal degeneration, old retinal scars or benign retinal and choroidal tumours.

In this article, we will be discussing the most common Benign Retinal and Choroid Tumours which are usually picked up on cursory examination or screening.

1. Congenital Hypertrophy of Retinal Pigment Epithelium (CHRPE)

A common pigmented benign tumour of the retina, occurring in 1.25% of screened cases[1]. It consists of single **Figure 1** or multiple lesions (Bear Track) **Figure 2** seen usually on incidental screening. It appears equally in different races.

CHRPE is a well-demarcated (sharp edges), pigmented and flat lesion. They are found both at the equator and peripheral retina.

They can measure between 1 to 6 mm in diameter, the hall mark is a border of hypopigmentation (Lacunar Areas).

Rarely, multiple and bilateral CHRPE lesions could be associated with familial Colonic Polyposis (Gardner's Syndrome)[2]. These lesions are small and lack the Lacunar areas seen in solitary CHRPE.

The top DIFFERENTIAL DIAGNOSIS is Malignant Choroidal Melanoma and Choroidal Naevus.

CHRPE lesions are not progressive and do not require periodic examination.

Figure -1-
Single large CHRPE (Congenital Hypertrophy of Retinal Pigment Epithelium.

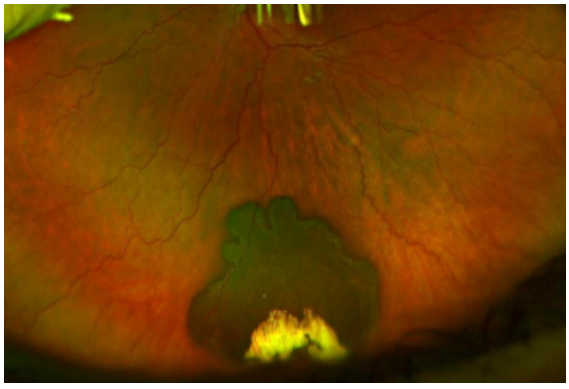
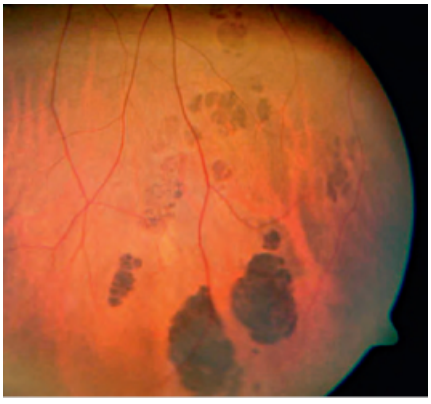


Figure -2- Multiple CHRPE lesions (Bear Track) in Familial Adenomatous Polyposis.



2. Choroidal Naevus

Common benign choroidal tumour with a prevalence 1-6% in the general population, mostly in white individuals[3]. Although a choroidal naevus is most commonly pigmented, it should not be ruled out in non-pigmented lesions as it might show variable degrees of pigmentation.

A choroidal naevus (like most benign tumours) is mostly asymptomatic and usually picked up incidentally on fundoscopy or photography while screening for other conditions (i.e. diabetes, optician visit, etc.).

In cases where there are any ocular symptoms present, a high suspicion of a malignant choroidal melanoma should be raised. Clinical fundoscopy shows ill-defined margins of grey or brown sub-retina lesions **Figure 3** (if non-pigmented called Amylanotic Naevus) **Figure 4**. Drusen could be present on the surface[4], this is an indication of chronicity and usually regarded as a benign sign **Figure 5.**

Malignant clinical signs include: reduced vision, sub retinal fluid, orange pigment on the naevus (lipofuscin), thick or elevated tumour and proximity to the optic nerve.

DIFFERENTIAL DIAGNOSIS: Choroidal Melanoma, Circumscribed Choroidal Haemangioma and Choroidal Metastasis.

The risk for a non-suspicious naevus to enlarge is less than 5% over 5 years[5]. The risk for malignancy conversion increases the more risk factors are present. Annual review with fundus photos is required and depending on the local protocol, a referral to a Hospital Eye Service for suspicious choroidal naevus needs to be made.

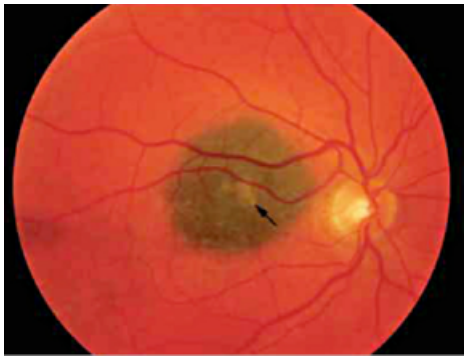


Figure -3- Choroidal Naevus.

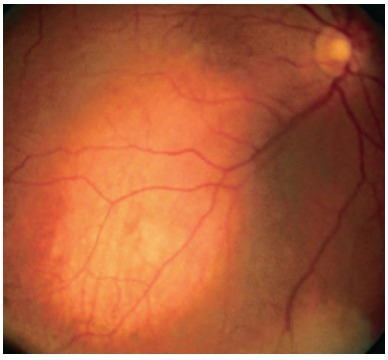


Figure -4- Amylanotic Choroidal Naevus.

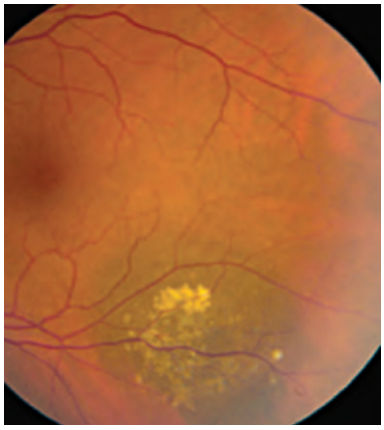


Figure -5-

Drusen on surface of Choroidal Naevus.

3. Melanocytoma

Typically, “unmissable” very dark lesion on the optic nerve head. These tumours are benign but have a potential to progress to a melanoma. Growth of the lesion is suspicious and could mean the lesion is undergoing a malignant transformation. The lesions are seen equally in black and white individuals. Most of the cases are unilateral[6].

Melanocytoma is asymptomatic, fundoscopy shows a charcoal coloured tumour on the optic nerve or adjacent to it **Figure 6.** Complications are unlikely but if they occur these include: optic nerve swelling, vascular occlusion and neovascular glaucoma[6].

DIFFERENTIAL DIAGNOSIS: Juxtapapillary Choroidal Melanoma, Choroidal Naevus and CHRPE. The prognosis is very good for patients with melanocytoma and only 1-2% can progress to malignant melanoma[6].

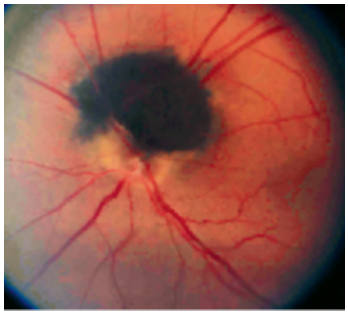


Figure -6- Melanocytoma on optic nerve.

4. Retinal Capillary Haemangioma

This is a benign vascular tumour often found in the peripheral retina as part of the Von-Hippel Lindau disease (VHL), or it can occur around the optic disc, juxtapapillary, as part of an isolated lesion[7]. Small tumours do not cause any visual symptoms but if the tumour is enlarging, it can present with intraretinal and subretinal exudation, with formation of circinate retinopathy and exudative retinal detachment. Further proliferation of this vascular tumour, can cause a vitreous heamorrhage and may lead to retinal detachment, often indistinguishable from proliferative diabetic retinopathy or sickle cell retinopathy, leading to severe vision impairments.

On fundoscopy the lesion is usually yellow-red & round (well-circumscribed) in the peripheral retina. (**Figure 7**) We can usually see a dilated feeder arteriole or drainage venule, although these are absent if the haemangioma is next to the optic nerve. With time, patients can get exudation and sub retinal fluid.

The retinal capillary haemangioma is mainly associated with Von Hippel-Lindau (VHL) disease[7], a rare autosomal dominant disease associated with benign and malignant tumours in the central nervous system, kidneys, liver and adrenal glands.

The differentials include: Cavernous Haemangioma, Racemose Haemangioma and Familial Exudative Vitreoretinopathy.

Prognosis is variable but if associated with VHL, life survival is usually less than 50 years of age[8]. Sporadic lesions usually have a good visual prognosis, unless the lesion is sub macular which could lead to permanent vision impairment.

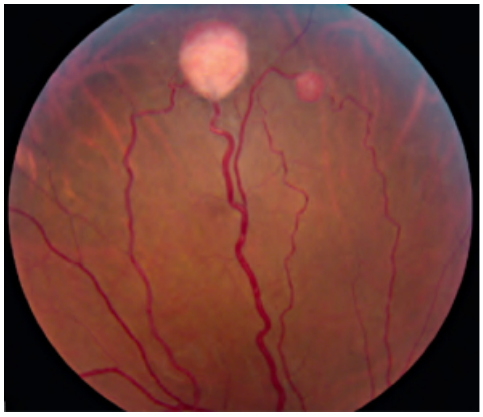


Figure -7-

Capillary Haemangioma with dilated feeder vessel.

Acquired (Secondary) Vasoprolifrative Tumour:[9]

This is an overgrowth of retinal vessels. Originally, it was confused with Primary Retinal Capillary Haemangioma but to differentiate from the latter it was named acquired or non-familial.

Nowadays, we know that clinical presentation is very similar to capillary haemangioma but they are usually acquired and are secondary to an ocular condition with no systemic associations.

Fundoscopy shows a vascular tumour with large feeder vessels and diffuse exudations. (**Figure 8**) Usually these tumours are associated with other ocular conditions, most common are Retinitis Pigmentosa, Pars Planitis (intermediate Uveitis) and Coat's Disease. It can be secondary to any previous trauma or inflammation of the eye. Prognosis is variable and most cases progress to affect the vision and need treatment. Treatment, like haemangioma, includes Laser Photocoagulation, Cryotherapy or Radiotherapy.

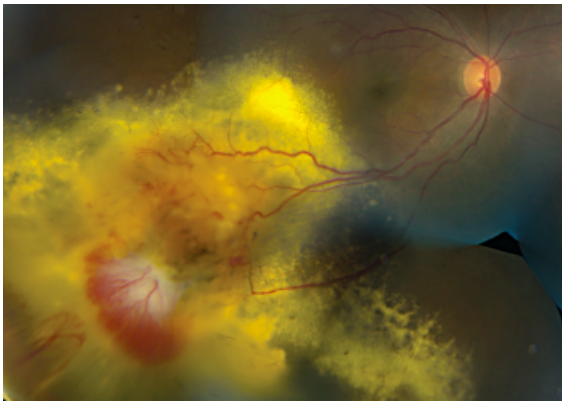


Figure -8-

Acquired Vasoprolifrative Tumour with severe exudation and feeder vessels.

5. Retinal Cavernous Haemangioma

It consists of multiple venous aneurysms filled with dark blood[10]. It might be sporadic or autosomal dominant[11]. They are asymptomatic usually although rarely they may affect vision if sub macular or there is vitreous haemorrhage.

Clinically they appear as dark-red 'clusters of grapes' in the inter retinal space. (**Figure 9**) This tumour does not have an apparent feeder vessel like the capillary haemangioma and shows no exudation and neovascularization. Vitreous haemorrhage can occur in 10%[11] of cases.

DIFFERENTIAL DIAGNOSIS: Acquired Vasoproliverative Tumour, Racemose Haemangioma and Capillary Haemangioma. Prognosis is very good as they unlikely to enlarge[12] and can be safely monitored periodically. Patients with recurrent vitreous haemorrhage can be treated with cryotherapy, laser or plaque radiotherapy to the tumour.

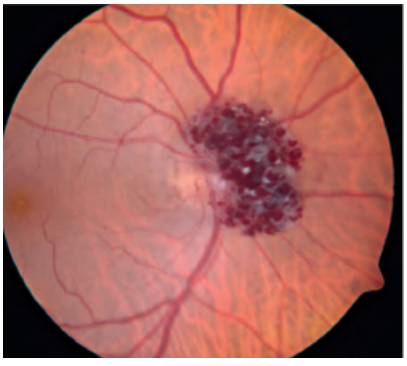


Figure -9- Cavernous Haemangioma on the optic nerve.

6. Retinal Astrocytoma (Astrocytic Hamartoma)

Hamartomas are a congenital lesion with abnormal tissue masses which are normally found in the tissue or organ in which they develop, they are benign lesions[13]. Retinal Astrocytoma consists of glial cells -mainly Astrocytes- overgrowth in the sub-retinal space or the retinal nerve fibres layer[14].

Retinal Astrocytoma is in 53%[15] of cases associated with Tuberous Sclerosis or Bourneville's disease (a rare autosomal dominant genetic disorder). Occasionally, it can be associated with Neurofibromatosis[16].

Clinically, the tumour is asymptomatic and appears as two types mainly:

a) Small, non-calcified, appears like a thickening of the nerve fibre layer[17] (**Figure10**).

b) Larger, calcified white-yellow mass (Mulberry lesion)[18] (**Figure 11**).

Ocular complications are common and[19] include vitreous haemorrhage, sub retinal haemorrhage and retinal detachment.

DIFFERENTIAL DIAGNOSIS: Retinoblastoma, Myelinated Nerve Fibres, Retinal Granuloma and Optic Nerve Drusen.

B-scan Ultrasonography: A larger, calcified lesion, with a sharp anterior border.

Most of the Astrocytomas remain asymptomatic[20] and can been safely monitored, but due to the risk of ocular complications such as retinal detachment, frequent follow up is required. Family members should be examined regularly.

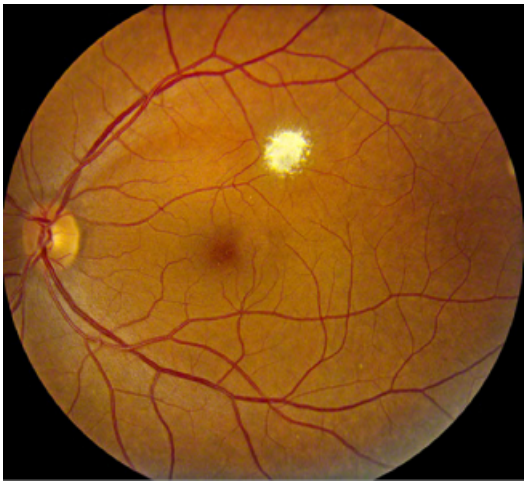
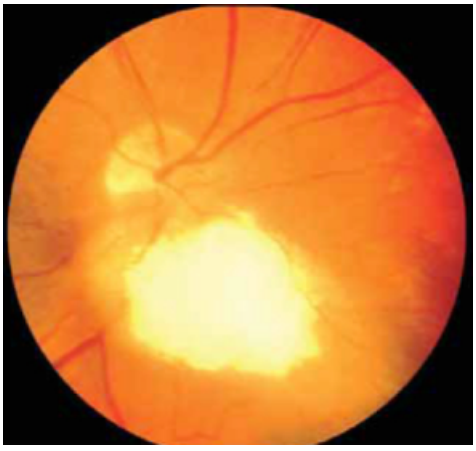


Figure -10- Small Astrocytoma.

Figure -11- Large Astrocytoma in Tuberous Sclerosis patient.



7. Choroidal Osteoma

Osteoma is the presence of boney tissue in other organs outside the skeletal system. Choroidal osteoma is a rare, benign tumour where mature bone structure is present in the choroid[21].

Most commonly, osteoma is seen in young women (younger than 30 year old)[21], and 75% of cases are unilateral[22]. On fundoscopy, it appears as pale yellow or orange lesion around the optic nerve or adjacent to it. (**Figure 12**) Osteoma can be overlaid by clumps of brown or orange pigment. (**Figure 13**)

DIFFERENTIAL DIAGNOSIS of this lesion includes: Amelanotic Choroidal Melanoma, Carcinoma Metastasis to the choroid, Circumscribed Choroidal Haemangioma, Disciform Scar of age-related macular degeneration and Idiopathic Sclerochoroidal Calcification.

B-scan is usefull for showing a hyper reflective lesion. CT scan can be helpful in cases without a clear clinical picture and reveals hyperintensity similar to bone in the choroid.

Prognosis is variable. Most of the cases are asymptomatic and do not affect the vision. Over time some cases (26% over 5 years)[23] could develop neovascularization which could lead to vision loss. Management of this tumour is usually by observation and treating neovascularization as needed.

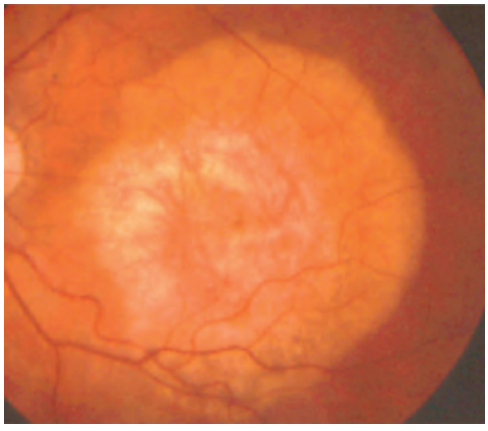


Figure -12- Sub macular Choroidal Osteoma.

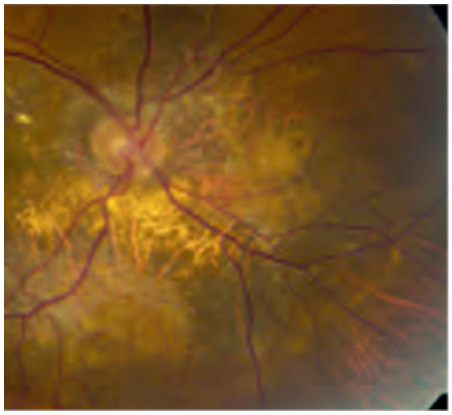


Figure -13- Long standing Osteoma with pigmentary changes and clumping.

Other Lesions

8. Choroidal Haemangioma:

This is another choroidal benign vascular tumour, but more often symptomatic because of common association with serous retinal detachment[24].

Clinically, two main forms are distinguished: **a)** circumscribed (discrete) and **b)** diffuse.

Circumscribed lesions are yellow-orange coloured, well defined, dome-shaped masses, usually in the posterior pole (**Figure 14**). Most commonly present in middle aged patients.

Diffuse choroidal haemangioma is most commonly associated with Sturge – Weber syndrome [24](Encephalo trigeminal angiomatosis) and is diagnosed at a much younger age.

Fundoscopy shows a bright red lesion involving a lot of the fundus (more than 50%). Usually the same side shows the typical Port-Wine Stain on the face of the patient.

DIFFERENTIAL DIAGNOSIS of this tumour includes: Central Serous Chorio-Retinopathy, Amylanotic Choroidal Melanoma, Choroidal Metastasis and Choroidal Inflammation. Management is usually observation in asymptomatic and uncomplicated cases. Patients with a tumour involving the macula or with serous retinal detachment are treated with Radiotherapy, Laser photocoagulation or Scleral Buckling.

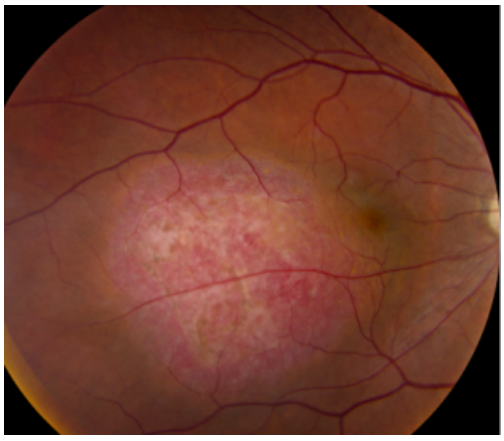


Figure -14- Circumscribed Choroidal Haemangioma.

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Addressing the psychological needs of people with diabetes

In Diabetes UK's Future of Diabetes report, many people asked for more psychological support and understanding from their diabetes team. **Dr Susan Aldridge**, Editor of Diabetes Update, the charity's magazine for healthcare professionals, has been talking to an NHS England manager and a clinical psychologist about some ground breaking work going on in the area of diabetes and mental health – all of could be highly relevant to the work of retinal screeners.

NHS England's Improving Access to Psychological Therapies (IAPT) is now well established and has a new focus on developing pathways designed to meet the needs of people with long-term health conditions (IAPT-LTC), including diabetes. Those CCGs who have been early implementers of these pathways are already showing good results. Ursula James, IAPT Senior Clinical Delivery Manager at NHS England, shared some of the successes being seen around the country.

1)

The early implementer site covering Blackburn with Darwen and East Lancashire CCGs developed a diabetes pathway that was integrated within the specialist diabetes community clinics working with diabetes specialist nurses. The service delivers psycho-education with DESMOND courses. The evaluation demonstrated that recovery rates achieved for the long-term condition patients has improved from 46.0% in 2016 to 53.5% in 2017 (ie, since delivery of IAPT for long-term conditions commenced). Their data also shows an overall saving of £5,877 on A&E attendances and an overall saving of £75,585 on emergency admissions and emergency beds, giving a combined saving of £81,462 for the initial sample of service users (£147 per service user). The three key indicators - emergency attendances, hospital admissions and ambulance callouts have all reduced by over 60%, with hospital admissions reduced from 29 to zero (100% reduction).

2)

In Warrington, the diabetes specific pathway was integrated via GP surgeries, acute care and with specialist nurses. The return on investment demonstrated through local evaluation indicated a saving of £2.14 for every £1 spent. This was based purely on secondary care utilisation, as the return on investment did not include primary care and prescribing data. Reductions of 60% in A&E attendance, 100% in ambulance attendance, 72% in non-elective admissions and 56% in outpatient appointments were also shown for those who had engaged with the new service compared with the period prior to its launch.

3)

In Sussex, the Time to Talk Health IAPT-LTC service is co-located within the diabetes team at Western Hospitals NHS Foundation Trust. The Nurse Consultant for Diabetes has reported that the development of IAPT-LTC in her area has been extremely positive for the outcomes of the patients and has contributed to shared learning for staff and the de-stigmatisation of diabetes distress. The service advises that there has been a significant change in the Diabetes Distress Scale (DDS) for this cohort of patients. At assessment 55% of people had high overall distress levels, but on discharge this had reduced to 11%. The local evaluation shows that the largest average reduction in category scores can be seen under 'emotional burden', followed by 'regimen-related distress'.

4)

The IAPT-LTC service in Dorset is also integrated with the community diabetes team and in GP surgeries. The local diabetes community team said: "IAPT has had a lot of referrals and the feedback from the staff in the Diabetes Centre is that we think it is great having someone based in the department. The patients see the service as a part of the diabetes service, rather than a separate mental health team. The waiting times for assessment and follow-up are short so it is a very responsive service." Meanwhile, 49% of individuals reported an improvement in their diabetes distress levels after IAPT treatment.

5)

One of the most successful sites developing a diabetes pathway was the Hertfordshire Wellbeing Service. The service focused solely on diabetes and integration spans across primary care, specialist care and the West Herts Hospital Trust. The long-term conditions lead within the IAPT service 'paired up' IAPT therapists with diabetes specialist nurses to sit in on diabetes clinics, allowing cross training and learning. Healthcare professionals involved in the integrated pathway were trained to administer screening tools used by the IAPT service to identify cases, which enabled a shared language and trusted assessment.

- Around 40% of people with depression and anxiety disorders also have a long-term condition.

- Mental health comorbidities are found among 30% of people with a long-term condition and among 70% of those with medically unexplained symptoms.

'More on Psychological support for those with Diabetes: Search 'psychological support' at **www.diabetes.org.uk**'.

Dr Amy-Kate Hurrell is a specialist clinical psychologist working on a pilot project in General Practice in Tower Hamlets aimed at improving the outcomes of people who are struggling to control their Type 2 diabetes.

Here she offers some top tips for healthcare professionals on psychological support for people with diabetes.

- **Always ask about psychological and social issues – even if you do not know what to do with the information you receive, you can always find out. Medical advice alone will not be enough for some people and therefore understanding what might be getting in the way of optimum diabetes care should be part of care planning. There will mostly likely be an IAPT service, Citizen's Advice Bureau, charity or local organisation that will be able to support. More often than not, just to be listened to and understood can be enough for people using your service.**

- **Make diabetes goals meaningful. I would recommend asking on a scale of 1 to 10 how important the goal is to the person and how confident they are in their ability to achieve it. You want a 7 plus on both scales for a greater chance of success.**

- **Ask yourself how accessible your service is to street homeless people – if you can deliver accessible care to someone without a fixed address, access to a telephone or internet then you are likely to be accessible to most, if not all.**

- **Run surveys with your staff teams and people attending your service – ask people anonymously and confidentially about what their training needs are and what they think is missing from psychological care in your service. You can then source training to meet those needs as well as adapting your service accordingly.**

- **Partnership working between community organisations and the NHS – more often than not, there will be organisations already engaged with and have a trusting relationship with people that NHS and other statutory organisations might struggle to reach. Partnerships offering expertise from both organisations is likely to provide the best care for people with diabetes.**

For more information and ideas on how to get involved visit:
www.diabetes.org.uk

Look out for our Summer issue of **Diabetes Update**, which will run a cover feature on psychological support.

For a world where diabetes can do no harm

Optical Coherence Tomography within Digital Surveillance Clinics for assessment of screen positive maculopathy (Summary of article)

Samantha Mann. (Consultant Ophthalmologist and Clinical Lead of SEL-DESP) MRCOphth MD BSc

With the current rising demand to see and treat patients with clinically significant diabetic maculopathy with anti-VEGF or steroid injection treatments [(1)], the pressure on NHS hospital eye services (HES) is at an all-time high. Traditionally all R1M1 patients (those with mild non-proliferative DR) from diabetic eye screening have had to be referred to HES despite the majority not having clinically significant macula oedema requiring treatment. This has resulted in units being overwhelmed by referrals and not being able to offer appointments within expected time-scales. This has ultimately led to many programmes struggling to meet the National Diabetic Eye Screening Standards for Routine patients; >70% M1 patients must have attended an appointment within 13 weeks of their screening episode (DES-PS 12) [(2)].

One possible solution, adopted by some Diabetic Eye Screening Programmes, is the introduction of optical coherence tomography (OCT) clinics within digital surveillance clinics. Digital Surveillance was introduced in the standard National DESP pathway in January 2015 for those patients requiring more frequent review than annual screening and are typically used for pregnant patients and those with stable treated R3 (R3-Stable). Since then, the National pathway has specified that surveillance clinics can interface with OCT assessment where this has been agreed with local commissioners of HES.

Spectral domain OCT technology is an imaging technique, which produces three-dimensional cross-sectional images using the reflection of optical waves through the retina. This allows the more accurate identification of patients with clinically significant macular oedema, reducing the number of false positive referrals to HES increasing the specificity of the current Screening Programme [(3)]. These OCT clinics have therefore assisted in reducing onward referrals to HES and enabled up-skilling of DESP staff to be able to assess optical coherence tomography (OCT) scans and only refer on those with clinically significant maculopathy. A recent article by Peter Scanlon's group from Gloucestershire have been able to show the significant cost-effectiveness of such a model [(4)].

The authors used data from the Gloucestershire DESP, digital surveillance programme and HES between 2012 and 2015. A model was used to simulate the progression of individuals with newly diagnosed R1M1 over 12 months. A total of 696 patients were found to be screen positive for maculopathy and 766 eyes were diagnosed with R1M1 between Jan 2012 and Dec 2014 (10% had R1M1 in both eyes). Two pathways for these surveillance patients were subsequently compared for cost effectiveness.

One surveillance pathway was technician led and consisted of two field mydriatic digital photography (macular and disc) followed by a macular SD-OCT using a Topcon 2000. For the HES surveillance pathway, this consisted of a slit lamp bio-microscopy examination by an ophthalmologist and a macular SD-OCT using one of 3 machines within HES (Heidelberg spectralis, Zeiss Cirrhus or the Topcon 2000). Patients attending HES that did not require treatment were followed up in a similar fashion to the technician led pathway. There was a 5% DNA rate of patients failing to attend their appointment within 12 months after screening.

The standard grading criteria were used for all images and fundi and a novel grading protocol used for the assessment of OCT's. These were either classified as OCT negative, OCT borderline and OCT positive. Definitions are currently being developed for these by the National/ London DESP team and EMIS/ digital healthcare are currently developing a feature-based OCT grading form to standardise OCT grading further.

Following grading, patients could either be discharged back to screening, referred to HES for possible treatment or remain in surveillance at 4,6, 9 or 12 months. The results of the study showed that of the patients screened with R1M1, 99% were initially assessed at a digital surveillance clinic with SD-OCT and only 1% were assessed at HES. Following OCT assessment, in those where data were available (98%), 19% were returned to annual screening, 66% remained in surveillance and 15% were referred to HES. Of those remaining in surveillance, <1% needed to be seen within 1-3 months, 42% were seen 6 monthly, 17% at 9 months and 39% seen annually. Patients with an OCT negative result in one eye were significantly more likely to have longer surveillance intervals. Of the patients seen in the OCT clinic for R1M1, the total percentage of patients ultimately receiving treatment with laser or Anti-VEGF in HES within the year was 3% (n=18: 7 anti-VEGF and 11 laser treatment).

Various statistical/ regression models were used to predict costings of the two pathways using data from various sources. The mean annual cost of assessing and surveillance of an eye identified as R1M1 at screening through the SD-OCT clinic pathway was estimated as £101 (95%CI:91-139) per patient and the cost of an eye with R1M1 through the HES pathway was calculated as £177 (95% CI: 164-219) per patient.

The study concluded that including SD-OCT within the digital surveillance pathway not only generated significantly fewer referrals (less than 20% required referral after the first surveillance visit) but was cost-effective and generated substantial cost savings. There was a £76 (95% CI: 70-81) saving per patient per year with the digital surveillance pathway compared to patients being seen in the HES clinic.

Despite a large number of patients analysed, the authors acknowledged the limitations of the study. It was assumed that the review outcomes would be the same in HES compared to the SD-OCT surveillance clinic. It is possible that the different OCT machines could have generated different results. Additionally, the analysis was only carried out over one year which may have limited the cost- benefit. Finally there was no control group to compare the SD-OCT surveillance clinic with. It was assumed that those being seen in HES that did not require treatment would be followed up in a similar fashion to the OCT surveillance clinic. Overall, the cost-effectiveness and efficiency of the SD-OCT surveillance clinic far outweighs the current HES pathway. The sooner this model can be adopted in diabetic eye-screening, the sooner we can reduce the burden on HES clinics and generate significant cost savings.

SD-OCT pathway

Although the final referral and grading pathway for the SD-OCT surveillance clinic has yet to be finalised, it is likely to be based on the Gloucestershire and London pathways. All patients with R1M1 or R3(S) M1 at screening are likely to be referred to the SD-OCT surveillance pathway to be seen within 3 months in a technician led clinic.

The OCT images are then graded as OCT negative, borderline or positive depending on the distortion of the foveal internal limiting membrane or the presence of cystic changes within the retinal layers (see **figures 1 a&b**). EMIS are currently producing a feature specific grading form for use with OCT grading.

Figure 1a: Proposed OCT grade definitions (from the London OCT surveillance protocol).

OCT Grade	OCT negative	OCT borderline	OCT positive
Description	No intra-retinal cysts or subretinal fluid or solitary intraretinal microaneurysm or exudate AND NO change in ILM contour	Presence of intra-retinal cysts or microaneurysms or exudates (due to diabetes) AND NO change in ILM contour	• Parafoveal thickening of greater than 0.5 disc area • Area of thickening >1.0 disc area within the macula region • Presence of intra-retinal cysts or intra-retinal microaneurysms or exudate (due to diabetes) AND with a change in foveal ILM contour

OCT positive - 3 definitions

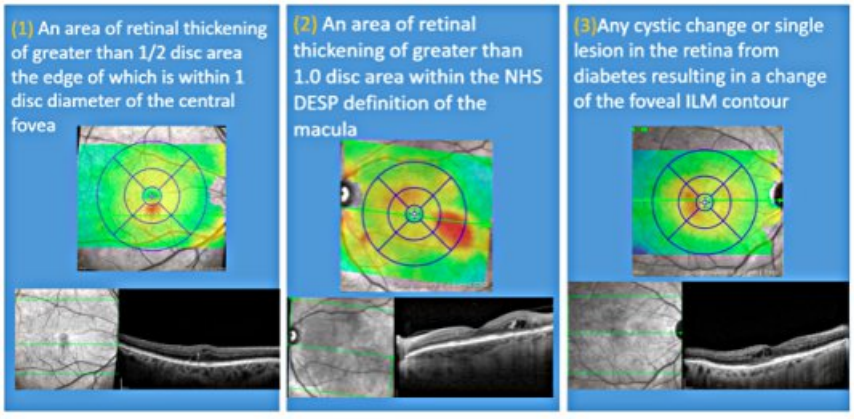

Figure 1b:
Proposed OCT positive definitions.

OCT Result	Retinal Photographic grade	Outcome
No macular disease on OCT **OCT Negative**	R1M0 or R0M0	Return to annual screening
No macular disease on OCT **OCT Negative**	R1M1	Review in OCT surveillance 6-12 months
Minimal/ Borderline macular disease (no change in ILM) **OCT Borderline**	R1M0 or R1M1	Review in OCT surveillance 6-12 months
Significant macular disease with cystic change, thickening or change in ILM (see definitions) **OCT Positive**	R1M1	Refer to Hospital Eye Service (or OCT surveillance depending on local protocol)
Poor quality images	U	Refer to Hospital Eye Service
Progressive retinopathy	R2 or R3	Refer to Hospital Eye Service
Other significant non DR pathology (17-20)	Traction, etc....	Refer to Hospital Eye Service (NON DR)

The final referral outcomes will be specified locally (see **figure 2**), but it is likely that the majority of the bilateral OCT negative scans will return to annual screening, the OCT borderline cases will remain in the SD-OCT surveillance clinic and the majority of the OCT positive scans will be referred to HES. Certain non-DR related pathologies are also likely to be detected such as epi-retinal membrane and vitreo-macular traction, which may also require referral to HES according to local protocol.

Figure 2: Proposed OCT Grading and Outcomes (taken from proposed London OCT surveillance protocol).

The outcome intervals within the SD-OCT clinic will be variable between 3, 6, 9 and 12 months to allow flexibility within the service. It is hoped that once commissioners for each DESP give the go ahead, SD-OCT surveillance clinics will be able to start seeing R1M1 patients reducing the burden on HES clinics and improve the cost effectiveness of the service. In the meantime, it is essential that individual DESPs start training up their graders and staff to recognise OCT features of diabetic maculopathy and other pathologies, as it is envisaged that large numbers of R1M1 patients are likely to pass through this pathway per year.

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The London DESPs OCT Training Programme and Re-aligning Screening

Farhan Zaidi

(Consultant Ophthalmologist and Clinical Lead SW London DESP, London DESPs OCT Training Organiser)

Optical coherence tomography (OCT) scanning is an imaging tool routinely used for many years in clinical ophthalmology departments by hospital eye services (HES) and increasingly by High Street opticians. NHS England (London) devised a pan-Thames CQUIN for the 5 London diabetic eye screening programmes to implement OCT scanning in the London DESPs. OCT scanning and interpretation is a stimulating addition to developing the skills of screener / graders and the benefits to patients are huge. Using OCT large numbers of patients with diabetic retinopathy can be safely monitored in the community by DESPs without the need to refer so many to hospital. Patients prefer care nearer to home outside hospitals and attendance rates are much higher. Not only does OCT significantly reduce over-diagnosis of maculopathy (in some hospitals up to 70% of M1 referrals made without OCT have been false positives), it also facilitates community monitoring of maculopathy. The immense pressures on HES can be reduced by safely keeping a higher proportion of diabetic retinopathy patients in the community. Ultimately DESPs may be able to provide a near-seamless pathway in the community for most patients, potentially linking to treating certain groups.

This demands training of screeners and graders in OCT scanning and image interpretation. For the London programmes a 2-stage certified training programme was developed: an online e-learning course followed by an OCT Training Day. Professor Peter Scanlon (Oxford and Gloucestershire), Clinical Director for the English NHS Diabetic Eye Screening Programme and Clare Waite (Gloucestershire) helped devise an e-learning course with modules and examinations. DESP Clinical Leads received the results of the performance of their staff. This was followed by attendance on the pan-London OCT Training Day held on 5 October 2018 in central London sponsored by EMIS Care and Topcon. Over 100 delegates attended for a packed day.

Prof Scanlon gave an overview of diabetic retinopathy screening and its future direction including the utility of OCT. Laura Pigula (Topcon) and her Team provided live demonstrations on how to take the scans, followed by hands-on workshops on different OCT machines used by delegates throughout the Day. Sam Mann and Nigel Davies from Guys' and St Thomas' Hospitals provided brilliantly illustrated talks on OCT in diabetic retinopathy and non-diabetic retinopathies. Nick Nightingale and Sarah Egan from EMIS provided an update on software changes being made to Optomize to incorporate OCT pathways. The Day concluded with an interactive Quiz and Q & A session from a London DESP Clinical Leads Panel, including its clinical guidelines which had been developed in anticipation of pan-London OCT scanning. At present, unlike diabetic eye screening, the funding stream for OCT scanning comes not direct from NHS England but from local Clinical Commissioning Groups (CCGs). London has 32 CCGs and OCT scanning is shaping up to being implemented by different CCGs based on local priorities. The clinical guidelines remain relevant containing excellent illustrations for teaching and training, while the pathways can be adapted for local use by different DESPs tailored to their needs under the supervision of the local Clinical Lead. Many of the talks from this highly successful and well-attended Training Day have been uploaded onto the BARS website as an educational resource.

Farhan Zaidi

Consultant Ophthalmologist and Clinical Lead,

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London DESPs OCT Training Organiser

Stereo anterior segment photography

Liz Sandler
Ophthalmic Scientific Practitioner
Ninewells Hospital, Dundee

Slit lamp photographs of the eye's anterior segment are taken to document pathology for teaching, publication, or clinical follow up. An ophthalmologist conducting a slit lamp examination will use both eyes so they see their subject in stereo. However, a slit lamp photograph captures the view through one eye-piece only, rendering the image flat. To compensate for this discrepancy we can take stereoscopic photos by shifting the joystick to take two photos from slightly different angles, mimicking our binocular vision and creating the illusion of depth. When viewed as a 'stereo pair' the result is a 3D image.

Should we be taking anterior segment photographs in stereo in order to mimic what the clinician sees?

In a clinical setting, stereo slit lamp photographs might better record pathology detail, like the shape and size of a corneal ulcer. This could be useful for tracking the course of a disease or monitoring the success of a patient's treatment. Unfortunately, even a little patient movement can make this photography technique quite a challenge! According to the clinicians we spoke to in the eye clinic, stereo anterior segment photographs wouldn't affect treatment plans or clinical outcomes, and one consultant added that the use of measuring tape stickers is more useful when photographing eyelid lesions. A couple of our doctors include stereo photos in their lectures, in the form of anaglyph images (**Figure 1**), to make teaching sessions more engaging.

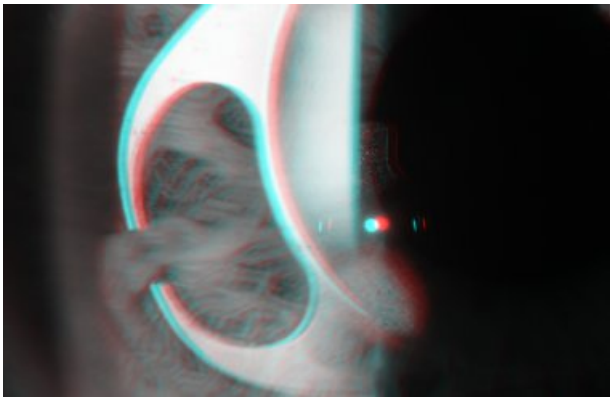


Figure 1:
Black and white anaglyph of an anterior chamber IOL (try viewing this image with anaglyph glasses).

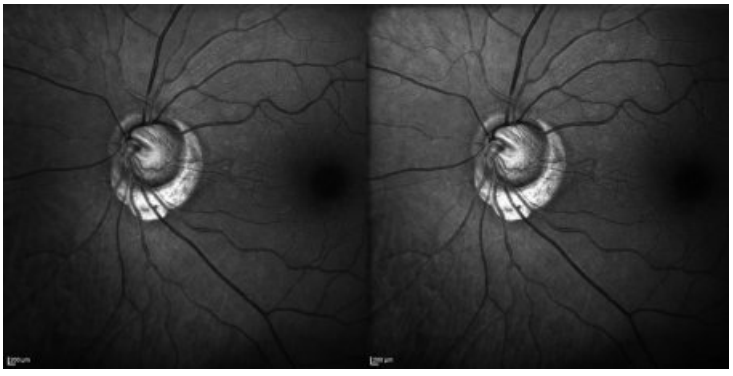


Figure 2:
Optic nerve head photographed in stereo.

Stereoscopic images captured during retinal angiography (FFA and ICG) enable us to visualize elevated structures and possibly to determine whether a bleed originates in the choroid or the retina. This is unlikely to have any impact on clinical decisions, but at a push may contribute to reaching a more refined diagnosis and therefore prognosis. Until recently, it was standard practice to take stereo colour photographs of the optic disc for glaucoma suspects, in addition to an optical coherence tomography (OCT) scan of the retinal nerve fibre layer (RNFL).

It is widely agreed that stereo disc photos are more useful for assessing the neuroretinal rim and the depth of the cup rather than two- dimensional photography (**Figure 2**). Stereo imaging in this case is useful for clinical follow up, keeping track of progression of disease and efficacy of treatment, but OCT has now become the imaging modality of choice for these patients.

Another medical application of stereo imaging is stereo x-rays, which have a lower radiation dose compared to the computer generated 3D model composited from the many stacked x-rays of a CT scan. We can also scan the body using techniques such as magnetic resonance imaging, ultrasonography, and optical coherence tomography to produce three-dimensional models. Systems like 3dMD are used in clinical photography departments around the world to capture virtual 3D models of, for example, a patient's face or torso.

There are many techniques for viewing stereo photographs in 3D, below are the three most accessible in our eye clinic.

The two photographs comprising a stereo pair can be viewed with a mirrored stereoscope Stereo Vu Stereoscope or without a viewing device 'free-viewing' by some **(Figure 3)**. Creating a stereo pair involves no post-processing so is quick to produce. However, some people with strabismus or poor binocular vision like me, struggle to see the 3D image with this method. Another restriction is that stereo viewers tend to be bulky and expensive.

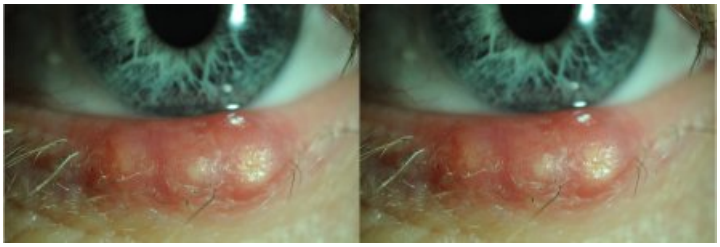
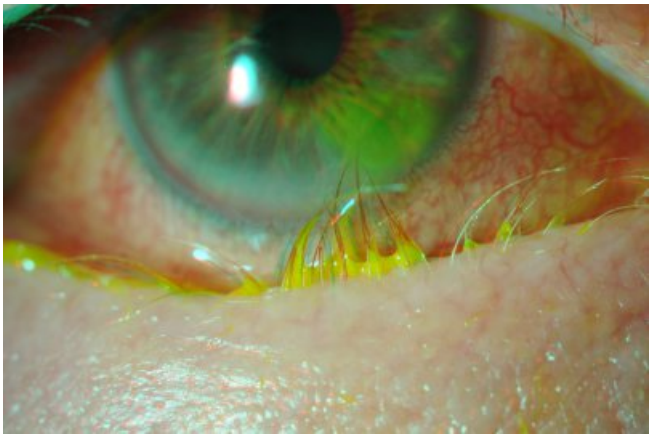


Figure 3:

Photographs of chalazion taken in stereo.



Anaglyphs are stereo pairs that are manipulated using software such as Anaglyph Maker (free to download: https://www.stereoeye.jp/software/index_e.html). The result is one fused picture containing two contrastingly filtered coloured images **(Figure 4)**, typically red and cyan, one for each eye. This picture can be viewed with anaglyph glasses which are small and low cost. It is possible for several people to view a 3D anaglyph simultaneously, making it suitable for use in teaching environments.

Figure 4:

Colour anaglyph of an entropion (try viewing this image with anaglyph glasses).

Wiggle stereoscopy is a GIF animation made from stereo pairs. The two photographs from the pair are shown alternately, whilst more than two photos can be used to make the transition smoother. People with stereo-blindness are able to view a wiggle GIF, and no special glasses are needed. One restriction of this animated format is that it is only suitable for viewing digitally (so can't be seen on this page!), however, most images looked at by doctors in the clinic or by students in a lecture are viewed on computer screens or digital projectors. Because wiggle stereoscopy is animated, it is difficult to appreciate fine details in the pictures, possibly making this format more appropriate for gross pathology such as large shield ulcers or skin lesions.

Ultrasonography and OCT can supplement stereo anterior segment photography. At Ninewells eye clinic we use ultrasound to diagnose and monitor large lesions like choroidal melanomas, but we don't have high-frequency ultrasound biomicroscopy (UBM) available for detailed anterior segment imaging. Unlike UBM, anterior segment optical coherence tomography (AS-OCT) has the benefit of being non-contact and examination is reportedly more straightforward.

Stereo photos of the anterior segment provide information about depth and texture, but AS-OCT shows the cross section of structures, allowing us to measure things like corneal thickness and the iridocorneal angle (great when gonioscopy is not tolerated by the patient). Some details like the internal structure of a bleb are visible with AS-OCT but not using a slit lamp; although the reverse is also true. The posterior lens capsule for example is difficult to scan with OCT whilst possible to image with the slit lamp and UBM. Even with the availability of AS-OCT, slit lamp photography remains hugely valuable for the following reasons:

- Appreciation of colour, surface texture and light permeability of structures
- Enhances fine details of subtle lesions
- Already familiar to clinicians, whilst some experience is needed to interpret AS-OCT scans
- Most importantly, the photograph can be used as a reference for future slit lamp examinations to be compared to.

As clinicians in our eye clinic become increasingly appreciative of the information anterior segment OCT scans provide, it is being used more and more commonly alongside, but not instead of, non-stereo slit lamp photography. Akin to how retinal OCT has almost eradicated the need for stereo fundus photography, if there ever was a clinical need for stereo slit lamp photography, it has been superseded by AS-OCT. In answer to our original question, 'should we be taking anterior segment photographs in stereo in order to mimic what the clinician sees?', the answer is generally no – these photos are technically challenging to take well, occupy valuable clinic time to process, and are not considered useful by clinicians. However, it is a handy extra resource for teaching. For this reason it is good to have an appreciation of the strengths, limitations, and viewing modes of stereo slit lamp photography.

Screeners in Diabetic Eye Careers

Liz Sandler

Ophthalmic Scientific Practitioner

Ninewells Hospital, Dundee

Q: What did you do before ophthalmic imaging?

A: I studied illustration because I wanted to be a children's book illustrator and author. During my degree though I became more interested in medical illustration. After graduating, I secured a work placement in Moorfields Eye Hospital's ophthalmic photography department where I was warmly welcomed, taught and encouraged. I then worked as a medical photographer for a short while which was interesting (my first task was to photograph a gunshot wound!) but not really my cup of tea.

Q: Why did you decide to do the work you are doing now?

A: At Moorfields I really enjoyed looking at and capturing all those amazing photographs, especially fluorescein angiograms and anterior segment images. I now work at Ninewells Hospital in Dundee, Scotland, as part of a great team of photographers. I love the combination of medical knowledge and biology, and the creativity and beauty of images. It is especially rewarding when imaging is key to making a diagnosis, particularly if it's something rare like an unusual inflammatory condition. I also think it's great being able to specialise in just one tiny but endlessly intriguing body part.

Q: What do you work toward in your free time?

A: I'm currently working towards a BSc in Biology with the Open University. It is so incredible how the human body works, especially at the cellular and molecular levels, and I am always learning something new and totally fascinating. I think it's really important to continue education in my role; everything from attending organised workshops and conferences, to sitting in with a clinician or discussing cases is really valuable. Building on my understanding of the biology of vision and imaging technology helps me to take better, more useful images. I really enjoy teaching others too, from medical students to small in-house teaching sessions, and presentations.

Apart from studying, I am training for an ultramarathon, although the dark evenings make sitting on the sofa with a good book more tempting...

Q: What's the farthest you've ever been from home?

A: Australia has to be the farthest. Between my two ophthalmic imaging jobs I spent almost a year there, working with lots of different animals, video editing and living in the rainforest (not all at the same time!). I also met some lovely ophthalmic and clinical photographers.

In 2015 I was invited to join the Vision2020 Indonesia Link team as the photographer and medical retina team member. We were based in Makassar, South Sulawesi where I was involved in two studies and ophthalmology teaching sessions. With the support of local ophthalmologists I undertook a diabetic retinal screening study of patients in the endocrine clinic and wards, comparing two hand-held retinal cameras – the Epicam and the Pictor Plus. I presented a poster of the study and findings at the Scottish Ophthalmological Club (SOC) Spring 2016 meeting. During the same week, I assisted with a retinopathy of prematurity (ROP) study, the resulting paper abstract was awarded first prize at the same SOC meeting. I was incredibly fortunate to travel to different neonatal clinics, gaining huge insight into the culture and healthcare system in the region. It was a really intense week but an incredible experience and I've never felt more warmly welcomed!

Q: And the future...?

A: I am learning ocular ultrasonography at the moment and hope that I will gain enough skill and knowledge to play a bigger role in the ultrasound clinics, scanning patients with dense cataracts, melanomas and vitreous haemorrhage. Apart from that, my plan for the next few years is to graduate with a good grade (studying part-time takes a while...) and hopefully go on to postgraduate study.

'Know Your Numbers' -

initiative for people with diabetes

This initiative has sprung from North Middlesex University Hospital NHS Trust (NMUH) Diabetic Eye Screening Programme (DESP), which provides services to people with Diabetes in North Central London (NCL) – boroughs of Barnet, Camden, Enfield, Haringey and Islington.

Abridged version published by DUK:

Update magazine for professionals - Spring 2019 issue.

Leanne Roberts-Singh, team leader and screener/grader at NCL DESP noted: *'The majority of people we see for retinal screening in our clinics are unaware of their results for Blood Sugar, Blood Pressure and Cholesterol; nor do they know where within the general spectrum they are.'* This, coupled with the recent MECC (Make Every Contact Count) scheme introduced by NHSE prompted this initiative.

NHS website on prevention of Diabetic Retinopathy: **'You can reduce your risk of developing diabetic retinopathy, or help stop it getting worse, by keeping your blood sugar levels, blood pressure and cholesterol levels under control.'**

https://www.nhs.uk/conditions/diabetic-retinopathy/prevention/

NCL-DESP hopes that this neat foldable card will help people to keep their results in one place, know where they are within the general spectrum plus it can help them to engage in taking more initiative when looking after their health. The idea is that individuals will ask their practitioners to fill in the most recent reading for HbA1c, BP and Cholesterol. Their practitioner can also set a target so they can readily access and, hopefully, remember what it is.

The card also includes useful contact details for those who feel low, stressed or overwhelmed by diabetes. Plus information on where to access diabetes education in their area. Screeners will write down the date of their last DES visit and the card contains our details if they need to get in touch. We are starting this initiative in March 2019 and are collecting feedback to monitor its effectiveness. We believe that engaging people with diabetes care is crucial in managing diabetic eye complications, as both go hand in hand.

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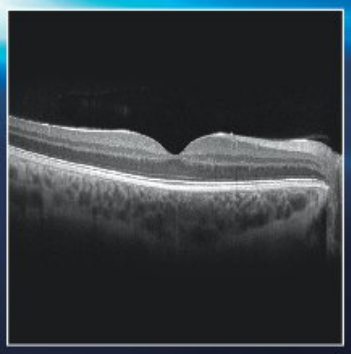
- Lightweight with small footprint
- 9 point adjustable internal fixation point matrix



DRI OCT Triton

TRC-NW400

TRC-NW8, TRC-NW8FA+

DRI OCT Triton Plus

All of our cameras are approved for diabetic screening by the NHS Diabetic Eye Screening Programme (DESP)

TOPCON

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