The New Frontier of Optical Practice OCT:

The NIDEK Retina Scan Duo™ 2

By Dr Sandip Doshi

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Image capture by optical coherence tomography (OCT) has now become an established procedure throughout many eye examinations in the UK. Whether the instrument is used for routine screening and/or aiding a diagnosis, many eyecare practitioners regard OCT as one of the most useful tools in their armoury. With the large-scale adoption of these instruments throughout the profession, optometrists are now in a better position to make very accurate assessments of their patient's eye health, which has led to refined screening and more precise, speedy referrals, the latter of which has inevitably preserved sight.

Purchasing or upgrading an OCT is a significant decision for any practice, both clinically and financially. In the authors opinion any new equipment should enhance the patient journey; be easy to use; provide additional clinical information that is easy to interpret and be a good return on investment. Moreover, for the author it is his view that any equipment purchased should also put his practice one step ahead of other local practices. As one of the first practitioners in the UK to purchase the original RS-330 Retina Scan Duo (RSD), these thoughts were at the forefront of my mind when I was recently invited to view and test the new NIDEK Retina Scan Duo™ 2 (RSD2) optical coherence tomographer.

It is all too common that when a supplier produces an upgraded instrument that the look and the format of use is changed. I was pleased to see that when comparing the original RSD with the new RSD2, NIDEK have not changed the familiar footprint, joystick, chinrest and operation of the instrument (*Figure 1*). I was able to apply familiar techniques that I have developed to capture images with ease. This could be quite a significant advantage to practices who delegate image capture to assistants. The Navis software, although upgraded, had the same user interface. This, and the ease of capture were reassuring to me as a user as there would be no need to learn a new process to capture images.

Figure-1 – The new NIDEK RSD-2 OCT

Birmingham Optical also explained to me that my original database could be quickly and easily imported to the new Navis software without any corruption of my original files. They added that some of my original fundus photos from an old AFC 210 fundus camera could also be easily imported, uncorrupted into the new software.

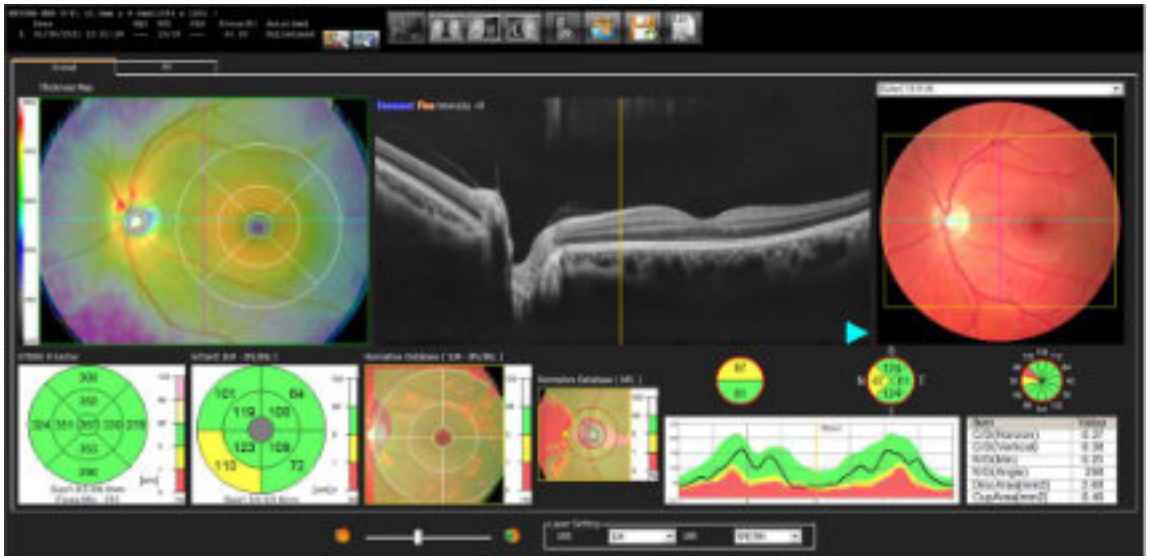
The new Retina Scan Duo™ 2 had four other significant, new clinical features. These were:

- A Retina Map scan which produces an OCT scan of the disc and macula in one capture, along with a colour fundus image in one scan.
- New denoising software, which is particularly useful in deciphering off-centre images which might be too grainy to interpret otherwise.
- An increased A-scan speed of 70,000 Hz/s compared to 53,000 Hz/s on the RSD. This feature is designed to improve scan times by up to 55%, scanning much quicker than before.
- OCT angiography of the disc and macula (OCT-A)

Currently, a typical combo scan on the original Retina Scan Duo might comprise a macula line B-scan, macula map, disc map and fundus photograph performed one after another with the patient having to change fixation significantly between the second and third scan taken. This can be time consuming, particularly in a busy clinic. Additionally, the change of fixation between these scans can be confusing for the patient and often leads to having to realign the patient further, adding time to capture the required scans. When explaining the results of the data captured in a current combination scan the practitioner is required to switch between data sets and explain each separately, again adding time to the overall consultation.

The new Retina Map scan performs a 12x9mm OCT scan to capture disc and macula map data in a single capture with the patient looking in one position only and combined with the upgraded 70,000 scans per second this results in capturing data much quicker. This can be particularly relevant for patients with poor fixation either due to poor concentration or physical constraints; patients with dry eye where capture may be difficult due to excessive blinking or patients who are wearing soft contact lenses, where drying of the lens surface might hinder decent image capture. NIDEK claim that the Retina Map is more than 75% faster than a typical, original combo scan. I found this claim to be well justified and arguably the simplicity of the single scan saves even more time than is claimed by the manufacturer.

Figure-2 – The New Retina Map Scan



The data presented in the new Retina Map brings together all the important information from a typical macula map, disc map, thickness map, fundus image and a B-scan (covering the disc and the macula) in one single presentation (*Figure-2*). Having all the information together in one place is impressive when shown to a patient and allows for a much more effective explanation of the results to the patient as the fundus image allows an easier explanation of which areas are being displayed in the B-scan. The B-scan then allows for a much more effective explanation of what is being displayed in both the macula and disc maps.

I have been using the Retina Map in practice for several months now and have found that having all of the information displayed in one area, rather than over several presentations as in the original combo, has provided me with a new "wow" factor with my patients. My patients, some of whom have become very familiar with looking at OCT scans, are very impressed by the technology being able to produce and display so much information on one single screen. However, the most important factor for me has been the significant time saving when explaining the results to the patient by having all the important information on one screen. It is important to stress however, that the maps produced are compared with NIDEK's highly sensitive normative databases and so it is still essential that the patient's age, sex, and ethnicity are all entered correctly. Therefore, the information from these maps should be used only for screening purposes and any outlying results should be followed up with additional supplementary testing.

Perhaps the only criticism of this first version of the Retina Map is that the maps within it cannot used in a progression analysis. NIDEK is already addressing this observation and it is expected that future updates to the software will allow for direct use of the maps within the scan to be used in a progression analysis. However, at present, this is easily addressed by performing an additional macula map scan and using information from this to update any previous progression analysis. Hence a typical new combo-scan, as I have set up in my practice, would comprise: a macula map, retina map scan and colour fundus photograph. As the Retina map is much quicker than the original combo the additional scan adds very little time to the overall image acquisition process. In the new instrument the scan speed is also quicker, thus potentially negating this issue.

Arguably the most impressive feature of the RSD 2 is the new denoising software. This is used to enhance rapid B-scans (B-scans taken at the 'regular' setting) to a similar quality of the high-resolution scans (B-scans taken at the ultra-fine setting) but as the original image is taken as a regular scan there is a much shorter acquisition time. Having used this software in practice, I have found it particularly useful when looking at poor quality, noisy scans such as those obtained in patients with media opacities such as cataract or off-axis scans. *Figure-4* shows a regular scan (*4a*), an ultra-fine scan (*4b*) and *4c* is the same regular scan image but enhanced with the denoising software.

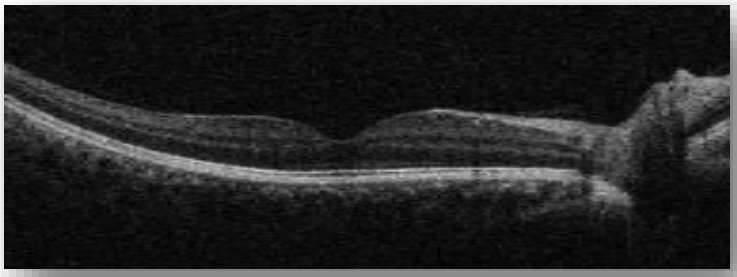


Figure-4a

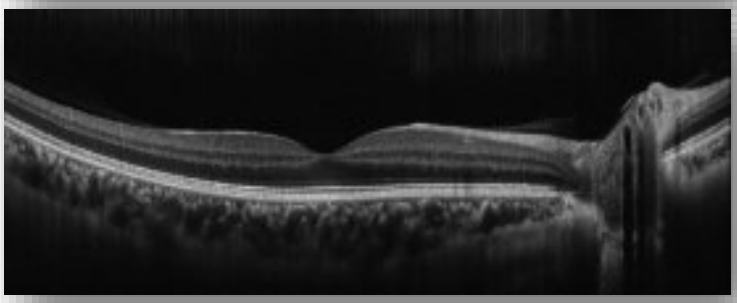


Figure-4b

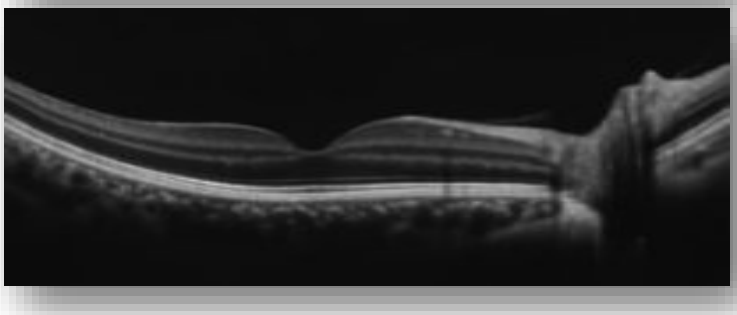


Figure-4c

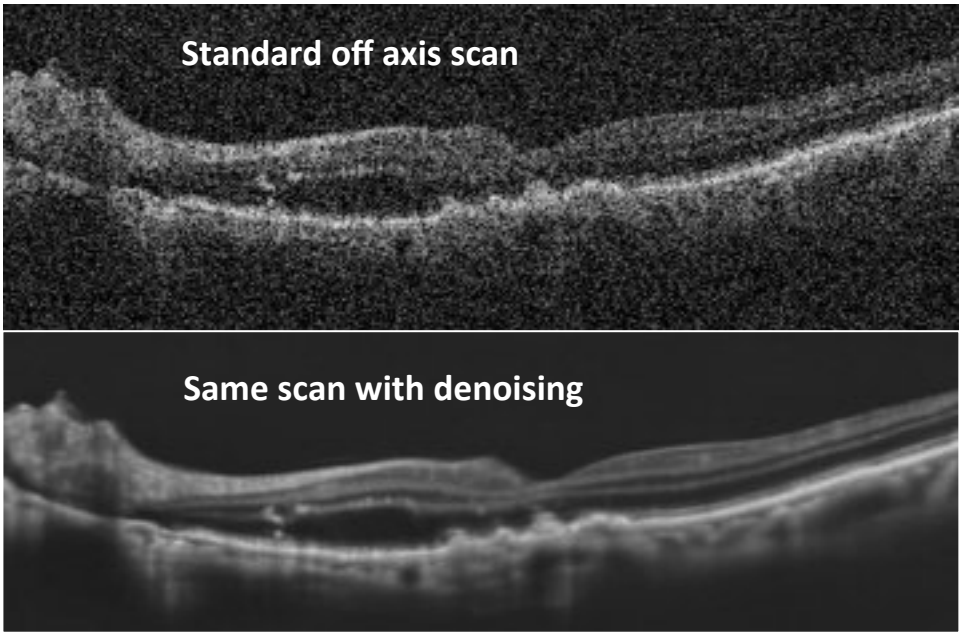


Figure-5 shows an off-axis scan before and after denoising.

Figure-6 shows an example of an elderly patient of mine who attended for an emergency examination complaining of a 1-week history of reduced acuity. His acuity had dropped from 6/5 to 6/18 in left eye. Undilated volk lens examination suggested the possibility of fluid under the macula. An OCT macula radial scan was performed on regular setting, as the patient had comfort issues maintaining his chin on the chin rest. The untreated images confirmed the presence of wet-AMD and sub retinal fluid (*Figure-6a*), however the denoising software used to enhance the image shows the full extent of the changes much clearer (*Figure-6b*). The patient was referred privately and received a first anti-VegF injection on the same evening.

Figure-6a – B-Scan without denoising

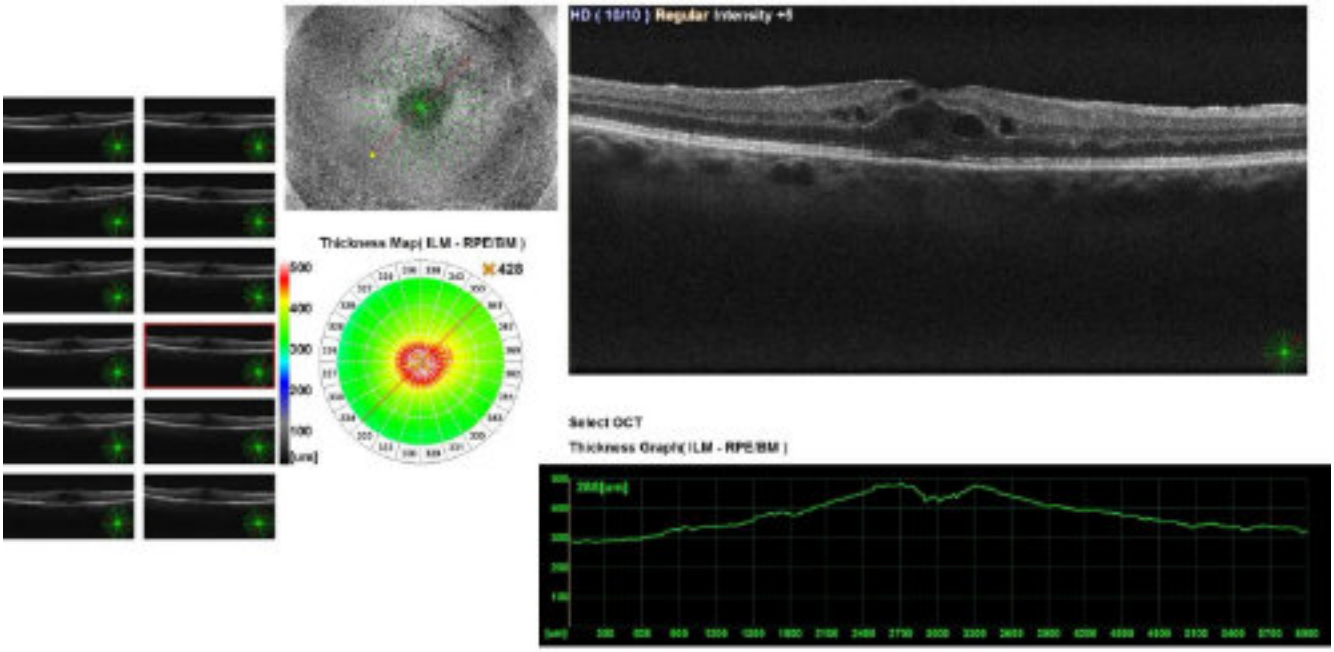
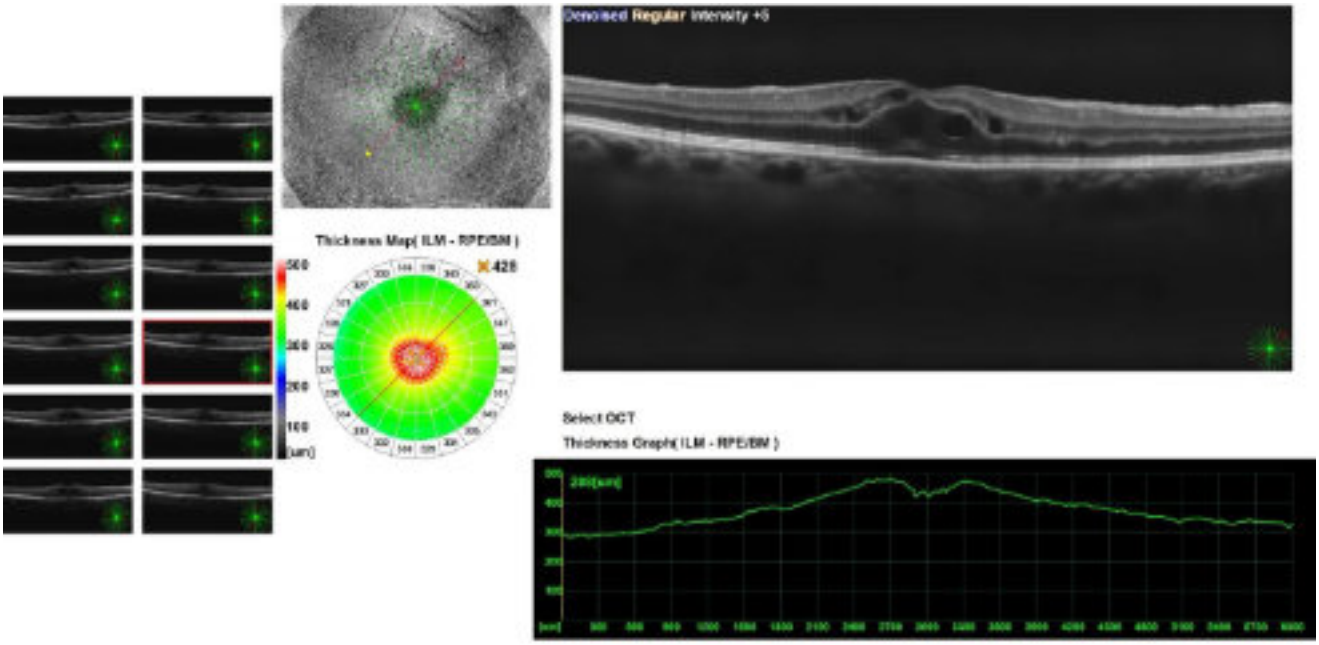


Figure-6b – B-Scan with denoising



Another major advantage of the denoising software is that it can also be applied retrospectively on previously captured B-scans. *Figure-7* shows images taken of a patient who has a malignant melanoma. The original image was taken during COVID lockdown (*Figure-7a*). The denoised B-scan is shown in *Figure-7b*. In the authors opinion the ability to enhance previously captured scans serves to improve screening for the most subtle pathological changes and therefore could result in more accurate and prompt referral.

Figure-7a – B-Scan without denoising

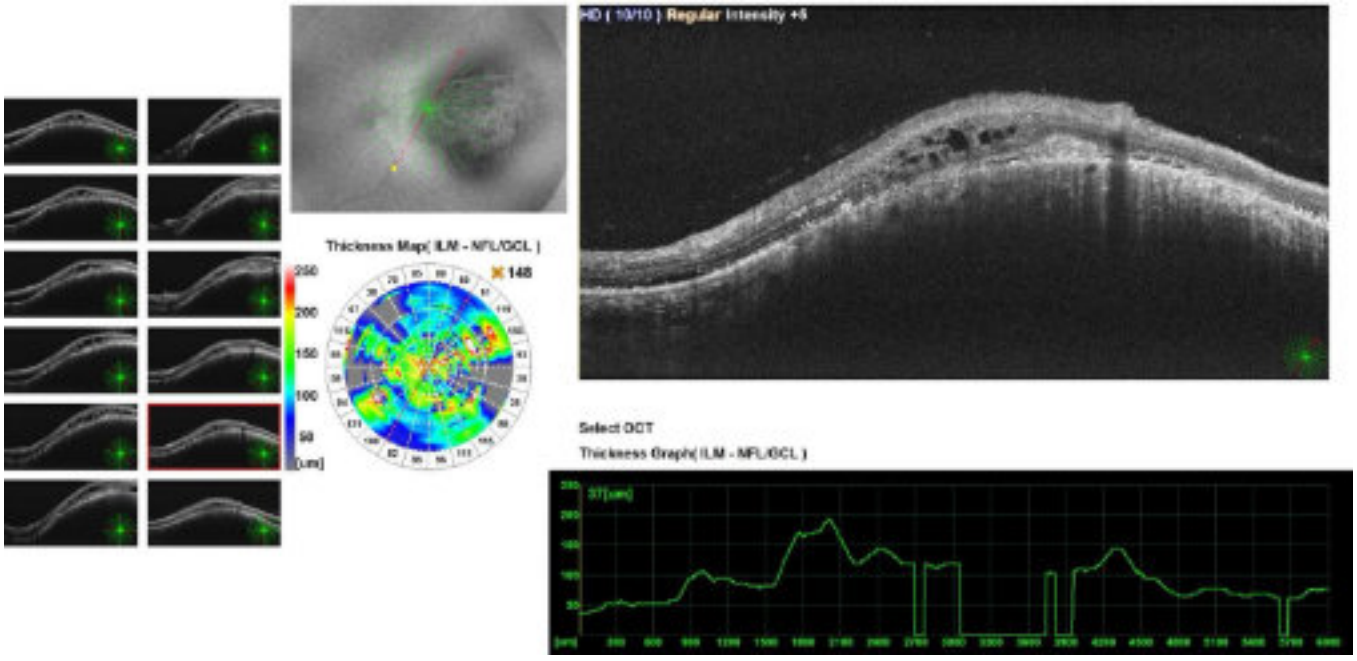
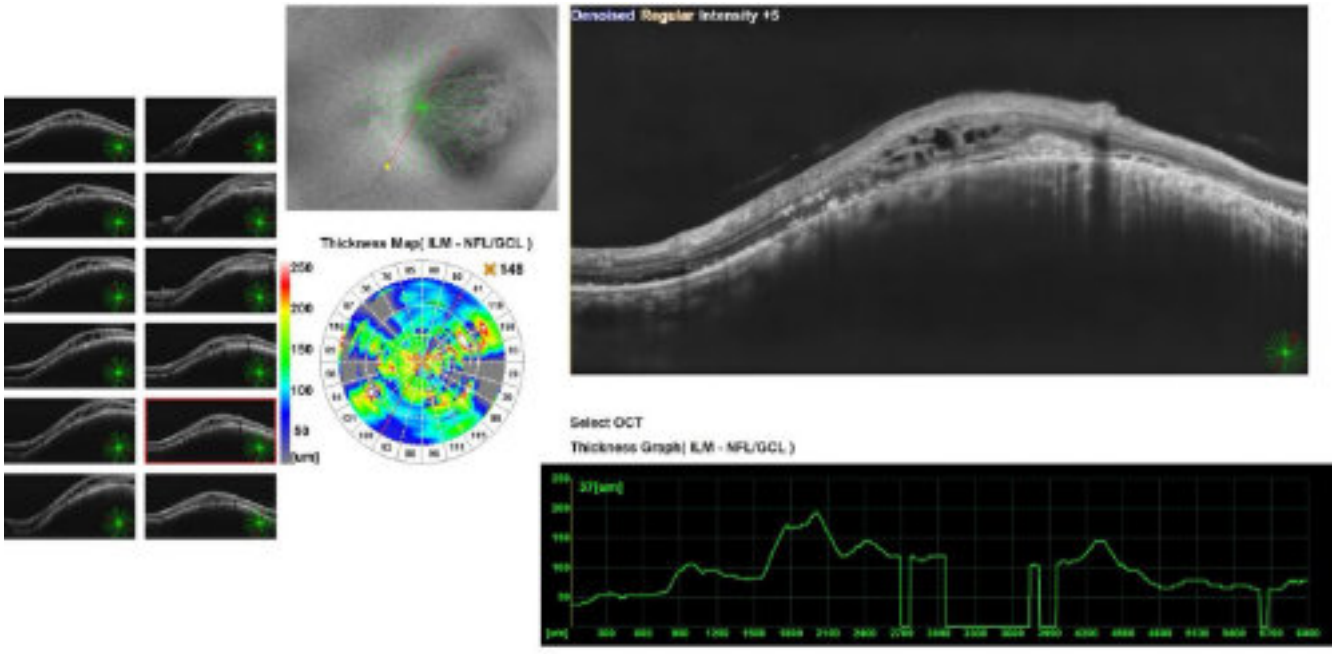


Figure-7ab– B-Scan with denoising



Retina Map and the denoising software come as standard with the new RSD 2. However, both features can also be purchased as additional modules to the original RSD. This could be particularly useful for practices with a large workflow with their RSD, as the former considerably speeds up scan times and the latter would allow new 'regular' B-scans to be enhanced to a much higher quality and, when applied to old images, it would facilitate a much better comparison of images to examine for change over time.

OCT-A is available with a licence as standard in the UK version of RSD 2. Although this imaging technique is not novel, it will be a new clinical feature to many clinicians. It is outside the scope of this article to discuss the clinical background of OCT A. The addition of this imaging technique enhances the clinician's understanding of a disease process such as: is there ischaemia or neovascularisation at the disc or macula? This could be particularly useful to practices who are involved, or hoping to be involved, in community ophthalmology schemes for monitoring disease such as age-related macular degeneration and glaucoma or monitoring diabetic patients.

OCT-A scans can be added as an additional scan to the new combo setting (for example, a disc map, retina map, colour fundus photo and OCT A) or performed as a standalone scan as required. *Figure-8* shows typical OCT-A macula map produced by the RDS 2. The foveal avascular zone (FAZ) is automatically mapped in the retina as well as blood vessel positioning on the B-scan image. In the figure shown, vessel density overlay is also in place – this feature can be particularly useful to the user who is new to interpreting OCT-A images. Macula map data is displayed either in a grid or ETDRS map and either as vessel density (Figure 8a) or perfusion density (Figure 8b).

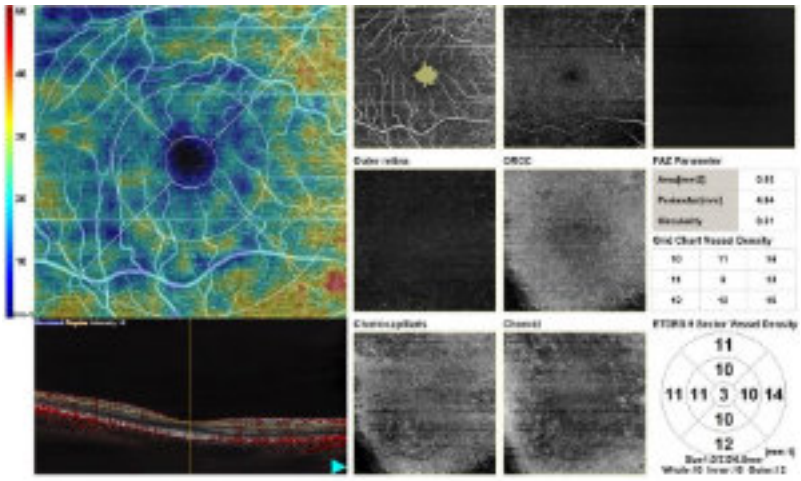
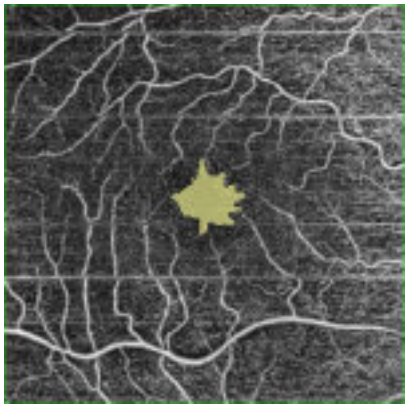


Figure-8a showing vessel density

FAZ shown below



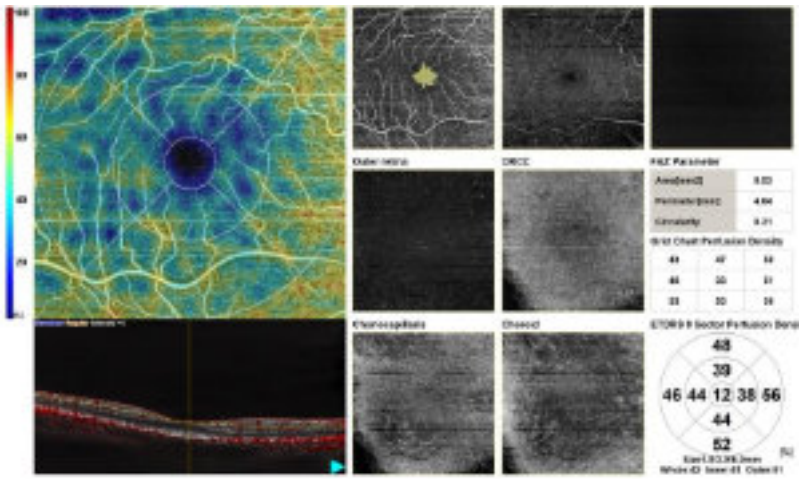


Figure-8a showing perfusion density

A typical OCT-A scan is performed across a 6x6mm area. *Figure-9* shows an OCT A disc map with a vessel density overlay (*Figure-9a*) and the same map with a perfusion density overlay (*Figure-9b*). These examples are ideal to gain a better understanding of the vascular aspect in glaucoma or fully understanding vessel pathology in diabetes. The software has a novel feature which allows the user to scroll to any part of the map and see the B-scan with and without vessel inclusion (see *Figure-9c*).

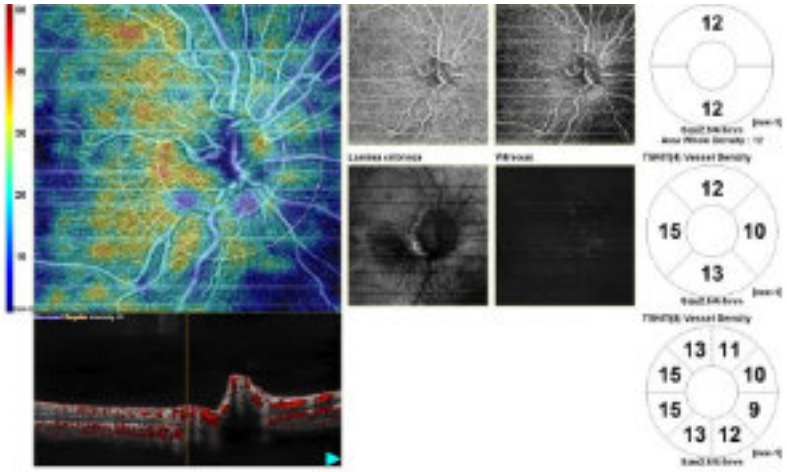


Figure-9a showing vessel density at the disc

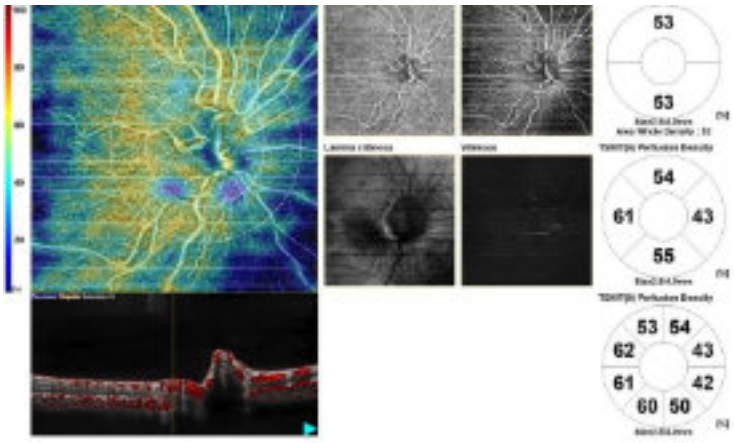


Figure-9b showing perfusion density at the disc

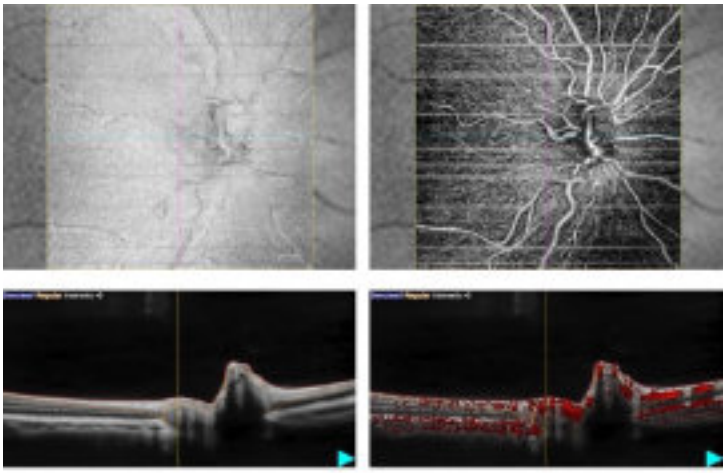


Figure-9c showing B-Scan with and without blood flow

The RSD 2 has retained the 12MP camera as in the original RSD, providing excellent high resolution fundus images. For the clinician wanting a fully future-proofed OCT, Nidek offer additional, optional modules for anterior segment imaging and fundus autofluorescence (FAF). These are the same modules as those available in the original RSD. As a practitioner who has had both modules on my RSD since my original purchase, I can highly recommend both to anyone looking to purchase the RSD 2. I regularly use both features - the anterior module for its pachymetry maps to refine my glaucoma referrals, to examine the cornea for ectatic disease and to image and assess the anterior chamber angle.
I also find the anterior module invaluable when assessing central clearance when fitting scleral contact lenses (see *Figure-10*). The latter has made fitting these complex lenses much simpler, saving significant time with each fit. Junior colleagues in my practice, who have found it difficult to assess RGP central fluorescein patterns have also found the anterior module useful to image the central portion of the lens to confirm a steep, flat, or optimal alignment.

FAF has been an invaluable tool to me in enhancing both my clinical understanding of disease (or normal variation) as well as providing me with an excellent tool for communicating pathological findings with my vitreo-retinal colleagues. It should be noted that for the practitioner looking to purchase these additional modules, FAF needs to be purchased at the time of ordering a new RSD as it cannot be retrofitted.

No single equipment used in practice can be the panacea of our clinical work. However, having an instrument that will improve our workflow and enhance our clinical capabilities is tantamount to best practice. I strongly believe that the new RSD 2 comes very close to being a major advancement in this direction. Having seen and used the new RSD 2 as well as using the Reina Map and denoising software now for several months, on a daily basis, I believe that this piece of equipment would fulfil all of my criterion highlighted at the beginning of this article. The ease of use, particularly to those already familiar with the original RSD, the enhancement of the patient journey with quicker scan times, the reduction of chair time by showing all the vital information on one presentation via the Retina Map Scan, all make the new RSD 2 appealing to the patient.

The additional clinical information obtained via the denoising software, and OCT-A make the RSD 2 an essential clinical tool for any practice wanting to offer the most up-to-date advanced eye examinations. With appropriate professional fees being charged, the RSD 2 is not only affordable but potentially an excellent return on investment which would put any practice in the forefront of clinical services within their community.

Dr Sandip Doshi PhD BSc MCOptom

Dr Sandip Doshi is an optometrist who owns a private practice in Hove, East Sussex. He is probably best known for his work in publishing and was the lead editor/ author for the popular series of books: Eye Essentials published by Elsevier Science. Sandip was also the first clinical editor of Optician magazine and previously was responsible for developing and running journal based CET in Optometry Today He has written numerous articles and lectured a variety of subjects within the profession ranging from clinical matters to business development.

He received his PhD from City University for his work in limbal anatomy and biochemistry over 20 years ago. As a result of this work, Sandip has always had a keen interest of the anterior segment of the eye and it was this which sparked his in interest of examination techniques of this area.

Lately Sandip has been involved in the area of technology and examination equipment. He currently is a key opinion leader and clinical advisor to many companies such as: Birmingham Optical, Optos, Keeler, Bausch and Lomb and AOS. One of the latest projects that Sandip has had a key role in is in developing the AOS digital grading scales and AOS anterior software.