Discusses scanning of the macula. Module C38457, one point for OOs and independent prescribers

When to use a macular OCT scan

of the retina.

aligned to produce a 3D cross-section

properties of the different retinal

layers, in order to determine where a

defect lies. Overlapping multiple scans

is very beneficial in eyes where the

signal strength is poor eg in eyes with

cataract, as this will boost the signal

output, and should always be checked

underneath them in the OCT scan due

to blocking of the infrared signal

(Figure 2A). This can also occur with
dense vitioretinal flares, which will cast
a shadow across all retinal layers of the

OCT scan. Secondly, as you move over
the foveal region of an OCT scan, the

outer segments of photoreceptors appear
to become oedematous (Figure 2B).
This will cause obvious concerns as it

is new to OCT interpretation, however,
this is a normal feature of the fovea,
representing the outer segment of cone

photoreceptors to enable clearer packing and hence provide high visual acuity.

3D macular scan components

● Shadowgram

The shadowgram is a very useful
element of the macular OCT scan
output, and should always be checked
first when analysing macular data, as
it offers a quick way to determine scan
quality over the whole scan area.
The shadowgram is a surface image
of all the scan data. Anything that
blocks light in an OCT scan will
appear as a shadow, while the deeper
the light penetrates, the brighter the
area will appear. Figure 3 depicts three
shadowgrams.

● Temperature thickness plot

The temperature thickness plot gives
a representation of the retinal thickness
over the scan area, with thicker areas
appearing as warmer colours,

and thinner areas as cooler colours.

Observation of the temperature
thickness gives vital information

providing a quick method for

establishing whether the

retinal architecture is normal over
the macular scan area, as seen in
Figure 4A.

Identification of the abnormality must
then be determined by observing the

B-scan for discontinuities.

● Normative comparison – ETDRS

OCT has become significantly popular
for real-time quantitative evaluation
of retinal sections using the ability
to detect the inner and outer retinal

boundaries to a high degree of accuracy,
due to improvements in OCT

technology. However, different

OCT instruments give different

measures of retinal thickness, which

can result in a disparity in the

measurement of retinal thickness.

As seen by the relatively high

standard deviations, there is a wide

range of retinal thicknesses in the

normal population. Retinal thickness

is reported to vary according to several factors including

axial length (decreasing retinal thickness with increasing axial length),

ethnecity (thinner in patients of African descent) and gender (thinner in

women).

Macular thickness is most commonly
analysed and presented on the Early Treatment Diabetic Retinopathy Screening Study (ETDRS) grid, where the patient’s retinal thickness is compared to that of a normative database and classified as ‘within normal limits’, ‘borderline’ or ‘outside normal limits’. Because of the numerous factors which can affect macular thickness the classifications should only be taken as an indicator of the probability of there being a retinal abnormality, indicating what the practitioner should expect to see when they view the B-scans. For example, if the ETDRS grid shows an orange or pink region (representing borderline thickening or outside...
normal limits thickening, respectively), the practitioner should be looking for conditions which can cause retinal thickening, most commonly oedema in wet AMD.

**B-scan analysis**
Viewing the shadowgram, temperature thickness plot and ETDRS grid are very useful, but individual B-scans provide the most information to the practitioner. Therefore, no macular analysis is complete without viewing each B-scan in turn. Subtle defects (including early signs of wet AMD) may be missed if each B-scan is not studied as they may not be evident in the temperature thickness plot or ETDRS grid.

With AMD being the principal cause of irreversible blindness among those aged over 65 years in the West, it is not surprising that signs of both wet and dry AMD are among the most common abnormalities viewed in macular scans. Dry AMD, characterised by drusen within the macular region, is the most common type, accounting for up to 90 per cent of all cases of AMD. On OCT examination, drusen appear as focal, hyper-reflective elevations of the RPE, disrupting the typically straight and smooth RPE (Figure 6A).

Development of choroidal neovascularisation (CNV) is the hallmark of wet AMD, a stage found in approximately 10 per cent of all AMD cases. CNV on OCT examination typically presents as increased reflectivity of the RPE, often associated with irregular RPE elevation (Figure 6B). Leakage of these new blood vessels causes development of fluid, which appears as dark spaces within the B-scan. Fluid may be classified as intra-retinal when it is found above the photoreceptors, sub-retinal when it forms below the photoreceptors but above the RPE (Figure 6B), or sub-RPE, when it forms below the RPE. In cystoid macular oedema, a condition which is also associated with diabetes and branch retinal vein occlusion, intra-retinal fluid forms characteristic cystic spaces (Figure 6D).

Signs of persistent vitreomacular traction is another common observation in macular OCT scans (Figure 6C). Where vitreomacular traction is seen as a thin, moderately reflective band which is pulling on the retina in an incomplete V-shaped posterior vitreous detachment (PVD). As OCT has enabled practitioners to view the interaction between the retina and vitreous for the first time, it often causes most questions with regards to best patient management. If the patient is relatively asymptomatic and vitreoretinal traction is a chance finding, patients should be advised regarding self-monitoring with an Amsler grid, and reviewed to see if spontaneous resolution occurs. However, it has been reported that spontaneous resolution only occurs in approximately 10 per cent of patients.

If vitreoretinal traction has resulted in significantly reduced vision, referral should be made to ophthalmology for consideration for treatment with vitrectomy or ocirplasmin.

**Part 2 will look at the scanning of the optic disc.**

**References**

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