Assessing Images for Retinopathy Level

A systematic approach is helpful when considering the retinopathy level of images. The following is a guide. Some information may not always be available to every grader on every occasion.

Check the age of the patient, and how long they have had diabetes

A young insulin-dependent diabetic doesn't often show signs of retinopathy during the first 5 years or so, unless their control is poor. All people with diabetes are more likely to have retinopathy the longer they have had diabetes.

Control

If the patient is with you, ask what their control is like. From Bob Young's presentation:

- Glucose control
  - HbA1c <7=low risk; 7-8=increased risk; 8.1-9=high risk; 9.1+=very high risk
- Blood Pressure Control
  - BP <135/75=low risk; 136/76-145/85=increased risk; 146/86-160/95=high risk; 161/96+=very high risk

Remember though, that the HbA1c numbers are changing.

Assess the whole picture first

Right click on the image to toggle the thumbnails off and assess the whole fundus in both colour and red free. This will allow you to spot obvious DR.

Then enlarge

Enlarge the image so that you can see just over half the image vertically. This will allow you to assess the whole image, with overlap, in 4 chunks (the 4 quarters). Do this in red free and flick back and forth to colour on any items you have concerns about. If you do not enlarge then you WILL miss dots. Enlarge further if you wish and use the magnifier button.

Pay particular attention to the disc and the foveal area. Ensure you do not miss disc new vessels or small exudates near the fovea; DNV are not always as obvious as you may suppose so make a conscious inspection of the disc and determine whether it is normal.

Assess the image clarity

If they are inadequate, check whether any referable retinopathy is visible, because that makes them adequate. Always use red free to assess quality. Try pulling out a bit more contrast if necessary. Use the sizing tool to give you the 2DD circle on right click. Can you see detail in this area around the fovea. Would you know if small haems or exudates were there? If not, it isn't assessable. You should be able to see blood vessels at least vaguely within the 2DD area. Check the disc image. If there were any disc new vessels, would you be able to see them? If not, it isn't assessable. A good test is to follow a major blood vessel, then a branch off it (2nd generation) then a branch off that (3rd generation). If you can see those 3rd generation BVs within a DD of the fovea, then it's OK.

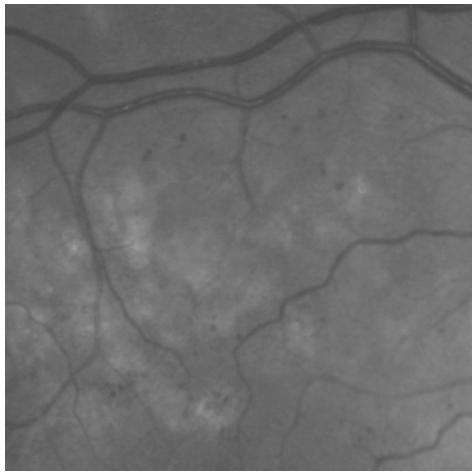
If the images are dim and the patient is with you, try taking another. With smaller pupils or media opacities, a brighter flash setting often helps improve the clarity.
See: Imaging in DRS

Assess the image position

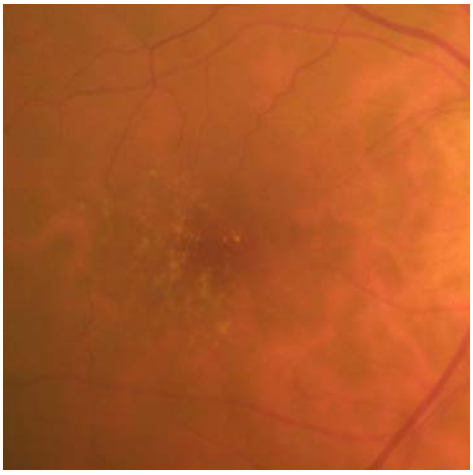
For both macula and disc centred images, the relevant macula or disc should be <1DD from the centre of the image to be graded as good, and < 2DD of the edge of the image to be graded as adequate. Remember that in some unusual cases (eg: large disc) then an image may be positioned as both good and inadequate. In these cases then the image should be classified as good.
See: Field Positions

Features

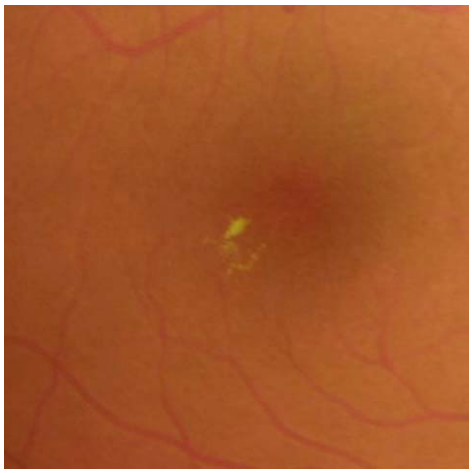
Microaneurysms are single bulges or are like bunches of grapes. Dot haemorrhages are just dots. Both of these are normally fairly high contrast dots in red free. If you are struggling to see a dot, or to decide whether it is really there, it probably isn't. Check your performance figures; if you have a very high detection rate and you often find yourself wondering if a dot is there or not, then maybe it's not.



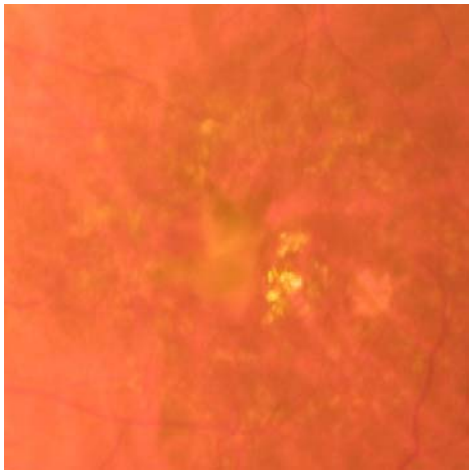
Drusen are generally yellow and soft edged and don't change much from year to year. Drusen can appear anywhere in the fundus, not just within the macula.



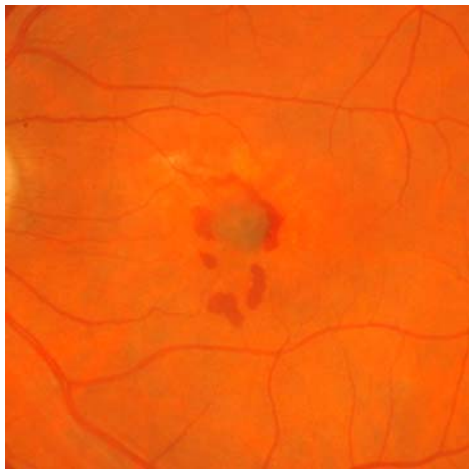
Exudates are whiter, harder or sharper, and do change. You don't often get exudates without haemorrhages somewhere. If you seem to have an awful lot of "exudates" and there is no other retinopathy anywhere, you should seriously consider the possibility that they are drusen.



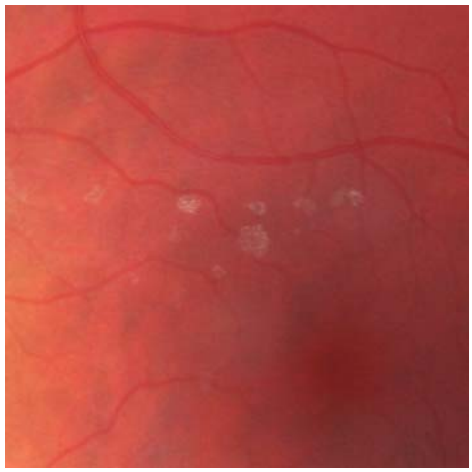
AMD - there may be areas of hypo-pigmentation appearing as paler patches around the fovea or bright calcified drusen. These are not exudates.



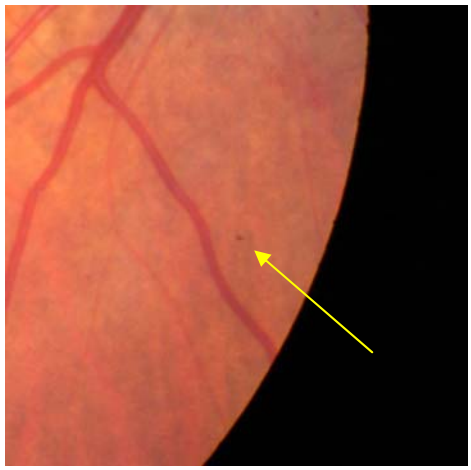
If you see haemorrhages at the macula in an older person and there is no other retinopathy, consider the possibility that it may be wet AMD. If it is, you need to refer it into the appropriate fast track service directly. It is not safe for you or the patient to refer wet AMD via Vector.



Reflections appear in younger people, those with PVDs and often in those who have had cataract surgery. For pale patches around the fovea, always check the disc centred image and see if the pale areas around the fovea are also visible. If not, then they may be reflections. This is why it is so important to get good bright disc centred shots in which the fovea is clearly visible.

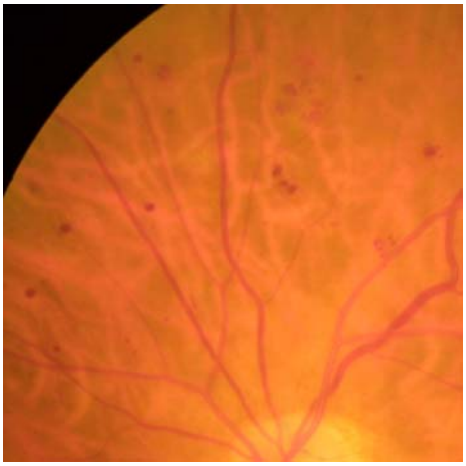


Some dots are **dust**. Some are obvious and appear clearly on every image. Some only appear in pale areas or under low contrast. To check, size all the images as originally downloaded (left double click the image). Put your finger just under the dot in question as a marker and then change the image. If the dot is identical in more than one image, then it will be dust. Check the colour as well – that may help.

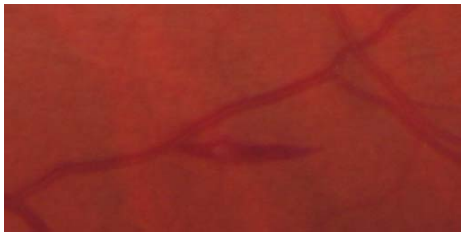


Haemorrhages come in all shapes and sizes. For the purposes of distinguishing between R1, R1.5 and R2 you have to consider numbers, which is an experience thing. You also have to consider depth. The "multiple, round, deep" haemorrhages of R2, otherwise known as "juicy" are darker in colour. Size can be misleading. A haemorrhage can look large but be quite pale and superficial. We are more concerned about the deeper, darker haems.

Juicy:



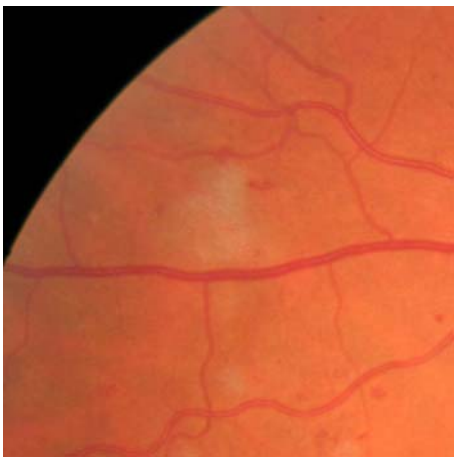
Roth Spots are haemorrhages, often flame-shaped, with a pale spot in the centre. The white spot is fibrin and is not an exudate. Simply count these as haemorrhages.



Pay particular attention to the area temporal to the fovea. This area is prone to retinopathy since it has the weakest perfusion. There may be lots more little haemorrhages here than elsewhere and this would change it from R1 to R1.5. Particularly look out for other changes such as IRMA and venous loops in this region too.

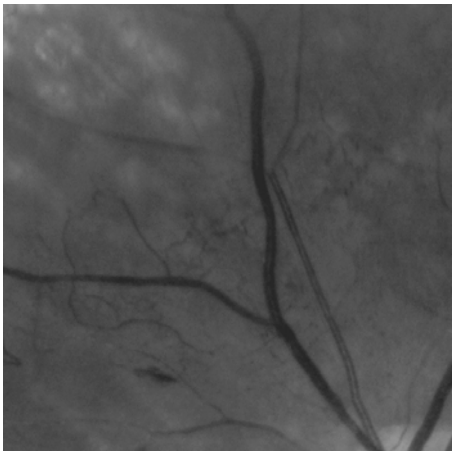
Look at Past Images to clarify some of the above points, particularly drusen vs hard exudates.

Cotton Wool Spots are whitish soft edged spots, sometimes with haemorrhages and sometimes without. They can be very obvious, or really quite faint. Peripheral artefacts from dust reflection can look very similar, as can artefacts caused by small smudges on the objective lens. Remember – doe it appear on the other photos? If yes, consider the possibility it is an artefact. If no, check the old images – was it there before?

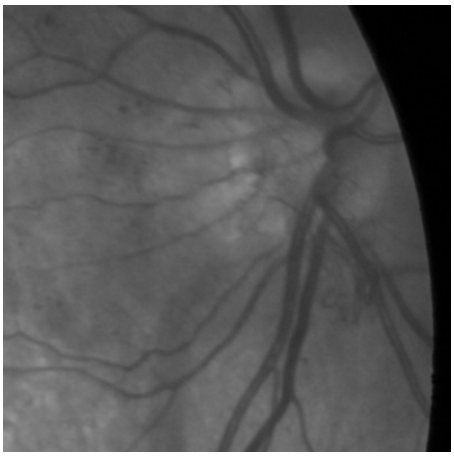


If there are cotton wool spots, you should be having a close look for signs of ischaemia, i.e pre-proliferative (R2-type) changes.

IRMA are like shunts running slightly chaotically between blood vessels and are within the retina.

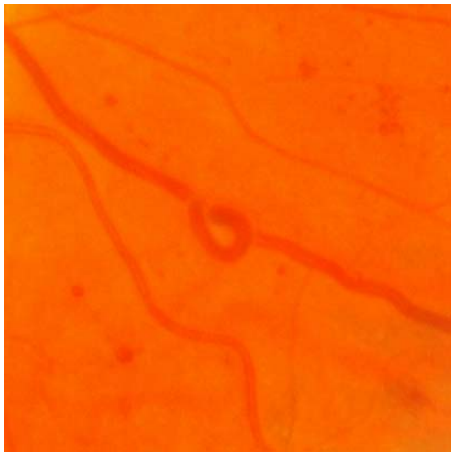


New vessels are extremely chaotic and come out into the vitreous.



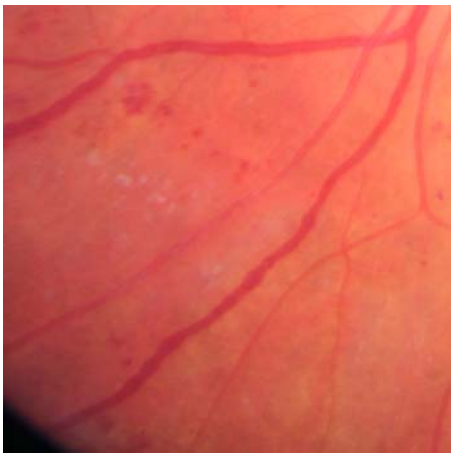
Venous loops develop, so check if they were there last time.

A loop is a sign of fairly advanced retinopathy - R2. It is unlikely to ever appear in the absence of any other retinopathy and, by and large, you would expect to see quite a bit of other retinopathy. So it might be the sign that makes it R2 rather than R1 or R1.5, but is not going to be a sign of DR all on its own.



Loops are commonly on the larger veins and one cause is thought to be gradual occlusion of the vein resulting in shunts which create the loop.

Venous beading – remember it is veins not arteries.



Outcomes

For the most part, stick to the default outcomes. The R1.5 is really just the national R1 level that we feel warrants 6 month review. Likewise the M0.5 level is a national M1 that we feel does not need referral. Don't grade something R1 and then put you think the haems near the fovea warrant a 6 month review. If they did, it would be R1.5. Exceptions to this would be stable treated DR where they are perhaps R3 because of old fibrosis and yet stable and so not requiring re-referral. In this case over ride the default outcome in favour of routine review. In the longer term there should normally be notes from an ophthalmologist in these cases.