RSD - Scan troubleshooting

The Nidek Retina Scan Duo (RSD) and NAVIS–EX software are a powerful combination for capturing and analysing OCT and fundus photographs. Before we can begin analysing any captured information, we need to ensure we are capturing the best data possible. The greatest source of error is usually User or Patient error. The following are a few hints and tips to help you achieve this, and what to do if things don't work out quite as expected first time.

Good Data

It is essential to have robust, reliable data to base any analysis on. Like any computer program, NAVIS–EX is only as good as the information you put into it. If the data is flawed, you must repeat the scan / photo.

Capture Review Screen

The capture review screen allows you to check the scan quality immediately after taking the scan to ensure that it meets the quality requirements.

Fig. 1 – Review screen

Check the SSI score – aim for at least one green bar (7/10). Then you will see the scan line scroll across the screen from one side to another (or from the top to the bottom) and you

will be able to view the corresponding B-scan (side on) image. You can then check for errors such as those now listed.

Blinking

In this image from a Macula Map scan, there is a loss of data at the bottom part of the image. NAVIS–EX would not be able to analyse these areas and would give incorrect results.

Fig. 2- Loss of data
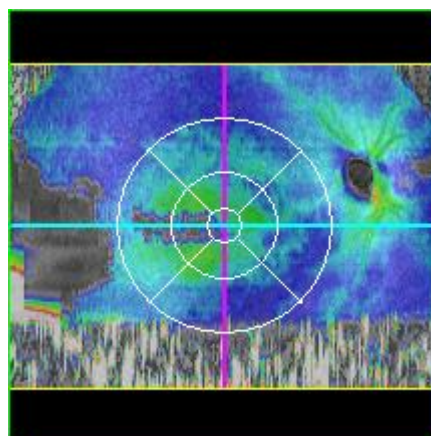
The loss of data at the bottom of the scan is from a blink. There will be 'static' lines in the image. The easiest way to avoid this type of error when capturing, is to carefully direct the Patient when to blink and when to stare.

TIP! - The Px can blink normally during the 'Optimising' phase (ie. When optimising is on the OCT screen) and must stare at the fixation when optimising has disappeared from the OCT screen. A double beep from the RSD means the scan is finished and the Px can blink normally again but try and stay in position. Then, carefully review the scan to ensure there are no 'static' lines through the scan image.

TIP! – If the Patient cannot hold their eyes open long enough to take a good quality scan due to dry eye symptoms, trying using some lubrication drops before the scan, or you can drop the resolution of the scan to capture more quickly.

TIP! – Try to use phrases such as *'nice wide eyes please'*, or *'keep staring'*. Try not to say *'don't blink'* as you will probably find this is the first thing the Patient will do!

TIP! – Get the Patient to blink in-between scans to minimise their impulse to blink during a scan.

TIP! - Before clicking 'OK' to move to the next scan in combo mode, remember to direct the patient on where to look next; 'Follow the flashing green dot as it moves to the left/right' (depending on which eye you are scanning) or 'back towards the centre' for the fundus photo, and ask them to blink several times. For best results they should be staring at the green light during the 'Optimizing' stage.

Out of Range

Sometimes, you can get good SSI scores when taking the scans, but due to incorrect positioning on the 'Z-axis' some of the scan area is cut off.
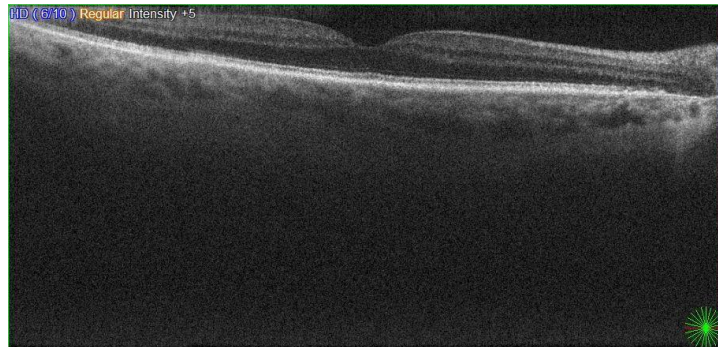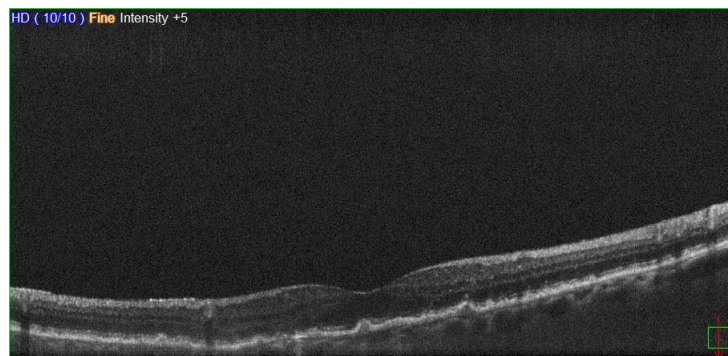
Fig 3 – Too high

Fig 4 – Too low

TIP! – Ensure during capture the B-scan is roughly in the middle of the capture box. You can use the arrows on the capture screen to better position the image if necessary – even turn off auto-capture and manually adjust the Z-axis if positioning is difficult.

Fig. 5 – Adjusting the 'Z' position using the arrows on the capture screen

Vignetting

This occurs when part of the OCT signal is blocked by iris, cataract, etc. This causes a loss of signal over an area of the scan image.

Fig 6 – Vignetting

TIP! – Try scanning again, but sometimes this is as good as you can get. If the problem is a vitreous floater, getting the Px to move their eyes around to try and move the floater. Try adjusting the fixation or repeat the scan on 'fine' resolution to enable more IR light to reach the retina.

Eye Movements

This scan shows the Patient moving their eye during a scan. You can see how different areas of the image do not line up and the image appears fragmented. You may also see movement errors when reviewing a Macula / Disc map scan, where the image moves markedly up or down.

Fig. 7 – Eye movements during a scan
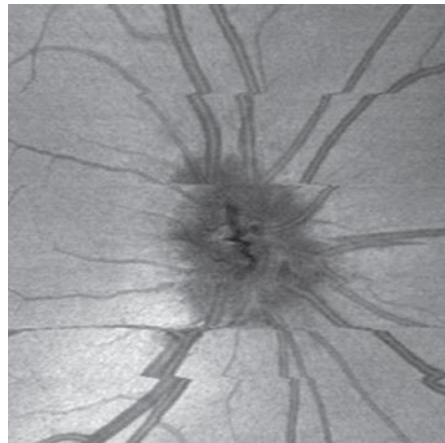
TIP! – If the Patient is struggling to maintain fixation, it may be because they have no central fixation in that eye. Try using the external fixation lamp to fixate with the other eye and adjust the position of it until you get the eye you want to scan into position. If all else fails, ask the Px to 'just stare ahead' and try to get some scan.

TIP! – Using a script to help direct the patient can make a big difference to how well they follow your instructions.

Mis-alignment

Often a scan can produce a 'defect' simply because it is slightly out of alignment.

(Disc Map)

Generally, you do not need to adjust the alignment of the Disc Map. Because of the many variations in a 'Normal' optic nerve head, a much better indication of normality is the symmetry score. It is generally easier to repeat the scan to try and get more reliable data.

TIP! – If there is very small or very indistinct disc cupping, or the disc margins are indistinct, the software sometimes gets confused with the positioning. You may even have to use the 'Optic Disc Shape editor' to help the software recognise the margins of the cup / disc.

(Macula Map)

The following sets of images are from the same scans – one is correctly aligned, the other misaligned.
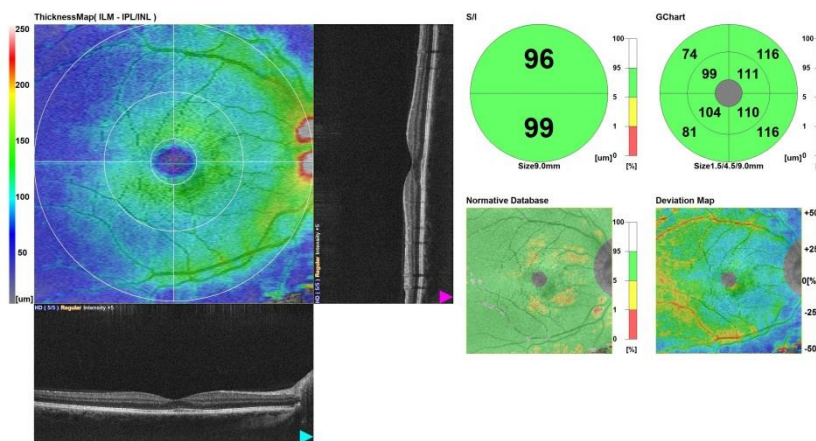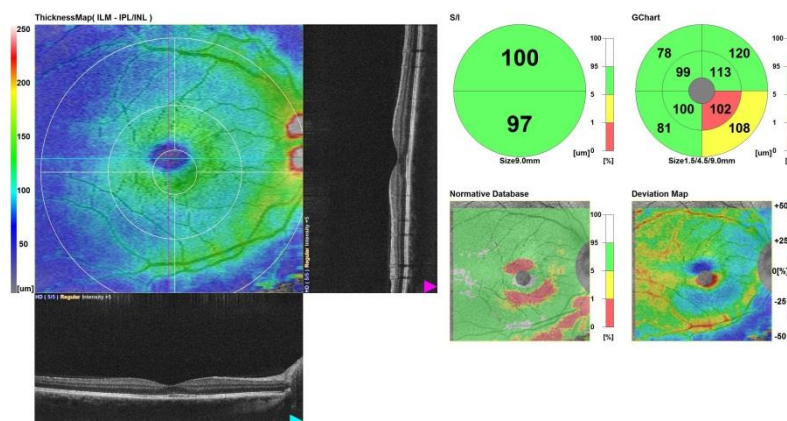
Fig. 8 – Aligned

Fig. 9 – Misaligned

TIP! – The easiest place to check for alignment is over the foveal pit. Always check the ETDRS grid is properly aligned over the foveal area. Normally you will only need to adjust by a few pixels, but even small adjustments can make a difference, especially if you are monitoring Ganglion Cell Complex changes.

The five basic rules for determining if the scans you have captured is 'good' data:

1. Ensure the scan you are analysing has no data errors. Generally, if you can see colours all over the full retinal thickness map on a macula map scan you should have good data. Grey areas on the full thickness map mean a lack of data in that area.
2. If you are getting strange results, repeat the scan. Is it repeatable, or was there Patient / User error the first time?
3. Wherever possible examine the RE and LE scans together to assess for symmetry between them (*Look for colour symmetry, number symmetry, what do I know of the Px?*). If there is a high level of symmetry and you are still getting strange results, it is probably 'just the way they are made!' If there is repeatable asymmetry, it could be pathological.
4. Always compare to the earliest scan, where possible. Can you show any progression?
5. Does the OCT data match what you expected from your eye examination? (*eg. high myope, amblyopic eye, etc*).

Remember, if scan quality is poor after careful scanning, it may be due to lens opacities. Try using Fine or Ultra-fine modes to get better quality images (but note that this increases capture time and may be challenging for some people with dry eyes who need to blink more often). Also, remember that macula / disc maps are captured quickly with 128 or 64 line scans, so the image of each of these is limited so as to avoid capture taking too long and file sizes being too large. Only the central Cross Scan is taken at a higher resolution. If you want higher resolution images of the posterior pole, try using the Macula Radial scan.

SO, If you can be sure you have 'good' data that is aligned, if the 'defect' is

repeatable in other scans, if there is colour and number asymmetry between the eyes, if the scan is different from before, and if it doesn't match what you expected from your eye examination........– **REFER!**