Electronic dispensing

Andy Hepworth explains how electronic dispensing systems assist in the measurement of patients, the displaying of various designs of frames and lenses, and the explanation of the impact of lenses of various types on vision. **Module C18744, one general CET point for optometrists and dispensing opticians**

The process of recommending the most suitable spectacles for each patient has changed significantly in the last few years. Not only does the eye care practitioner have to consider the enormous array of lens designs available today, there are also the treatments, materials and the frames, to think about.

When we consider the quest for optimal visual performance delivered through spectacle lenses, the introduction of 'freeform' (digital surfacing), was a catalyst for many technological advances, several of which require additional patient measurements to personalise the lens, thus providing the ultimate correction for the end wearer.

This can challenge even the most experienced eye care practitioners in relation to:

- Obtaining the required measurements for the given lens
- Supporting the frame selection process
- Demonstrating the wearer benefits.

To ensure personalised lenses are accessible to all patients, some of the larger manufacturers have developed electronic dispensing devices, ranging from the very basic, that are effectively a camera, to, in some cases, the very sophisticated video enabled systems that link directly to practice software and PMS systems. Patient measurements are fed directly into the lens ordering modules, making ordering simplistic and error free. It may sound cumbersome but these systems are actually self-contained and come in stand-alone column or desktop formats which can make a stylish and technically impressive addition to an optical practice (Figure 1).

Taking each of the above steps in isolation, let us look at how electronic dispensing devices aid the eye care practitioner:

Measurements

The popularity of personalised lenses has grown significantly in the past few years across Europe. For this article we are considering the personalised lenses that require additional parameters on top of the usual patient prescription, pupillary distances and fitting heights.

Figure 1 Two electronic dispensing systems (a) Essilor (b) Zeiss

Within the personalised lens category, there are a number of additional parameters that can be considered and incorporated into the manufacturing of a lens. These include at the standard level:

- Frame fitting
- Lifestyle.

At the higher level:

- Behaviour
- Wavefront
- Anatomical.

The benefit for the wearer is greatly refined visual performance.

Frame fitting personalisation

Thinking specifically about progressive lenses with frame fitting personalisation, the additional wearer measurements required include:

- Vertex distance
- Pantoscopic angle
- Faceform angle (bow).

Inclusion of these additional parameters will refine the design in several ways. Firstly, the area of clear vision will match more accurately the wearer's natural eye path as it converges from distance zone to near (Figure 2). Secondly, the usable near area will be wider. And finally, by calculating compensated powers, it is possible to eliminate unwanted oblique astigmatism caused by the pantoscopic angle of the frame in the areas of clear vision.

These calculations are extremely complex and lens manufacturers use mathematical algorithms to match the additional measurements with the wearer's prescription. Using these calculations, manufacturers are able to refine designs and produce lenses using freeform digital manufacturing technology. Let's not forget that traditional hand-held dispensing tools are also available to measure additional frame parameters. These have been around for a few years and are an alternative to the digital measuring systems (Figure 3).

There can, however, be a pitfall with this approach – the unnatural head position a patient may adopt when a device is moved closer to the face. This ▶

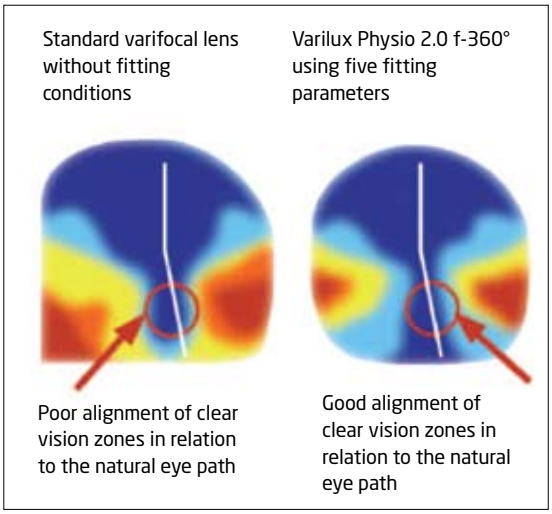

Figure 2 Contour plots showing area of clear vision

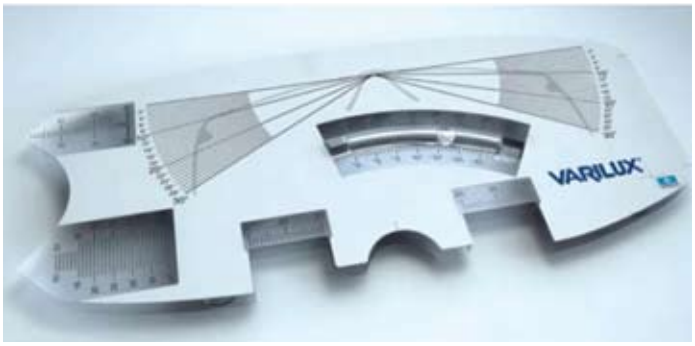

Figure 3 Universal measuring rule – watch out for postural error

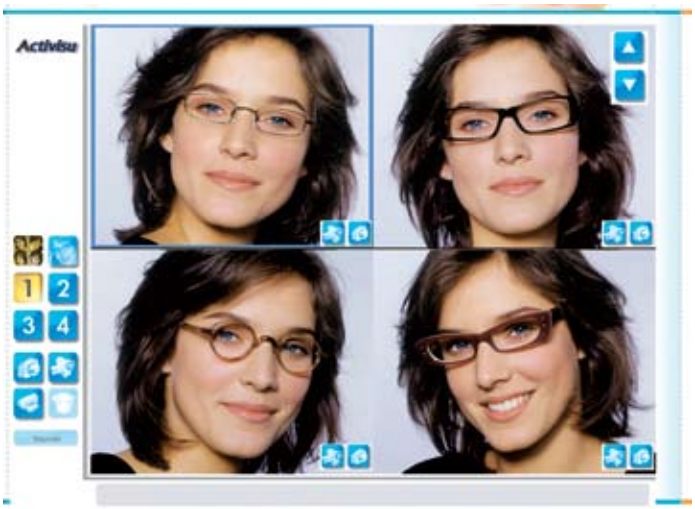

Figure 4 Frames may be viewed simultaneously

can be from either a vertical perspective (elevation) or horizontal (rotation, also known as head cape).

Experienced practitioners can often overcome potential inaccuracies by easing the patient into a more natural position. This is achieved by asking the patient to look at a distance target and to hold the position until the measurements have been taken.

Alternatively some practitioners will observe how the patient moves naturally and will have a feel for what the 'natural' head position is. Once the patient is observing the distant target the practitioner can confidently identify the natural posture before taking the measurements.

The importance of accurate measuring is paramount, as these measurements have a direct bearing on the accuracy of both the horizontal PD and vertical fitting heights. Through an Essilor Research Centre Study carried out in 2009 we know that head posture and gaze direction when looking straight ahead can vary dramatically between patients, uncovering an average wearer head cape when viewing a distant object of ±2.5° with some adopting significantly larger even up to 10°.

So this is one of the most significant advantages that an electronic measuring device can bring to any practice. Not that all patients automatically adopt their natural position before their measurements are taken, but none of the devices on the market are positioned at a close proximity to the patient so the likelihood does increase. Each device has a fixation target that can be matched to the patient's eye level which again will lead most wearers to their natural position.

A final very important benefit to the practitioner in relation to head position is that the patient can be viewed from a third-person perspective, allowing the practitioner to compare with their natural posture prior to being measured. Some electronic devices will go one step further by automatically highlighting the exact position of the patient's head while in front of the unit, elevation, rotation and in some cases inclination before the measurement is taken.

If you, as the practitioner, feel the head position does not represent the patient's natural position, either from your prior observations or from the automated reading displayed on the screen of the unit, you should ask the patient to move away from the unit then return until you are comfortable with the position.

In terms of visual performance and frame fit, several 'frame personalised lens designs' are available, all offering the wearer ever greater visual performance. Of course the more natural the head position that the patient adopts during the measurement process, the more accurate visual performance in everyday life with the subsequent lens.

Higher level personalisation

Looking at additional personalisation techniques the practitioner can consider the patient's lifestyle and prescribe a lens optimised to match the wearer's daily visual task requirement. Again electronic devices can assist this by taking the wearer through a questionnaire and assigning a calculation based on the results. This data is worked into the final lens.

For lenses that fall into the behavioural, wavefront or anatomical personalisation categories (as described below), electronic devices also facilitate dispensing.

Behavioural: the measurement of how much head rotation a patient adopts when observing their surroundings – a lens design can be uniquely tailored to respect this.

Wavefront: by combining both the subjective refraction with a wavefront measurement a patient's higher-order aberration requirements are additionally corrected. This wavefront measurement is taken using an aberrometer and this measurement is built into the final lens.

Anatomical: a patient's eye rotation centre (ERC) is pin-pointed in three dimensions (horizontal, vertical and a depth position) and is measured to the lens rear surface. Of course the only way to measure from the patient's ERC is by using an electronic device. Lenses are then calculated to include these additional parameters.

An opportunity exists for the practitioner to perfect the end-user's vision through any one or a combination of these techniques. Many will, however, require electronic instruments to measure the patient.

Frame selection

When it comes to spectacles, some wearers consider the frame to be equally as important or in some cases more important than the lenses. It's another key need the practitioner must fulfil, offering guidance around shape with particular focus on frame size as the horizontal A and vertical B measurements are significant not only for comfort but also critical in the final decision on lens design and material.

Many other parameters are also essential to consider when recommending the most appropriate frame, so of course electronic devices are in no way able to make the final decision as to the most appropriate frame.

So how can they help? Well, put simply, they can support the decision by offering the patient an opportunity to view the frame on their face in the third person. Currently, most patients can only do this by viewing their reflection in the mirror. However, a major benefit ▶

Figure 5 Two on-screen simulations courtesy of BIB

of some electronic dispensing devices is that they can record images of the patient wearing a selection of frames, and can display the images side by side simultaneously, allowing the patient to compare.

Some electronic devices go a stage further by offering video functionality. They can record a short video showing the frame on the face from any angle the wearer chooses – maybe they would like to view what the side arm detail looks like when on their face and compare with other frames (Figure 4).

Not all patients will want this functionality and it is possible to fulfil the basic needs using a simple digital camera. However, a high-tech digital dispensing system will not only offer the wearer the chance see their images in practice, but also allow the image to be added to a practice branded template and emailed to a friend should a second opinion be needed. An ideal solution when the patient is unsure of their choice.

Because images can be shown on a desktop digital device or exported from a stand-alone column unit directly to the dispensing desk, practitioners can discuss with their patients the most suitable frames and lens combinations. Viewing the options side by side on the screen can help with the decision.

Highlighting the benefits

Showing the benefits of any recommended optical solution is important to patients. Electronic dispensing devices offer a range of on-screen simulations with graphics designed to demonstrate the key advantages the latest designs, coatings and materials will deliver. The graphics are shown on the connected computer screen delivering an extremely clear view of the comparative options. This is a particularly useful tool for upselling additional product benefits (Figure 5).

Exporting information

Although not essential for digital dispensing devices, many practices will utilise the benefits of practice management software. Together there is great synergy, as patient information can be exported directly to practice software, offering significant benefits. These include:

- Automatically transferring patient measurements directly into an ordering system, reducing the chance of inaccurate translation from the unit to the order
- Reduction in the time taken to process the measurements into a final lens order
- The facility to set up patient records and store measurements and images. This is very useful file as it allows an overview of what has previously been dispensed for return appointments.

Conclusion

Of course some of the features highlighted in this article are available outside of digital dispensing devices; however, using one of these self-contained units will not only deliver a more technical look to the practice but more importantly facilitate the dispensing of the latest lens designs while offering support in frame selection. This article is an introduction. Later in the year I will be going through the dispensing process in detail in a follow-up article.

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MULTIPLE-CHOICE QUESTIONS – take part at opticianonline.net

1 Which of the following is eliminated by compensation for the pantoscopic angle?
A Refractive error
B On axis astigmatism
C Chromatic aberration
D Oblique astigmatism

2 What is head cape?
A An error in vertical alignment due to head moving downward
B Error due to the face of the patient looking upward
C Horizontal error due to head turn to the side
D A form of head wear

3 What is the average wearer head cape?
A 1 degree
B ± 2.5 degrees
C ± 5 degrees
D ± 10 degrees

4 Which of the following will measure from the eye's rotation centre?
A A PD rule
B A frame rule
C A pupillometer
D An electronic dispensing system

5 Which of the following is NOT measured by an electronic dispensing system?
A Pantoscopic angle
B Angle of bow
C Refractive index of lens
D Vertex distance

6 Which of the following might be described as a behavioural measure when dispensing?
A The position of the eye rotation centre
B The variation of eye and head movement when looking around
C The amount of coma in the image formed by the eye
D The interpupillary distance

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The deadline for responses is April 5 2012