There have now been many, often excellent, articles advocating the use of fundus viewing lenses, usually known as Volk lenses. Unfortunately, however, there still seems to be a general impression that Volk lenses are to be regarded as a special technique, unsuitable for more routine optometric work.

There has been considerable emphasis on the need for pupil dilation (eg ‘it is necessary to dilate with appropriate mydriatics’). However, there has been no discussion as to the effects of pupil size and this has led to the impression that Volk lenses will only work through a super-wide fixed dilated pupil. From various conversations with colleagues over the years this appears to be the major factor that has discouraged people from trying this technique.

In addition, the image that has been used in many previous articles is, to my mind, not very representative of the sort of view that is now usually possible. Again from conversations, it is clear that this has left the impression that the Volk view is not that much better than the view obtained with the standard direct ophthalmoscope.

Figure 1 is similar to that used in previous articles, apparently through a dilated pupil (implying that the illuminated slit is the actual view), while Figure 2 is an actual view through a dilated pupil – the whole image being the ‘slit section’.

The aim of this two-part series is to encourage the use of Volk lenses which can and should be used much more widely in routine optometric work.

With the extended range of Volk lenses that are now available, pupil dilation is not nearly as important as has been previously indicated. With practice this technique may be a viable alternative to direct ophthalmoscopy in routine examination (without pupil dilation). This is also a view which has been creeping into the literature: ‘Many practitioners find they can obtain an acceptable view of the central fundus using an indirect method in an undilated eye.’

Patient selection
In my practice this technique is now used on all patients, except where it is impossible or impractical to get the patient positioned correctly on the slit lamp (eg the very young and those with postural problems etc). No other selection is required.

If handled correctly it is surprising how well even quite young patients will manage. It goes without saying that you must be prepared to adapt your technique, put the child at ease, and if necessary demonstrate on a parent, favourite toy etc (Figure 3).

I was initially surprised how well tolerated this is by patients of all ages.
Although a few, slightly photophobic patients may find it excessively bright, this seems to be the only real complaint. With the correct technique, patients appear to prefer this method to direct ophthalmoscopy.

I initially wondered why and I suspect this is due to the extra working distance.

Something that is not usually considered in patient management is the concept of personal space. People are effectively surrounded by an ‘area of space’ and feel uncomfortable if someone encroaches on this. It is interesting that this distance can be decreased if there is a suitable barrier between people. The slit lamp meets this criterion while the distance employed by the direct ophthalmoscope is so close that, for an adult, it is the region where it is normally only experienced in very intimate situations2 (Figure 4). We examine so frequently that we become fairly immune to this, but it is hardly surprising that it remains uncomfortable for patients, even if they are not directly conscious of why.

Anyone who doubts the validity of this only has to look at a queue of people in which each person is separated by their own comfortable space (Figure 5). Being aware of this sort of unspoken social interaction can make patients’ visits less stressful. This is true for any procedure, not just ophthalmoscopy. Try not to stray within this ‘personal space’ and when necessary do so for as short a time as possible. Where possible keep some form of ‘barrier’ between you and your patient (Figure 6).

It is outside the scope of this article to go into greater depth but it is an interesting area worthy of further reading.

**How the lens works (Figure 7)**

Light from the slit lamp (A) passes through the Volk lens and enters the patient’s eye, illuminating the fundus. The illuminated fundus represents the object (B). Light emerging from the eye is focused by the lens, forming an aerial image (C). It is this image that is viewed by the slit lamp.

The Volk lens is a positive lens and the aerial image is therefore inverted and laterally reversed and is located between the back of the lens and the slit lamp. Its exact location depends on the lens used.

In some articles a lot of emphasis has been placed on the fact the image is laterally reversed and inverted. I suspect this is more problematic if you only use this occasionally, particularly if you are likely also to view the area by a direct method. My own preference is to clearly record how the image was obtained and record it ‘as seen’. As I am
using the same method for virtually all my patients I would rather my record reflects the view I am seeing as this makes it easier to compare images. If you correct your view for the lateral reversal and inversion then the next time you see the patient you need to ‘uncorrect’ this to compare with the current view.

For the same reason when taking photographs through the Volk lens I usually leave them ‘as viewed’. I can see that if you are used to a direct view and you are only using the Volk as a ‘one off’ it may then make sense to convert the view. This can easily be done by turning the record upside down before recording. When doing this I record ‘Volk – corrected view’. This should stop future confusion.

With photographs it is easy to correct the image with any basic image software (including ‘Paint’ – included with Windows) and is no more complicated than a couple of mouse clicks (Figure 8). If (A) is the initial Volk image, flipping the image vertically and then horizontally gives the ‘correct view’ (C). Alternatively the image could also be rotated – rotating the page illustrates this.

**Magnification**

The magnifications quoted for the various lenses do not take into account the optics of the slit lamp (which obviously vary) and relate to the magnification of the image formed by the Volk lens. While this is useful to compare the technical data between lens types, the view that is actually obtained depends also on the optics and magnification of the slit lamp that you use.

**Volk lenses – lens choice**

Magnification is only part of the information necessary when selecting a lens. It is also important that there is an ‘adequate’ field of view (Table 1).

A complete range of lenses would be the ideal solution. This would obviously be a somewhat expensive option. The choice of a single lens depends very much on personal preference. Initially there may be a tendency to choose a lens which gives the view closest to that of the familiar direct ophthalmoscope (ie larger magnification but smaller field), but this initial impression may be misleading. I would advise trying several lenses for a week or so before actually buying (several suppliers have allowed me to do this in the past).

As with most optical systems, generally the more magnification obtained the smaller the field of view. The exception to this appears to be the 90D lens which has a smaller field than the 78D and Super 66 and appears to have no advantage over the more recent SuperField NC.

The larger magnifications are obtained with the weaker lenses (ie closest to the direct view). However, these are the most difficult to use on small pupils and are the least likely to give a binocular view without dilation.

The 90D SuperField and SuperPupil are all capable of binocular views through normal sized undilated pupils. I can usually obtain a reasonable view with the 90D and SuperField through a miotic pupil; however, the view may then be monocular.

The SuperPupil is designed to work through miotic pupils. Many people find it does not give enough magnification for general use, but it is a useful lens for problem cases – small pupils

<table>
<thead>
<tr>
<th>Lens</th>
<th>Field of view static (degree)</th>
<th>Field of view dynamic (degree)</th>
<th>Image magnification - X</th>
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</thead>
<tbody>
<tr>
<td>60D</td>
<td>68</td>
<td>81</td>
<td>1.15</td>
</tr>
<tr>
<td>Super 66</td>
<td>89</td>
<td>96</td>
<td>1.0</td>
</tr>
<tr>
<td>78D</td>
<td>81</td>
<td>97</td>
<td>0.93</td>
</tr>
<tr>
<td>90D</td>
<td>74</td>
<td>89</td>
<td>0.76</td>
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<tr>
<td>SuperField NC</td>
<td>95</td>
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<td>0.76</td>
</tr>
<tr>
<td>Super VitreoFundus</td>
<td>103</td>
<td>124</td>
<td>0.57</td>
</tr>
<tr>
<td>SuperPupilXL</td>
<td>103</td>
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<td>0.45</td>
</tr>
</tbody>
</table>
where dilation may not be possible or advisable. It also has the largest field of view in this class of lens.

The SuperField has the advantage of the same magnification as the 90D but a significantly wider field of vision and has the widest range of supplementary lenses/attachments that further enhance its flexibility.

These include:
- Minus power non-contact adaptor. This simply clips onto the SuperField giving a field and magnification that is similar to the 78D lens
- Plus power non-contact adaptor. When fitted this gives a field and magnification similar to the Super VitreoFundus Lens
- Retinal scale. This allows comparative measurements and is graduated in 1/10mm. This is positioned in the plane of the aerial image and is therefore seen overlying the retinal image (Figure 12).
- Yellow filter. This produces a sharp cut off at 490nm ‘completely overlying the retinal image (Figure 12).
- Lid lens adaptor. This rests on the external eyelid ‘providing exact lens positioning, lens stability and eyelid control’.

The contact modes give very good images as they remove corneal reflexes; however, they are not really suitable for routine examination. They are used in a similar manner to a gonio lens and as with any contact method are not tolerated as well by patients.

There are also the usual disinfection procedures (made more difficult with CJD disinfection guidelines).

The non-contact adaptors work well. I find the 78 adaptor useful. It is easy to fit and remove and is cheaper than acquiring a separate lens.

The retinal scale is very difficult to use to the degree of accuracy marked. First it needs to be positioned over the ‘target structure’ in the correct orientation. Any movement of your hand or the patient’s eye makes accurate measurement difficult. Because the scale is in the aerial image plane, any marks, dust particles etc are particularly troublesome. It does work well if you photograph the image when most of the above problems no longer apply – ie measurements are possible as long as the scale and ‘target structure’ are visible in the same image.

The yellow filter is useful if you are concerned about the risk of light exposure to the retina. It is also possible to obtain the Volk lens with this filter incorporated. However, as I find it interferes with assessing disc colour I prefer the removable version. This filter is probably a good idea if you are doing prolonged examinations, especially through dilated pupils.

The lid lens adaptor may be worth trying if you are having difficulty mastering the technique. I personally did not find it of any benefit; however, I had been using the lenses regularly for several years when I tried it.

In addition to the optics, the ‘feel’ of the lens can be important. I find the 90D rather small and fiddly for prolonged use, while the SuperField is ‘a more comfortable size’. I currently use the SuperField (most of the time). I have the 78 adaptor for the SuperField when more magnification is required, and the SuperPupil for very small pupils etc. I find this covers most eventualities.

If I were to choose a single lens it would be the SuperField. It has adequate magnification coupled with a very wide field and works through all but the smallest of pupils. As already mentioned, it has by far the widest range of supplementary attachments, further enhancing its capabilities.

The Super 66 is increasingly being used in clinics where it is routine to measure disc size, as it is useful in determining whether a disc is glaucomatous or not. By lining up the height of the slit to exactly match the vertical diameter of the disc when viewed through the Super 66 lens, the height of the slit is the same as the height of the disc in millimetres without the need for any conversion factor.

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**MULTIPLE-CHOICE QUESTIONS** - take part at opticianonline.net

1. Which of the following is true about the use of fundus viewing lenses?
   - The image is inverted vertically but not laterally
   - The image is formed between the patient’s eye and the lens
   - The image is not useful without slit-lamp magnification
   - The image formed is in focus when the slit lamp is focused upon the patient’s retina

2. Which of the following is easiest to use to measure the height of an optic disc?
   - SuperPupil
   - SuperField
   - Super66
   - 90D

3. Which of the following is best to use in an elderly miosed patient not responding to dilation?
   - SuperPupil
   - SuperField
   - Super66
   - 90D

4. Which of the following lenses gives the best retinal view of a diabetic with multifocal lesions that are best interpreted in one view?
   - SuperPupil
   - SuperField
   - Super66
   - 90D

5. Which of the following lenses has the smallest image magnification factor?
   - SuperPupil
   - SuperField
   - Super66
   - 90D

6. Which of the following is an advantage of a contact fundus viewing lens?
   - No corneal reflections to detract from the view
   - Easier and quicker to use than non-contact approach
   - Patients prefer them to other methods
   - There is no longer a requirement to sterilise after each use

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Successful participation in this module counts as one credit towards the GOC CET scheme administered by Vantage and one towards the Association of Optometrists' Ireland's scheme. The deadline for responses is February 24 2011.