Progressive Lens Troubleshooting

Overview

- The Prescription
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  - Near Rx Verification
- The Fit
  - Measurements
    - Pupillary Distance
    - Height
  - The Adjustment
    - Vertex Distance
    - Pantoscopic Tilt/Faceform
- The Design

Troubleshooting

You’re facing a patient who cannot see through his new $780 eyewear...

...time for a little troubleshooting!
Troubleshooting
The patient complains “I can’t see…”

“Are you having difficulty with near vision, distance vision, or both?”

The patient responds “Both…”

The Prescription
Verify that the lenses are accurate with respect to the order...
- Distance Vision
- Sphere
- Cylinder
- Axis
- Prism
- Near Vision
Although a lot of “focus” is placed on the PAL’s ADD... 

...the distance Rx is where it all starts - and so should you!

The distance portion of the lens acts as a “carrier” similar to a SV lens... 

...if parallel light isn’t being focused on the retina, distance and near vision will be disrupted.

The ADD power is only used to bring divergent light from near objects to parallel... 

...one method to ascertain if the distance Rx is accurate is known as the DuoChrome test.
The Prescription

The **DuoChrome** test works because all colors do not refract equally...

...**yellow** light falls in the middle of the spectrum of visible light, and is focused on the retina...

...however, **red** light is refracted to a lesser degree, focusing slightly behind yellow objects...

...**green** is focused in front of yellow...
An optimal refraction will result in a prescription which centrally focuses the spectrum on the retina. Since white is a combination of all colors, Snellen charts use black letters on a white background.

Red is focused about the same distance behind yellow as green is focused in front of yellow, so black letters on red & green backgrounds will appear equally "out" of focus when viewed side by side.

If letters on the green side of the line are “crisper,” the prescribed lens may be overly minus powered...
If the red side of the line is “crisper,” the lens may not provide enough minus power…

The patient complains “I can’t see…”

“Are you having difficulty with near vision, distance vision, or both?”

The patient responds “Just near…”

The patient is telling you the distance is “okay…”

...so verify the ADD power is appropriate!
The Prescription

The DuoChrome can be used for near vision as well...

...another method is measuring the distance at which near vision is possible for the patient.

The Prescription

Ideal = 10″ (25cm)
ADD weak >12″ (30cm)
ADD strong <8″ (20cm)

Place the reading Rx (dist + ADD) in a trial frame and ask the patient to pull the reading card closer until the smallest line becomes impossible to read...

The Prescription

If both the distance and near Rx are verified to be appropriate...

...the prescription can be eliminated and the fit should be evaluated.
The Fit

Areas to investigate...
- Measurements
- Monocular PDs
- Fitting Height
- Vertex Distance
- Pantoscopic / Face Form

The Fit

Most PAL “non-adapts” (and patient complaints) are caused by inaccurate measurements...
Placement of the Fitting Reference Point (FRP) is crucial to the visual comfort and function of a PAL...

...with very few exceptions, the FRP should be placed at the corneal reflex.

A Corneal Reflection Pupilometer (CRP) is the indispensable tool for fitting PALs...

...that said, even measurements taken with a CRP may be inaccurate.

Align a remarking tape with the PAL identification marks and verify that the FRP is central pupil....
Horizontal measurement errors usually cause specific and readily identifiable complaints...

...this fit will require the patient to turn the head to the left to gain clarity at intermediate and near.
The Fit
Horizontal measurement errors usually cause specific and readily identifiable complaints...

...this fit will produce intermittent clarity in each eye depending upon head position.

The Fit
Other fit problems can mimic horizontal errors...

...axis errors can require the patient to turn the head even with correct FRP placement- especially for near.

The Fit
Vertical measurement errors are readily identifiable as well...

...in higher ADD powers, a high fit will require the patient to tilt the head down for clarity in distance.
Vertical measurement errors are readily identifiable as well...

...in lower ADD powers, a high fit may simply produce the sensation of a “narrow field” during distance vision.*

...a low fit will reduce near vision and narrow the field in intermediate and near vision.

...one high lens will cause clarity at different focal lengths for each eye and will affect zone width.
The Adjustment

If the Rx and measurements have been verified, move on to an analysis of the adjustment...

...adjustment affects the height of the FRP, as well as the optical axis of the lens.

The Adjustment

The optical axis of the lens is a line perpendicular to the surfaces of the lens...

...ideally, it should pass through the center of rotation of the eye.
Most fits require about 8-12º of pantoscopic tilt to achieve this...

...2º of pantoscopic tilt is required for each mm of decentration

...the optical axis of this lens is 5mm lower than the visual axis- requiring 10º panto tilt

Incorrect pantoscopic tilt creates unwanted astigmatism throughout the lens...

+2º tilt = -1mm height
-2º tilt = +1mm height

...the tilt also affects the perceived height of the progression

Average Tilt should be around +8º
The Adjustment

Faceform (or "wrap") also determines the relationship of optical and visual axes...

...most frames have a slight amount of "positive" wrap and should average about +7°

The Adjustment

Although wrap does move the optical axis, it also brings the lens periphery closer...

...if the measurements are accurate, increasing wrap may widen the distance field

The Adjustment

Negative wrap should always be avoided...

...frames with negative wrap give the sensation of extremely narrow fields
The Adjustment

Vertex distance should be kept as short as possible...

...a vertex distance of "0mm" eliminates all optical aberrations- get as close as possible!

The Adjustment

Longer vertex distances also narrow perception of fields...

...decreasing VD reduces the area of the lens traversed during eye movements

The Adjustment

Plastic frames usually have small Vertex Distances and are minimally adjustable...

...metal frames are very adjustable

Vertex Distances should be between 12-14mm
Troubleshooting

Verify/adjust in this order...
- Order Accuracy
- Rx Accuracy
  - Distance Rx
  - Near Rx
- Fitting Measurements
  - Monocular PDs
  - Fitting Heights
- Frame Adjustment
  - Pantoscopic Tilt
  - Vertex Distance

If difficulty persist, consider the PAL design...
- Did I choose the right lens for their visual needs?
- Type of Design
  - Design Characteristics
    - Soft vs. Hard
    - Sphere Slopes
    - Zone widths
  - Channel Designed or Global Designed
  - Personalized or Customized
  - Progression Length