



PRESCRIBING SPECTACLES FOR ASTIGMATISM

THINK

You do a refraction on a 25 year old woman and discover she has high astigmatism. She tells you that she wore spectacles when she was a small girl, but when they broke she was unable to get them replaced. She is hoping that you will be able to give her spectacles so she can see well again.

You know that people with astigmatism often have difficulty adjusting to their new spectacles. You know that this woman will probably feel uncomfortable if you prescribe her full prescription, so you decide to modify it to make her feel more comfortable. But how do you do this?

AIM

This unit explains how to prescribe astigmatic lenses for a person with astigmatism, so that they can have clear and comfortable vision.

LEARNING OUTCOMES

When you have completed this unit you should be able to:

- modify the cylinder power to make an astigmatic correction more comfortable for a person
- modify the cylinder axis to make an astigmatic correction more comfortable for a person.

REVIEW: PRESCRIBING SPECTACLES FOR ASTIGMATISM


ASTIGMATISM	<p>Definition of astigmatism:</p> <ul style="list-style-type: none"> The light from an object does not focus evenly at one point in an eye with astigmatism. Astigmatism may occur just by itself, or in an eye which also has another type of refractive error. <p>Causes of astigmatism:</p> <ul style="list-style-type: none"> An astigmatic eye does not have the same curvature in all meridians (directions). It is helpful to imagine the corneal surface of an eye with astigmatism to be shaped like the surface of a rugby ball or an egg (this is called a toric surface) – even though if you look at the eye of a person with astigmatism it will seem round. There are two principal meridians in an astigmatic eye and these meridians are perpendicular to each other. <p>Accommodation and astigmatism:</p> <ul style="list-style-type: none"> If the amount of accommodation is small and the person is young, the eye can accommodate to make the vision clearer. This can cause asthenopia and/or headaches. <p>Symptoms of astigmatism:</p> <ul style="list-style-type: none"> Distance and near vision may be blurred. Vision may be clear but the person may have asthenopia or headaches – especially in young people with only a small amount of astigmatism. <p>Correction for astigmatism:</p> <ul style="list-style-type: none"> Corrected with astigmatic lenses. Astigmatic lenses can be cylindrical or sphero-cylindrical. Cylindrical lenses correct eyes with only astigmatism. Sphero-cylindrical lenses correct eyes with astigmatism and another refractive error. The axis of an astigmatic lens must be correct in front of the eye to give clear vision – especially for high powered astigmatic lenses. It is often difficult for people with astigmatism to get used to wearing their new spectacles. Usually a person will adapt to their new glasses within 2 weeks. Sometimes it is better to give a newly-diagnosed astigmat only a partial correction to help them adapt.
REFRACTION CHECK	<ul style="list-style-type: none"> When you have finished your refraction, you need to double check your results. <ul style="list-style-type: none"> → is the person's vision clear and comfortable? Show the person the limitations of their new spectacles <ul style="list-style-type: none"> → perhaps distance vision is clear but near vision is blurry → perhaps near vision is clear but distance vision is blurry.
BEFORE YOU PRESCRIBE	<ul style="list-style-type: none"> Some conditions and medication can cause a person's refraction to change. These include: <ul style="list-style-type: none"> – people with diabetes – women who are pregnant – people taking some medications (including some anti-depressants, anti-psychotics and steroids).
PRESCRIBING SPECTACLES	<ul style="list-style-type: none"> Always tell people that new spectacles take time to get used to <ul style="list-style-type: none"> → Allow 2 weeks for adaptation → Tell the person to come back after 2 weeks if they are still having difficulties with their new spectacles.

PRESCRIBING SPECTACLES FOR ASTIGMATISM

Spectacles that have astigmatic lenses are more difficult for people to adapt to than spectacles that only have spherical lenses. For this reason you must be especially careful when choosing which lenses to prescribe for a person who has astigmatism.

How well a person will adapt to their astigmatic lenses depends on the:

- cylindrical power → high powers are more difficult to adapt to
- cylindrical axis → oblique axes are more difficult to adapt to
- person's previous spectacles
- person's sensitivity.

CYLINDER POWER	<p>Depending on a person's previous spectacles and sensitivity, you can prescribe:</p> <ul style="list-style-type: none"> • their full astigmatic correction • no astigmatic correction • a partial astigmatic correction.
CYLINDER AXIS	<p>Depending on a person's previous spectacles and sensitivity, you can prescribe the cylindrical power at:</p> <ul style="list-style-type: none"> • its exact axis • a modified axis. <div data-bbox="459 1023 1519 1135">  <p>Sometimes you will need to modify the cylinder power, the cylinder axis, or both, in order to make the person's vision comfortable.</p> </div>

CYLINDER POWER

PRESCRIBING THE FULL ASTIGMATIC CORRECTION

- The full astigmatic correction is the total cylindrical or sphero-cylindrical power that you found during your sphero-cylindrical refraction.
 - Prescribing the full astigmatic correction will give the person the clearest vision possible – but it will not always be comfortable for the person.
- A full astigmatic correction can be prescribed for a person who:
- has previously worn spectacles with the same amount of cylindrical power
 - has previously worn spectacles with cylindrical power that is less than 1.00 DC different from their current refraction
 - has never worn spectacles before, but has less than 1.00 DC astigmatism
 - is comfortable wearing the full astigmatic correction when they walk around and try it in the trial frame
 - make sure you let them look at different things at different distances and give them enough time to decide
 - you believe will adapt to their new spectacle prescription.



Let the person wear the trial frame and look at different things.

Encourage the person to:

- walk around your refraction clinic: look at the floor, walls and ceiling
- look outside your refraction clinic: look at the street, the people, the horizon and the sky.

Ask the person if they feel comfortable wearing these lenses:

- Do the walls and ceiling look smooth and straight? Or do they look like they are curved or on an angle?
- Does the floor look flat? Or does it look like it is sloping?
- Does the street outside seem regular? Or does it look strange?

PRESCRIBING NO ASTIGMATIC CORRECTION

Sometimes you will prescribe spherical lenses only for a person – even though they have astigmatism. This may be because:

- the person only has a small amount of astigmatism
- you do not have astigmatic lenses to give the person
- you wish to prescribe or the person may want readymade spectacles (readymade spectacles come with spherical lenses only)
- the person has had problems adapting to even small amounts of cylindrical power in the past.


If you choose to prescribe spherical lenses only:

- Only the person's myopia or hyperopia will be corrected
 - astigmatism cannot be corrected by spherical lenses
 - astigmatism can only be corrected by astigmatic lenses (cylindrical or sphero-cylindrical lenses).
- The person's visual acuity (VA) will probably not be as good as it would be with their full astigmatic correction.

If you decide to prescribe no astigmatic correction, you must:

- convert your refraction to an equivalent sphere
- prescribe the equivalent sphere.

CYLINDER POWER (cont.)

CALCULATING EQUIVALENT SPHERE	<p>To calculate the equivalent sphere you must add half the power of the cylinder to the power of the sphere:</p> <p style="text-align: center;">Equivalent Sphere = Power of Sphere + $\frac{1}{2}$ Power of Cylinder</p>
EXAMPLES	<ul style="list-style-type: none"> Refraction is +3.00 / -1.00 x 90 Equivalent sphere = +3.00 + ($\frac{1}{2}$ x -1.00) = +2.50 D sphere Refraction is -2.00 / -2.00 x 135 Equivalent sphere = -2.00 + ($\frac{1}{2}$ x -2.00) = -3.00 D sphere Refraction is +0.75 / -1.50 x 155 Equivalent sphere = +0.75 + ($\frac{1}{2}$ x -1.50) = plano Refraction is -0.50 / -0.75 x 180 Equivalent sphere = -0.50 + ($\frac{1}{2}$ x -0.75) = -0.50 - 0.375 → round down to less minus = -0.50 - 0.25 = -0.75 D sphere. <div data-bbox="459 1019 1517 1317" style="border: 1px solid black; padding: 10px; margin-top: 20px;">  <p>BE CAREFUL!</p> <p>If the person has previously worn a full astigmatic correction and you decide not to give them any astigmatic correction:</p> <ul style="list-style-type: none"> → they may feel uncomfortable in their new spectacles → they may have problems adapting to their new spectacles. <p>Always trial frame the prescription you want to give the person first!</p> </div>
PRESCRIBING A PARTIAL ASTIGMATIC CORRECTION	<p>Sometimes you will prescribe a partial astigmatic correction for a person – instead of their full correction. This may be because:</p> <ul style="list-style-type: none"> you are concerned that the person will not adapt to their full refraction you want to give them some of their astigmatic correction to improve their vision. <p>If you choose to prescribe only a partial correction:</p> <ul style="list-style-type: none"> only some of the person's astigmatism will be corrected the person's VA will probably be <ul style="list-style-type: none"> → worse than their VA with their full astigmatic correction → better than their VA with no astigmatic correction. <p>If you choose to prescribe only a partial correction you must:</p> <ul style="list-style-type: none"> convert the cylinder amount that you do not prescribe into an equivalent sphere add this equivalent sphere to the spherical part of your prescription=/*

CYLINDER POWER (cont.)

EXAMPLES

- **Refraction is +4.00 / -3.00 x 90**
 - You decide to only prescribe -1.00 DC of the cylindrical power
 - This leaves -2.00 DC that you must convert to an equivalent sphere.
$$\begin{aligned}\text{Equivalent sphere of } -2.00 \text{ DC} &= \frac{1}{2} \times -2.00 \\ &= -1.00 \text{ D}\end{aligned}$$

Add the equivalent sphere to the spherical part of your prescription:
 $+4.00 + -1.00 = +3.00$

Your partial correction is: +3.00 / -1.00 x 90
- **Refraction is -2.50 / -2.50 x 45**
 - You decide to only prescribe -1.50 DC of the cylindrical power
 - This leaves -1.00 DC that you must convert to an equivalent sphere.
$$\begin{aligned}\text{Equivalent sphere of } -1.00 \text{ DC} &= \frac{1}{2} \times -1.00 \\ &= -0.50 \text{ D}\end{aligned}$$

Add the equivalent sphere to the spherical part of your prescription:
 $-2.50 + -0.50 = -3.00$

Your partial correction is: -3.00 / -1.50 x 45
- **Refraction is +1.25 / -3.50 x 180**
 - You decide to only prescribe -1.00 DC of the cylindrical power
 - This leaves -2.50 DC that you must convert to an equivalent sphere.
$$\begin{aligned}\text{Equivalent sphere of } -2.50 \text{ DC} &= \frac{1}{2} \times -2.50 \\ &= -1.25 \text{ D}\end{aligned}$$

Add the equivalent sphere to the spherical part of your prescription:
 $+1.25 + -1.25 = \text{plano}$

Your partial correction is: plano / -1.00 x 180
- **Refraction is +3.25 / -2.25 x 60**
 - You decide to only prescribe -1.00 DC of the cylindrical power
 - This leaves -1.25 DC that you must convert to an equivalent sphere.
$$\begin{aligned}\text{Equivalent sphere of } -1.25 \text{ DC} &= \frac{1}{2} \times -1.25 \\ &= -0.62 \\ &\rightarrow \text{round down to less minus} \\ &= -0.50\end{aligned}$$

Add the equivalent sphere to the spherical part of your prescription:
 $+3.25 + -0.50 = +2.75$

Your partial correction is: +2.75 / -1.00 x 60



If you prescribe a partial correction tell the person that:

- you are giving them a weaker version of their full correction so that it will be easier for them to get used to their new spectacles
- next time they need new spectacles you will be able to give them more (or all) of their full correction
- their partial correction is like a stepping stone to their full correction.

Show the person their partial correction in the trial frame to make sure that the person:


- feels comfortable with the lenses
- is happy with the vision they get with the lenses.

CYLINDER AXIS

Astigmatic lenses that are at an oblique axis are more difficult for people to adapt to than astigmatic lenses that have a vertical or horizontal axis.

→ an oblique axis is an axis that is at an angle (not at 90° or 180°).

Depending on the person's previous spectacles and sensitivity, you may choose to rotate an oblique axis so that it is closer to 90° or 180° .

<p>PRESCRIBING A CYLINDER AT ITS EXACT AXIS</p>	<p>This will give the person the clearest vision, but if the person's exact axis is at an oblique angle they may have difficulty adapting to it.</p> <p>A cylinder can be prescribed at its exact axis if:</p> <ul style="list-style-type: none"> the person is comfortable wearing the lenses in a trial frame the cylinder axis of the person's previous spectacles was also at (or close to) this axis.
<p>PRESCRIBING A CYLINDER AT A MODIFIED AXIS</p>	<ul style="list-style-type: none"> If the cylinder lens is rotated away from its exact axis the vision will not be as clear – but it may be necessary to help a person feel more comfortable wearing their spectacle lenses. The amount that you choose to rotate the axis will need to be a compromise between vision and comfort: <ul style="list-style-type: none"> → the more you rotate the cylinder away from the exact axis, the worse the vision will be → most people will feel more comfortable if the axis is rotated towards 90° or 180° (whichever is closest). <div data-bbox="459 1189 1519 1357">  <p>Cylinders with a low power can be rotated more than cylinders with a high power, whilst still maintaining good vision.</p> <p>Usually we do not rotate the axis of the cylinder more than 20 to 30 degrees – even for low cylinder powers.</p> </div>

SUMMARY: PRESCRIBING SPECTACLES FOR ASTIGMATISM

- Spectacles that have astigmatic lenses are more difficult for people to adapt to than spectacles that only have spherical lenses.
- A person will have more difficulty adapting to a spectacle lens that has a high cylinder power and an oblique axis of astigmatism, especially if they have not had a similar astigmatic prescription before.

CYLINDER POWER

Prescribing the full astigmatic correction:

- Will give the clearest vision possible – but it will not always be comfortable for the person.

Prescribing no astigmatic correction:

- Can make the person feel more comfortable, but the vision will not be as good.
- If you decide to prescribe no astigmatic correction you must prescribe the equivalent sphere of the spherocylindrical refraction.

$$\text{Equivalent Sphere} = \text{Power of Sphere} + \frac{1}{2} \text{Power of Cylinder}$$

Prescribing a partial astigmatic correction:

- Prescribing a partial astigmatic correction is a compromise between making the person feel comfortable and giving them good vision.
- If you decide to prescribe a partial astigmatic correction you must:
 - convert the cylinder that is not prescribed into an equivalent sphere
 - add this equivalent sphere to the spherical part of your prescription.

CYLINDER AXIS

- Astigmatic lenses at an oblique axis are more difficult to adapt to than those at 90° or 180°.

Prescribing a cylinder at its exact axis:

- Will give the best vision, but if the person's exact axis is at an oblique angle they may have difficulty adapting to it, especially if they have not worn an astigmatic prescription like this before.

Prescribing a cylinder at a modified axis:

- If the cylinder lens is rotated away from its exact axis the vision will not be as clear – but it may be necessary to help a person feel more comfortable wearing their spectacle lenses.
- Most people will feel more comfortable if the axis is rotated towards 90° or 180° (whichever is closest).

TEST YOURSELF QUESTIONS

1. Which astigmatic corrections are the most difficult for people to adapt to?

2. When can you prescribe the full astigmatic correction for a person?

3. When should you prescribe a partial astigmatic correction for a person?

4. You refract a person and find that his refractive error is: R $+3.50 / -2.00 \times 180$ L $+3.75 / -2.50 \times 180$
Because he has never had astigmatic lenses before, you decide to only prescribe -1.00 DC of the cylindrical power for both eyes. What is your final prescription for this person?

5. A person's refraction is: R $-1.00 / -1.25 \times 160$ L $-1.25 / -1.50 \times 20$
This person has never worn spectacles before, so you decide to rotate the axis of the cylinder lenses to make the prescription more comfortable for the person to wear. Do you rotate the lenses towards 90° or 180° ? Why?

6. It is always important to allow a person to try your final prescription by wearing the lenses in a trial frame. What activities should you ask the person to do while wearing the trial frame? What should you ask them to pay attention to?



NOTES