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Our ability to see and to understand what we see is a very complex process involving not just the eyes but many parts of the brain as well. It is estimated that over 40% of our brain is devoted to visual function. So it is not surprising that a large proportion of people who suffer a brain injury will have visual problems of one sort or another. Yet many people are unaware of the nature of vision loss associated with brain injury and what assistance can be provided to alleviate the problems that this significant vision loss can cause.

This booklet is designed to provide information about vision deficits associated with a brain injury. It describes how messages from our eyes are processed by the brain and how injury to parts of the brain can affect the vision.

It will also explain how to identify signs and symptoms of neurological vision loss as well as treatment options and support services available.
How we see

The eye works very much like a video camera. The lens system at the front of the eye works in exactly the same way as the lens of a camera to focus the image on the lining at the back of the eye (the retina) which, in principle, is very much like the film in a camera or the detection system inside a video camera.

The optic nerve is like the video cable that sends the signals to the back of the brain which then combines the images from the two eyes and interprets the images.

The pictures formed by each of the two eyes are slightly different and the two pictures are passed as electrical signals along nerves from each eye into the brain. The two nerves combine together in a cross (called the chiasm) in such a way that the picture seen on the right by both eyes is passed to the left side of the brain and the picture seen on the left side is passed to the right side of the brain.

Thus if you have damage to one side of the brain this can result in the loss of half the vision as seen through both eyes. The medical term for this vision loss is a homonymous hemianopia meaning the same half of the visual field.

Homonymous hemianopias are diagnosed with visual field testing. The patient is asked to look directly at a target in front of them while responding to visual stimuli above, below, right and left of the target. The figure on the left shows a normal visual field printout for each eye as if the person is looking at it. In the diagram the dark areas are what the individual cannot see. There is a blind spot in each eye towards the outer corner, which is where the optic nerve enters the eye ball. In the figure on the right, there is a right homonymous hemianopia where the person is not able to see the right half out of each eye as a result of a left sided brain injury.

Normal Vision

Right Homonymous Hemianopia

Left Eye

Right Eye

Left Eye

Right Eye
What can cause damage to the brain

The most common cause of acquired brain injury affecting vision is a stroke or trauma to the head.

In Australia each year:
- Over 27,000 Australians are hospitalised with traumatic brain injury
- Over 52,000 with a diagnosis of stroke
- Over 15,000 with other non-traumatic Acquired Brain Injury.

Up to 30% of people who have a stroke or traumatic brain injury have an associated vision impairment. Homonymous hemianopia may be caused by any disorder that affects the brain, the most common cause being stroke but can also include tumours, trauma, inflammation and infections.
It is difficult to explain a homonymous hemianopia. Affected people often “feel like” the problem is in the one eye when they have a homonymous hemianopia, but checking each eye by itself shows that half the side of each eye is not seeing. The pictures below illustrate what an individual with a homonymous hemianopia sees compared to an individual with normal vision.

In many cases, despite these significant changes to how much someone is seeing, these losses may not be obvious to the person. The person can express surprise and annoyance that people keep bumping into them on one side or they fail to notice that there is still food on half of their plate.

They may be at risk of serious injury when attempting to cross roads as they are not aware of cars moving towards them from their affected side. In addition, people affected by homonymous hemianopia can also have problems with everyday activities such as finding objects, dressing themselves and reading.

The symptom check list shows signs that may be linked to the presence of neurological vision impairment and warrants further investigation by an Ophthalmologist (eye specialist).

Reading has its own special set of difficulties. People with a left homonymous hemianopia often have difficulty finding the next line when they finish one line and try to move their eyes back to the start of the line. Since we read from left to right, people with a right homonymous hemianopia often have difficulty shifting their vision from one word to the next and may miss the end of the word or the end of the line. This makes reading slow and frustrating.

Symptoms of vision loss as a result of brain injury

Reading has its own special set of difficulties. People with a left homonymous hemianopia often have difficulty finding the next line when they finish one line and try to move their eyes back to the start of the line. Since we read from left to right, people with a right homonymous hemianopia often have difficulty shifting their vision from one word to the next and may miss the end of the word or the end of the line. This makes reading slow and frustrating.
For example, read the text in the box on the previous page which demonstrates what an individual with homonymous hemianopia may see. Try to make sense of the paragraph. The presence of these symptoms can lead a person to become confused and result in a loss of confidence in their ability to carry out tasks.

A visual field defect may be suspected at the initial diagnosis of a brain injury when the doctor screens the patient by asking if he/she sees the object in the four quadrants of each eye. A complete evaluation of the visual system should be done by an Ophthalmologist to determine the nature of the vision deficits. The visual field defect, i.e. the area that a person is not seeing, can be mapped out accurately manually or with an automated visual field test (see diagram in ‘How we see’ section). The Ophthalmologist may work with a Neurologist who requests a Magnetic Resonance Imaging (MRI) to diagnose the location and cause of the brain injury.

Symptom check list

- An inability to see on one side
- Bumping into objects or people on one side
- Difficulty locating objects which are obvious to others
- Ignoring food on one side of a plate, or shaving one side of the face or applying make-up to only one side of the face
- Seeing double or objects appearing to be hazy or blurred
- Difficulty moving through crowded areas
- Suffering from increased glare sensitivity or difficulty making out detail in dimly lit situations
- Getting lost in familiar environments
- Difficulty in recognising objects or faces
- Changes in ability to read or in the appearance of print.

Diagnosis
Homonymous hemianopias may resolve in the first couple of months after the stroke or injury. However, there is no medical treatment available to restore the individual’s vision. An awareness or understanding of the vision problem is essential for the person to be able to adopt helpful strategies. It is important to stress to a person that corrective glasses will not change the visual field defect. **Glasses improve the clarity of vision but do not alter the area that a person can see.** Use of magnification may also be of no benefit as the person will continue to miss half of the image, irrespective of its size.

**Compensatory scanning training**

The RSB uses technology specifically designed for visual field loss assessment and training. The specialised equipment teaches the individual to systematically turn their head to look into their affected side, thus compensating for their vision loss. When the individual has learned to scan efficiently using the technology they learn how to use their skills more safely and independently in their environment. This technology is also used to demonstrate to family and carers the nature of the individual’s vision loss.

**Prisms**

Prisms or mirrors have been used on glasses to compensate for the hemianopia. These are designed to shift or relocate the image from the affected field into the seeing field in order to attract attention to objects there. The person needs to move their eyes in that direction to focus on the object.

**Vision Restorative Therapy**

Vision Restorative Therapy recovery uses a computer program to stimulate the lost field. This form of treatment is controversial; field recovery in people with hemianopias is unproven. Until this approach has been evaluated caution should be used concerning the investment of large amounts of effort and funds into this type of treatment.
Frequently asked questions

Will my vision improve?

Some hemianopias can improve spontaneously. The degree of resolution depends on the underlying cause of the brain injury. Visual field losses due to strokes have a poor prognosis for spontaneous recovery. Less than 10% of patients recover a full field. Hemianopias caused by traumatic brain injury can have a more promising prognosis. Larger areas of the visual field frequently recover after the initial period where any swelling of the brain has eased and the person becomes more alert and able to pay attention and respond to visual information. Often however, the functions regained are limited to the perception of light.

Will glasses help?

Blurry vision can occur after a stroke but it usually resolves. Permanent vision loss from a brain injury generally affects how much you see not how clearly you see something; therefore glasses generally do not help. This should not be seen as a reason not to wear existing prescription glasses to improve the clarity of the remaining vision. It is important that the person with the hemianopia wears their usual glasses.

Should I get my glasses changed?

It is important that everyone who wears prescription glasses has them regularly checked and, if need be, upgraded to adjust for the ageing process or pre-existing eye conditions. Regular checks by an Optometrist or Ophthalmologist are needed to monitor eye health and to test for preventable causes of vision loss, such as Glaucoma or Cataracts.

If the Optometrist indicates that “there is nothing they can do for the vision loss” they are referring to the hemianopia i.e. the loss of visual field.

What can be done if double vision (diplopia) is present?

Double vision can be a common consequence following traumatic brain injury. This can be extremely frustrating for the person and may cause difficulty in accurately reaching and picking up or putting down objects, difficulty in judging distances and heights of steps. Some people may be encouraged to patch one eye to remove one image. Advice should be sought from an Ophthalmologist as to the merits of patching and the most appropriate eye to be patched.

Once the degree of double vision is stable, usually around three months after the acquired brain injury, other management options include special prism glasses to fuse the images into one or an operation to straighten the eyes.
Can I drive?
In South Australia and the Northern Territory legislation currently requires the health professional to report directly to the licensing authority if they are concerned about the impact of the patient’s health on their ability to drive safely. Often hospital staff or Medical Practitioners will automatically notify Austroads.

The law requires you to report to your Driver Licensing Authority any permanent or long-term illness that is likely to affect your ability to drive safely. If you do not notify your Driver Licensing Authority that you have a medical condition that affects your ability to drive and you are involved in a motor vehicle accident you may be criminally liable and not covered by insurance.

Criteria for licence cancellation
The Austroads guidelines state that a person would not meet the standards for private driver’s licence if the following conditions are present:

- the binocular visual field does not have a horizontal extent of at least 120 degrees within 10 degrees above and below the horizontal midline; or
- the person has a hemianopia; or
- the person has a quadrantanopia; or
- the person has any significant visual field loss (scotoma) that is likely to impede driving performance.

In the event of a Stroke the person should not drive for a minimum of 1 month (3 months for a subarachnoid haemorrhage) if there is significant neurological or cognitive deficits. Return to driving depends upon a Physician assessment and, where appropriate, evaluation by a driver assessor.
Driving a motor vehicle is a complex task requiring perception, good judgement, responsiveness and reasonable physical capability. A range of medical conditions, including stroke or other brain injury, may therefore impair your driving ability.

Adequate visual fields are important for driving and peripheral vision is particularly important in certain driving tasks, such as merging into a traffic stream, changing lanes, and detecting pedestrians to the side of the line of vision.

In the event of a stroke the person should not drive for a minimum of one month (three months for a subarachnoid haemorrhage) if there is significant neurological or cognitive deficits. Return to driving depends upon a Physician assessment and, where appropriate, evaluation by a driver assessor.

From the vision point of view, to drive a private vehicle, you need to see clearly in the area involving the central 120 degrees horizontally and 10 degrees vertically as well as having a vision of better than 6/12 in one eye with both eyes open.

**Am I eligible for the Blind Pension?**

According to the Social Security Act 1991 a person is considered to be “permanently blind” if any of the following criteria is satisfied:

- Visual acuity on the Snellen Scale after correction must be less than 6/60 in both eyes; or
- A field of vision constricted to 10 degrees or less of arc around central fixation in the better eye irrespective of corrected visual acuity; or
- A combination of visual defects resulting in the same degree of visual impairments as that occurring in the previous points.

An individual with a hemianopia does not meet the above criteria and so isn’t eligible for a DSP Blind pension. However you may be eligible for a disability support pension if you are not able to work or be retrained for work. You will need to provide to Centrelink a report from your doctor on your impairment and meet a number of other criteria.

**Is the problem solved by moving objects?**

No, it is a misconception to think that simply moving an object to the “better side” will make it easier to see. The field loss moves everywhere the eyes move, across all fields. For example in the presence of a left homonymous hemianopia, when a person is looking towards the right he/she will still not see the left half of what he/she is looking at.

This applies to all objects irrespective of whether it is a word, a line of print, food on the plate or a scene around you. If you are looking directly at the object you miss half of it.

Additionally, moving objects does not help the person develop compensatory scanning strategies.
Tips for family, friends and carers

Problem: Managing fatigue

The presence of an overwhelming fatigue is a common problem following any brain injury, and one that needs careful management. Everyday tasks that were previously performed without any conscious effort now require additional concentration and effort. The brain needs time to heal and any activity that requires mental energy will cause fatigue.

Tips for managing fatigue:

• Attempt visual tasks, particularly those that require attention to detail, for short periods with frequent rest breaks. During these breaks it is helpful if the person closes their eyes in order to rest the vision system (eyes and brain).
• Try to pick a time of the day when the person is feeling ‘at their best’ to do essential tasks. If you feel tired, take a break and return to the task at a later time or on another day.
• Talk to the person about how they might recognise that they are tired. People who are not used to having a rest during the day may need one to prevent fatigue and making mistakes. The onset of signs of visual fatigue should cue the person to take a break from certain activities, e.g. watching television or reading.
• Reassure the person that the rapid onset of fatigue is very common in the early stages after an acquired brain injury (ABI). This should improve with time, but any recovery may be hampered if a person pushes themselves too hard.

Signs of fatigue include:

• Yawning
• Inconsistencies in visual skills
• Slowing down in performance
• Difficulty grasping new concepts or instructions
• Blurring or doubling of vision
• Fading of visual images, or reduced perception of colour differences such as yellow-red, blue-green
• Pain around the eyes or headache
• Anxiety
• Irritability
• Rapid swings in emotion.
Problem: Walking in busy or crowded areas

Walking in busy or crowded areas can cause difficulties for a person with restricted visual fields. Other pedestrians approaching from the affected side may suddenly appear in front of the person with a hemianopia giving a ‘jack in the box’ effect. Because the vision loss is not obvious to others, people assume that the person will make an effort to avoid contact.

Tips for safe walking:

• If you are accompanying a person with a hemianopia in a crowded area walk on the persons affected side, slightly ahead of them. This provides a buffer between the person with the vision loss and obstacles or approaching pedestrians. This also has the added benefit of encouraging the person with the vision loss to look towards you and be more aware of their deficit side.

• Where at all possible in the early stages of a person’s recovery avoid busy, noisy, crowded areas. Always accompany a person in busy areas, particularly if it is unfamiliar to the person with the vision loss.

When these bumps and collisions occur it can lead to embarrassment and surprise on the part of the person with the vision loss and angry responses from others.

Problem: Travelling as a passenger in a car

Following a brain injury there is often a period of time when the brain’s ability to process visual information is slowed.

In practice this makes it difficult for someone in the early stages of recovery to see things that are moving or changing quickly. An example of this is when the person with the vision loss is travelling in a car. Even at slow speeds it is difficult to move the remaining vision across to locate and recognise a building or object.

As a result people can have trouble in recognising familiar landmarks that they would normally use to help them know where they are. Hence they may become disorientated, even in previously familiar areas.

Others have reported that they have the feeling that they are travelling at a faster speed than is actually the case. This is because the scene outside the car as they travel past it may be blurred and the brain tells them that this is because they are travelling quickly.

Tips for car travel:

• Encourage the person to focus inside the car or on the car in front rather than trying to keep track of the passing scene outside the car.

• Where possible avoid long car journeys. What may have been intended as a relaxing drive in the country can become a tiring and stressful experience.

• If long car journeys are unavoidable then schedule frequent breaks.

• Allow additional time for the person to rest and recover from car travel and an appointment.

• Wearing sunglasses can improve the vision and make the person more comfortable.
**Problem: Watching fast action on the TV or at sporting events**

Difficulties resulting from slowed processing of visual information following brain injury can also impact on a person’s ability to follow the action in fast moving sports or other entertainment. People will often report that they were once avid spectators of their favourite football team but after their stroke they struggle to follow the game and lose interest. This issue relates to the additional effort required to scan the scene with a reduced visual field and the speed at which the brain can process what it is seeing.

**Tips for watching TV:**

- Try listening to a radio broadcast of the game
- When selecting TV viewing choose programmes that have a slower pace. Record programmes of high interest so that you can choose a time to view them when you are not tired or watch them in parts
- Make sure the TV is not near or in front of a window
- Position yourself at a sporting venue where the majority of the action is occurring on the side where vision is unaffected. Similarly, choose seats at the theatre where the stage is on the side where vision is unaffected.

**Problem: Blurring of vision when reading.**

How clearly a person can see fine detail is dependent on many factors. One of the main factors following a brain injury is the impact of fatigue, which gives rise to inconsistencies in the vision. Print may appear to be clearly focused when the person starts to read but then as they tire their vision can become blurred, the colours can fade or the print may appear to move on the page.

**Reading Tips:**

- Maximise the clarity of the material being read by using larger print, reading lamp carefully positioned and wearing any prescription glasses
- Read for short periods and take frequent breaks where the eyes are closed
- If the print starts to blur or words run into one another stop and rest by closing your eyes. If, on returning to the reading task, it continues to be blurry then stop for a few hours or try again on another day
- In the first few months immediately after the onset of the brain injury avoid tasks such as crosswords or puzzles as they involve a lot of eye movements to locate particular items adding to the difficulty of the task.
Services and Resources

1. Royal Society for the Blind
   Community Services at the RSB offers rehabilitation to individuals who have significant vision loss.
   230 Pirie Street Adelaide SA 5000
   GPO Box 1855 Adelaide SA 5001
   Phone: (08) 8232 2444
   Freecall: 1800 675 554
   Email: mail@rsb.org.au
   Website: www.rsb.org.au

2. Stroke SA Inc
   Provide information on support and assistance to people who have experienced stroke, their caregivers and families.
   23A King William Road, UNLEY SA 5041
   Phone: (08) 8373 057
   Email: strokesa@chariot.net.au
   Website: www.stroke.org.au

3. National Stroke Foundation
   Encourages the development of comprehensive and coordinated services for all stroke survivors and their families.
   Phone: (03) 9670 1000
   Stroke Line: 1800 787 653 (free call)
   Email: admin@strokefoundation.com.au

4. Carers SA
   Provides support and information for carers living in South Australia.
   Phone: (08) 8271 6288
   Toll free: 1800 242 636
   Website: www.carers-sa.asn.au

5. The Commonwealth Respite and Carelink Centre
   Provides information on community aged care, disability and other support services.
   Phone: 1800 052 222

6. Commonwealth Rehabilitation Service
   Provides information and assistance for people injured or with a disability to get a job or return to work.
   Phone: 1800 624 824
   Website: www.crsrehab.gov.au

7. Centrelink
   Offers payments to help people who are caring for someone who has a severe disability or medical condition or who is frail aged.
   Phone: 132 300
   Website: www.centrelink.gov.au

8. Disability SA
   Disability SA is part of the Department for Families and Communities and provides services and supports for adults with acquired brain injury (as well as other disabilities).
   Phone: 1300 786 117 (local call fee for country callers)
   Website: www.disability.sa.gov.au

9. Brain Injury Network of South Australia (BINSWA)
   BINSWA runs several services and programs which reduce the isolation that some people and their families feel following a brain injury.
   Phone: 8217 7600
   Country Callers: 1300 733 049
   Website: www.binswa.org

10. Transport SA
    Phone: 1300 360 067
    Website: www.transport.sa.gov.au

11. Driver Assessment unit
    This unit assesses drivers with disabilities and medical conditions to determine if they are able to drive safely. Department of Rehabilitation and Aged Care, Repatriation General Hospital
    Daws Road, Daw Park, 5041
    Phone: 82751219
The RSB is an ISO9000:2001 quality accredited organisation. All RSB brochures are available in alternative formats.