SYDNEY CONCUSSION CENTRE

Concussion

Dispelling the myths

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Contents

Introduction

Chapter One: What is Concussion?

- Concussion explained
- What is needed to cause a concussion?
- What actually happens to the brain?
- How do we know if is concussion?
- “If in doubt, sit them out”
- Summary

Chapter Two: How do we treat Concussion?

- Current principles in acute concussions
- Persistant/Post Concussion Symptoms (PCS)
- The 8 domains of Concussion
- Summary

Chapter Three: Prevention

- The prevention of concussion
- Preventing Post Concussion Syndrome

Chapter Four: Education

- Community Education
- Resources

Conclusion

Introduction

Sydney Concussion Centre is a scientifically-based initiative, aimed at reducing the impact of concussion on people's lives by:

- providing expert treatment and advice based on the latest research for those affected by Concussion
- improving the general public's understanding of Concussion through education and community seminars.
- advising on potential preventative strategies for athletes and sporting clubs.

It is an area of scientific health where copious amounts of research information is disseminated on a weekly basis which often leads to much confusion anxiety and fear.

This eBook aims to dispel myths associated with Concussion, together with bringing hope and direction for those affected by Concussion.

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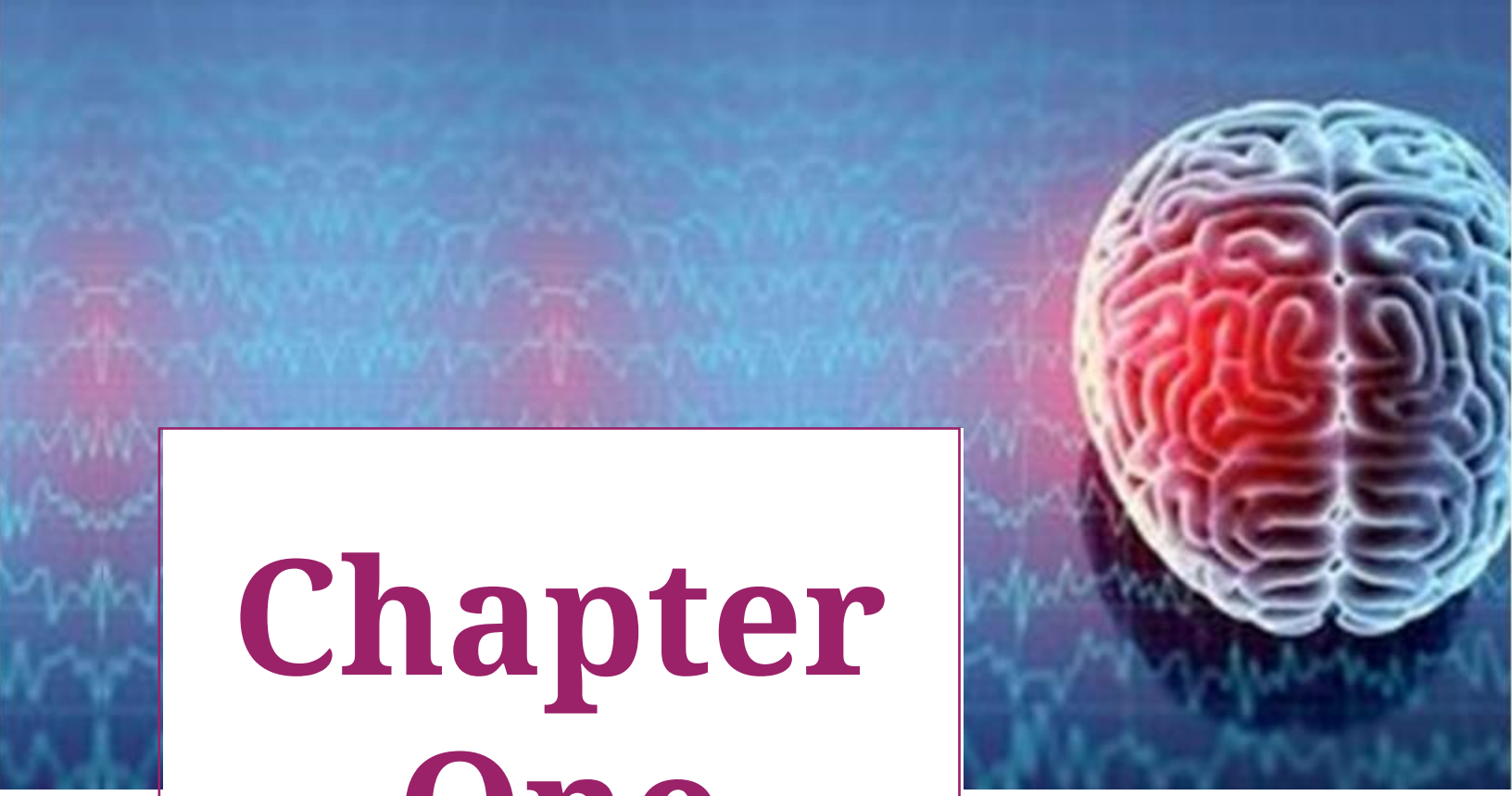


Chapter One

What is Concussion?

- What is Concussion?
- What causes concussion?
- What actually happens to the brain?
- How do we know if it is concussion?
- “If in doubt, sit them out”
- Summary

What is Concussion?

Concussion explained

Concussion is defined as a mild traumatic brain injury, caused by an acceleration/deceleration of the head, which has an impact on the way the nerves in your brain function.
There is no bruising, just inflammation. There is nothing to see on scans or any test. The brain looks normal! **This creates a problem!**

How do we know if it is a concussion?

Before we try to answer that question, let's talk about what's going on in the brain after a concussive episode…

What is needed to cause a concussion?

70-120 G's of force is required to produce a concussion. To help with context, air bags deploy at about 60G's of force. Heading a soccer ball produces about 18-20 G's so a concussion requires a significant force!

These forces have been measured by the use of force transducers in the helmets of American Football players, mainly at university level.
It's important to note that you don't need to be hit on the head to cause a concussion - a whiplash type injury can cause the required acceleration/deceleration forces to produce a concussion.

What actually happens to the brain?

The brain undergoes a sheering force during the injury process, which places a stretching load on the nerves. This leads to an initial burst of over-activity in the nerves, which affects body function Responses such as body rigidity, hearing noises ('bell rung') or visual bursts ('seeing stars') are often signs of this nerve activity.

This burst of activity in the brain then causes an energy deficit in the brain - FATIGUE. It is like the nerves have done a 400m sprint and then collapsed. This nerve fatigue in the brain can take a few minutes to six weeks to resolve.

‘

How do we know if it is a concussion?

Generally we look for two things to establish that a concussion has occurred.

1. An injury that leads to an acceleration or deceleration movement of the head. It may be a direct blow or it could be a whiplash-type movement, ie. the body is hit and the head keeps moving!

2. Signs of a concussion injury.
   These include symptoms such as:

   - Unsteady on feet or off balance
   - Difficulty getting up off the ground
   - Loss of consciousness(LOC) *Only 10% max have LOC.*
   - Fencing response
   - Clutching at head
   - Nausea &/or vomiting
   - Confusion/inability to speak
   - Blank or vacant stare
   - Sensitivity to light or noise

For a comprehensive list see “Concussion in Sport Australia Position Statement Feb 2019” (p5).

HOWEVER…
This question can be ‘tricky’ to answer in the first few minutes after the injury.

Sometimes, by the time the player is off the field, they feel OK. All the sideline tests that are done to test for concussion seem to be normal.

This is because the ‘energy deficit’ that kicks in, after the initial concussive episode, may be delayed by up to 24-36 hours.

This is why the **“Concussion in Sport Australia Position Statement Feb 2019”** (see link the end of the eBook), has an over-riding guideline –

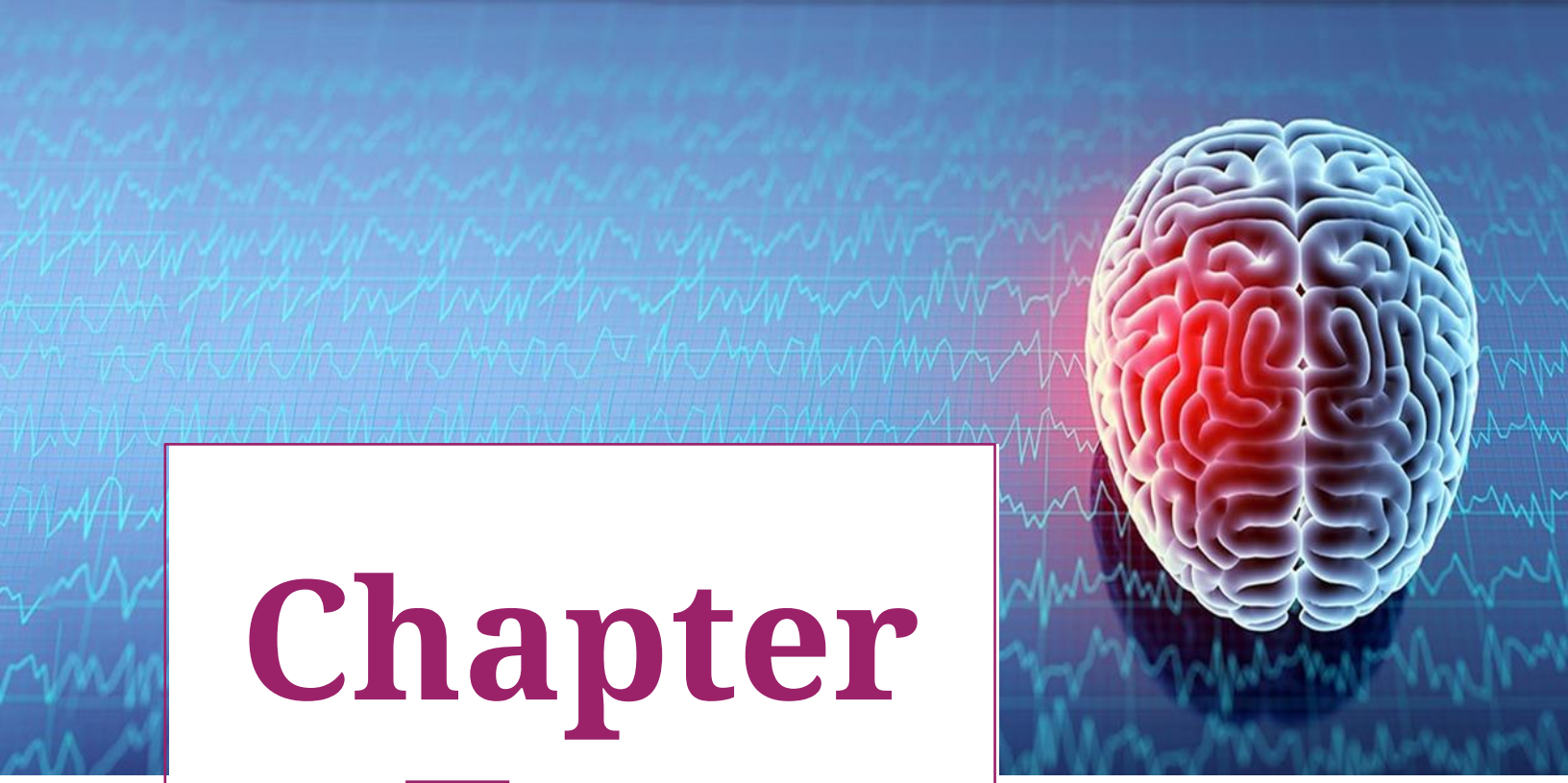
“If in Doubt, Sit them out”

It may seem obvious, but if this occurs in the middle of a big game, and it’s a key player who has suffered the injury, it’s easy to overlook the issue. This is why the **“Concussion in Sport Australia Position Statement Feb 2019”** is so important because it is encouraging sporting clubs, at all levels, to have well-established policies and to stick to them!

If you don’t think your club is organised well enough, read up on the position statement and encourage some positive change!

SUMMARY of Concussion

- Concussion is an acceleration/deceleration injury to the brain.
- Concussion does not need a hit to the head.
- Concussion leads to a change in the brain’s function for a period of time, resulting in fatigue.



Chapter Two

How do we treat Concussion?

- Current principles in acute Concussion
- Persistent/Post Concussion Symptoms (PCS)
- 8 Domains of Concussion
- Summary

Concussion – How do we treat it?

Current Principles in Acute Concussion

What do you do if someone has just had a concussion? Lets go the position statement again…

> "The current principles of concussion management involve rest during the acute period post-injury, followed by a gradual increase in cognitive activity and then physical activity. The optimal duration of the period of rest is not clear, but the most current evidence supports rest during the acute period (24–48 hours post-injury)."
>
> **Concussion in Sport Australia Position Statement Feb 2019**

Although complete rest is important, the consensus now is that one to two days rest is all that is required. Beyond this time period, complete rest leads to the development of other unwanted problems such as loss of fitness. Hence, a gradual increase in activity, without any increase in symptoms, is encouraged to help restore normal brain function.

The IMPORTANT things to REMEMBER are:

- Be prepared on game day
- "If in doubt, sit them out"
- Rest for 1-2 days, then gradually increase activity

Persistent Concussion Symptoms or Post-Concussion Syndrome (PCS)

For a majority of people, following this simple protocol will lead to a reasonably adequate recovery from concussion symptoms over a two to four-week period. Unfortunately for some, symptoms can persist and this can get complicated. Let's go to the guidelines again…

"Patients with symptoms persisting longer than 14 days for adults or four weeks for children require careful reassessment. Persisting symptoms can be due to a range of pre-existing confounding issues. The specific contributors to symptom persistence may be difficult to identify. Every effort should be made to structure a treatment program which addresses any medical, physical or psychosocial factors identified on assessment. Those who can tolerate a short duration of light exercise may benefit from a closely monitored and graduated aerobic rehabilitation program. When there is any evidence of cervical spine/vestibular dysfunction, referral to a physiotherapist with specific skills in cervical/vestibular rehabilitation is appropriate. Mood or behavioural issues may respond to cognitive behavioural therapy." *Concussion in Sport Australia Position Statement Feb 2019*

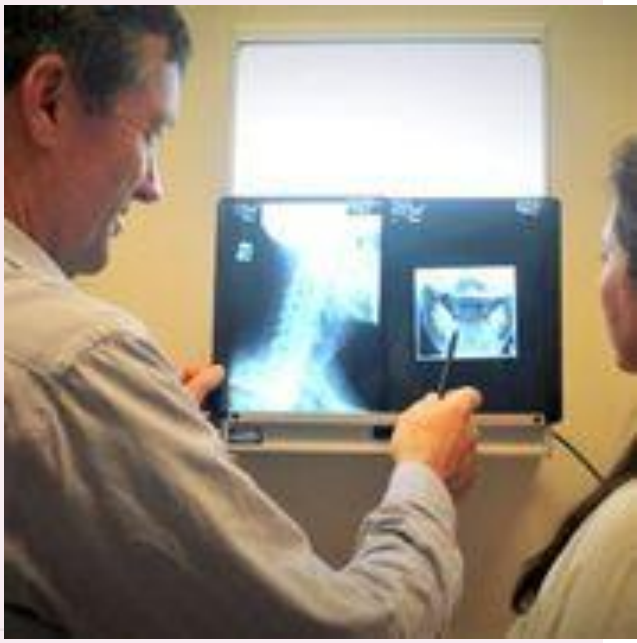
Let's unpack that statement and try and make some sense of it!

Everyone is an individual in Concussion!

Every Concussion is 'heterogeneous' - this means each person presents differently. Presentations differ because a concussion injury can cause a number of issues to different body systems. These problems include:

- headache
- dizziness
- fatigue
- light sensitivity
- tinnitus
- neck pain
- poor concentration, and
- confusion.

The 8 Domains of Concussion outline these potential areas



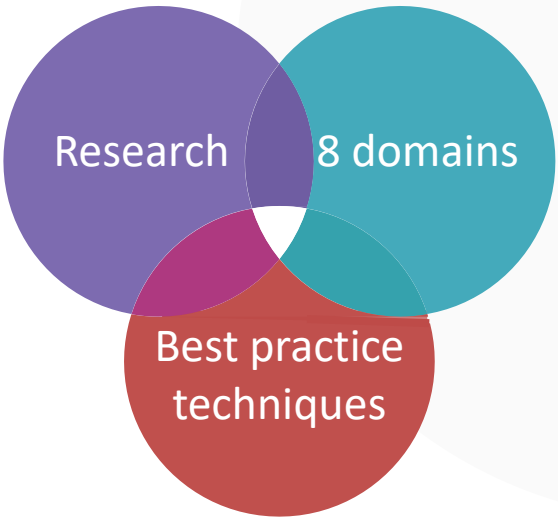
Explanation of the 8 Domains of Treatment

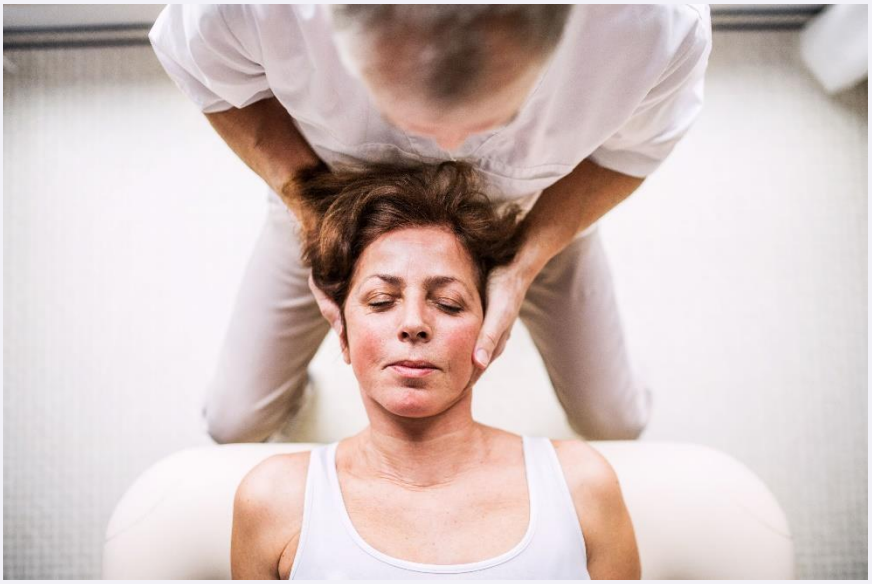
The program carried out at Sydney Concussion Centre uses:

- ✓ the latest research to assess
- ✓ the 8 Domains of Concussion
- ✓ with best practice techniques

This involves a wide range of techniques to determine where your concussion symptoms are originating. Once the areas of dysfunction are determined, a specific treatment and exercise program is developed to address the issues and expedite recovery.

The 8 Domains of Concussion and appropriate treatment for each area are outlined below:





Cervicogenic/Neck

If someone has sustained a concussion injury, we know they must have a whiplash injury to the neck as well. The neck can be a source of headaches, dizziness or balance problems.

Treatment: Focus is on restoring normal function of range and strength. Sydney Concussion Centre uses the Watson Headache® Approach to treat dysfunction in the upper neck to address these issues.

For further information, go to: www.WatsonHeadache.com

There are also a number of exercises to improve neck strength and function which may be required to restore all normal activity levels.

Vestibular/Vertigo/Dizziness

The vestibular system (part of the body's balance system) in the ear can be affected by the acceleration/deceleration injury which causes Concussion. This involves the release of 'crystals' called otoconia from the utricle into the circular canals of the vestibular system in the ear, which affects its ability to function. Called Benign Paroxysmal Positional Vertigo (BPPV), the result is vertigo where people feel like the room is spinning with a change of position, eg rolling over in bed or rising from lying. Nausea and vomiting can be associated with vertigo.

Treatment: Specialised assessment and treatment is required to restore the system to normal. The assessment procedures are called the Dix-Hallpike manoeuvre and the Roll Test. A previous history of vertigo (BPPV) makes you more likely to suffer from this issue after a concussion.

Oculo-motor/ Eye movement

The burst of activity in the brain that results in an ongoing fatigued state, affects its ability to control normal body functions - the eyes are one of those areas. When our eyes aren't moving or focusing properly, our ability to read and concentrate on tasks is affected.

Treatment: A variety of tests are performed to establish what is being affected by the concussion. Once the various problems are isolated, specific exercises are performed to restore normal brain control over these aspects of eye function.

Balance/Equilibrium

Our balance is controlled by a very refined system in our brain. Information from the three previous areas, the neck (muscle/proprioception), vestibular system (ears) and eyes (vision), is processed in the brain to help us maintain our balance. The disruption to the brain of a concussion can affect this processing system, leading to a feeling of disequilibrium or 'floating'. This is often described like walking on a trampoline or boat.

Treatment: Physiotherapists and other health professionals, world-wide, have been developing techniques to improve this problem for many years. Specific exercises can target this problem, however, treatment may be required to attend to any dysfunction in the individual areas first. These are often a combination of eye movement exercises, neck treatment and balance retraining.

Physiological fitness and fatigue

A concussive episode can impact physiological fitness in a number of ways. The initial period of inactivity is enough to start the process of losing physical fitness. To complicate this, concussion can often cause a disruption to the Autonomic Nervous System which controls how we respond to exercise. Usually, we don't have to think about increasing our heart rate when we exercise, the Autonomic Nervous System looks after that, to increase blood flow to the areas that need more oxygen and removing waste products out of the system. When the body doesn't respond appropriately to the required demands, our ability to exercise is significantly affected. This is the case in concussion - a person's ability to exercise can be diminished very quickly.

Treatment: A team of researchers from Buffalo, New York, has been assessing the impact of concussion on physiological fitness. Their latest research has proved that exercise, starting as early as two weeks after a concussion, can help improve recovery time compared to rest. A special test called the Buffalo Treadmill Test is used to assess the required level of exercise intensity required for rehabilitation.

Cognitive/concentration/thought processes

Disruption to the brain function also affects our ability to think clearly. Often described as 'brain fog', it is characterised by its impact on executive function, ability to learn, memory and recall, ability to focus and slowed processing of information. Some recent research suggests post-concussive amnesia may lead to more cognitive issues during recovery. Recovery can also be affected by sleep, mood, daily stresses and headaches.

Treatment: Assessment of cognitive function can be performed using a variety of testing procedures, often online. Results can give direction for treatment which is often best performed by a psychologist, especially in cases where improvement is slow.

Anxiety/mood/psychological disorders

It is believed that symptoms of psychological (mood and anxiety) disorders have a contribution from the Limbic system, which includes the emotional centres of the brain. A concussion can potentially cause further disruption to this part of the brain, leading to an aggravation of symptoms that may already be present.

Treatment: Anyone with pre-existing symptoms of a psychological nature should be aware of this possibility and seek follow-up with their GP or trusted psychological health professional. Even without a pre-existing condition, some people rehabilitating from a concussion will benefit from psychological intervention especially if symptoms persist for an extended period of time.

Post-Traumatic Migraine

Migraine is a severe headache involving significant neurological dysfunction and hypersensitivity, similar in many ways to concussion. This type of headache often has a strong genetic predisposition. There are 40 genetic factors associated with migraine, a majority only being isolated in recent years. Consequently, it is not surprising that a concussive episode can either trigger or exaggerate a person's Migraine frequency or intensity.

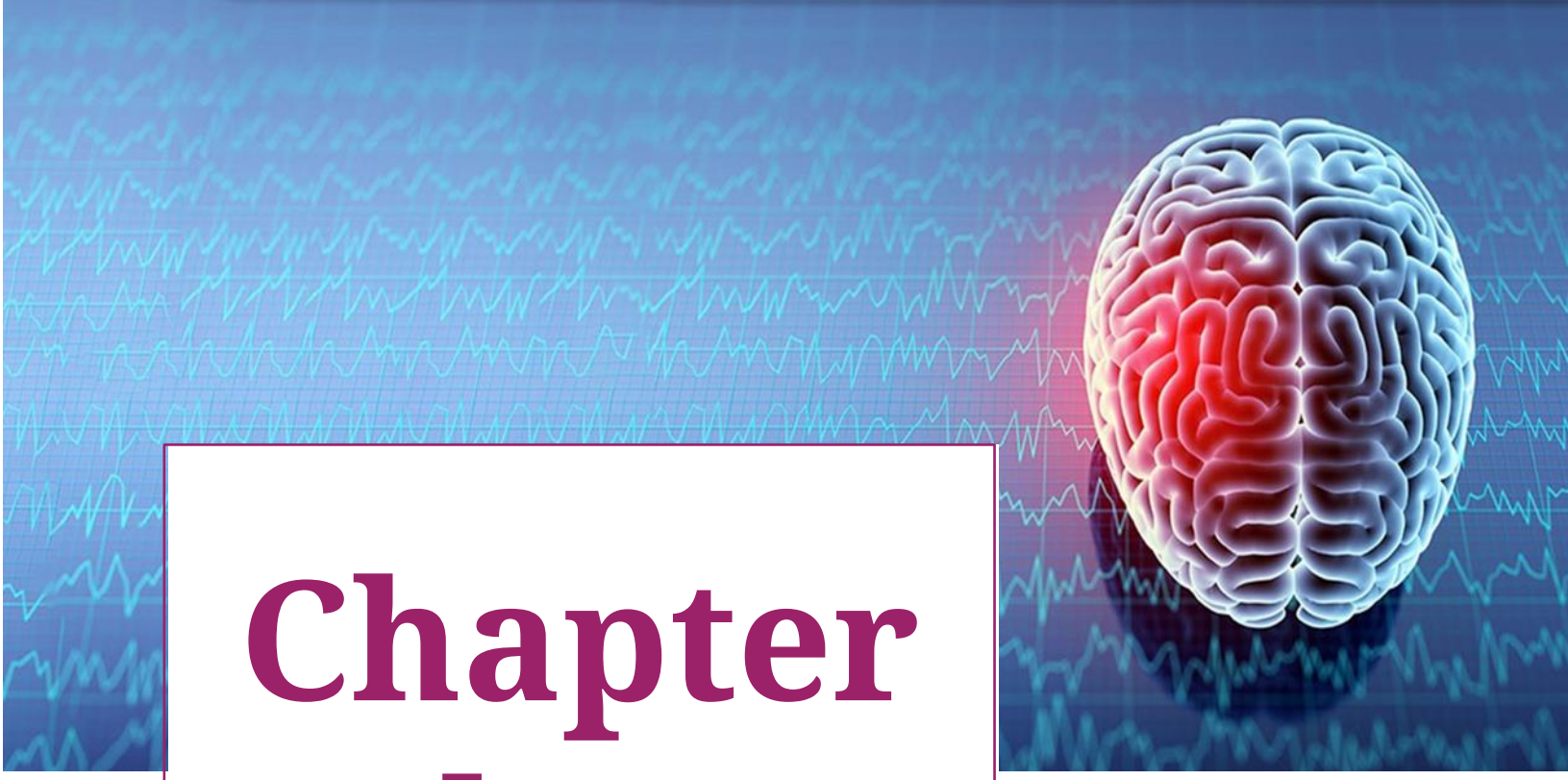
There has been much debate in the medical literature as to the association between concussion, headache and migraine. As research methods improve the similarities between concussion and migraine are becoming more obvious.

Treatment: From the chemical changes at a cellular level through the progression of neurological dysfunction, to the signs and symptoms of both headache and migraine, the similarities are becoming more evident. It has been our clinical experience that migraine sufferers often have an aggravation or change of their migraine presentation after a concussion.

The treatment goal at Sydney Concussion Centre is to return a person back to their original symptomatic presentation, which involves all the domains of treatment outlined and possible review with medical specialists.

SUMMARY

- Initially after a concussion, it is ideal to have 24-48 hours rest from all activity – physical and mental/cognitive. After this initial period of rest, it's important to 'get moving' both physically and mentally, without aggravating your symptoms.
- A range of 8 'Domains' can be affected by concussion, which is why everyone's concussion experience will be different.
- Concussion leads to a change in your brain's function, for a period of time, resulting in to fatigue.



Chapter Three

Prevention

- Preventing concussion
- Preventing Post Concussion Syndrome

Prevention

The Prevention of Concussion

Preventing concussion is more difficult than you might think**.** Whenever there is a risk of quick movement of the head and neck, there is a distinct risk of concussion. Whether it is on the sporting field, on a bike, in a car, jumping into the water…the potential list is endless. There has only been one definite preventative strategy that's worked!

Rule changes

In the past decade or two, rule changes have made many games safer, especially when it comes to concussion. Lower levels of contact in junior sport have protected young players in their more vulnerable years. Even at a professional level, rule changes to protect the head region have become standard and accepted by players and coaches alike. This should continue to be an area of focus moving forward.

A few other suggested mechanisms to prevent concussion are:

Head gear & mouth guards

Contrary to what many believe, there is no proof that using headgear or mouthguards will reduce the likelihood of concussion. They obviously have an important role in reducing damage to the skull, teeth and jaw but they won't stop the brain from moving around inside the head. Hence they won't prevent a concussion.

Neck strength

Some pretty complicated research and theory has led some to propose that better neck strength in athletes will reduce the incidence of concussions in many sporting arenas. There may be some truth to this idea as many players in football contact sports are hit at high force without any signs of concussion.

The real problem is when players are hit without expecting the force. It takes way too long to switch on the neck muscles, when relaxed, for them to be able to protect the head from the acceleration forces that cause a concussion. It may be a useful intervention for younger players who are involved in contact sports.

Diet

There are many potential dietary biases and supplements that may prove helpful in reducing the impacts of a concussive episode. There is still much research to be done before any specific recommendations can be made by dietitians. WATCH THIS SPACE!

Preventing Post-Concussion Syndrome

Post-concussion syndrome occurs when a number of the common concussion symptoms continue for longer than six weeks, the usual maximum period of time for recovery. This is the generally accepted time period for the 'energy' dysfunction in the brain to recover. Ongoing symptoms can be caused by the **8 Domains of Concussion Treatment** discussed in the previous section. Prevention of post-concussion syndrome can be approached in a several different ways

1. Immediate removal from sport/activity

The research is clear that an immediate removal from activity after a concussive episode will reduce recovery times. This could be due to a number of reasons including reducing the glutamate release in the brain which starts the 'fatigue' process in the brain. It also reduces the risk of second impact syndrome, which occurs when a second concussion following close on an initial episode usually leads to a significant amplification of the concussion symptoms.

2. Education

Often the key to knowing if a concussion episode has occurred is someone knowing what to look for and reporting it. The more people in your club who know what to look for, including the players, the more likely it is to be reported as a concussion. The basic premise of " When in doubt, sit them out" as suggested by the **Concussion in Sport Australia Position Statement (Feb 2019)** is the key response that ideally should be practised by all sports at all levels in Australia.

3. Early Intervention of Treatment

One of the misconceptions regarding treatment of concussion is that there is nothing that can be done to treat a concussion. This is far from the truth as a growing body of evidence suggests that PROACTIVE treatment, as outlined in Chapter 2 can help improve recovery rates and limit the development of Post Concussion Syndrome.

4. Pre-season screening

Although a matter of some debate, it is generally accepted that a lot of the concussion assessment tests such as balance, cognitive and eye movement assessments have a wide degree of variance between individuals. This makes it difficult to determine if and when a person has returned to 'normal' after a concussion, if you haven't done a pre-season assessment of what their 'normal' is! This a developing area and hopefully in the future there will be a consensus on the best approach to determine when a person has fully recovered and is ready to return to sport or activity.

5. Diet

As mentioned above, dietitians are developing evidence to suggest that diet can help recovery. Although it isn't our area of expertise, it seems a good to have a healthy diet, including plenty of fresh vegetables with lots of colours regularly on the plate.

In an area of rapidly growing knowledge such as Concussion, it can take a long time for information to filter down from academia to the general public.

Sydney Concussion Centre is committed to facilitating this flow of information to grass roots level of the sporting and general public.

Information will focus on the recovery process from the on-field assessment to the return to normal activity. This includes all the proactive approaches that can be used to 'speed up' the recovery process

Sydney Concussion Centre

**Our goal is to educate the public,
at the grass roots level,
about all aspects of
Concussion assessment and recovery.**

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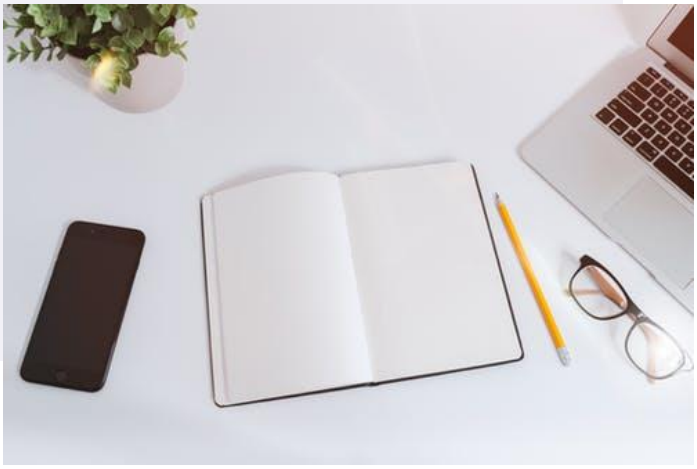

Resources

The following are helpful resources for your reference:

"Concussion in Sport Australia Position Statement Feb 2019"
https://www.sportaus.gov.au/__data/assets/pdf_file/0005/683501/February_2019_-_Concussion_Position_Statement_AC.pdf

This website is a great resource for the general public with a range of information focussing on the initial on-field assessment and early ongoing management of Concussion.

Brain Injury Australia
https://www.braininjuryaustralia.org.au/resource-category/brain-injury-links/brain-injury/concussion/

Sports Medicine Australia
https://sma.org.au/sma-site-content/uploads/2018/03/Concussion-Policy-2018.pdf

Your specific sport may have its own resources available on Concussion so it is worth doing a search on line. Remember to check when the information has been developed, anything older than 2018 will be well out of date in this rapidly growing research area!

Conclusion

Concussion has been, and will probably always be, a risk for any person who is active, who rides a bike, who drives a car, who plays sport…

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Our understanding of concussion is improving at an amazing rate. It is important for the general public to stay informed and understand that concussion is an injury which can be treated. Early intervention, with best practice treatment, can minimise the long term impact of concussion.

Sydney Concussion Centre provides expert care for all patients experiencing the debilitating effects of Concussion

Book an appointment

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www.sydneyconcussioncentre.com.au