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Unit -III

SPINE INJURIES AND EXERCISE

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Unit-III
Spine Injuries and Exercise

Head injuries

When people bang their heads, it can be difficult to tell whether they have done any serious damage. Most head injuries are not serious and simply result in a bump or bruise. However, severe or repeated head injuries can cause damage to the brain.

Fortunately, the majority of falls or blows to the head, result in injury to the scalp only and this is more frightening than life threatening – the head and face are served by numerous blood vessels and consequently these injuries bleed profusely and can be very scary.

It is very important to look out for anything unusual following a head injury as a severe bang on the head could cause swelling and damage to the brain and it is vitally important that you recognise any early and worrying signs of increased pressure on the brain.

Signs of a serious head injury

Call an ambulance if someone shows any of these symptoms:

- Unconsciousness
- Abnormal breathing
- Obvious serious wound or suspected skull fracture
- Bleeding or clear fluid from the nose, ear, or mouth
- Disturbance of speech or vision
- Pupils of unequal size
- Weakness or paralysis
- Dizziness
- Neck pain or stiffness
- Fitting

- Vomiting more than two to three times – (it is not unusual for children to vomit immediately after an accident as a response to pain, so do not panic if an injured child is sick just once after a head injury).

Major types of head injuries?

There are many different types of head injuries.

Concussion. This is the most common type of head injury. A concussion is a type of traumatic brain injury (TBI) that happens when the brain is jarred or shaken hard enough to bounce against the skull. It can range from mild to severe. You don't have to be hit in the head to get a concussion. An impact elsewhere on the body can create enough force to jar the brain.

Contusion. A bruise on the actual brain itself is called a contusion. It can cause bleeding and swelling.

Intracranial hematoma (ICH). This is bleeding under the skull in the brain that forms a clot. Brain hematomas range from mild to severe and are grouped according to where they form.

Skull fracture. Sometimes, a broken skull bone can affect the brain. The broken pieces of bone can cut into the brain and cause bleeding and other types of injury. It can lead to permanent brain damage and even death.

Head Injury Treatment

If you think you may have a concussion or suspect that someone else has one, the most important step to take is to prevent further injury. Stop whatever activity you are involved in and tell someone you think you may have been injured. Then get medical attention. If you're playing as part of a team, ask to be taken out of the game and tell the coach what happened. If a fellow player has signs of being confused or a sudden loss of coordination, be sure to report this to a coach. If you are coaching a team and you notice a potential injury, take the person out of the game, and see that the person gets medical care.

Common Neck Injuries

When your neck is sore – whether it's from a poor night's sleep or sudden injury – it can make simple tasks a challenge. Turning your head when driving, lifting objects or just playing a favorite sport can become painful and uncomfortable. Discover the most common neck injuries and how you can find relief.

Types and Causes of Common Neck Injuries

The most common neck injuries include:

1. **Neck sprain or strain** – A sprain can happen when ligaments in the neck are torn. A strain refers to a torn muscle or tendon. This can occur as a result of a sudden injury during physical activity or even a minor car accident.
2. **Stiff muscles and tendons –** Often called a crick in the neck, stiffness can be caused moving awkwardly or keeping the neck in the same position for a long period of time (like sleeping overnight).

3. **Herniated disc –** A herniated disc occurs when a spinal disc becomes torn and the soft jellylike interior leaks or bulges out of the disc. Most commonly a result of wear and tear, herniated discs can also be caused by a sudden injury, including a fall.
4. **Pinched nerve –** Bone, tissue or tendons can push against surrounding nerves, which causes pain. This can happen as a result of a muscle sprain or strain.
5. **Fractured cervical spine –** Though rare, a fractured cervical spine (or broken neck) is a serious condition that requires immediate medical attention.

Common neck injury symptoms

Your symptoms will depend on the type and severity of your injury, but most common symptoms include:

- Difficulty turning the neck
- Headaches
- Muscle spasms in neck and shoulders
- Neck pain

- Stiffness in the neck
- Weakness in the legs, arms, hands or fingers

Common neck injury treatment

Your treatment will depend on the cause of your neck injury. Treatment may include:

1. **Physical therapy –** A certified physical therapist will teach you exercises to reduce pain, improve flexibility and strengthen muscles in the neck.
2. **Medicine –** Over-the-counter and prescription medicine can help relieve pain, reduce inflammation and help you find comfort.
3. **Injections –** Corticosteroid injections, medial branch blocks and other injections can help reduce inflammation and help relieve pain caused by several different injuries to the neck.

4. **Acupuncture –** Thin needles are inserted into specific spots along the spine to trigger the release of certain chemicals into the body, helping reduce pain. Acupuncture, used with traditional treatment, like pain management or physical therapy can help.
5. **Massage –** Medical massage therapy can help reduce inflammation, ease pain and provide relief from certain back conditions. Your doctor may recommend massage therapy along with other treatments.
6. **Anti-inflammatory Diet –** A diet that helps boost your body's natural ability to fight inflammation may help reduce symptoms when combined with other treatment plans.

Spinal Cord Injury

Definition

The spinal cord contains the nerves that carry messages between your brain and the rest of the body. The cord passes through your neck and back. A spinal cord injury is very serious because it can cause loss of movement (paralysis), function, and sensation below the site of the injury.

Causes

A spinal cord injury may be caused by incidents such as:

- Bullet or stab wound
- Fracture of the spine
- Traumatic injury to the face, neck, head, chest, or back (for example, a car accident)
- Diving accident
- Electric shock
- Extreme twisting of the middle of the body
- Sports injury
- Falls

Symptoms

Symptoms of a spinal cord injury may include any of the following:

- Head that is in an unusual position
- Numbness or tingling that spreads down an arm or leg

- Weakness
- Difficulty walking
- Paralysis (loss of movement) of arms or legs
- Loss of bladder or bowel control
- Shock (pale, clammy skin, bluish lips and fingernails, acting dazed or semiconscious)
- Lack of alertness (unconsciousness)
- Stiff neck, headache, or neck pain

First Aid

Never move anyone who you think may have a spinal injury unless it is absolutely necessary. For example, if you need to get the person out of a burning car or help them to breathe.

- Keep the person completely still and safe until medical help arrives.
- Call the local emergency number, such as 911.
- Hold the person's head and neck in the position in which they were found. DO NOT try to straighten the neck. DO NOT allow the neck to bend or twist.

- DO NOT allow the person to get up and walk.
- If the person is not alert or responding to you:
- Check the person's breathing and circulation.
- If needed, do CPR. DO NOT do rescue breathing or change the position of the neck, do chest compressions only.

Presentational of Spinal anomalies

Spinal cord anomalies or spinal dysraphism is a heterogeneous group containing some entities that are obvious at birth and many that are discovered only after imaging for neurological symptoms or signs. Congenital spinal tumors are closely related and present either as an external mass or imaging abnormalities.

Flexion Injuries

1. Tearing of interspinous ligaments
2. Disruption of capsular ligaments around facet joints

3. Fracture of posterior elements
4. Disruption of posterior ligaments
5. Often unstable fractures

Compression

Spinal cord compression is caused by a condition that puts pressure on your spinal cord.

Symptoms such as pain, numbness, or weakness in the arms, hands, legs, or feet can come on gradually or more suddenly, depending on the cause.

Symptoms

Symptoms depend on where the pressure in the spinal cord is. Pain is often the first symptom and more than 9 out of 10 people (90%) with spinal cord compression have it. The pain:

1. could be anywhere in your back, spine or neck
2. may feel like a tight band around your body
3. in your spine could be made worse when you cough, sneeze or go to the toilet
4. is getting worse or doesn't go away
5. is stopping you sleeping or wakes you up at night
6. is made worse by lying flat on your back

Treatment

- Usually surgery
- Sometimes corticosteroids given intravenously
- For tumors, usually radiation therapy (with or without surgery)
- For abscesses or hematomas, sometimes drainage

What is a Hyperextension Injury?

Joints in the human body normally have a fixed range of motion that involves both *flexion* (for example, folding your arm to your shoulder to create a zero-degree angle at the elbow)

and *extension* (extending your arm out straight to create a 180-degree angle at the elbow). The same type of range of motion exists for the knee, and wider ranges of motion exist for ball-and-socket joints such as the hip and the shoulder, which can pivot in more directions than just forward and backward.

Neck hyperextension

Hyperextension of the neck is an injury caused by an abrupt forward then backward movement of the head and neck. This injury is also known as whiplash because the sudden movement resembles the motion of a cracking whip.

What causes hyperextension of the neck?

Whiplash is typically associated with being struck from behind in a car accident. But any impact that causes the forceful flexion and hyperextension of the neck can result in this injury.

The injury may include trauma to the cervical muscles as well as the intervertebral ligaments, discs, and joints.

What are the symptoms of hyperextension of the neck?

1. Neck Stiffness
2. Pain That Worsens When Neck Is Moved
3. Headache
4. Dizziness
5. Range of Motion In Neck Is Limited
6. Myofascial Injuries (Ligaments And Muscles)
7. Shoulder Pain
8. Back Pain
9. Paresthesia

Neck hyperextension treated?

1. X-rays
2. Magnetic resonance imaging (MRI)
3. Computerized tomography (CT)

What is a rotational injury?

- Usually in combination with flexion – extension injury.
- Lateral mass fractures, luxations, uncovertebral dislocations.

A rotational brain injury is the result of a rapid change of the rotational velocity of the head. This rapid change can be caused by a direct hit to the helmet or the skull or by an indirect hit to the shoulder leading to a rotational motion of the head. Linear acceleration injuries result from straight line forces that compress or stretch the brain within the skull. In contrast, rotational acceleration injuries result from non-linear forces that twist/shear the brain within the skull. Brain tissue

deformation hence, damage is mainly caused by shear rather than compression or tension due to its mechanical properties. Therefore, most traumatic brain injuries are caused by rotational acceleration.

What is spinal range of motion?

The cervical spine's range of motion is approximately 80° to 90° of flexion, 70° of extension, 20° to 45° of lateral flexion, and up to 90° of rotation to both sides.

What Is Free Hand Exercise?

Free hand exercises are those exercises that are done without the help of any special equipment. These are also known as calisthenics. You perform these exercises without equipment and fuss, only using your bare hands. While doing free hand exercises, you rely on your body weight.

Free Hand Exercises

There are multiple free hand exercises for weight loss and muscle toning that you can perform at home, such as:

1. Push ups
2. Squats

3. Plank
4. Ab Crunches
5. Side Bends
6. Leg Lifts or Leg Raises
7. Burpee
8. Freehand Skipping
9. Sprinting
10. Calf Raises
11. Bridges

Free Hand Exercise Benefits

Here are some benefits of free hand exercises:

1. Aid in Weight loss
2. Maintain Your Heart Health
3. Balance Sugar Levels
4. Build Musculoskeletal Health
5. Reduce Stress and Tension
6. Improve Memory
7. Increase Your Productivity
8. Works as a Mood Booster
9. Strengthen the Immune System
10. Improve Self-Confidence

Head and Neck Stretches

1. **Upper Trapezius Stretch**: Sit up tall with good posture keeping shoulders down. Grasp the bottom of the seat with one hand. Slightly turn your ear to your shoulder until a comfortable stretch is felt on the opposite side of the neck. Hold that position for 20 seconds. Repeat to each side 3 times. Perform this exercise 2 times per day.
2. **Levator Scapular Stretch:** Sit up tall with good posture keeping shoulders down. Grasp the bottom of the seat with one hand. Slightly turn your chin toward your armpit until a comfortable stretch is felt on the opposite side of the neck. Hold that position for 20 seconds. Repeat to each side 3 times. Perform this exercise 2 times per day.
3. **Neck Rotation:** Rotate head gently and slowly from side to side. Do not turn head completely to either side, keep motion small. Keep chin level with ground without letting chin drop to chest. Repeat 10 times. Perform this exercise 2 times per day.
4. **Doorway Stretch:** Stand in a doorway with hands and arms out to the side as shown in picture. Keep forearms flat on door frame. Take one step forward with one leg to feel a comfortable

stretch in chest region. Hold that position for 10-20 seconds. Repeat 3 times. Perform this exercise 2 times per day.

Neck Strengthening

1. **Shoulder Scapular Squeeze:** Squeeze your shoulder blades together as shown in the picture. Hold 5 seconds. Repeat 10 times. Only squeeze hard enough to encourage good posture, not to create pain or discomfort. Perform this exercise 2 times per day.
2. **Wall Push Up:** Start with feet approximately shoulder width apart. Place hands against wall slightly below shoulder level and elbows straight as shown in the picture. Bend elbows while keeping head in a neutral position. Repeat 10 times
3. **Theraband Rows:** Place Theraband around a doorknob, or tie a knot in the Theraband and close it in the door. Anchor the band at chest level. Stand tall with each end of Theraband in your hands, knees slightly bent, abdominal muscles tight. Maintaining tight trunk muscles, pull arms back while squeezing shoulder blades together. Focus on squeezing the shoulder blades

without shrugging the shoulders up towards the ears. Return to starting position. Do not lean back. Repeat 20 times. Perform 2 times per day.

4. **Prone Rows:** Lie on your stomach with your arms dangling off the side of the bed (try angling your body so your head is facing the corner of your bed). Use a pillow under your stomach for comfort. Begin by pulling arms back while bending elbows and squeezing shoulders blades together then slowly return to starting position. Do not lift head up while pulling arms back. Repeat 20 times. Perform 2 times per day.

Exercises: Back or spine Stretches

1. **Supine Hamstring Stretch:** Lie on your back, starting with both knees bent. Wrap a rope or towel around one foot. While holding both ends of the towel, slowly lift one leg off the surface until a stretch is felt in the back of the leg. Hold 20 seconds. Return to the starting position. Repeat 3 times on each side. Perform 2 times per day.

2. Knee to Chest: Lie on your back with both knees bent. Grab behind one knee and gently pull the knee towards your chest until a comfortable stretch is felt in the lower back. Hold 20 seconds then return to starting position. Repeat 3 times on each side. Perform 2 times per day.
3. Piriformis Stretch: Lie on your back with both knees bent. Pull one knee to your opposite shoulder. Keep your back flat, do not twist. Hold 20 seconds then return to the starting position. Repeat 3 times on each side. Perform 2 times per day.
4. Prone Quadriceps Stretch: Lie on your stomach. Put a rope, sheet or belt around one of your feet and pull your heel toward your buttock until you feel a stretch in the front of the thigh. Hold 20 seconds then return to the starting position. Repeat 3 times on each side. Perform this exercise 2 times per day.
5. Calf stretch: Stand facing a wall. Keep back leg straight with heel on floor and foot facing forward. Bend front knee slightly and lean into wall until a stretch is felt in the calf. It is important to keep the back heel on the floor throughout entire stretch. Hold 20 seconds. Return to starting position. Repeat 3 times on each side. Perform 2 times per day.

Exercises: Back or spine strengthening

1. Transverse Abdominal Contraction: Lie on your back with both knees bent, feet flat. Tighten abdominal muscles by pulling your belly button towards your spine. Hold 10 seconds and relax. Repeat 10 times. Perform 2 times per day.
2. Bridging: Lie on your back with both knees bent. Squeeze your buttocks together then slowly lift your buttocks off the table, keeping your stomach tight and buttocks contracted. Slowly lower and release to starting position. Hold 5 seconds and repeat 10 times. Perform 2 times per day.
3. Gluteal Squeeze: Lie on your back with both knees bent and squeeze your buttocks together. Hold 10 seconds and relax. Repeat 10 times. Perform 2 times per day.
4. Transverse Abdominal March: Lie on your back with both knees bent. Tighten your abdominal muscles by bringing your belly button toward your spine. Slowly march by lifting one leg off the floor, then alternating to the other. Continue pulling your belly button toward spine during this exercise. Repeat 10 times on each side. Perform 2 times per day.

5. Wall Squats: Stand with your back against a wall with your feet approximately 1-2 feet away from the wall. With feet shoulder width apart, squat approximately ½ of the way down, making sure your knees do not go past your toes. Hold 10 seconds and repeat 10 times. Perform 2 times per day.

Supporting and aiding techniques and equipment for Head

List of sports requiring head protection include: Amateur boxing, baseball, cycling, football, ice hockey, men's' lacrosse, softball, cricket.

1. Football Helmet

- Athlete should be aware of inspection of helmet before usage as: Check foam padding for proper placement and any deterioration. Check for cracks. Check for any alteration. Check for inflation in air-padded helmets. Check fastening.
- A helmet is not legal for use if the warning label adopted by NOCSAE is not visible.
- Revolution helmet by Riddell has shown to reduce the risk of concussion by as much as 31 percent.

Ice Hockey Helmet – Must only absorb singular as opposed to multiple impacts in football. Helmet should also protect the head from low-mass, high-velocity impact forces (like hit with stick or puck) in addition to high-mass, low velocity (like fall). Must be certified by Canadian standards association (CSA). Use of full-face shield reduces the number and severity of facial injuries.

Baseball Helmets – should absorb high-velocity impacts. Ability to prevent head injury is questionable.

2. Face Protection

Face guards

- Main purpose is to protect against projectile, carried objects and collisions with other players.
- Junior A hockey players wearing no face visor were 4.7 times more likely to suffer eye and face injuries.
- NCAA require goal keepers to wear throat protection as well as face protection.

- Men’s lacrosse rule mandate helmets and face masks with a NOCSAE standard

3. Chin Straps

- Single strap allows some rotation of the helmet but is usually adequate in maintaining the appropriate position of the helmet on the top of the head. Used in sports like cycling and kayaking.
- Four-point chin strap used in sports like football and lacrosse, which are secured by either the high hookup or the low hookup. Decrease the angle of low hookup means that there is less chance of the chin strap rotating off the chin.

Eye and Ear Protection

Eye Protection

- Special precautions should be taken in sports like ice hockey, men’s and women’s lacrosse, baseball, basketball, squash and handball.

- Types of eye protectors: Total head protector (used in football, lacrosse, hockey), full-face protector (used in fencing, catching or umpiring), separate eye protector (used in ski racing, auto racing, cycling, and horseback riding), Partial eye protection (used in boxing). Sports eye protectors (used in baseball, soccer, cross country skiing).
- Sports eye protector: Class I – a molded single unit lens and frame, Class II – lens mounted in a separate frame, Class III – protector that contains no lens that is used alone or over eyeglasses.
- Use of goggles in women's lacrosse became mandatory in 2004.
- Eye protectors with shatterproof polycarbonate or CR 36 prescription lenses give good protection during sports activities.
- "One-eyed" Athlete – Athlete is considered "one-eyed" if the corrected vision is 20/200 or less in one eye. Athlete should not participate in extremely high risk sports like boxing.

Ear Protection

- "Cauliflower Ear" – Hematoma in the outer ear, may occur without use of appropriate equipment.

- Ear protection is required in sports like boxing, wrestling, and water polo, because of high incidence of ear injury in these sports.

Mouth Guards

- NCAA requires participants to wear mouth guards for the sports such as football.
- There is no consistent evidence suggesting that mouth guards help in preventing concussion, but there is substantial evidence which states that properly fitted mouth guards help in reducing dental injuries.[6]
- Types of mouth guard: “boil and bite” and custom-made.
- Studies suggests that mouth guards do not prevent or reduce the incidence of concussions.
- No significant difference between “boil and Bite” mouth guard and manufactured one.
- Simple “boil and bite” mouth guards are effective and can be bought in bulk to fit an entire team.
- Mouth guards should fit comfortably, not impede speech or breathing, and should extend back as far as last molar.

Mobility Devices

1. These are set of equipment that are used in moving patients with spinal cord injury, they include wheelchairs (manual, sport, power, power-assisted), walking frames, crutches, hand bike, canes, and adapted shoes. It also includes adapted vehicles that can be used indoors, most times within the family. The essence of mobility devices is to give patients the maximum mobility possible rather than being confined to bed at a spot.
2. **Beds**

   This is very important, especially when considering skin care and protection. When choosing bed, height is a very important factor considering turning, positioning, transfers, and getting dressed.

   There are three types of beds based on the mode of control; full-electric, semi-electric, and manual beds. The levels of care to consider when choosing mattresses include pressure reduction, pressure relief and fluid.

3. Transfer Equipment

These enable patients and caregivers move the patients about. It includes transfer boards, lifts, slings and benches. The purpose of transfer equipment is to drastically reduce the support a patient is needed from caregivers.