South Shore Hospital

Orthopedic, Spine and Sports Therapy

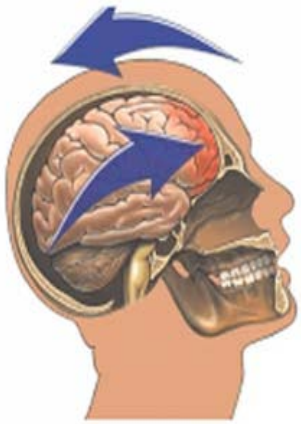
Post-Concussion Syndrome

Anatomy of the injury:

The brain is a soft delicate structure encased in our skull, which protects it from external damage. It is suspended within the skull in a liquid called cerebral spinal fluid. This liquid serves to cushion the brain from damage. A concussion is a traumatic brain injury from a "jolt to the head" or a "bell ringer" that results in the brain quickly shifting and pulling on the structures within the skull. An external impact is not always necessary to produce a concussive force. This force can also result from the brain impacting the inside of the skull as well as the straining of the tissues that support the brain when the body stops too quickly, like in an auto accident. Regardless of the type of impact, the injury causes a chemical change within the brain that alters its ability to function, even though structural damage is not always present. For this reason, concussions are often not evident on diagnostic tests, like MRIs or CT scan imaging. Our nerves within the brain are extremely sensitive to this chemical change. When these changes occur our nerves have difficulty regulating some of our body's basic functions, such as keeping our heart rate stable during exercise. This chemical change within the nerves also disrupts our body's coordination and balance.

Symptoms (what your child will feel)

- Headaches
- Dizziness
- Difficulty concentrating/remembering
- Loss of balance
- Sensitivity to light/noise
- Fogginess
- Vision changes
- Ringing in the ears
- Fatigue/Drowsiness
- Nausea/Vomiting



Signs (what you will see in your child)

- Loss of balance
- Acting disoriented
- Forgetting game scores or rules
- Personality changes
- Poor coordination
- Forgetfulness/amnesia
- Dazed/confused
- Inappropriate emotions
- Slow to respond
- Loss of consciousness (only seen 10% of the time)

Treatment

After your child has been diagnosed with a concussion, the first step in treatment is REST! The brain is extremely sensitive to further damage in the time following the concussion. This damage doesn't have to be the result of a physical injury. Daily stress and overuse of the brain can actually take away the focus on healing and recovery. The most important course of treatment is to rest the brain as much as possible, both physically (sports/activities) and cognitively (school). This sometimes means limiting school, sports, TV, computer, cell phones and loud or crowded places. Recovery time for each child is unique for each case. As symptoms start to subside, your doctor can provide help in determining when to return to cognitive and physical activity.

Doctors Visits

If your child continues to experience symptoms beyond two weeks, they are recommended to see their pediatrician or a concussion specialist. These visits are there to assist you and your child with any medical management that may help their recovery as well with any academic or athletic accommodations that are needed. In the Commonwealth of Massachusetts if your child is suspected to have a concussion, they will not be able to return to athletics without written medical clearance by a certified physician.

ImPACT Testing

After your child's injury, they may be asked to take a test to assess their neurocognitive function (thinking ability). This test is administered and interpreted by trained professionals only. The results can be used to measure progress, and will help determine your child's return to cognitive and physical activity.

What is Post-Concussion Syndrome?

Many concussions and their symptoms resolve within 7-10 days with proper rest. More severe cases of concussion do carry the possibility that post-concussion syndrome can arise. Post-concussion syndrome occurs when the brain is having difficulty healing and returning to its prior level of function. This normally manifests as three or more symptoms lasting longer than four weeks. Treatment options frequently include prolonged rest, academic accommodations, medications and physical therapy.

Rehabilitation Philosophy

There is currently no treatment that will accelerate your child's recovery from a concussion. However, rehabilitation can treat secondary injuries such as vertigo, neck muscle strains, balance dysfunction, and abnormal eye movements that stress the brain and slow its recovery time. By treating these injuries, rehabilitation puts your child's brain in its most optimal healing environment.

One of the goals of post-concussion rehabilitation is to increase blood flow and nutrients to the brain during recovery. This will aide in healing, higher cognitive functioning, and help increase your child's tolerance to exercise. Research done under Dr. John Leddy indicate that closely monitored, progressive increases in physical activity can in fact be performed safely to assist with decreasing these lingering symptoms. Your child's physical therapist will design and assist in administering an individualized exercise plan, which will re-educate the brain to tolerate exercise and eventually return to athletics safely.

Rehabilitation

****The following is an outlined progression for rehab. Timetables are approximate and advancement from phase to phase as well as specific exercises performed should be based on each individual patient's case and sound clinical judgment by the rehab professional. ****

Pre-Rehab Phase:

Goals

Protect from further damage.
Decrease acute symptoms.
Promote adequate rest.

Precautions

No return to activity until cleared by MD.
Decrease physical and cognitive stimuli.

Guidelines

As symptoms start to subside, your doctor can provide help in determining when to return to cognitive and physical activity

Phase 1:

Benign Paroxysmal Positional Vertigo (BPPV) (if applicable):

Criteria

Dizziness is a significant symptom lasting for longer than two weeks.
Usually lasting during short duration from 5-30 seconds. P
Patient reports dizziness or "room spinning" sensation.

Tests:

Hallpike-Dix Test
Roll Test

Treatment:

Canalith Repositioning Technique

Cervical/Thoracic Strain, Cervicogenic Headaches (if applicable):

Criteria

Consistent cervical pain at rest or with movement
Palpated tenderness through cervical and thoracic musculature
Palpated tenderness at suboccipital musculature with provocation of headache.
"Over the head" headaches with prolonged upright activities.

Tests:

Rule out peripheral neurological involvement; warrants a return to MD

Treatment

Sub-occupital release.
Cervical PROM/stretching.
Soft tissue mobilization, myofascial release.
Initiate postural strengthening
Cervical isometrics

Oculomotor Dysfunction(if applicable):

Criteria

Symptoms of double vision, difficulty ready and loss of balance.

Tests

Cranial Nerve Testing (II, III, IV, VI, VII)
VOR I, II, Cancellation
Convergence, Divergence
Saccades

Treatment

Cooksey- Cawthorne Exercises.
Habituation exercises
Gaze stabilization exercises in various positions.
Visual scanning exercises in various positions.

Balance Dysfunction (if applicable):

Criteria

Unable to walk a straight line with normal or narrow BOS
Frequent LOB reported.
Increased postural sway

Tests

Romberg Test
BESS (Balance Error Scoring System) test
Postural Perturbations
Righting reactions assessment
Coordination assessment

Treatment

Progressive balance training
Core strengthening
Postural strengthening

Initiate Light Phase I Exercise:

Criteria

No symptoms greater the 3/6 (according to Acute Concussion Evaluation from UPMC)

Progressive decrease in symptoms
Increased baseline HR

Tests

Exertional Assessment

Treatment

Initiate light cardiovascular exercise (30-40% Max HR)
Limited positional change and head movement
Static balance exercises
Minimal stimuli in exercise environment

Phase II Exercise

Criteria

Progressive decrease in symptoms at rest < 3/6 (according to Acute Concussion Evaluation from UPMC)
Symptoms continue to be provoked by exercise
Noted improvement in all applicable phase I symptoms

Treatment

Progress cardiovascular exercise to 40-60% Max HR
Initiate positional changes with head movement
Progress to dynamic balance exercises
Continue phase I treatment as needed

Phase III Exercise

Criteria

No symptoms at rest or during activity
Decreasing baseline HR

Treatment

Progress cardiovascular exercise with 60-80% Max HR
Progress postural changes with cardiovascular exertion
Progress to dynamic balance exercises with cardiovascular exertion
Increase environment stimuli
Initiate multi-step exercises

Phase IV (Functional) Exercise

Treatment

Progress cardiovascular exercise to 80-90% Max HR
Non-contact sport-specific training
Increase coordination and cardiovascular training
Increase reactionary neuromuscular re-education
Increase dynamic balance exercises

Phase V (Return to Play) Exercise:

Treatment

Cardiovascular exercise to 100% Max HR
Progress to return to play contact exercises

PHASE	SYMPTOMS	PLAN OF CARE
Phase I- Benign Paroxysmal Positional Vertigo (BPPV)	-Dizziness is a significant symptom lasting for longer than two weeks. -Usually lasting during short duration from 5-30 seconds. P -Patient experiencing “room spinning” sensation.	Test: Hallpike-Dix, Roll Test Treatment: Canalith Repositioning Techniques
Phase I- cervical/thoracic strain, cervicogenic headaches	-Consistent cervical pain at rest or with movement -Palpated tenderness through cervical and thoracic musculature -Palpated tenderness at suboccipital musculature with provocation of headache. -“Over the head” headaches with prolonged upright activities.	- Sub-occupital release. - Cervical PROM/stretching. - Soft tissue mobilization, myofascial release. - Initiate postural strengthening - Initiate cervical Isometrics
Phase I- Oculomotor Dysfunction	-Symptoms of double vision, difficulty ready and loss of balance.	Tests: Cranial Nerve Testing (II, III, IV, VI, VII),VOR I, II, Cancellation, Convergence, Divergence, Saccades Treatment: Cooksey- Cawthorne Exercises, Habituation exercises, Gaze stabilization exercises in various positions, Visual scanning exercises in various positions.
Phase I- Balance Dysfunction	- Unable to walk a straight line with normal or narrow BOS - Frequent LOB reported. - Increased postural sway	Tests: Romberg Test, BESS (Balance Error Scoring System) test, Postural Perturbations, Righting reactions assessment, Coordination assessment Treatment: Progressive balance training, Core strengthening, Postural strengthening
Phase I- Initiate light exercise	-No symptoms greater the 3/6 (according to Acute Concussion Evaluation from UPMC) -Progressive decrease in symptoms -Increased baseline HR	Tests: Exertional Assessment Treatment: Initiate light cardiovascular exercise (30-40% Max HR) , Limited positional change and head movement, static balance exercises, minimal stimuli in exercise environment

Phase II – Exercise	- Progressive decrease in symptoms at rest < 3/6 (according to Acute Concussion Evaluation from UPMC) - Symptoms continue to be provoked by exercise - Noted improvement in all applicable phase I symptoms	Treatment: Progress cardiovascular exercise to 40-60% Max HR, Initiate positional changes with head movement Progress to dynamic balance exercises, Continue phase I treatment as needed
Phase III- Exercise	- No symptoms at rest or during activity - Decreasing baseline HR	Treatment: Progress cardiovascular exercise with 60-80% Max HR, Progress postural changes with cardiovascular exertion, Progress to dynamic balance exercises with cardiovascular exertion, Increase environment stimuli, Initiate multi-step exercises
Phase IV- Functional Exercise	- No symptoms at rest or during activity - Decreasing baseline HR	Treatment: Progress cardiovascular exercise to 80-90% Max HR, Non-contact sport-specific training, Increase coordination and cardiovascular training, Increase reactionary neuromuscular re-education Increase dynamic balance exercises
Phase V- Return to Play Exercise	- No symptoms at rest or during activity - Decreasing baseline HR	Treatment: Cardiovascular exercise to 100% Max HR, Progress to return to play contact exercises

***Reviewed by Janet Kent, MD**