CONCUSSION RESOURCE CENTER

Management Recommendations by Dr. Michael Lee

There is an epidemic in our midst that most of us are unaware of. Untold numbers of young people are suffering concussions at an alarming rate. Many go unreported. The public as well as the medical profession have failed to appreciate the consequences of this problem and have been unaware of its significance and its long-term complications. In order to prevent both the short and potentially long term functional brain impairment that may occur if a concussion is not treated properly, the following management recommendations are outlined.

In the past few years, there has been a paradigm shift in the management of concussions. Prior to that, well over 20 different management guidelines were used and no guidelines or grading system was optimal. Patients were often told to "take it easy" for a few days and then to return to play. International concussion conferences in Vienna and Prague as well as recent research have caused a change in many of our concepts about concussions. [i] [ii] Initially, amnesia was found to be more important than loss of consciousness in predicting poorer outcomes. [iii] Subsequently, **how long the concussion symptoms last has turned out to be far more important than the initial symptoms of concussions in predicting outcomes.** In laboratory tests of rats, it was found to take approximately two weeks to recover from a concussion. We can draw the conclusion that humans may act similarly. Research subsequently showed that with the mildest of concussions, the bell ringer (ding) concussion, it took approximately one week to recover. [iv] With the realization of Second Impact Syndrome (a person under age 21, whose initial concussion symptoms are unresolved, may suffer sudden death if there is a second concussion within two weeks of the first concussion), it is clear that adolescents must to protected from this potential catastrophic event. [v]

We have learned many new facts about concussions. Concussion manifestations vary from individual to individual. Lesser blows can cause more symptoms, harder blows may cause fewer symptoms. Younger athletes (in high school or in lower grades) have been shown to exhibit longer recovery times when compared to college and professional athletes. [vi] There may be a significant risk if they return to play too quickly. Concussions seem to have more symptoms and last longer in females. [vii] A gene may exist that causes some individuals to be more susceptible to concussions. [viii] What we now know is that **each concussion should be treated individually** depending on the symptoms and the neuro-cognitive test results. This may be the reason why standardized management guidelines were unsuccessful. The following recommendations are made to improve concussion management and speed the recovery process.

RECOMMENDATION #1

NO ADOLESCENT WITH A CONCUSSION SHOULD CONTINUE TO PLAY OR RETURN TO A GAME AFTER SUSTAINING A CONCUSSION.

Athletes continuing to play (exercise) or receiving multiple blows to the head, after suffering a concussion, may take longer to recover from a concussion. They also may be more at risk for developing post-concussion syndrome.

IMMEDIATE EVALUATION AND EXAM AFTER A CONCUSSION

- While it is important to do a neurological exam to rule out a bleed, it is normal in the vast majority of patients. Occasional balance problems or nystagmus on lateral gaze may be found and they usually disappear as the patient recovers.
- CT scans and MRIs of the head are usually normal and are not necessary unless the patient has increasing symptoms or there is concern that there might be a bleed. (Research indicates that functional MRIs and PET scans can show the area of the brain affected.)

RECOMMENDATION #2

AN INDIVIDUAL SUSTAINING A CONCUSSION SHOULD CEASE DOING ANY ACTIVITY THAT CAUSES THE SYMPTOMS OF A CONCUSSION TO INCREASE (e.g. headaches, dizziness, nausea, etc.).

Due to the metabolic imbalance that occurs following a concussion, it has been shown that increased blood flow to the brain during recovery may impede or slow down the recovery process and worsen the symptoms of concussion. Most patients do not need to be placed on bed rest unless they are having severe symptoms (severe headaches, marked photophobia, disorientation, balance problems, extreme fatigue, etc). They may participate in any activity that doesn't cause increased symptoms (headaches). In some cases, activities such as reading, watching TV, working at the computer, taking hot tubs and having heated discussions with others may increase symptoms. **If patients develop increased symptoms while doing a specific activity, that activity should be discontinued.**

Many concussed individuals may be unable to concentrate (focus). They may not be able to read or absorb material and may develop an increased headache while doing so. When this occurs, they might be able to participate in an activity for only a few minutes before symptoms increase. If a rest break can be interspersed between those few minute intervals, these activities can be done. As the symptoms abate, longer intervals can be spent reading, watching TV and using the computer.

Continuing activities, or exercise that increases symptoms, can delay the recovery from the concussion.

Tylenol can be used to help headache symptoms.

RECOMMENDATION #3

SCHOOL ATTENDANCE AND ACTIVITIES MAY NEED TO BE MODIFIED.

School:

While some individuals may be able to attend school without increasing their symptoms, the majority will probably need some modifications depending on the nature of the symptoms. Trial and error may be needed to discover what they can and cannot do.

- If students are unable to attend school for an entire day without symptoms, they may attend for a half day. Some students may only be able to attend for one period, some not at all, due to sever headaches or other symptoms. Frequent breaks with rest periods in the nurse's office may be necessary. Often, alternating a class with a rest period may be helpful. Math causes more symptoms in my patients than other subject classes. As recovery proceeds, gradually hours spent in school may be increased.
- Depending on their symptoms, some students may need to be driven to school to avoid walking and should be given elevator passes to avoid stairs. They should not attend gym or exercise classes.
- Workload and homework may need to be reduced. Frequent breaks while doing homework may be helpful. Term papers should be postponed. Pre-printed class notes and tutors may help to relieve the pressure of schoolwork.
- Tests: If there are concentration and memory problems, quizzes, tests, PSAT tests, SAT tests and final exams should be delayed or postponed. If test results are poor, a note to the school should request that the scores be voided. Extra time (un-timed tests) may be necessary initially when test taking is resumed.

Activities:

- If noise causes increased symptoms, students with concussions should not listen to loud music (especially in cars or on their I-Pods). They should avoid attending dances, parties, music concerts and sports events until the hyperacusis is gone.
- If light causes increased symptoms or students have photophobia they should avoid bright sunlight and exposure to flashing lights (computer games). Sunglasses may be necessary.
- My experience suggests that spinning carnival rides should be avoided while recovering from a concussion.

RECOMMENDATION #4

NEURO-COGNITIVE TESTING IS AN IMPORTANT COMPONENT FOR THE MANAGEMENT OF CONCUSSIONS.

The use of neuro-cognitive testing is one piece of the puzzle in assessing recovery from concussions and determining the timing of return to play. *It should only be used as a tool, and should not be the only deciding factor in returning a concussed athlete to play.* It provides objective data and prevents athletes who hide their symptoms from returning to play before they are fully recovered. While there are several available tests to accomplish this, the one with the widest acceptance and the largest data base is the ImPACT Test developed at the University of Pittsburgh. The ImPACT Test is used by the NFL, NHL, and other professional sports organizations. It is used by many universities and is now recommended by some states for high school students. This test is recommended by the CIAC in Connecticut to be used as a baseline in Connecticut high schools.

Although this test can be used without a baseline (due to the enormous data base of normal controls that have been

developed) it is more easily and effectively used with a baseline test. Special training is necessary to use it without a baseline. There are two parts of the test, the Symptom Score component and the six part neuro-cognitive test component. **Both component scores should return to baseline or normal before an athlete is allowed to resume playing a contact sport.** [ix]

Generally, the symptoms of a concussion disappear before the neuro-cognitive findings return to normal, although occasionally, this can be reversed. I have seen a patient with zero symptoms following a concussion whose ImPACT test took two weeks to return to normal. *It is for these reasons that symptoms evaluation alone can not be used as the sole criteria for return to play.*

Migraine headache concussion symptoms, as opposed to the usual generalized headache of a concussion, are predictive of poorer scores on ImPACT testing and are associated with a longer healing time. [x] Increased headaches often occur when taking the initial ImPACT test after a concussion. The different components that are measured (verbal and visual memory, processing speed and reaction time) usually correlate with different regions of brain function that may be involved with the concussion.

- Individuals who score well below expected levels of function initially (e.g. 1st percentile across all four summary scores) should be monitored very carefully as they will usually take longer to heal and may be more prone to developing post-concussion syndrome. They may need greater school or activity modification, perhaps not attending school for a prolonged period. Initial bed rest may be necessary.
- Individuals with high reaction times (e.g. scores > .70 on ImPACT) should not drive and, initially might need greater activity modifications, sometimes even bed rest.
- Increasingly poorer successive ImPACT test scores will identify those individuals who continue to exercise or do activities that cause their symptoms to increase.

RECOMMENDATION #5

NO ATHLETES SHOULD RETURN TO CONTACT COMPETITIVE SPORTS UNTIL THEY ARE SYMPTOM FREE, BOTH AT REST AND WITH EXERCISE AND HAVE NORMAL NEURO-COGNITIVE TESTING.

Usually concussed athletes will start to recover rapidly once the feelings of fogginess and being slowed down disappear. Students may literally wake up one morning and say, "Wow, I'm back to normal!" **When they have no headaches *or other concussion symptoms* athletes can begin the concussion graduated return-to-play exercise program** that was recommended at the Prague Concussion Conference.

Day 1: Walking for 20-30 minutes at a rate of 2-1/2 miles per hour
Day 2: Jogging for 20-30 minutes
Day 3: Running for 20-30 minutes
Day 4: Performing sports specific practice drills
Day 5: Return to contact sports **if RECOMMENDATION #5 is met**

If headaches or other symptoms occur, during any step, the activity needs to be stopped. The athlete should then wait 24 hours and start at the previous level again.

Post-Concussion Syndrome

Fortunately, post-concussion syndrome occurs only occasionally but it is devastating to those individuals encountering it. It is usually defined as having concussion symptoms that last for greater than a month after the initial blow. The problems that can develop are categorized as follows:

- **SLEEP ISSUES** - Initially, most concussed individuals are very fatigued and sleep more than usual. As the concussion persists, they may have difficulty falling asleep and sleep less than usual. Lack of sleep causes major difficulties and should be resolved before treating the next two issues. Sleep disorders can be treated with medications such as Elavil. [xi] Melatonin may also be of help in patients having difficulty falling asleep.
- **CONCENTRATION AND MEMORY ISSUES** - Inability to concentrate (focus) and poor memory, often associated with increased headaches during schoolwork, may cause poor school attendance and performance. It can take months, or even longer, to recover from this. Methylphenidate or Strattera may be helpful.
  Full neuro-cognitive testing and rehabilitation may be indicated in some cases.
- **DEPRESSION AND OTHER PSYCHIATRIC PROBLEMS** - Although depression may be caused by the concussion itself, the persistence of symptoms and being unable to play may also cause depression. Psychotherapy and anti-depressant medication may be warranted.

Individuals with concussions often suffer frustration and anger due to the curtailment of their normal activities. They may not be able to participate in their chosen sport or attend school. **Support groups may help individuals cope with their feelings.**

Some athletes may not be able to return to contact sports due to the long term symptoms they have suffered as a result of their concussion.

Conclusion:

In summary, each concussion should be treated individually. No one guideline will work for each patient. The general public, physicians, coaches, athletic trainers, parents, and the athletes themselves, must be educated about the signs, symptoms and treatment of concussions. Generally, the athlete may be unaware that they have sustained a concussion. In order to prevent poor outcomes from concussions, it is crucial to educate athletes. Therefore, the last recommendation is:

RECOMMENDATION #6

ALL SPORTS AND HEALTH EDUCATION PROGRAMS SHOULD TEACH STUDENTS THE SPECIFIC SIGNS AND SYMPTOMS OF CONCUSSIONS. INSTRUCTORS MUST EMPHASIZE THE SERIOUS CONSEQUENCES OF IGNORING CONCUSSION SYMPTOMS AND THE CONSEQUENCES THAT WILL OCCUR IF CONCUSSIONS ARE NOT PROPERLY TREATED.

---

i Aubry, Cantu, et al:. Summary and Agreement Statement of the 1st International Symposium on Concussion in sport, Vienna 2001 Clin J Sports Med 2002; 12:6-11

ii International Conference on Concussion in sport, Prague 2004. Clin J Sports Med 2005; 15(2):48-54

iii Collins et al. On field amnesia up to 10X more predictive than LOC in predicting outcome. Clin J Sports Med 2003; 13:222-229

iv Lovell, Collins et al. Grade 1 or "ding" Concussions in High School Athletes. Am J Sports Med 2004; 32:47-54

v Cantu, RC: Head injuries in Sport. Brit J Sports Med 1996; 30:289-296

vi Field, Collins, et al. Does age play a role in recovery from sports related concussions? J Pediatr 2003; 142(5):546-53

vii Bazarian and Atabaki. Predicting post-concussion syndrome after MBTI. Acad Emerg Med 2001; 8(8):788-795

viii Apolipoprotein E-epsilon 4 Genotype predicts poor outcome in survivors of traumatic brain injury. Neurol 1999; 52:244-249

ix Collie et al. Cognition in the days following concussion. J Neurol Neurosurg Psychiatry 2006; 77:241-245

x Goldberg. What happens after brain injury? Postgraduate Med 1998; 104(2)

xi Mihalik, Stump et al. Post-traumatic migraine characteristics in athletes following sports-related concussion. J Neurosurg 2005; 102:850-855

Dr. Lee is a pediatrician with Pediatric Healthcare Associate in Southport, Connecticut specializing in adolescent and sports medicine. He is a charter member of AMSSM and Medical Director of the Student Health Center at Fairfield University.

Next: Mild Traumatic Brain Injury (MTBI)