

Spotlight on Concussions:

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Every hockey fan is wondering, *will Sidney Crosby ever be the same?*

Penguins Captain Sidney Crosby has been sitting out from the game since January 5, 2011 as a result of suffering a concussion as the result of 2 hits to the head within 4 days. There is still no timetable for his return.

A concussion can be caused by direct or indirect blows or a hit to the head, violent shaking of the head, or force from a whiplash type injury. Most concussions are due to a collision with another object while the object/person is moving at a high rate of speed. The brain suddenly shifts or shakes inside the skull and can knock against the rough, bony undersurface of the skull.

With a concussion, there is usually no visible injury to the structure of the brain. Therefore the results of MRI tests or CT scans usually appear normal. Because most concussions do not appear on brain scans and symptoms can take until 24 hours to appear, caution must be exercised. If someone has sustained a concussion and a second brain injury occurs before the first one has healed, the result can be devastating.

It is recommended that a person who is thought to have suffered a concussion avoid driving and be monitored for worsening symptoms. It is even recommended to avoid video games and other visually stimulating activities.

Symptoms can include:

- Headaches
- Neck Pain
- Vomiting and Nausea
- Dizziness
- Blurred Vision/Sensitivity to Light/Noise
- Unsteadiness
- Confusion/Trouble Concentrating
- Possible Loss of Consciousness

We, the public, do not know the severity of Crosby's concussion as there seems to be a veil of secrecy concerning his injury. What we do know is that he is now vulnerable and at risk for reoccurrence and has to be cautious upon his return to the game, whenever that should occur.

He is not a reckless player but hockey is a dangerous sport. And headshots are especially dangerous.

“When you get hit like that there’s nothing you can do, there’s no way you can protect yourself”

- *Sidney Crosby*

Before Crosby can be cleared, he must go symptom free for a period of 10 consecutive days. He is nauseous, suffering from headaches and experiencing sleepless nights. His symptoms are still persisting.

The NHL adopted Rule 48 this hockey season, which outlaws blindside hits where the head is the primary target. The point is though, that the NHL should punish hits to the head whether intentional or accidental. David Steckel and Victor Hedman were not fined or suspended for making contact with Sidney Crosby’s head from behind.

The 23-year old hockey star’s medical condition has been quite a hot topic as of late. Media reporters have had a heyday examining the circumstances of his concussion. Currently, he is taking part in regular practices, without contact. His fans are hoping to see Sid the Kid make a return to hockey during the playoffs, but no one knows when his return will happen.

“If you get through one day, it doesn’t, mean you’re out of the woods...I try not to put too much pressure on that one day.”

- *Sidney Crosby*

The attention being paid to him is not because he is more important than other players who have missed a significant portion of the NHL season with post-concussion symptoms but because he is touted as the Face of Hockey; “Sid the Kid”, the best player in the world (to quote various media sources).

After all, you only have one brain. And it is a delicate organ.

What this incident tells us is that every hockey player is vulnerable, even hockey’s fan favourite and leading star. What we can take from this is that concussions need to be taken seriously and blows to the head need to be examined more closely.

Brain Injuries:

Finally, the sports world is catching up to the position where we who specialize in brain injuries from car accidents have been for many years.

Let’s take a closer look at the statistics dealing with brain injuries (statistics courtesy of www.biaph.com):

- Acquired Brain Injuries is the number one killer and cause of disability in Canadians under the age of 44.

- Each year, 50,000 Canadians sustain brain injuries. Of these 50,000
 - 11,000 will die;
 - Over 6,000 will be permanently disabled.
- Head injuries account of 80% of child cycling deaths;
- 30 % of all traumatic brain injuries are sustained by children and youth, mainly while participating in sports and recreational activities;
- Direct and indirect costs associated with ABIs are \$3 billion annually in Canada and \$1 billion in Ontario;
- Close to half a million Ontarians currently live with an acquired brain injury (ABI) and 18,000 cases arise each year.

Aside from the obvious sports-related injuries, traumatic brain injuries are caused by other external forces such as motor vehicle accidents, bicycle accidents, slip and falls, assaults etc. For an illustration of types of brain injuries, visit http://www.biaph.com/abi-prevention-education/types_of_brain_injuries.html .

Concussions and Hockey:

Is the NHL behind the times when it comes to in-game diagnosis and return-to-play protocol for concussions? When NFL players show symptoms of a concussion, they are not allowed to return to play the same day. They must be symptom-free and cleared by an independent neurologist before returning to the field.

One in five NHL players who sustained a concussion during the regular season returned to the same game where they were hit. The study published in the Canadian Medical Association Journal also mentions that a significant number of these players missed 10 days due to concussion symptoms. The study analyzes data collected from 1997 to 2004 and authors include Dr. Brain Benson of the University of Calgary and Dr. Charles Burke, team doctor of the Pittsburgh Penguins.

The U.S. Centers for Disease Control and Prevention estimates that there may be up to 3.8 million sports and recreation-related concussions in the U.S. each year, with concussions accounting for one in ten of all sports injuries.

Hockey Canada (<http://www.hockeycanada.ca/>) deems concussions to be a “common injury” but one that is “difficult to fully investigate and understand”. Hockey Canada does recognize that ALL concussions have the potential for “serious and long-lasting symptoms” and discloses that they should be treated with caution and in consultation with a physician.

Interestingly enough, on February 15, 2011, Maple Leafs’ Mikhail Grabovski was believed to have suffered a concussion after two hard hits in the game but was allowed back on the ice and scored the winning goal. It was not a doctor who made this decision but a trainer who determined that since Grabovski responded coherently to questions, he was okay to return to the ice.

Maple Leafs GM Brian Burke had this to say *“Our job is to make this game as safe as we can make it while preserving full-body contact.”*

Does anyone else find this statement troubling?

According to www.thinkfirst.ca:

- During a game of hockey, the puck can travel up to 100 miles per hour;
- In 2008, there were 190 catastrophic injuries in hockey in Ontario, 82% of these injuries happened to males under the age of 30;
- According to the ThinkFirst-Tator study of 2008, many catastrophic injuries were caused by hits from behind and hits to the head.

Recently, The Globe and Mail has been running a series of articles concerning hockey and concussions. The discussions have featured discussions by Dr. Charles Tator, well-known Toronto Neurosurgeon and Canada’s leading expert on concussions. Of Sidney Crosby, Dr. Tator states, *“I hope he gets back...But he may never be the same.”*

To quote Dr. Tator, *“I’m out to protect the brain...it’s so marvelous a structure- but so fragile.”* He could not be more right. The brain is so fragile and very little is known or understood about the immediate or long-term effects of concussions, but slowly, new information is beginning to emerge.

When will the NHL create a standard return-to-play protocol for concussions?

A New Direction for the NHL: the Results of the GM Meeting

The NHL General Managers met in Florida with Commissioner Gary Bettman and company during the week of March 14, 2011. The concussion debate was a hot topic during their meeting. This hockey season, approximately **80** players suffered from concussions. A five point plan to treat concussions was recommended as follows:

1. If a player is injured and appears to have a concussion, the player is to be removed from the rink to a quiet place, for at least 15 minutes and to be examined by a physician (versus a trainer);
2. For repeat offenders who perform illegal hits to the head, penalties will be handed out to the player, the team and possibly the head coach;
3. The NHL will hire a safety engineer to ensure that all arenas comply with safety standards and are uniform, focusing on the hard boards and glass (think Pacioretty’s brutal hit);
4. League VP Brendan Shanahan is set to work with the NHLPA on the issue of improved equipment;
5. A new league committee, composed of Shanahan, Rob Blake, Tampa Bay GM Steve Yzerman and Dallas Stars GM Joe Nieuwendyk will study safety issues and concussions.

Within forty-eight hours of the announcement of the new rules, the new concussion protocol took effect. An injured player is to be attended to by a doctor, and the tests have to be conducted without a sense of urgency. This is a tremendous change. The player has to be willing and ready to go back on the ice. It was recognized that concussions take longer than merely 15 minutes to emerge.

During the NHL Board of Governors meeting in June 2011, discussions will be held concerning Step 2, fining organizations that consistently have players who break hockey laws. The rationale behind this line of thinking is that coaches will be less inclined to allow dangerous players back on the ice if these players are costing them money due to fines.

The NHL General Managers did not seem to want to change the pace or physicality of hockey, which is why they opted for this 5 step plan. Commissioner Bettman decided that a ban on all headshots would be too radical a response. The League determined that nearly half of all concussions from the 2010-2011 hockey season were caused by legal hits. The GMs' push for longer suspensions is seen as a significant step in the right direction.

General Managers were given the results of a 2 year study of NHL concussions:

- 44% of the concussions resulted from legal hits;
- 26% from accident hits;
- 17% from illegal hits;
- 8 % from fighting.

History of Dangerous Hits:

February 21, 2000: Marty McSorley of the Boston Bruins swung his stick at the head of Vancouver Canucks' Donald Brashear, rendering him unconscious. Brashear suffered seizures on the ice and post-concussion symptoms, causing him to miss six weeks of playing time. He went on to play for 9 more seasons. McSorley was found guilty of assault with a weapon and was sentenced to 18 months probation. He was suspended from the NHL for one year. By that time, the NHL was no longer interested in him.

March 8, 2004: Vancouver Canucks' Todd Bertuzzi attacked Colorado Avalanche's Steve Moore, effectively ending his career. Moore suffered a concussion and three cracked vertebrae in the neck. He was never able to play again and still suffers from post-concussion symptoms. Bertuzzi was suspended for the rest of the 2004 season, served one year of probation and 80 days of community service after pleading guilty to assault. Moore's civil suit is still pending.

March 7, 2010: a day that Marc Savard will never forget. That was the day that he suffered a severe concussion as a result of being hit by Matt Cooke of the Pittsburgh Penguins, and did not play again until early December 2010. He does not remember being hit by Cooke but he cannot forget his symptoms. He then suffered another

moderate concussion on January 25, 2011. Savard told ESPN.com that he is having real memory problems and is quite worried about it.

March 8, 2011: Max Pacioretty of the Montreal Canadiens suffered a severe concussion and fractured vertebrae at the hands of Boston Bruins Zdeno Chara, which led him to crash into a stanchion. There is speculation that Pacioretty may return to play during the playoffs. This led to massive public outcry in Quebec when the League decided no supplementary discipline against Chara was required. Callers flooded emergency lines begging for something to be done and a criminal investigation was opened. Corporate sponsors like Air Canada and Via Rail were ready to withdraw their support. This incident prompted Prime Minister Stephen Harper to say:

“I just say this as a hockey fan, I’m very concerned about the growing number of very serious injuries, and in some cases to some of the premier players in the game..”

Yes, hockey fans were ready to see change. The public was ready to see changes come into effect regarding hockey violence and concussions. It is because of public outcry that the emergence of change has come.

On Monday, March 21, 2011, Pittsburgh Penguins’ Matt Cooke was suspended for the rest of the NHL season and from the first round of the playoffs for his dangerous play tactics. He was fined \$219, 512.20 as part of his sentence.

Cooke is known to be a repeat offender and the League decided to suspend him after he delivered a blindside hit to the New York Rangers’ Ryan McDonagh during the previous night’s game. The suspension is the fifth in the player’s career for a hit to the head. It is also the most serious.

The GM of the Pittsburgh Penguins, Ray Shero, a big supporter for concussion prevention said:

“The suspension is warranted because that’s exactly the kind of hit we’re trying to get out of the game...Head shots have no place in hockey...Head shots must be dealt with severely, and the Pittsburgh Penguins support the NHL in sending this very strong message.”

Other Sports and Concussions:

In October of 2010, Major League Baseball announced that they were considering a 7 day disabled list specifically for players with concussions, to be implemented for the following season. The disabled list was previously 15 days. However, a new concussion subcommittee is being formed under a medical advisory committee. In addition, they have introduced redesigned helmets that can withstand greater impact.

2006 American League MVP Justin Morneau of the Minnesota Twins has been out of play since July 7, 2010 after sustaining a concussion. He has been able to participate in spring training, but still has lingering symptoms.

Another baseball star, Boston Red Sox player Josh Beckett had mild concussion symptoms after being hit in the back of the head during batting practice at the end of February 2011. He only missed one game.

Major League Baseball has taking a genuine interest in concussions. They maintain that player safety is important. A special committee to study concussion protocols has been formed, and is headed by Dr. Alex Valadka, the Chief of Adult Neurosciences and Neurotrauma at the Seton Brain and Spine Institute in Austin, Texas.

How about the National Basketball Association? In early March 2011, the NBA announced they were considering a formal concussion policy. The league has been consulting with an independent neurologist and may establish a league-wide policy for monitoring and treating concussions by next season. The idea is to bring the NBA in line with the NFL and NHL. Between February and March 2011, six NBA players missed games due to concussions.

Notably, Chris Paul, of the New Orleans Hornets was taken away by stretcher on March 6, 2011 after suffering a concussion. He sat out for two games. Prior to that, basketball players who suffered from hits to the head included Miami Heat's Mike Miller, San Antonio Spurs' Gary Neal, Phoenix Suns' Vince Carter and New Jersey Nets' Anthony Morrow and Damien James.

Currently, the NBA protocol is for each team to follow its own treatment and return to play protocols. According to the Associated Press, eight NBA players missed games this season because of head injuries, concussions, or concussion-like symptoms. Of course, there are no helmets in basketball.

The National Football League has installed standardized concussion evaluation guidelines for 2011. These guidelines include a symptom checklist, cognitive evaluation, neurologic examination and balance assessment. These guidelines are to be administered on the sidelines and to determine if the player should be removed from play.

The Globe and Mail published an article of interested to football players everywhere: a University of North Carolina revealed that repeatedly concussed NFL players had five times the rate of mild cognitive impairment than the average population while retired NFL players suffer from Alzheimer's disease at a 37% higher than average rate. CFL players were informed of this grim report at the CFL Players' Association meeting in Las Vegas. According to the study, two doctors determined that the average life expectancy for all pro football players is 55. Readers, be sure to visit globeandmail.com to read about this interesting study and players' reactions. The CFL Players' Association aims to bring itself in line with the NFL and spent hours discussing safety and adopting a protocol for dangerous hits to the head.

Youth and Concussions:

Dr. Tator is currently advocating for a “dramatic change in the culture of the game”, going beyond restoring respect for players amongst each other. He wants the attitudes to change amongst coaches, parents, officials, trainers and even fans.

It’s about awareness. It’s about losing the attitude of “sucking-it-up”.

Players are often reluctant to admit to weakness and unwilling to be pulled out of the game. Concussions are silent injuries. Hockey is a game that involves a macho personality and bravado. Players are so competitive and with all that adrenaline surging through ...they make a plea to stay in the game and fight on.

We have to be concerned with how the perception of “tough guy” hockey players affects youth hockey players who are eager to imitate their favourite hockey players.

Athletes who have suffered concussions hide the fact that they have dizzy spells, headaches or other symptoms because of the fear of appearing weak. It is also for the love of the game. Another issue is that young athletes may have difficulty describing their symptoms.

The U.S. Centers for Disease Control and Prevention calls traumatic brain injury a serious health problem for children under age 15; they account for approximately 40% of the 1,100 000 brain injuries that hospitalize children each year.

An Ontario study looking at brain injuries in 2010 found that 25% of junior hockey players on the 2 teams studied suffered concussions during the 2009-2010 season.

Recommendations for how to reduce injury include anticipating a collision. These recommendations come from the Department of Exercise and Sport Science at the University of North Carolina:

- Keep your head up, looking in the direction of the coming hit;
- Keep your knees and hips slightly flexed;
- Keep your feet shoulder-width apart;
- Use your legs and shoulders to drive through the collision.

Do the entertainment value of fighting and a fast paced game justify the risk of brain damage to its participants?

Young players have to learn that it’s okay to say “no” and to sit one out. Learn the importance and vulnerability of the brain!

Keith Primeau, formerly of the Philadelphia Flyers was forced to end his NHL career early in 2006 due to multiple concussions. “I’ve damaged my brain and I don’t know if

that will ever go away”. Since retiring, he has become an advocate for hockey safety and a spokesperson for concussions.

Former Maple Leafs' player Mike Van Ryn also retired from the NHL early. After suffering a painful concussion and other injuries in November of 2009, Van Ryn decided to retire at age 31. He now coaches minor league hockey with the Niagara IceDogs.

“We have to make the head off limits. It’s just too important an organ to mess with.”
- ***Keith Primeau, 2011***

Concussions and Siblings:

Sidney Crosby’s 14-year old sister, Taylor Crosby, also suffered from a concussion this hockey season. She missed a week of hockey practice and 2 games. Dr. Charles Tator, commented that experts often wonder if some families have a special susceptibility to concussions.

Take for example the Lindros brothers. Both Eric and Brett Lindros suffered concussions. Brett Lindros had a short lived hockey career due to 3 concussions, playing only 52 NHL games. . Eric Lindros suffered 8 concussions before ending his career in 2007.

The scientific community is trying to find a link between genetics and concussions.

Female Athletes and Concussions:

The Globe and Mail published an article concerning the possibility that females are more susceptible to concussions. This leads to an interesting discussion, since major league sports and studies tend to focus on males.

New research could point to the need for adjusting rules in women’s sports as well, which would make sense. Brain injuries are not gender specific!

Katie Weatherston, Olympic gold medalist has sustained multiple concussions. She was a member of the Canadian Women’s Ice Hockey Team that won the gold medal in Turin in 2006. She suffered her first concussion in 2006. She fell during a game of pick-up hockey in late 2008 and as a result could not participate in the Vancouver 2010 Olympics. She has been in the post-concussion phase for two years.

According to researchers, current testing protocol for sports-related concussions is geared towards male athletes, as are the return to play guidelines.

Now that more research is being conducted, it is suspected that female athletes potentially have three times greater a risk of suffering a sports-related concussion than males. Researchers are not sure why this is, but speculate the female brain is generally more

fragile. There is also the possibility that females are coached differently. Females are not taught how to brace themselves or how to avoid a collision in hockey, for example.

According to the Ontario Women's Hockey Association, there were 96 reported concussions this season in the OWHA.

New Research on Concussions:

Scientists are investigating the long-term impact of repeated concussions and growing evidence that they may be linked to an Alzheimer's like condition associated with personality changes and dementia.

There is evidence that multiple concussions (even two or three) can have a cumulative impact and affect attention and processing speed. Dr. Tator states that researchers now recognize the relationship between repeated concussions and depression.

The latest research that speaks to the effects of concussions comes out of studies conducted on the brains of NHL 'brawlers', Reggie Fleming and Bob Probert.

Reggie Fleming suffered approximately 20 concussions and his brain tissue showed he had suffered from chronic traumatic encephalopathy (CTE). The distinctive build up of an abnormal protein called "tau" in his brain was consistent with a history of repetitive head trauma. Fleming's son recalls his father's erratic behaviour from emotional outbursts, substance abuse, gambling, severe lack of concentration, memory impairment and ultimately, full dementia and a disease resembling Parkinson's.

Bob Probert's brain was also donated to science. Like Fleming, he too was found to have been suffering from CTE. He was the second former professional hockey player to be found with the degenerative disease after Reggie Fleming. He suffered at least 3 concussions and also suffered with substance abuse, odd bouts of rage and memory gaps.

Forty athletes donated their brains to the Sports Legacy Institute in Boston including boxers, professional wrestlers and more than a dozen former NFL players. CTE can only be diagnosed once a person has died. Scientists found chronic traumatic encephalopathy in 30 of the 40 donated brains.

The Center for the Study of Traumatic Encephalopathy at Boston School of Medicine tells us the following:

- Chronic Traumatic Encephalopathy (CTE) is also referred to as being "punch drunk"; a phrase coined after examining the brains of boxers who suffered many blows to the head;
- It can only be diagnosed after death;
- It is caused by repetitive concussive or subconcussive blows to the head. However, the symptoms of the disease might not appear for years or decades after the head trauma;

- The symptoms are similar to Alzheimer's, specifically: memory impairment, emotional instability, erratic behaviour, depression, problems with impulse control and eventual dementia;
- It is a progressive degenerative disease.

Treating Concussions:

Dr. Donna Ouchterlony, Director of the Head Injury Clinic at St. Michael's Hospital appreciates the seriousness of concussions and mild traumatic brain injuries. St. Michael's Head Injury Clinic provides leading edge treatments to patients with mild brain injuries.

Currently, her clinic is researching how blood tests can tell us if a patient has suffered a mild brain injury through positive biomarkers. The study was presented in Washington, D.C. The results of the study will be published in the Journal of Trauma.

Dr. Ouchterlony explains that there are four major components of a mild brain injury, such as a concussion:

- 1) Benign Positional Vertigo (BPV), more commonly known as dizziness;
- 2) Headaches;
- 3) Fatigue;
- 4) Cognitive Problems.

She explained that the key to treating dizziness and BPV is to treat it early. Her colleagues, Dr. Cheryl Masanic and Dr. John Rutka are leaders in this industry. This early treatment applies to athletes and to car accident victims. If people who have suffered head injuries from car accidents could receive treatment within the first three to six months, they would benefit immensely. Anyone who has ever suffered from vertigo can appreciate how early intervention would be beneficial.

Dr. Ouchterlony and her colleagues focus on treating patients who suffer from mild TBIs. To treat the fatigue component, they can send their patients for a sleep study as they have sleep laboratories available for their patients.

The St. Michael's Head Injury Clinic is a very unique clinic as it lends itself to treating concussions and mild traumatic brain injuries. The reality is that most brain injuries that occur are of the mild variety. Toronto is fortunate to have such a resource.

Those who have been advocating for concussion prevention have seemed to be neglecting the fact that concussions need to be treated. Concussions can still occur, even with Commissioner Bettman's new plan. It is important to recognize that treatment is available.

Final Thoughts:

Treatment has to happen as soon as possible, whether a person sustains a concussion through a sports injury or through an accident or assault. The injury has to be recognized and treated.

The rise of hockey concussions and especially high profile concussions has helped to raise awareness and bring the brain's vulnerability to the fore. Now it is time to bring treatment to centre ice as well.

So now we see the whole gamut of symptoms of a concussion, or what multiple concussions can do. From headaches to dementia, a concussion is a brain injury and must be treated as such. And what have we learned? **Concussions are to be taken seriously. Concussions are a big deal!** They can lead to serious disabilities.

No two concussions are alike, the same way no two brains are alike. It is impossible to predict the course of a concussion.

What's the bottom line? **Cherish your brain.**

If not for our brains, we would not be functioning, now would we?

Do we want to live our lives like the Scarecrow from the *Wizard of Oz*, singing gaily, "*If I only had a brain?*".