Mind Meld

By Beth Saulnier

The Weill Cornell Concussion and Brain Injury Clinic offers comprehensive care, from pediatric patients to pro players

I don't even get to tell the cool story that I was diving to save the goal," Brandon Swersey says with a chuckle. "A kid who couldn't skate fell on me."

It happened in March 2012, when the Westchester County native was a high school freshman playing hockey on a travel team. They were in the semifinals at a tournament in Massachusetts when Brandon got checked, lost his balance, and landed on the ice. Then, he says, "a very large kid lost his edge and fell on my head."

At first, he didn't think there was anything amiss. "I remember feeling OK, just a little shocked," recalls Brandon, now a seventeen-year-old senior. "I'd been hit before, and there was always that 'whoa' factor. I didn't really think anything of it."

Smooth skating: Brandon Swersey is back on the ice after recovering from a concussion. JOHN ABBOTT

‘The thing that makes this program unique is that it doesn’t only look at assessment. It’s providing a mechanism for complete recovery.’

Brandon’s team scored, and the players assembled for the next face-off—but he lined up on the wrong side of the ice, facing the opposite direction, and his coach berated him for it. He didn’t play much more—he started feeling tired and headachy, which he attributed to the fact that it was the second game of the day—but he was buoyed by his team’s victory. That evening he ate dinner, got a good night’s sleep, and wrote a perfectly cogent paper for a science class. The next morning he still had a headache, so he took a Motrin—and decided to play in the finals. “I got cross-checked in the neck that game,” he says. “I don’t know if that was a tipping point, but it definitely didn’t help. The whole ride home I remember feeling really tired and lights seeming a little brighter. But I just chalked it up to being sleep deprived.”

Flash forward to the next day at school, when Brandon—a top student and AP scholar—couldn’t make out words on the chalkboard. “I didn’t forget how to read, but it hurt,” he says. “It was really hard to focus. Something didn’t seem right.” His mother took him to his pediatrician, who did some basic neurological tests; Brandon was able to follow a finger with his eyes, but when it came to counting backward by sevens, he ran into trouble. The doctor diagnosed a concussion and told the boy to go home and rest. “I stayed out of school for a few days, just sat on the couch in the dark,” he says. “I tried doing a little schoolwork, but I couldn’t. I just sat home and ate. It wasn’t good.”

Brandon’s dad, Kevin, sought advice from friends and colleagues in tracking down a leading concussion specialist in the New York metro area. That’s how Brandon wound up at the Weill Cornell Concussion and Brain Injury Clinic, where he was seen by Barry Kosofsky, MD, PhD, the Horace W. Goldsmith Foundation Professor of Pediatrics and a professor of neuroscience in the Feil Family Brain and Mind Research Institute. A neurologist with a specialty in traumatic brain injury (TBI) in children, Kosofsky is director of the clinic’s pediatric section. He examined Brandon, finding subtleties that the other physician hadn’t been trained to detect; for example, while Brandon could indeed follow a finger, his eye movements were jerky and halting. “He basically said, ‘Yes, you’ve got a concussion—and you have to shut down,” Kevin Swersey recalls. “No TV, no reading, no school—nothing that could cause a headache.”

Concussion has become a subject of national discussion, as former professional athletes—football players, boxers, hockey linesmen—have gone public about the long-term damage they’ve suffered after years of sports-related head injuries. Ills such as dementia, depression, and cognitive deficits are increasingly being linked to the tackles, knock-outs, and cross-checks of bygone sports careers—even if an injury didn’t seem devastating at the time. And the concern extends to kids’ sports as well. “The real challenge is that we can’t predict from a given hit who will be symptomatic in a week, a month, or six months,” Kosofsky says. “That’s what makes this so complicated. You’re trying to figure out if somebody has had a problem that’s going to require an intervention—and as clinicians, we’re just not smart enough yet.” Plus, Kosofsky stresses, although concussion among the pros may draw the most headlines, it’s just the tip of the neurological iceberg. “For every one professional athlete, there are 1,000 in college—and for every 1,000 in college, there are 100,000 in high school,” he says. “So the base of the concussion pyramid is really the younger kids in sports.”

At Weill Cornell, clinicians and researchers are at the forefront of work on concussion—striving to create a gold standard for patient care as well as to understand the condition’s physiological underpinnings. Faculty are practicing on the sidelines of marquee match-ups (including the 2013 Super Bowl); working to establish better ways to assess TBI both on the field and in the clinic; treating patients from pediatrics to the pros; and advancing research on the subject, including investigating ways to identify concussion through new imaging techniques. “The thing that makes this program unique—the overarching thing, besides the fact that it’s completely integrated—is that it doesn’t only look at assessment,” Philip Stieg, MD, PhD, professor and chief of neurosurgery and director of the Weill Cornell Brain and Spine Center, says of the clinic. “It’s providing a mechanism for complete recovery.”

In a concussion, the brain is injured at least twice—at the initial point of impact, and again as it rebounds against the skull. The condition is considered a mild form of TBI—one that, using conventional technologies, often can’t be detected on an MRI or CT scan—but it’s still serious, potentially causing a kaleidoscope of symptoms including headache, temporary amnesia, vertigo, insomnia, and an inability to concentrate. Some half a million children go to emergency departments with TBIs each year; the injuries are the most common reason for ED visits among adolescents. In addition to sports mishaps, children suffer brain injuries through falls, accidents, and abuse; in adults, the most common source of concussion is motor vehicle or bicycle accidents. One basic challenge, clinicians say, is convincing them to take it seriously. While parents may be increasingly willing to bring their kids to the ED for the merest bump on the head, adults can be more reticent when it comes to their own crania. “Most Americans don’t want to look at the brain as another organ in their body; they want to treat it as some mystical entity,” Stieg says. “And to admit that there’s some injury to it means admitting that there’s some fundamental flaw in their personality. We need to get Americans over that concept. If you had a heart attack, how resistant would you be to be taking medicine?”

Overall, about 70 percent of people who suffer mild traumatic brain injury (mTBI) recover fully within four to six weeks. It’s the other 30 percent that clinicians and researchers are most worried about. The issue is also on the radar of the policymakers coping with concussion’s socioeconomic costs: in late May, President Barack Obama hosted the Healthy Kids and Safe Sports Concussion Summit, bringing league commissioners, scientists, and former professional and amateur players to the White House. “I think this is going to end up being like the American Heart Association or the American Cancer Society,” Stieg says. “The only way we’re going to be able to affect this in the short course is by altering behavior. So, making people aware: getting mom and

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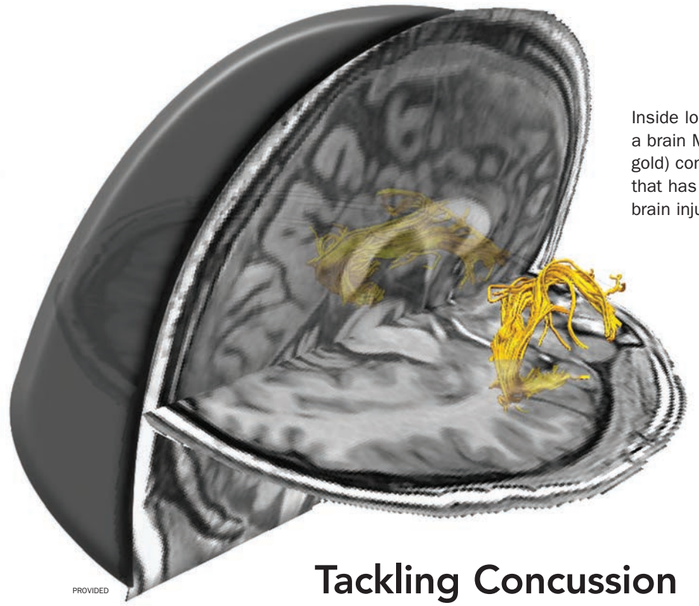
Goal oriented: “Everything revolves around hockey,” says Brandon, a left wing who aims to play at the club level in college.



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Inside look: A three-dimensional reconstruction of a brain MRI depicts a white matter pathway (in gold) connecting the frontal and temporal lobes that has been shown to be vulnerable to traumatic brain injury.

Tackling Concussion

In addition to the Concussion Clinic, Weill Cornell faculty are addressing the condition on a variety of fronts. They include:

On the sidelines—Numerous clinicians work with professional sports teams, offering on-the-spot evaluations using instruments such as the SCAT (Sport Concussion Assessment Tool) that test cognition, motor response, and more. "There are specific protocols we follow on the sideline, and then if we think it's severe we take the player into the locker room and do a much more formalized exam," says Philip Stieg, MD, PhD, professor and chief of neurosurgery, a longtime consultant to the NFL. "Once you take them into the locker room, they're pretty much out of the game. It's at the sideline where you can make the decision about whether it was a concussion or just a head bump." Stieg was on the Seahawks side at last year's Super Bowl; though the team had no concussions, the opposing Broncos had one. "Being on the sideline of the Super Bowl is kind of a surreal experience," he says. "At the end of the game, it was virtually blinding with all the confetti coming down." Other faculty who work with pro teams include Roger Härtl, MD, professor of neurological surgery and co-director of the Weill Cornell Spine Center (the New York Giants), Kenneth Perrine, PhD, assistant professor of neuropsychology in neurological surgery (the New York Jets and Islanders), and Nitin Sethi, MD, assistant professor of clinical neurology (the Giants, as well as the New York State Boxing Association).

In the radiology lab—A team led by P. David Mozley, MD, professor of radiology and chief of the Division of Nuclear Medicine, is working under a challenge grant from the NFL and General Electric. The investigators are using nuclear medicine and advanced MRI techniques to diagnose head injuries in athletes immediately after they occur. The team will compare scans from former professional boxers with known, long-term head injuries against those of NFL players in whom a concussion is suspected.

Collaboration and data gathering—In addition to keeping comprehensive data on patient treatment and outcomes that may prove invaluable for future research, the Concussion Clinic is collaborating with a Stanford neurosurgeon and Weill Cornell alumnus—Jamshid Ghajar, MD'81, PhD '83—on a promising avenue for assessing concussion. Under a grant from the Department of Defense, Ghajar is studying the efficacy of eye-tracking as a method of diagnosis. Says Barry Kosofsky, MD, PhD, the Horace W. Goldsmith Foundation Professor of Pediatrics: "It turns out that in combat—and they're now looking in sports—traumatic brain injury correlates with an inability to visually follow a dot around a circle."

dad to stop their kids from running into each other with their football helmets, and telling college players that they can't spear-tackle anymore. That will change the natural history and the incidence of this disease. Once we've maximized that, there's still going to be the need for a blood test, urine test, or imaging test that quickly tells us, 'Yes, you've had a concussion.' And hopefully whatever that test is will also be reversible—because the other big question that the trainers and coaches want answered is return to play. We need a test that tells us if you've got it, how bad it is, and when it's over."

At the Concussion Clinic, patients like Brandon Swersey get comprehensive care by specialists who meet regularly to integrate their treatment. The clinic has a dedicated hotline, where a nurse triages the query and directs it to a clinician for an initial phone consultation. "Then, depending on how serious it is, the patient is referred to an emergency department or to one of us," says Kenneth Perrine, PhD, assistant professor of neuropsychology in neurological surgery. "We'll see the patient in twenty-four to forty-eight hours and do an intake and an assessment, and then the services follow from that." Those services can range from imaging scans (to rule out more serious brain injury) to cognitive testing to appointments with specialists in headache, vision, and balance. Patients are closely followed, and those who have lingering problems with attention and memory—what's known as post-concussion syndrome—can undergo a process called cognitive remediation that includes concentration exercises and psychotherapy. "We get a lot of people who are six to eight to twelve weeks post, and they're still symptomatic and complaining of cognitive issues that impact their work functioning—and there can be a big psychological piece to that," says Amanda Sacks, PhD, assistant professor of neuropsychology in neurological surgery. "We offer complete, multi-faceted treatment that addresses both the cognitive and emotional consequences of brain injury."

Kevin Swersey calls the neuropsychology component the "back end" of treatment, and one that was essential to helping his son recover fully. After missing nearly two weeks of school, Brandon went back, at first for half days. "That was a disaster, because I couldn't manage," he says. "The symptoms were still there." He tried a more reduced schedule, minimizing eye strain by taking tests orally and listening to audiobooks. "It was really depressing," Brandon recalls. "Dr. Kosofsky was saying, 'I don't know if you're going to play hockey again,' and that was terrible, because it's so much of my life. Everything revolves around hockey. I told him, 'I *will* play again, one way or another.' "

A basic challenge for Brandon's treatment was one that's common to his fellow patients everywhere: as of now, there's no magic pill to treat concussion. Doctors prescribe a period of rest and reduced activity, and a gradual return to a normal schedule. While the old-school antidepressant amitriptyline has shown some success for treating post-concussion headaches—Perrine and Nitin Sethi, MD, assistant professor of clinical neurology, are planning a trial on the subject—Brandon says it didn't help him. And in any event, headache is just one symptom of many. "We really don't have a good way to treat concussion right now," Sethi admits. "The way we treat it is to treat the predominant symptoms. If patients have headaches, we treat the headaches. If they have sleep problems, we treat that. There's no specific drug."

For Brandon, a breakthrough came in the form of an experimental treatment based on research by the U.S. military, which has seen a huge rise in TBI cases due to the post-9/11 wars. Neurology resident Baxter Allen, MD '10, who was working in the pediatric concussion clinic as a research assistant, had read that some patients had improved after taking high doses of omega-3 fatty acids—fish oil—along with magnesium, a cocktail thought to help rebuild brain proteins. Since Brandon's symptoms had lingered longer than anticipated and the treatment had no downside, the family decided it was worth a try. "That's what really helped me in the end," Brandon says. "I had stayed at the same point for a month and nothing was improving, even though an MRI came out clean. I tried the fish oil, and after a couple of weeks I actually started feeling a lot better." Says his father: "It was almost like a miracle."

After months on the couch during which he'd packed on forty pounds and grown increasingly forlorn, Brandon was finally able to go back to school full time in June. The following month, he returned to the ice—albeit just doing laps during public skating hours. He was eventually allowed to take some hockey lessons, as long as there was zero contact. By August he was back in the game, training at a camp in Minnesota. And though he admits that his return to full-contact play was a bit scary—"I played very cautiously, because I didn't want the whole thing to happen again"—he's been going full-steam ever since. In November, he was elected captain of his high school varsity team, for which he plays left wing. But these days, he has taken on another role: as a reality check for his peers on the potential dangers of concussion. "Not so much in hockey, but a lot of my friends who play soccer take the concussion thing as a little bit of a joke; they take it lightly," Brandon says. "To a certain extent I get it, because it sucks to be out of a game. But I don't want anybody to go through what I did."

His father, too, has become something of an evangelist for concussion awareness. Last summer, Kosofsky and Stieg hosted a continuing medical education course on concussion, and Kevin Swersey attended to provide a parent's perspective. "There has been some progress, but parents really have no clue," he says. "People hear 'concussion' and they think if you don't black out it means you're OK, but that's not the case. For the general parental population in varsity and club-travel sports, the naiveté and lack of education is shocking." He recalls another parent telling him about a varsity soccer game in which a player was knocked down; when the teenager got up, he was moving slowly and clearly groggy as he made his way to the bench. "The coach and the athletic director asked his *parents* if he could go back into the game," Swersey says, sounding incredulous. "Since when is it acceptable to ask parents a medical question like that? Why aren't there better protocols in place? The minute Brandon lined up in the wrong spot, why didn't the coach pull him off the ice and not put him in again? It's just common sense." The bottom line, Swersey says: "You need to seek out the proper, medically trained staff to help you get through this." ●

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