

# Brain Trauma Extends to the Soccer Field

By [JOHN BRANCH](#) FEB. 26, 2014



Photographs of Patrick Grange, who had chronic traumatic encephalopathy and died of amyotrophic lateral sclerosis at 29, at his parents' home in Albuquerque. Credit Mark Holm for The New York Times

Chronic traumatic [encephalopathy](#), the degenerative brain disease linked to repeated blows to the head, has been found posthumously in a 29-year-old former soccer player, the strongest indication yet that the condition is not limited to athletes who played sports known for violent collisions, like football and boxing.

Researchers at Boston University and the VA Boston Healthcare System, who have diagnosed scores of cases of C.T.E., said the player, Patrick Grange of Albuquerque, was the first named soccer player found to have C.T.E. On a four-point scale of severity, his disease was considered Stage 2.

Soccer is a physical game but rarely a violent one. Players sometimes collide or fall to the ground, but the most repeated blows to the head may come from the act of heading an airborne ball — to redirect it purposely — in games and practices.

Grange, who died in April 2012 after being found to have [amyotrophic lateral sclerosis](#), was especially proud of his ability to head the ball, said his parents, Mike and Michele. They recalled him as a 3-year-old, endlessly tossing a soccer ball into the air and heading it into a net, a skill that he continued to practice and display in college and in top-level amateur and semiprofessional leagues in his quest to play Major League Soccer.



Scans of his brain showed a buildup of a protein often linked to C.T.E. Credit Ann McKee, M.D., VA Boston Healthcare System/Boston University School of Medicine

Grange sustained a few memorable [concussions](#), his parents said — falling hard as a toddler, being knocked unconscious in a high school game and once receiving 17 stitches in his head after an on-field collision in college.

“He had very extensive frontal lobe damage,” said Dr. Ann McKee, the neuropathologist who performed the brain examination on Grange. “We have seen other athletes in their 20s with this level of pathology, but they’ve usually been football players.”

The damage to Grange’s brain, McKee said, corresponded to the part of the head that Grange would have used for headers. But she cautioned against broad conclusions.

“We can’t say for certain that heading the ball caused his condition in this case,” McKee said. “But it is noteworthy that he was a frequent header of the ball, and he did develop this disease. I’m not sure we can take it any further than that.”



Patrick Grange's parents, Michele and Michael Grange, said they wished they had discouraged him from heading soccer balls as a child. Credit Mark Holm for The New York Times

C.T.E. is believed to be caused by repetitive hits to the head — even subconcussive ones barely noted. Once considered unique to boxers, it has been diagnosed over the past decade in dozens of deceased football players and several hockey players. In December, it was found for the first time [in a baseball player](#). Symptoms can include depression, [memory loss](#), impulse control disorders and, eventually, progressive [dementia](#), scientists said.

Boston University researchers also found a severe case of C.T.E. in a 77-year-old former rugby player from Australia, Barry Taylor, who was known by his nickname, Tizza. A hard-charging sort, he played competitive rugby for 19 years, including 235 games for Manly Rugby Union, an Australian professional team near Sydney.

While brain research involving rugby players is still in its infancy — partly because of the sport's general lack of popularity in the United States, where much of the research occurs — Taylor's condition may come as little surprise. Though rugby players do not wear helmets, their games, like those of American football, are filled with collisions, many involving the head.

Taylor's family noticed increasing cognitive problems when he was in his 50s. Within a decade, Taylor had severe dementia. He died in April.



Grange was 27 when he was found to have A.L.S., a degenerative disease of the nervous system that is sometimes referred to as Lou Gehrig's disease. Grange with his two older brothers, Ryan, left, and Casey, right. At far left is Amanda Aragon, who was Patrick's girlfriend; then Ali Sward, Ryan's girlfriend. At right are Casey's wife, Melissa, and the couple's two sons, Addison and Michael. Credit Mark Holm for The New York Times

“At one point, I took him for a walk, and I was getting a lot of monosyllabic answers,” said Taylor’s son, Steven. “I said, ‘What’s your name, mate?’ He looked at me and just shrugged his shoulders. That’s the point he got to. He didn’t even know who he was.”

McKee found Taylor’s brain to be extraordinarily shriveled and deteriorated. His disease was diagnosed as severe Stage 4 C.T.E.

“It was, in a lot of ways, a very classic case — the tearing of the septum pellucidum and lining of the ventricles, and atrophy of the central structures of the brain,” McKee said.

“And then, microscopically, he had this tremendous buildup of abnormal tau,” she added, referring to a symptomatic protein, “and no evidence of any other disorder. It was a pure C.T.E. case.”



Grange sustained a concussion and received 17 stitches in his head after an on-field collision in college. Credit Mark Holm for The New York Times

The diagnosis came as something of a relief to Taylor's family, including his daughter, Jennifer, and his son. But the regret is that the illness could have been avoided.

"Both of us after talked about it and had this great relief," Steven Taylor said. "It is not genetic. But there was a great deal of sadness, knowing it was preventable. It was a great waste, a great shame, knowing that the last 20 years did not have to be like this."

The findings are part of an updated version of the 2012 documentary "Head Games," by the filmmaker Steve James. The updated film, titled "Head Games: The Global Concussion Crisis," will [debut Thursday at NYU Langone Medical Center](#).

Dr. Erin Bigler, a professor of psychology and neuroscience and the director of the Magnetic Resonance Imaging Research Facility at Brigham Young, said he was not surprised to learn that C.T.E. was found in a soccer player.



Boston University researchers found a severe case of C.T.E. in a 77-year-old former rugby player from Australia named Barry Taylor.

"The brain is a very delicate organ, and it probably can withstand some injury, but the whole issue of repeated injury is a very different circumstance," he said. "When it's moving, it's moving with its 200 billion brain cells. And those cells are being, in some way, mechanically deformed, some more than others, which gives you an appreciation of what's going on with these collisions."

Bigler said he would not recommend that players, especially young ones, routinely head the ball. The brain is not fully developed until about age 25, he said, making it more susceptible to injury.

Some youth soccer organizations have warned against practicing heading until players reach a certain age, usually between 10 and 14. Some scientists believe those ages are somewhat arbitrary, but they understand that parents want to know whether their children should be allowed to head soccer balls.

“The cold, hard reality is that the data don’t exist to address that question,” said Dr. Michael L. Lipton, a neuroscientist and neuroradiologist at Yeshiva University’s Albert Einstein College of Medicine, who studies the effects of heading. “We’re really in very much uncharted territory. So what should I do with my kid? That basically becomes the kind of risk-benefit assessment we have to make all the time in life.”



Sections of Taylor's brain show the buildup of an abnormal protein called tau. Taylor’s case was diagnosed as severe Stage 4 C.T.E. Credit Ann McKee, M.D., VA Boston Healthcare System/Boston University School of Medicine

Last year, the journal *Radiology* published results of a study by Lipton and others of 39 amateur adult soccer players, with a median age of 31, who had played soccer since childhood. It concluded that “heading is associated with abnormal white matter microstructure and with poorer neurocognitive performance.”

Lipton said Wednesday that there was probably a reasonable threshold below which heading might cause few problems.

“Above some level, heading is probably not good for anyone,” he said.

After the 2002 death of Jeff Astle, 59, a longtime player in England’s top league who showed dementia-like symptoms in his final years, [a coroner determined that heading the ball](#) probably led to the damage found in his brain. The term C.T.E. was not in wide use at the time, but scientists believe Astle probably had it.



A hard-charging sort, Taylor played competitive rugby for 19 years, including 235 games for Manly Rugby Union, an Australian professional team near Sydney.

Grange was a lifelong soccer player who starred in high school and played collegiately at Illinois-Chicago and New Mexico. He played for the Chicago franchise of the Premier Development League, a proving ground for future professional players, and in a couple of semiprofessional leagues. He coached and played at an indoor soccer complex in Albuquerque, his hometown.

Grange was 27 when he was found to have A.L.S., a degenerative disease of the nervous system that is sometimes referred to as Lou Gehrig's disease. Most people with A.L.S. are deep into middle age or older, with the average age of 55 at diagnosis, according to the ALS Association.

Grange's symptoms began with a sore calf. He soon struggled to walk, and the A.L.S. diagnosis followed. Grange had to use a wheelchair within six months. [Paralysis](#) soon made him unable to feed himself. He died 17 months after the A.L.S. diagnosis.

McKee believes that the damage to Grange's brain was at the core of his A.L.S.

"We think the precipitating factor in his case was most likely the trauma," McKee said. "First of all, he was absurdly young when he developed this disease. And he had considerable evidence of this trauma-induced tauopathy, or C.T.E."

In hindsight, Grange's family said that he showed symptoms of C.T.E. beginning in high school. He struggled to balance a checkbook. He did not understand the repercussions of failing classes. He once left for Seattle to try out for a soccer team and returned to find he had been fired from his job waiting tables because he never asked for time off. Grange fought depression in the years leading to his diagnosis, his parents said.

When he died, the Granges received a call from Boston University, requesting his brain. Learning that their son had C.T.E. was painful, but it brought some semblance of relief and peace. Like the doctors, they cannot be sure that their son's death was precipitated by soccer, but they wish they would have discouraged his habit of heading the ball.

"Every park you go by, kids are playing soccer," Michele Grange said. "And they're doing headers. And that really bothers me. When I see the little kids playing soccer, even my grandson, for one thing it reminds me of better days. But on the other, it makes you think of the consequences. And I hope that these kids and their parents are going to see to it that they take care of their heads."

**Correction: February 27, 2014**

An earlier version of this article misstated the year Patrick Grange died. It was in April 2012, not last April.