

Scanning invisible damage of PTSD, brain blasts

November 9 2009, By LAURAN NEERGAARD , AP Medical Writer

(AP) -- Powerful scans are letting doctors watch just how the brain changes in veterans with post-traumatic stress disorder and concussion-like brain injuries - signature damage of the Iraq and Afghanistan wars.

It's work that one day may allow far easier diagnosis for patients - civilian or military - who today struggle to get help for these largely invisible disorders. For now it brings a powerful message: Problems too often shrugged off as "just in your head" in fact do have physical signs, now that scientists are learning where and how to look for them.

"There's something different in your [brain](#)," explains Dr. Jasmeet Pannu Hayes of Boston University, who is helping to lead that research at the Veterans Affairs' National Center for PTSD. "Just putting a real physical marker there, saying that this is a real thing," encourages more people to seek care.

Up to one in five U.S. veterans from the long-running combat in Iraq and Afghanistan is thought to have symptoms of PTSD. An equal number are believed to have suffered traumatic brain injuries, or TBIs - most that don't involve open wounds but hidden damage caused by explosion's pressure wave.

Many of those TBIs are considered similar to a concussion, but because symptoms may not be apparent immediately, many soldiers are exposed multiple times, despite evidence from the sports world that damage can add up, especially if there's little time between assaults.

"My brain has been rattled," is how a recently retired Marine whom Hayes identifies only as Sgt. N described the 50 to 60 explosions he estimates he felt while part of an ordnance disposal unit.

Hayes studied the man in a new way, tracking how water flows through tiny, celery stalk-like nerve fibers in his brain - and found otherwise undetectable evidence that those fibers were damaged in a brain region that explained his [memory problems](#) and confusion.

It's a noninvasive technique called "[diffusion tensor imaging](#)" that merely adds a little time to a standard MRI scan. Water molecules constantly move, bumping into each other and then bouncing away. Measuring the direction and speed of that diffusion in nerve fibers can tell if the fibers are intact or damaged. Those fibers are sort of a highway along which the brain's cells communicate. The bigger the gaps, the more interrupted the brain's work becomes.

"Sgt. N's brain is very different," Hayes told a military medical meeting last week. "His connective tissue has been largely compromised."

There's a remarkable overlap of symptoms between those brain injuries and PTSD, says Dr. James Kelly, a University of Colorado neurologist tapped to lead the military's new National Intrepid Center of Excellence. It will open next year in Bethesda, Md., to treat both conditions.

Yes, headaches are a hallmark of TBI while the classic PTSD symptoms are flashbacks and nightmares. But both tend to cause memory and attention problems, anxiety, irritability, depression and insomnia. That means the two disorders share [brain regions](#).

And Hayes can measure how some of those regions go awry in the vicious cycle that is PTSD, where patients feel like they're re-living a trauma instead of understanding that it's just a memory.

What happens? A brain processing system that includes the amygdala - the fear hot spot - becomes overactive. Other regions important for attention and memory, regions that usually moderate our response to fear, are tamped down.

"The good news is this neural signal is not permanent. It can change with treatment," Hayes says.

Her lab performed MRI scans while patients either tried to suppress their negative memories, or followed PTSD therapy and changed how they thought about their trauma. That fear-processing region quickly cooled down when people followed the PTSD therapy.

It's work that has implications far beyond the military: About a quarter of a million Americans will develop PTSD at some point in their lives. Anyone can develop it after a terrifying experience, from a car accident or hurricane to rape or child abuse.

More research is needed for the scans to be used in diagnosing either PTSD or a TBI. But some are getting close - like another MRI-based test that can spot lingering traces of iron left over from bleeding, thus signaling a healed TBI. If the brain was hit hard enough to bleed, then more delicate nerve pathways surely were damaged, too, Kelly notes.

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Citation: Scanning invisible damage of PTSD, brain blasts (2009, November 9) retrieved 23 April 2024 from

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