

# OPTIMISM IN A NEW REALITY

Presented by

Steven A. Shapiro  
Ogborn Mihm, LLP

and

Keith Fuicelli  
Fuicelli & Lee, P.C.



# Keith's Story of Personal Injury and Recovery

- ▣ May 2, 2007, started out like so many other days in my life. I went to work, came home, and went for a jog around City Park. The next thing I know, it's June and I was waking up in Craig Hospital.
- ▣ Apparently, I was hit by a car as I crossed 17th Avenue on my way home. According to the police report, the car was traveling around 45 mph and was totaled from the impact. As for me, I had to be resuscitated at the scene and was on life support for a few days. The amazing doctors at Denver Health literally saved my life.
- ▣ After a two-week stay at Denver Health, I was fortunate enough to be transferred to the world-renowned Craig Rehabilitation Hospital. I cannot say enough great things about the staff at Craig Hospital. From the doctors, to the nurses, physical therapists and on, the staff at Craig was nothing short of amazing.
- ▣ It took me close to a year to recover from my extensive injuries. People ask me what I learned from the experience. First, make sure you tell your loved ones just how much they mean to you every day. Practically speaking, make sure you have enough insurance, including uninsured/underinsured motorist coverage.
- ▣ I suppose some of the more valuable lessons I learned help me relate to and empathize with clients. Most people do not understand how vulnerable and terrifying it is going through a serious accident. Unless you have been through it, it is very difficult to comprehend the worry, self-doubt, and frustration that accompany personal injury and recovery. I think many people take for granted the ability to work and earn a living for their family until it is taken away. In my case, I was a hair away from not being able to do the job I truly love.
- ▣ Without a doubt, my experience makes me the best personal injury attorney I can be. In fact, I have never been more proud to represent people who many times are at their most vulnerable state.

Keith was thrown 20 feet after being struck by a moving vehicle moving at 45 MPH.





FUICELLI RANDALL KEITH  
X443193  
13-August-1973 M  
XR TIBIA FIBULA LT AP LAT



CR  
LittleEndianExplicit  
Images: 1/1  
Series: 3003

Swedish Medical Center  
5000  
RIPLEY DAVID L  
17-May-2007  
19:39:31

FUICELLI RANDALL KEITH  
X443193  
13-August-1973 M  
XR TIBIA FIBULA LT AP LAT



CR  
LittleEndianExplicit  
Images: 1/1  
Series: 3002

Swedish Medical Center  
5000  
RIPLEY DAVID L  
17-May-2007  
19:39:30

WL: 1429 WW: 2417



FUICELLI RANDALL KEITH  
X443193  
13-August-1973 M  
XR PELVIS W OBLIQUES



CR  
LittleEndianExplicit  
Images: 1/1  
Series: 7002

SWEDISH MEDICAL CENTER  
FUICELLI RANDALL KEITH  
5502DX443193  
L  
RIPLEY DAVID L13-August-1973 M  
17-May-2007XR PELVIS W OBLIQUES  
19:42:12



CR  
LittleEndianExplicit  
Images: 1/1  
Series: 7003

WL: 1424 WW: 2434



SWEDISH MEDICAL CENTER  
FUICELLI RANDALL KEITH  
5502DX443193  
L  
RIPLEY DAVID L13-August-1973 M  
17-May-2007XR PELVIS W OBLIQUES  
19:43:20

CR  
LittleEndianExplicit  
Images: 1/1  
Series: 7003

WL: 1424 WW: 2434

# Glasgow Coma Scale

- ▣ Keith received a rating of 8 in the field (intubated) and 3t in Emergency Room

## Motor Activity (1-6 Points)

1. Makes no movements.
2. Decerebrate (extensor) posture.
3. Decorticate (flexor) posture.
4. Withdrawal from painful stimuli.
5. Localizes to painful stimuli.
6. Obeys commands.

## Eye opening (1-4 Points)

1. Does not open eyes in response to anything.
2. Opens eyes in response to painful stimuli.
3. Opens eyes in response to voice.
4. Opens eyes spontaneously.

## Verbal response (1-5 Points)

1. Makes no sounds.
2. Incomprehensible sounds.
3. Utters incoherent words.
4. Confused, disoriented.
5. Oriented, converses normally.



# Keith's Issues at Craig Hospital

- ▣ Keith was completely disoriented at Craig Hospital. He thought he was at Walter Reed and Miami-Dade Hospital.
- ▣ Keith suffered from a month of post-traumatic amnesia.
- ▣ Along with sustaining injuries to his brain, Keith sustained a right orbital fracture, left tibia and fibula fractures, as well as a right acetabular fracture.
- ▣ A CT/MRI and a neuropsychological examination were performed upon Keith.



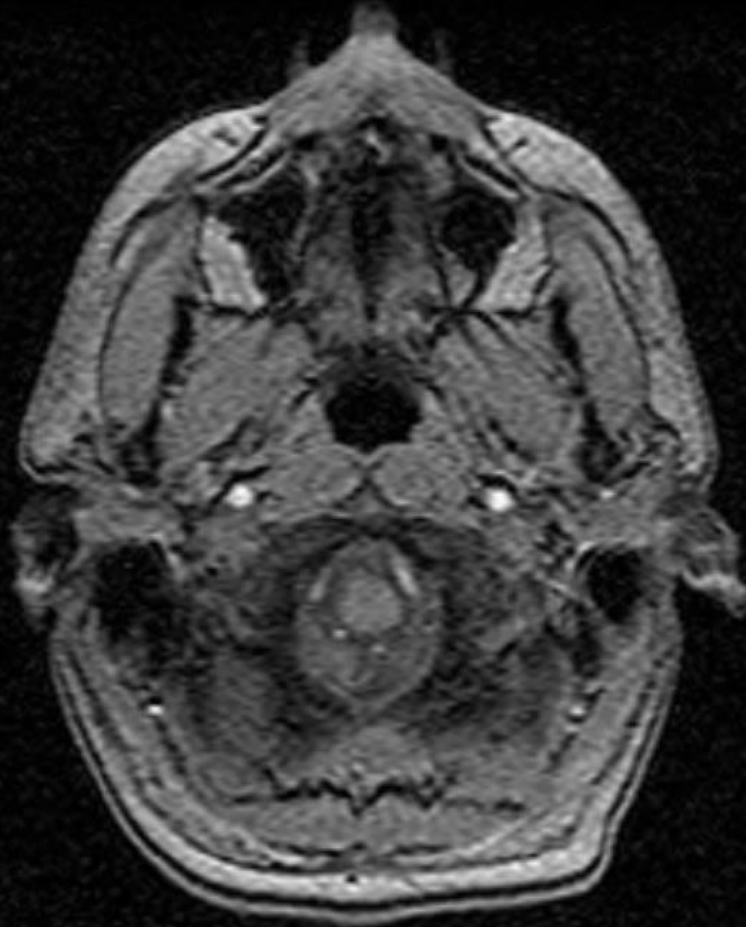
# Keith's Issues at Craig Hospital

- ▣ His results fell within the moderately to severely impaired levels
- ▣ Executive functioning deficits included:
  - Decreased awareness of deficits
  - Decreased insight
  - Decreased planning
  - Decreased mental flexibility
  - Decreased self-monitoring and/or error awareness
- ▣ Conditions included:
  - Multifocal shearing with prominent area of injury in right frontal lobe
  - Right frontal epidural hematoma with small with a small intraparenchymal hemorrhage
  - Speed of cognitive processing
  - Emotional lability
  - Perseveration
  - Involuntary emotional depression disorder
  - Inattention
  - Distraction
  - Poor concentration
  - Ranch Los Amigos Levels of Cognitive Functioning Stage IV to V
  - Post-Traumatic Amnesia / Agitation

# Keith's MRI's

FUICELLI RANDALL KEITH  
X443193  
13-August-1973 M  
MRI BRAIN WO  
3-pl T2\* FGRE S

Swedish MC MR2  
GENESIS\_SIGNA  
RIPLEY DAVID L  
1-June-2007  
14:58:56



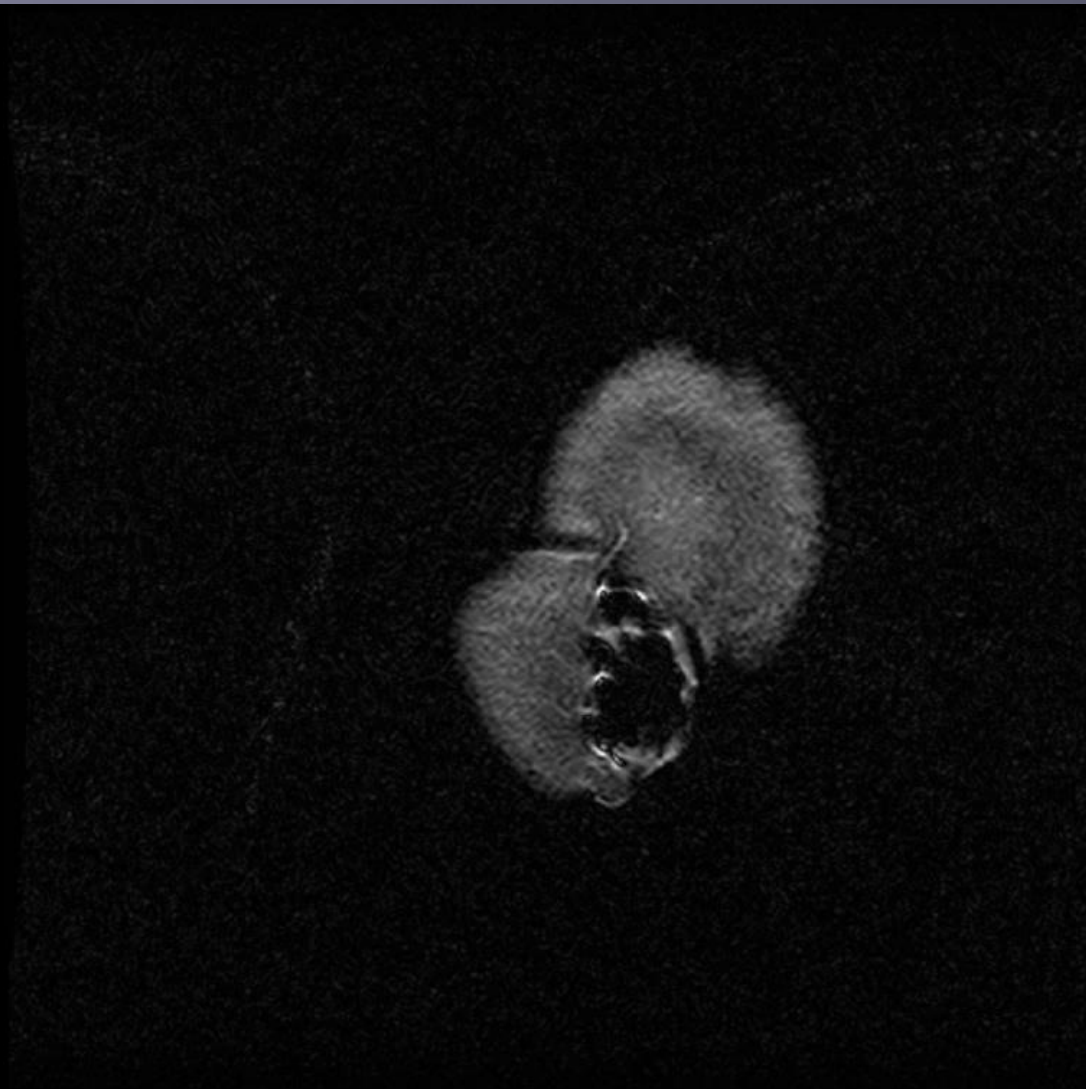
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RT: 63.70 ET: 1.60  
FS: 15000.00  
MR  
LittleEndianExplicit  
Images: 1/21  
Series: 1

WL: 155 WW: 310

# Keith's MRI's

FUICELLI RANDALL KEITH  
X443193  
13-August-1973 M  
MRI BRAIN WO  
SAG 3D T1

Swedish MC MR2  
GENESIS\_SIGNA  
RIPLEY DAVID L  
1-June-2007  
15:00:14



ST: 2.00 SL: -78.47  
RT: 12.90 ET: 4.20  
FS: 15000.00  
MR  
LittleEndianExplicit  
Images: 1/152  
Series: 2

WL: 40 WW: 81



# What Triggers Recovery

- ▣ Support network is key to successful recovery.
- ▣ Physical and Aerobic exercise, early speech therapy, and early neuropsychological counseling is imperative to improvement.
- ▣ The staff at Craig Hospital worked tirelessly to help Keith on his road to recovery and the care they provided to him gave him the tools to overcome even the most traumatic injuries.

# Keith's Neuropsychological Test

	6/1/2007	6/12/2007	8/24/2007	11/2/2007	12/28/2007	10/22/2021
Word List; Learning/Memory						
Total Recall	<1%			46%		42%
Delayed Recall	<1%			2-5%		25%
Recognition	<1%			7%		14%
Mental Flexibility						
Part A	2%			58%		66%
Part B	Discontinued			66%		31%
Working Memory	N/A					95%
Forward	Longest=7					Longest=8
Backward	Longest=4					Longest=7
Spatial Orientation		>16%				54%
Word Finding		>16%				62%
Verbal Fluency		>16%				73%
NAB - Form 1/2			Form 1		Form 2	Form 1
Planning/Impulse Control			2-5%		5%	66%
Judgement/Decision Making			2-5%		11%	84%
Concept Formation/Mental Flexibility			2-5%		11%	88%
Verbal Fluency			2-5%		46%	46%
Processing Speed						
T1				73%		82%
T2				62%		84%
T3				34%		50%
T4				38%		27%
Total				N/A		46%
Non-Verbal Fluency				42%		66%

This neuropsychological testing was generously provided by Dr. Steven Schmitz of the Brain and Behavior Clinic

# What is left

- ▣ There are always lingering concerns for people who suffer from brain injuries, such as:
  - Atrophy
  - Dementia
  - Concerns with what the future will bring
- ▣ Although this injury was life changing for Keith, he was still fortunate to have the support network he needed and the phenomenal medical care from Craig Hospital to ensure his recovery.



# Keith Fuicelli

CT Brain 5/19/07 is Normal (CT insensitive to TBI)

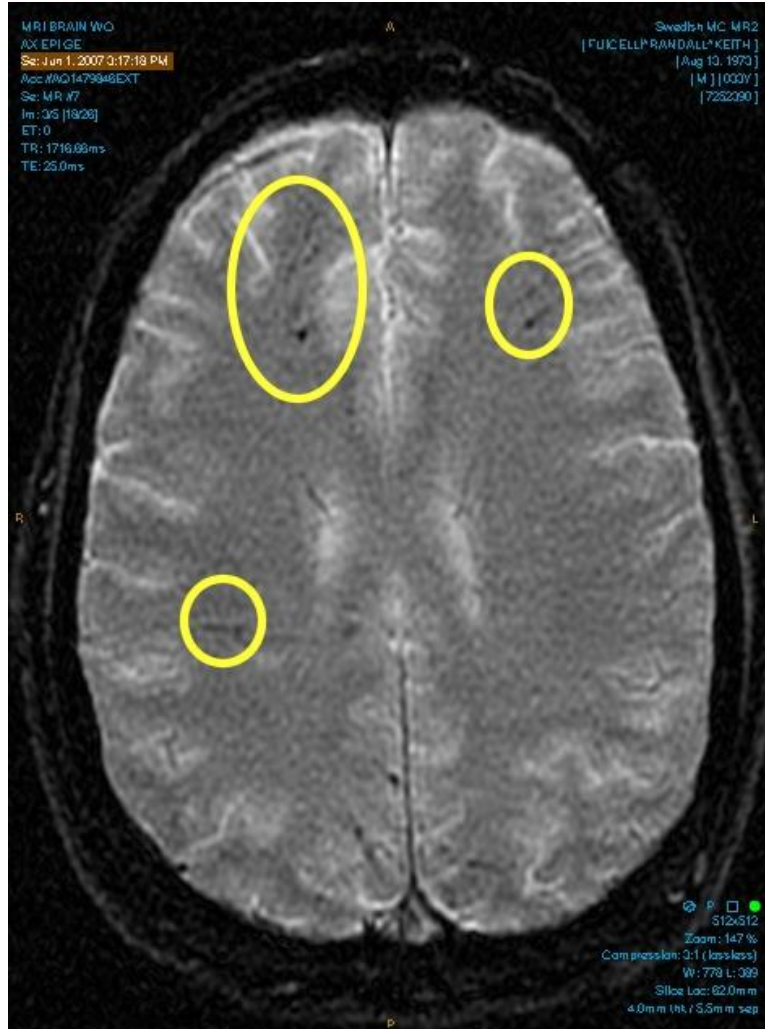


This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

# Keith Fuicelli

## Hemorrhagic Shearing (Diffuse Axonal Injury/DAI)

Brain MRI 6/1/07

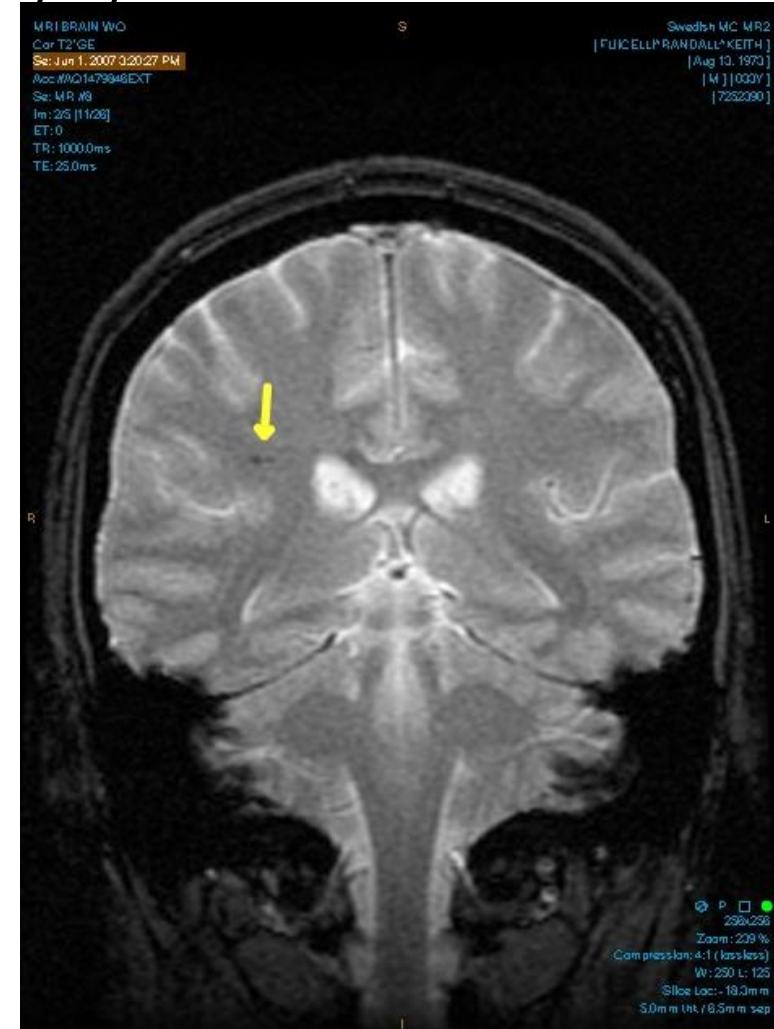
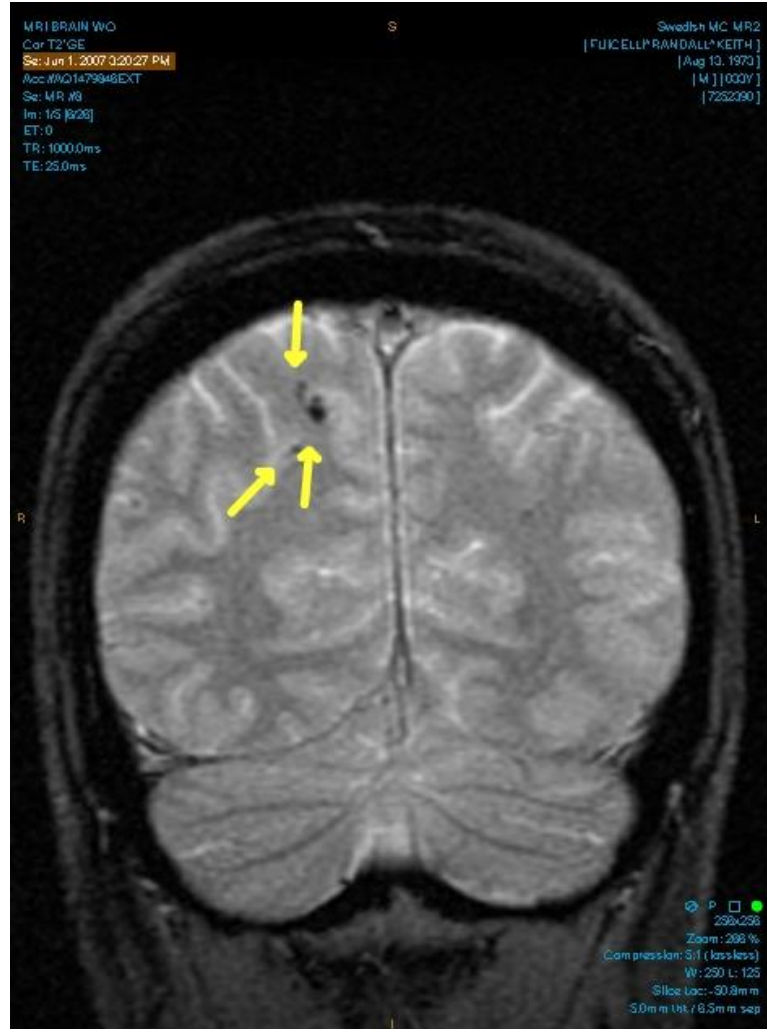


This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

# Keith Fuicelli

## Hemorrhagic Shearing (Diffuse Axonal Injury –DAI)

Brain MRI 6/1/07



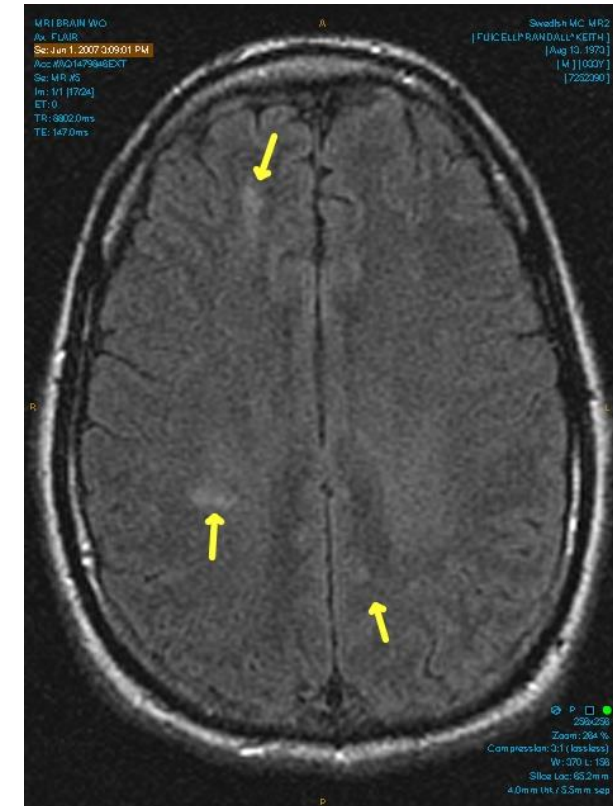
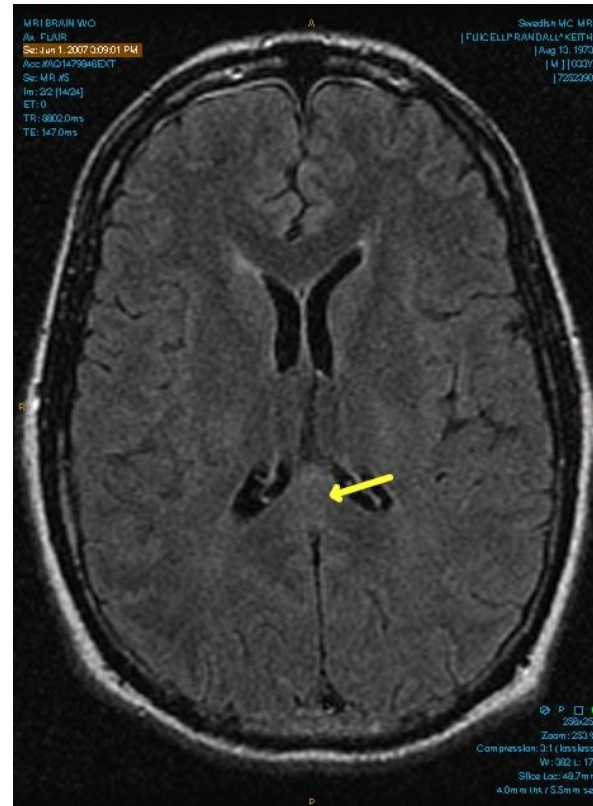
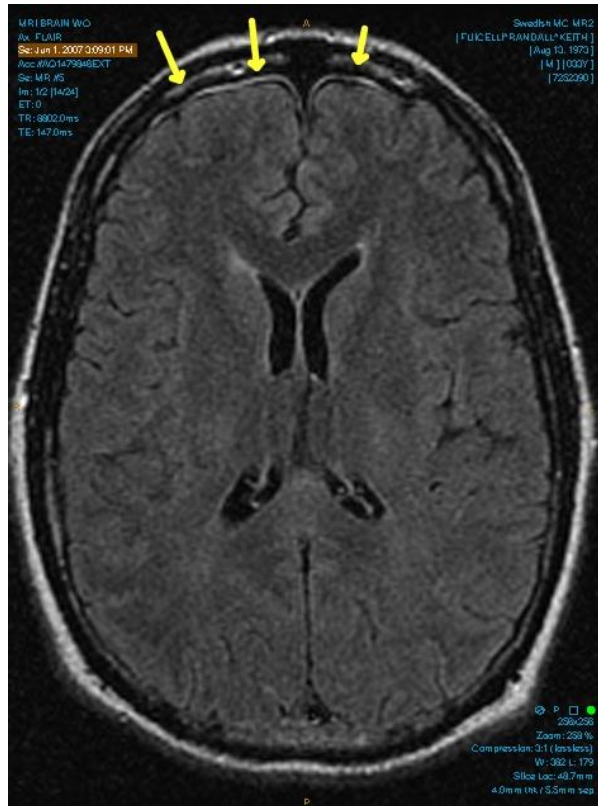
These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging



# Keith Fuicelli

## Scarring from Hemorrhagic Shearing

Brain MRI 6/1/07

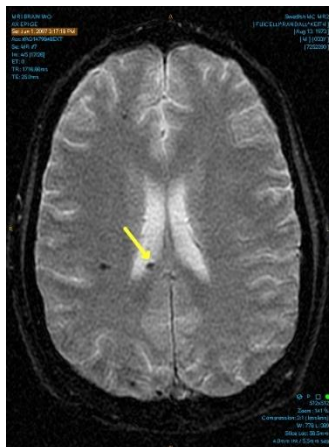


These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

# Keith Fuicelli

## Hemorrhage Shearing (DAI)

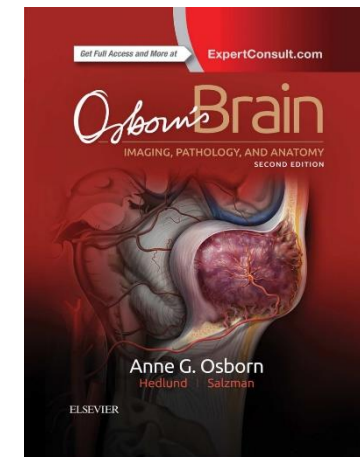
Brain MRI 6/1/07



It is likely the MRI on Keith Fuicelli underestimates the extent of the hemorrhagic DAI as it is estimated that 78% of hemorrhagic DAI lesions seen on the initial MRI resolve on follow-up examinations with smaller volumes of those still seen

DAI lesions on MRI can be thought of as the 'tip of the iceberg' with many additional microscopic lesions often present below the resolution of MRI.

Liu, W., K. Soderlund, J. S. Senseney, D. Joy, P. H. Yeh, J. Ollinger, E. B. Sham, T. Liu, Y. Wang, T. R. Oakes and G. Riedy (2016). "Imaging Cerebral Microhemorrhages in Military Service Members with Chronic Traumatic Brain Injury." *Radiology* 278(2): 536-545.



These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

# Keith Fuicelli

## Significance of Frontal Lobe Injury

### Patient's Scan



This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

### Literature



The frontal lobes of the brain are the most commonly reported location for traumatic brain injury (Levin et al 1987). It is well established that patients suffering even mild traumatic brain injury may suffer from a variety of symptoms, including lower intelligence scores (Koings, Engenhorst et al. 2016) and lower IQ (Stuss, Hugenholtz et al. 1985).

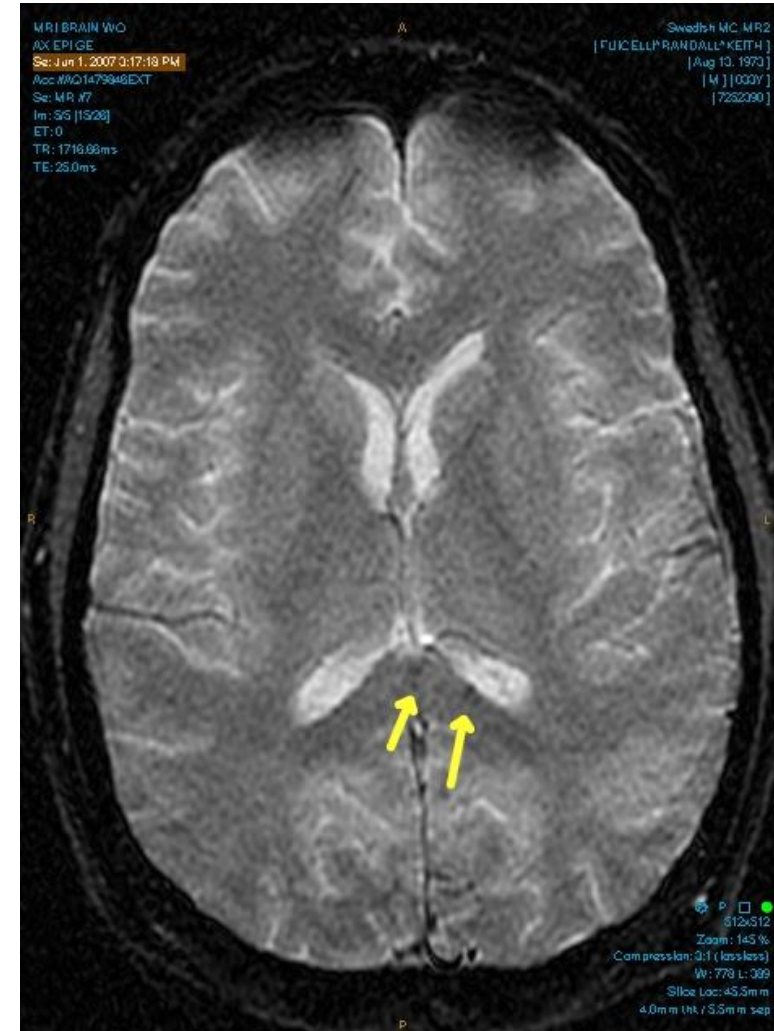
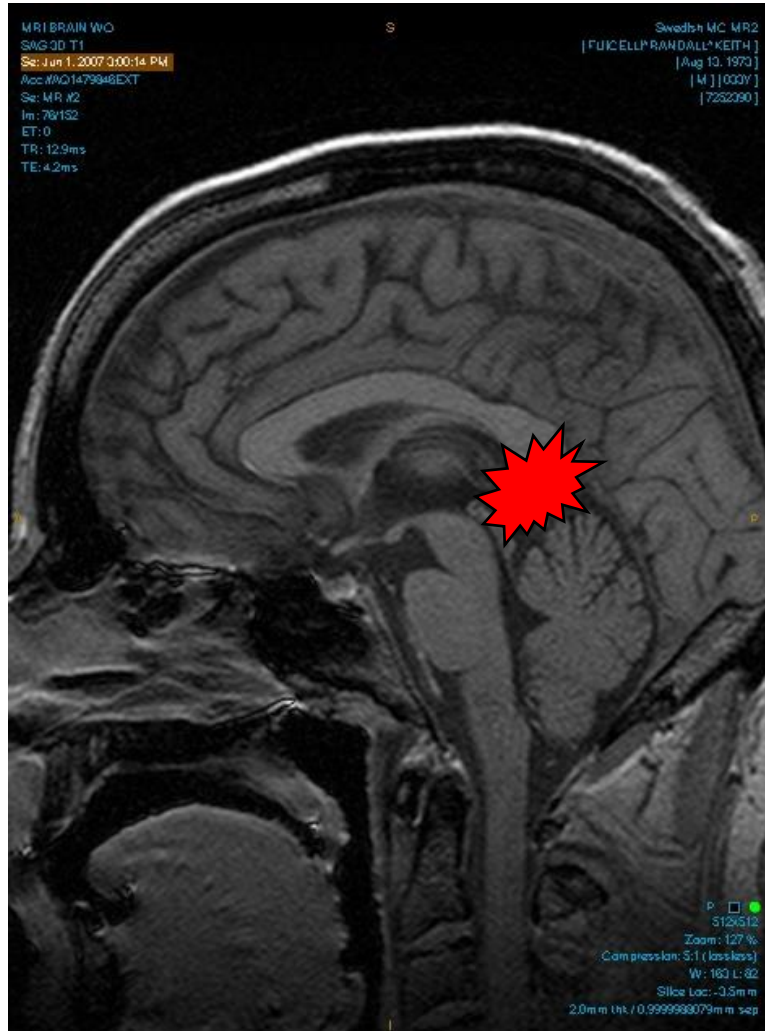
The frontal lobes are involved in a wide variety of essential functions, with reported deficits from frontal lobe injury involving: motor function (Kuypers, 1981, Leonard et al. 1988), memory (Kim, Kim et al. 2009, Levin et al. 1987), executive functions and personality (Blummer et al. 1975), risk taking (Miller 1985, Miller 1992), disinhibition (Hugh 1954) and behavioral spontaneity (Milner 1964).



# Keith Fuicelli

## Splenium of Corpus Callosum DAI (Poor Prognosis)

Brain MRI 6/1/07

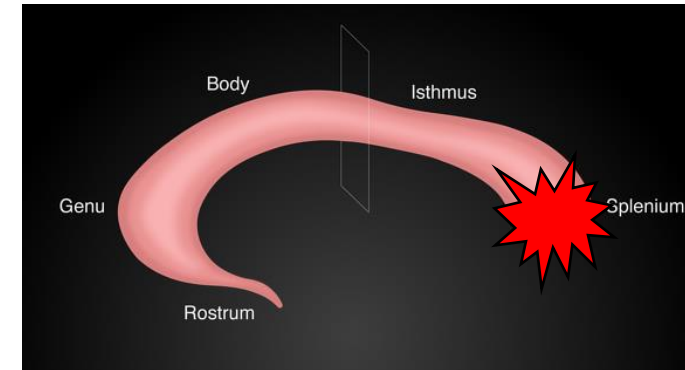
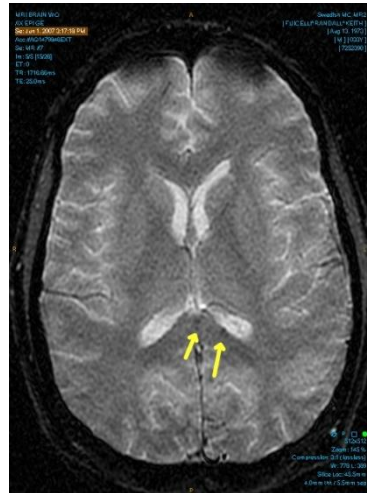
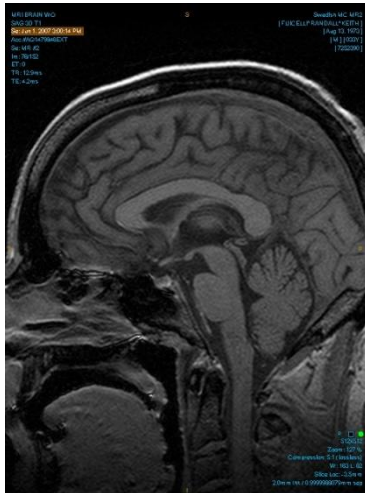


These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

# Keith Fuicelli

## Prognosis of Damage to the Corpus Callosum

The corpus callosum is the largest white matter fiber tract of the brain and the only significant fiber tract connecting the right and left hemispheres. Without the corpus callosum, the two halves (hemispheres) of the brain cannot communicate. Injury to this vital structure is a very poor prognostic sign.



These image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

Hemorrhagic shearing in the corpus callosum was the worst prognostic sign amongst patients with a severe TBI (who already have a poor prognosis).

Moen KG1, Brezova V, Skandsen T, Håberg AK, Folvik M, Vik A.

Traumatic axonal injury: the prognostic value of lesion load in corpus callosum, brain stem, and thalamus in different magnetic resonance imaging sequences

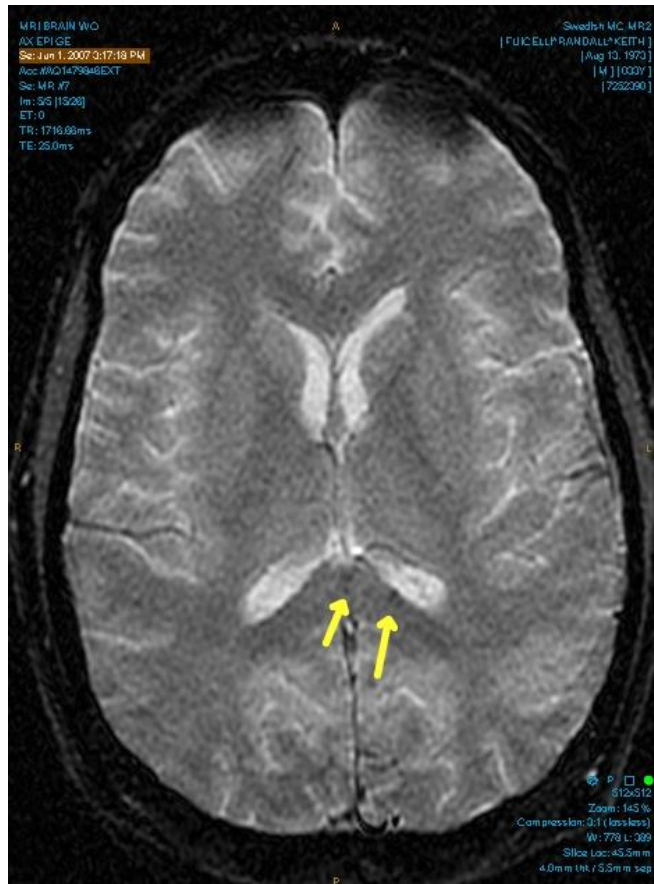
J Neurotrauma. 2014 Sep 1;31(17):1486-96. doi: 10.1089/neu.2013.3258. Epub 2014 Jul 1..

# Keith Fuicelli

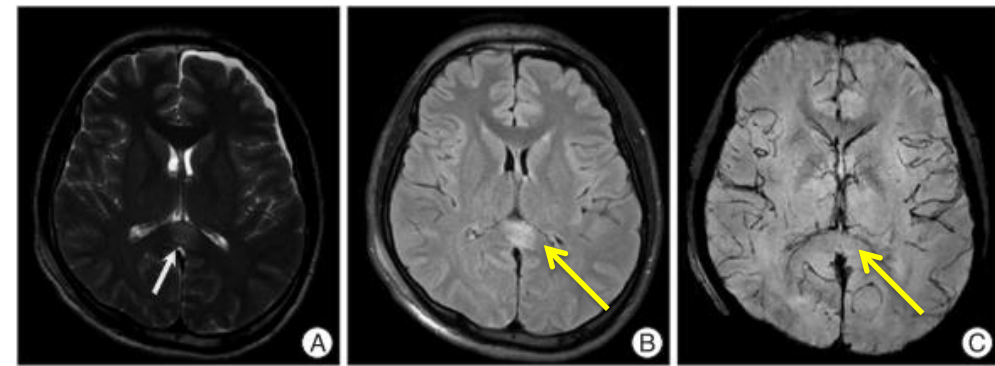
Splenium (Posterior Corpus Callosum) is Commonly Affected in More Severe Head Trauma

Brain MRI 6/1/07

Patient's Scan



Literature



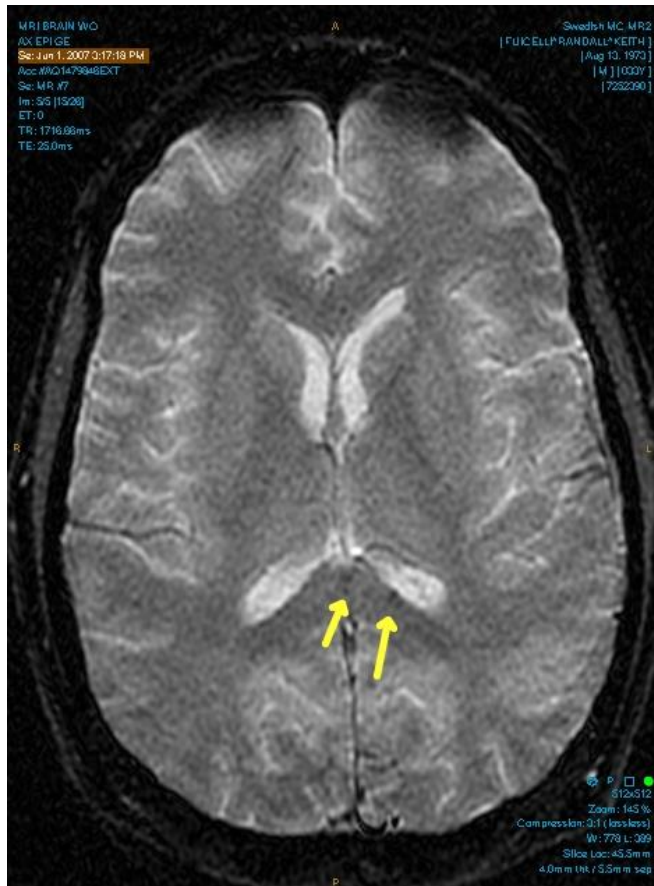
Chung, S. W., Y. S. Park, T. K. Nam, J. T. Kwon, B. K. Min and S. N. Hwang (2012). "Locations and clinical significance of non-hemorrhagic brain lesions in diffuse axonal injuries." J Korean Neurosurg Soc **52**(4): 377-383.

# Keith Fuicelli

Splenium (Posterior Corpus Callosum) is Commonly Affected in More Severe Head Trauma

Brain MRI 6/1/07

Patient's Scan



This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

Literature



Huisman, T. A. (2003). "Diffusion-weighted imaging: basic concepts and application in cerebral stroke and head trauma." Eur Radiol **13**(10): 2283-2297.



# Keith Fuicelli

## Diffusion Tensor Imaging

- Diffusion Tensor Imaging (DTI) measures water flow along axons.
- Axons are the 'telephone wires' of the brain.
- FA values give a numerical value to the health of the axons.
- Low values are indicative of axonal injury.
- SimonMed has partnered with Mindset to compared 48 DTI tracts to a large normative database (thousands).
- Most Sensitive assessment of TBI.

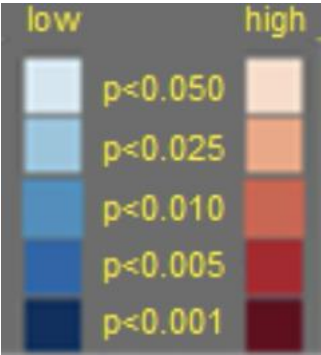
(Ω μ<sup>A</sup> N τ i f γ)

DIFFUSION TENSOR IMAGING ANALYSIS

Client Name: Fuicelli, Keith  
Date of Birth: 08/13/1973  
Date and Location of Exam: 08/17/2021, SimonMed - Parker  
Comparison Database: 75 male subjects, ages 38-58

At the level of individual isolated analyses:

Gray bars show fiber tract regions that are within normal limits  
Fiber tracts where the bar is red have abnormally high FA values (p<0.05, one-tail).  
Fiber tracts where the bar is blue have abnormally low FA values (p<0.05, one-tail).



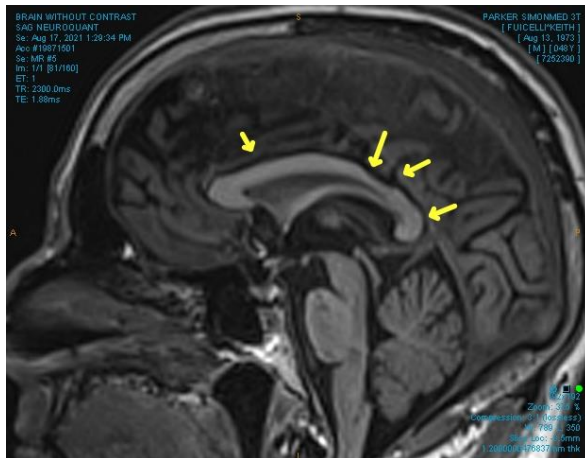
# Keith Fuicelli

## Abnormal Diffusion Tensor Imaging

M I N D S E T  
(  $\Omega \mu^A N \tau i f \gamma$  )

### DIFFUSION TENSOR IMAGING ANALYSIS

Brain MRI 8/17/21



This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

### Cingulate Gyrus Damage

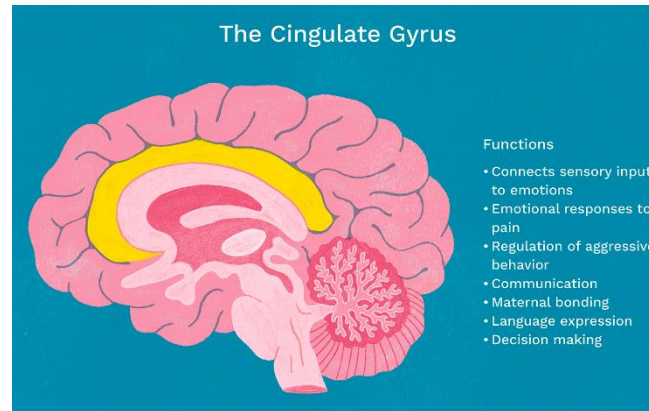
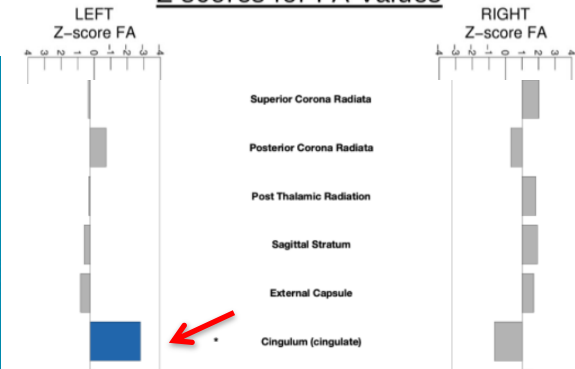
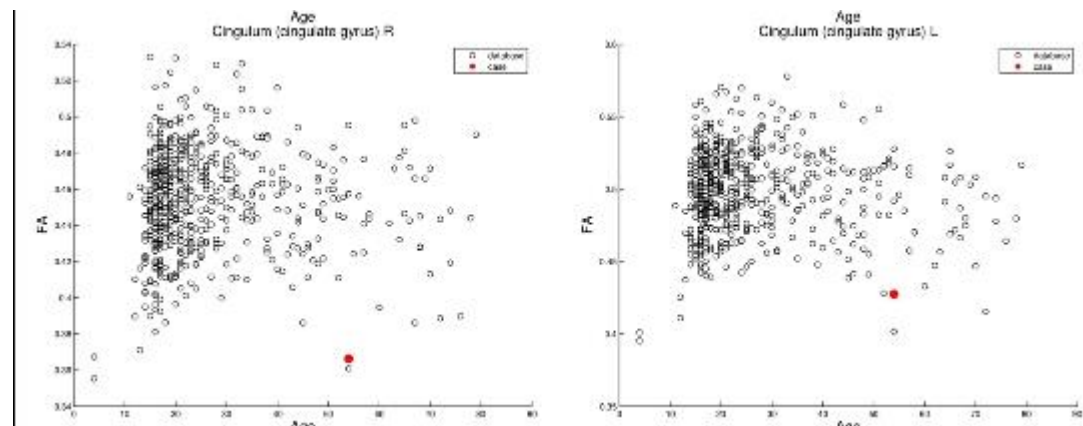


Figure 3: Mr. Hollier  
Z-scores for FA Values



The Cingulate is just  
Above the Corpus Callosum

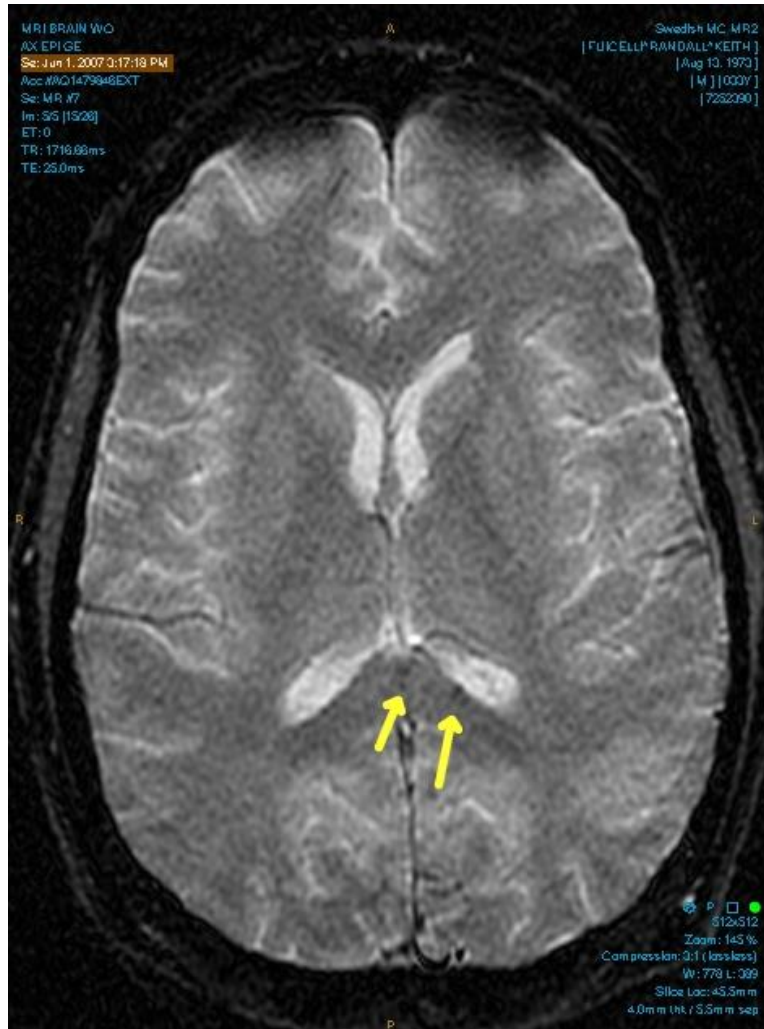
Wilde, E. A., M. A. Ramos, R. Yallampalli, E. D. Bigler, S. R. McCauley, Z. Chu, T. C. Wu, G. Hanten, R. S. Scheibel, X. Li, A. C. Vasquez, J. V. Hunter and H. S. Levin (2010). "Diffusion tensor imaging of the cingulum bundle in children after traumatic brain injury." *Dev Neuropsychol* 35(3): 333-351.



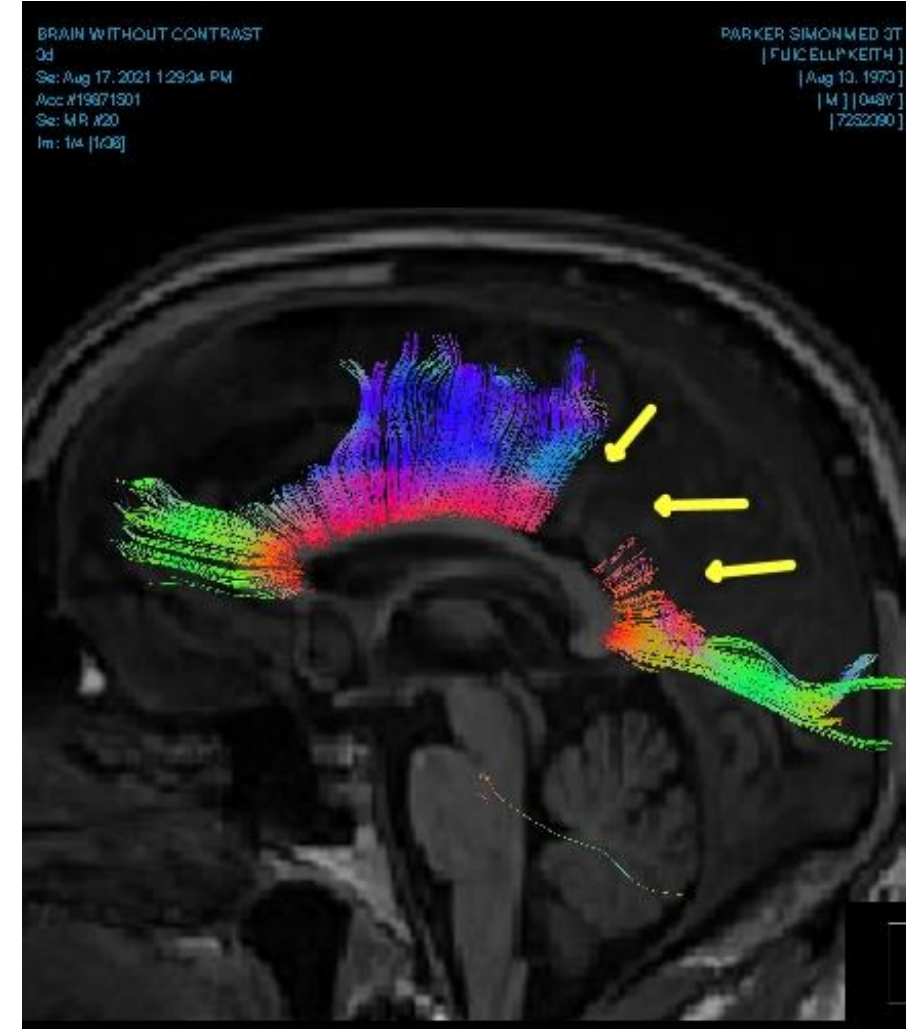
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## DTI matched Corpus Callosum DAI

Brain MRI 6/1/07



Brain MRI 8/17/21



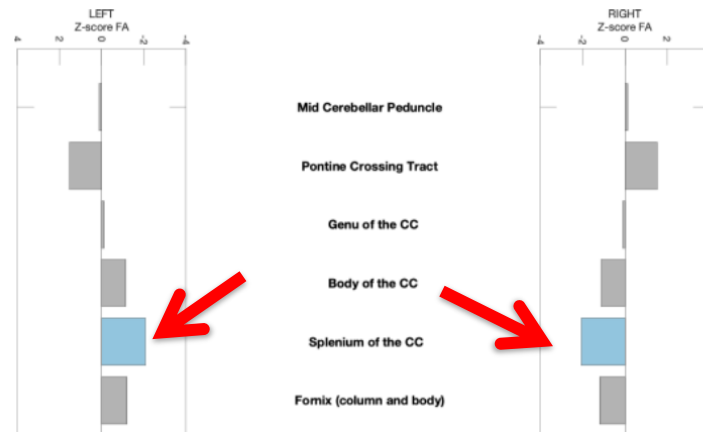
These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging



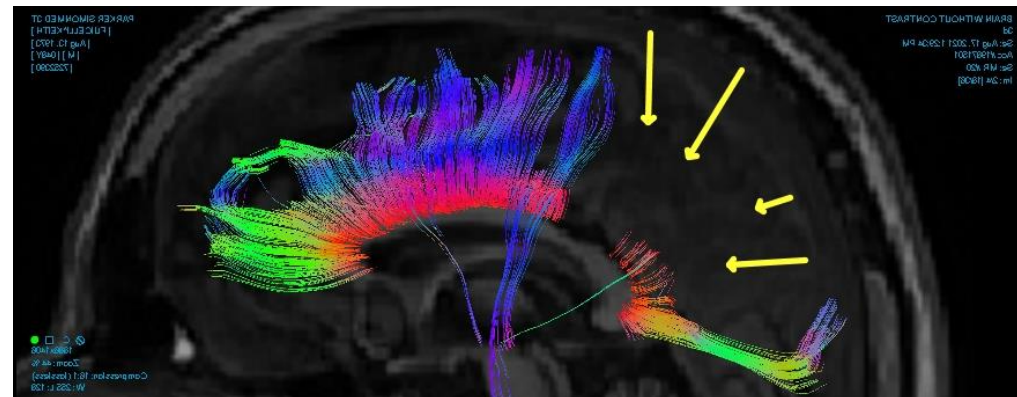
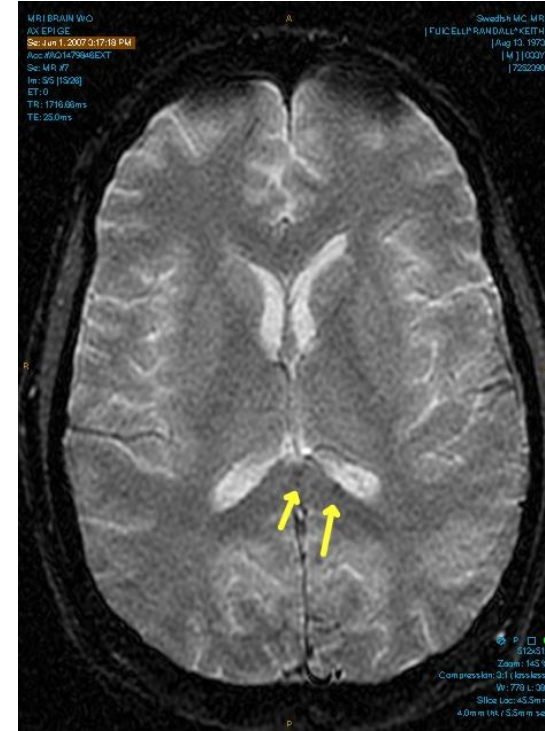
# Keith Fuicelli

## DTI Fiber Tract Damage (Splenum of the Corpus Callosum)

Brain MRI 8/17/21



Hanks, R., Millis, S., Scott, S., Gattu, R., O'Hara, N. B., Haacke, M., & Kou, Z. (2019). The relation between cognitive dysfunction and diffusion tensor imaging parameters in traumatic brain injury. *Brain Inj*, 33(3), 355-363. doi:10.1080/02699052.2018.1553073

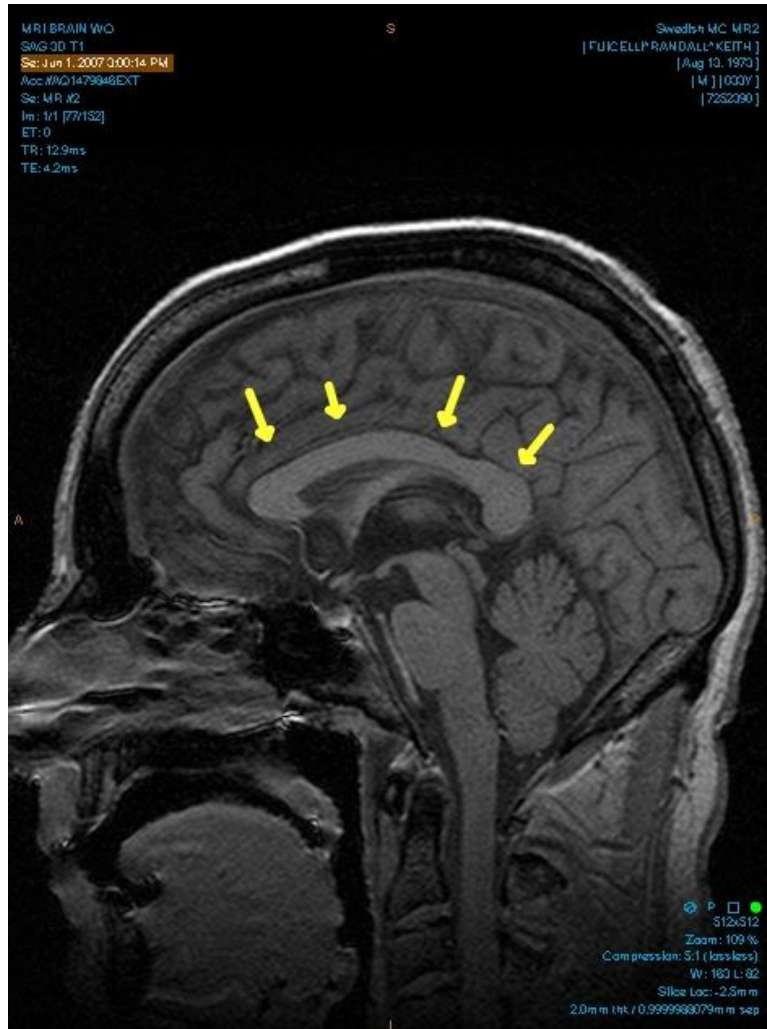


These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

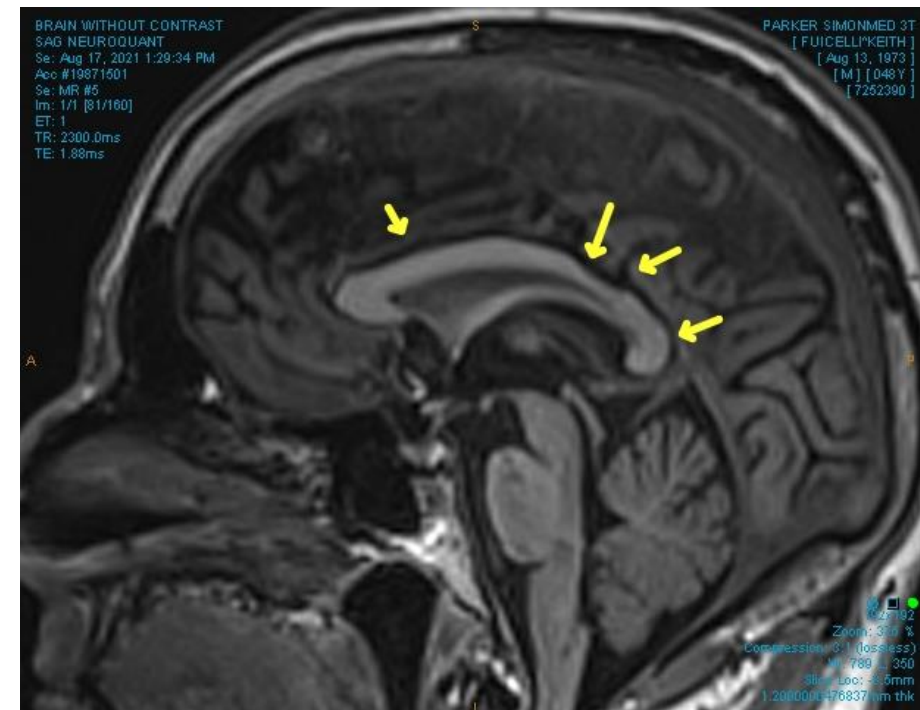
# Keith Fuicelli

Resultant Corpus Callosal Thinning (atrophy = injury)

Brain MRI 6/1/07



Brain MRI 8/17/21

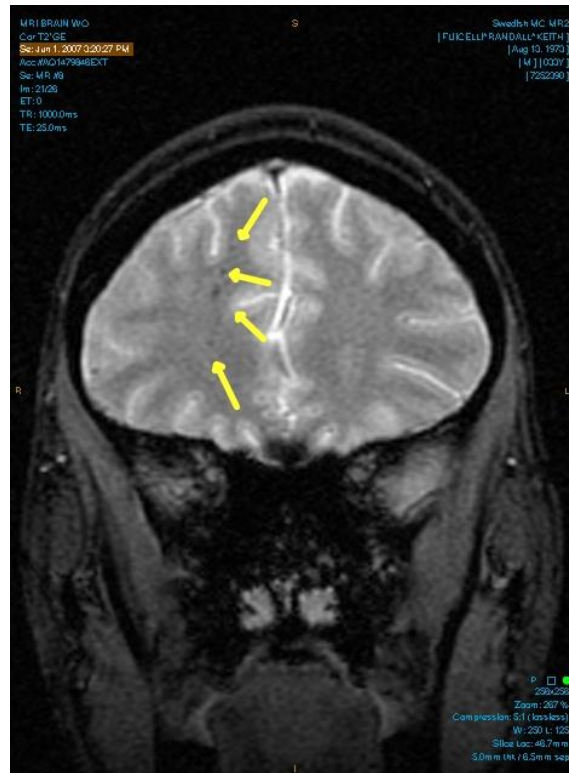
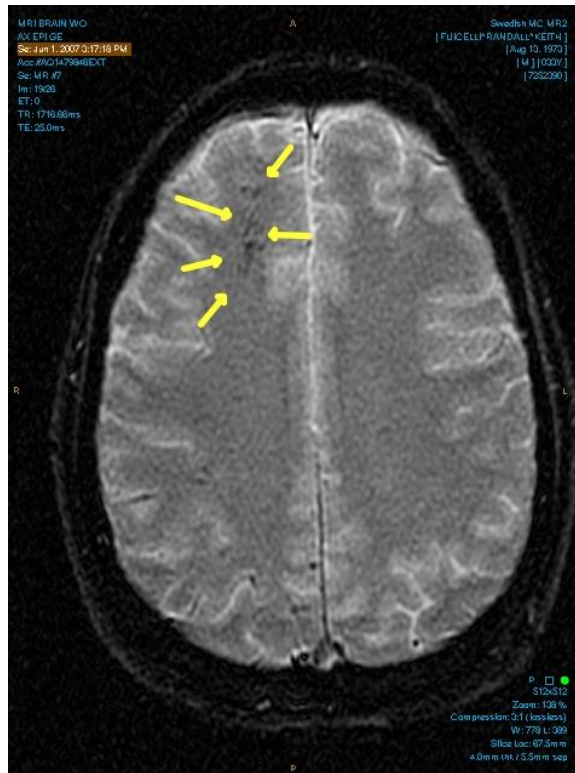


These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

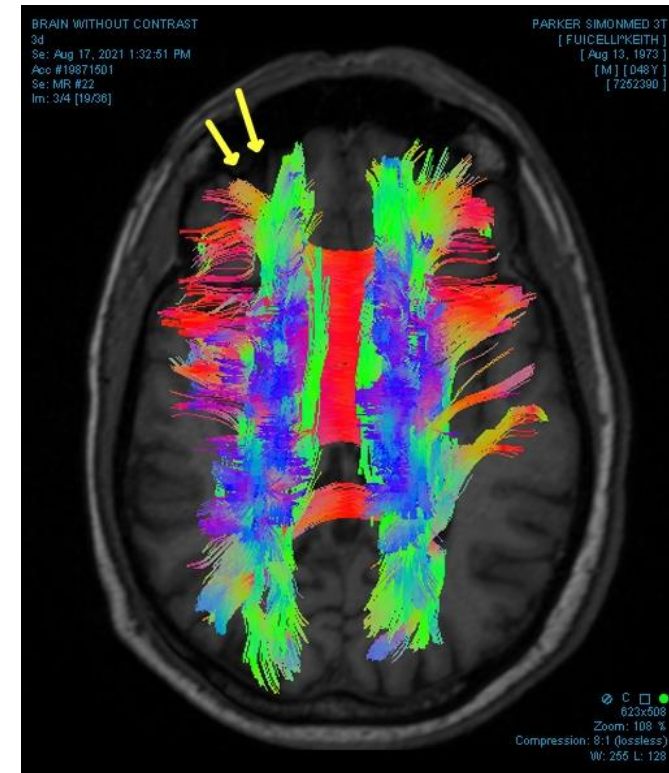
# Keith Fuicelli

## 3D DTI Matches Shearing

Brain MRI 6/1/07



Brain MRI 8/17/21



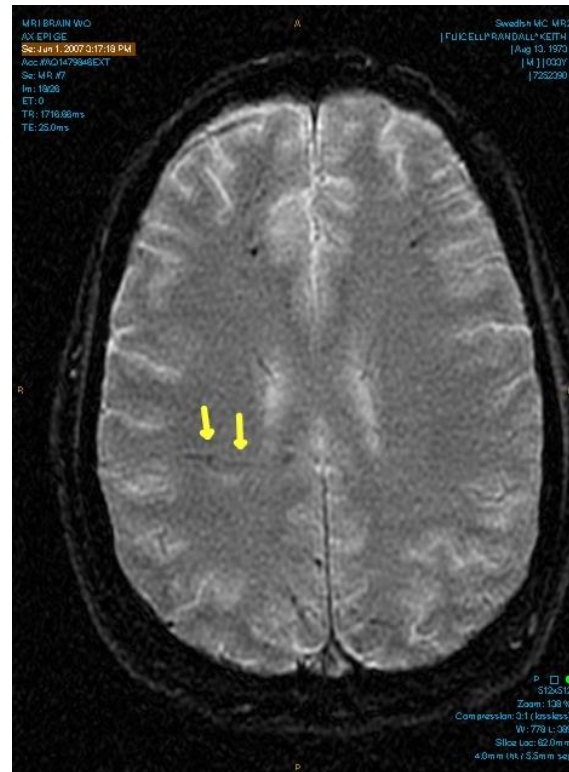
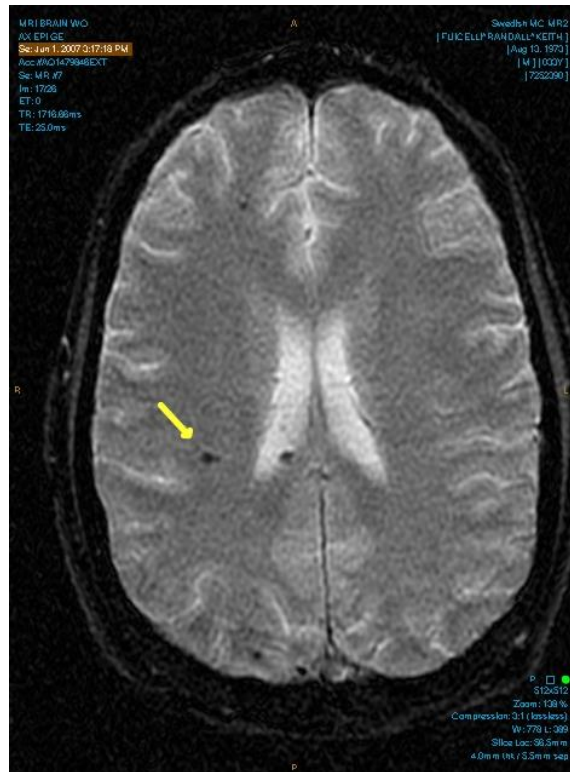
These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging



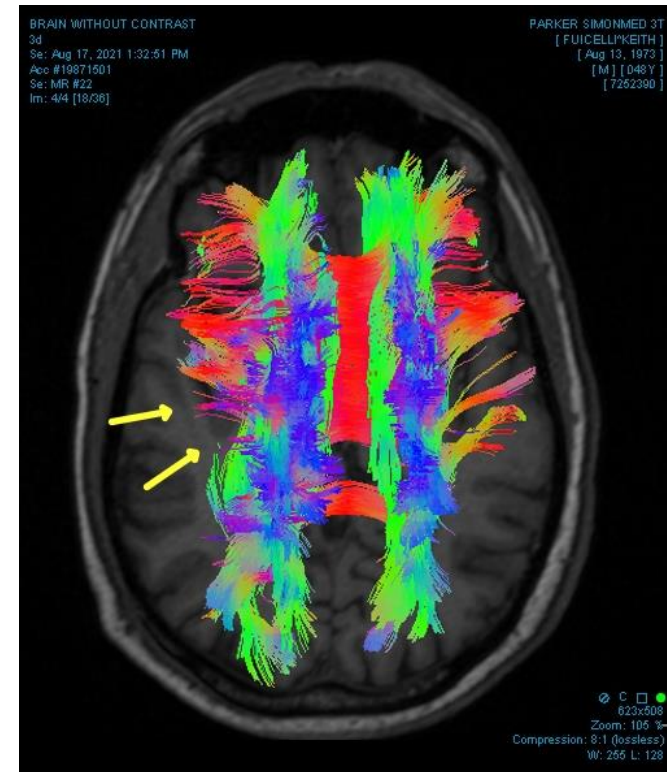
# Keith Fuicelli

## 3D DTI Matches Shearing

Brain MRI 6/1/07



Brain MRI 8/17/21



These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

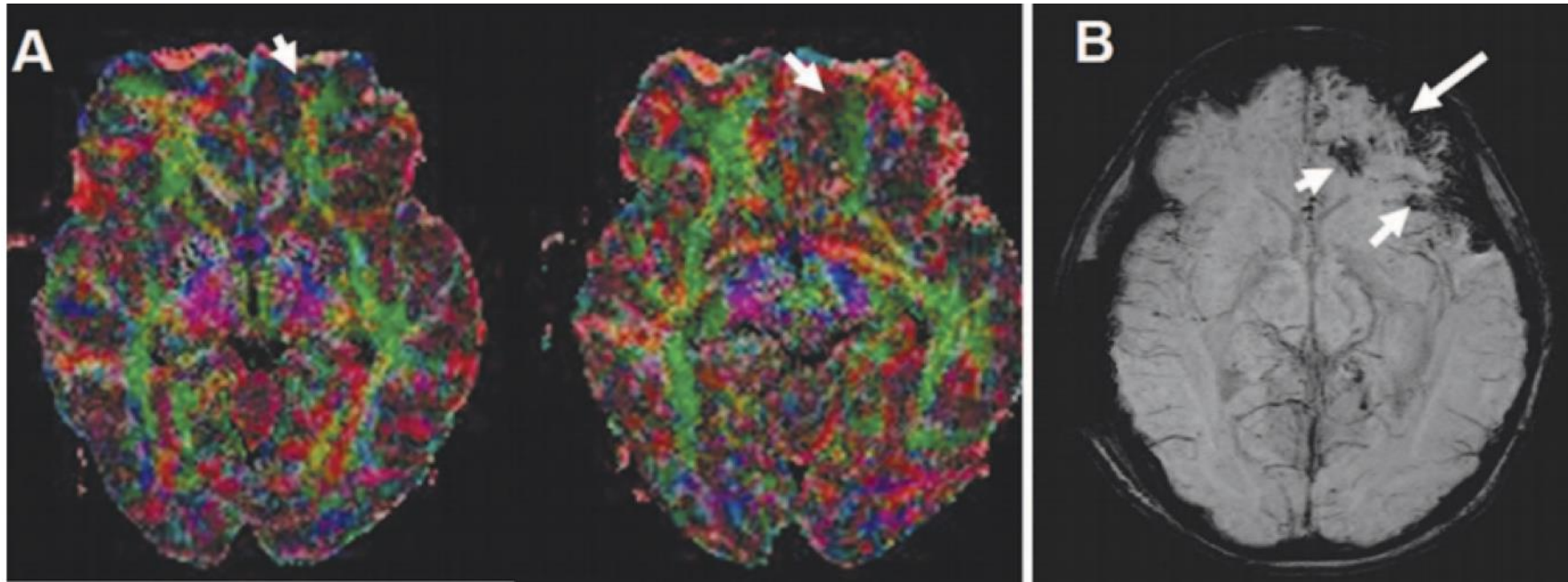




# Keith Fuicelli

## Diffusion Tensor Imaging

### Literature



Kou Z1, Wu Z, Tong KA, Holshouser B, Benson RR, Hu J, Haacke EM (2010).  
*The role of advanced MR imaging findings as biomarkers of traumatic brain injury.*  
J Head Trauma Rehabil. 2010 Jul-Aug;25(4):267-82. doi: 10.1097/HTR.0b013e3181e54793.

# Keith Fuicelli

## Diffusion Tensor Imaging

### DTI Literature Review Article

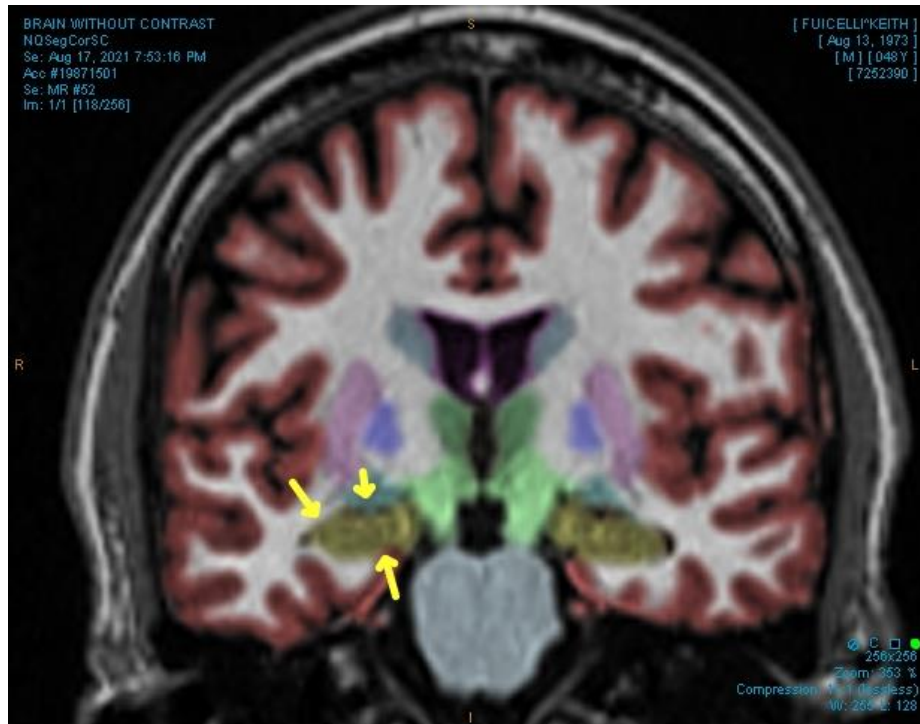
“Despite significant variability in sample characteristics, technical aspects of imaging, and analysis approaches, the consensus is that DTI effectively differentiates patients with TBI and controls, regardless of the severity and timeframe following injury. Furthermore, many have established a relationship between DTI measures and TBI outcomes.”

Hulkower, M. B., D. B. Poliak, S. B. Rosenbaum, M. E. Zimmerman and M. L. Lipton (2013).  
*A decade of DTI in traumatic brain injury: 10 years and 100 articles later.*  
AJNR Am J Neuroradiol 34(11): 2064-2074.

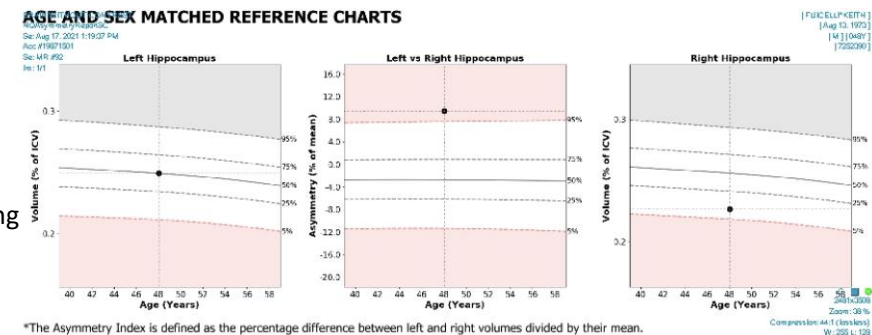
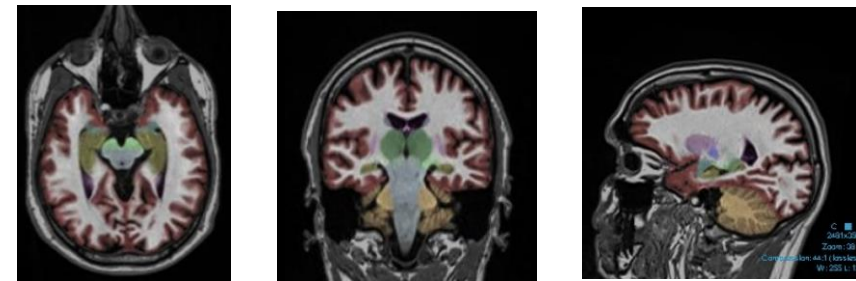
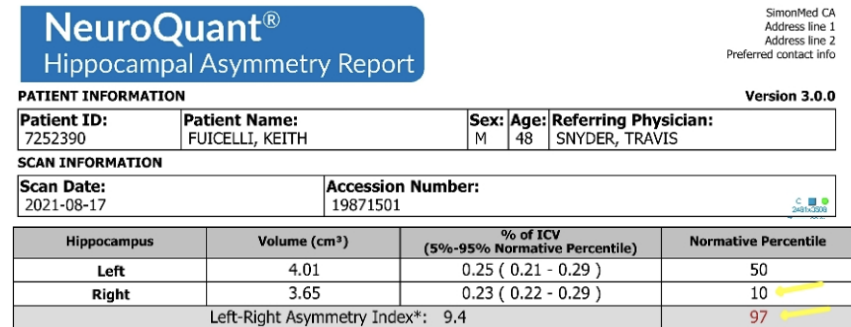
# Keith Fuicelli

## Right Hippocampal Atrophy

Brain MRI 8/17/21



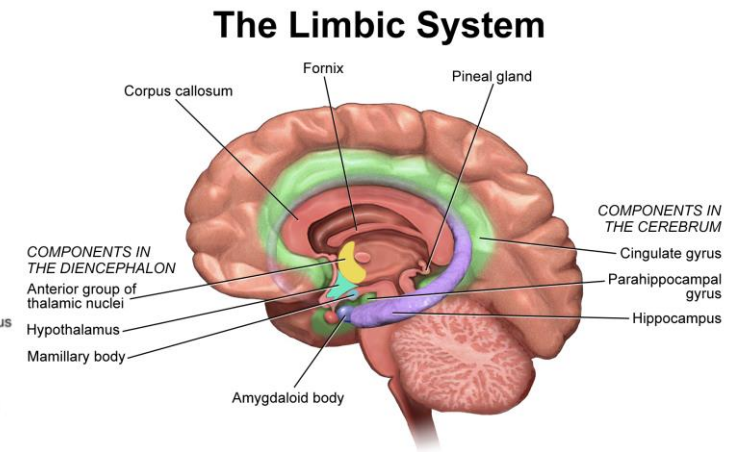
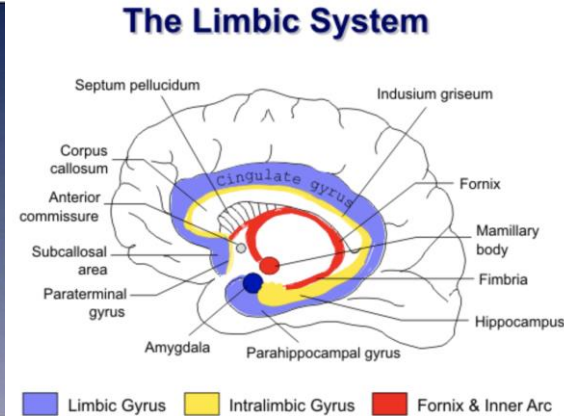
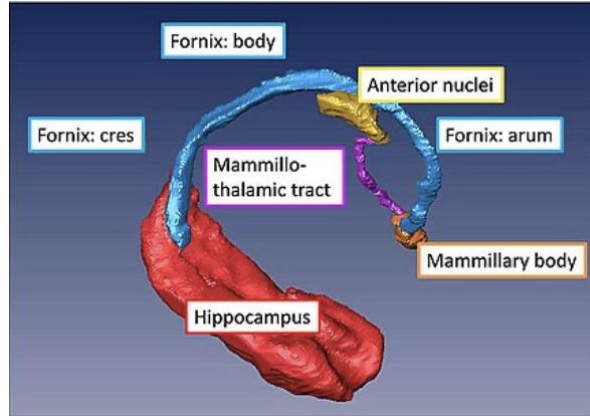
These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging





# Keith Fuicelli

## Right Hippocampal Atrophy



### Functions

1. Memory loss
2. Emotional problems
3. Other symptoms from TBI

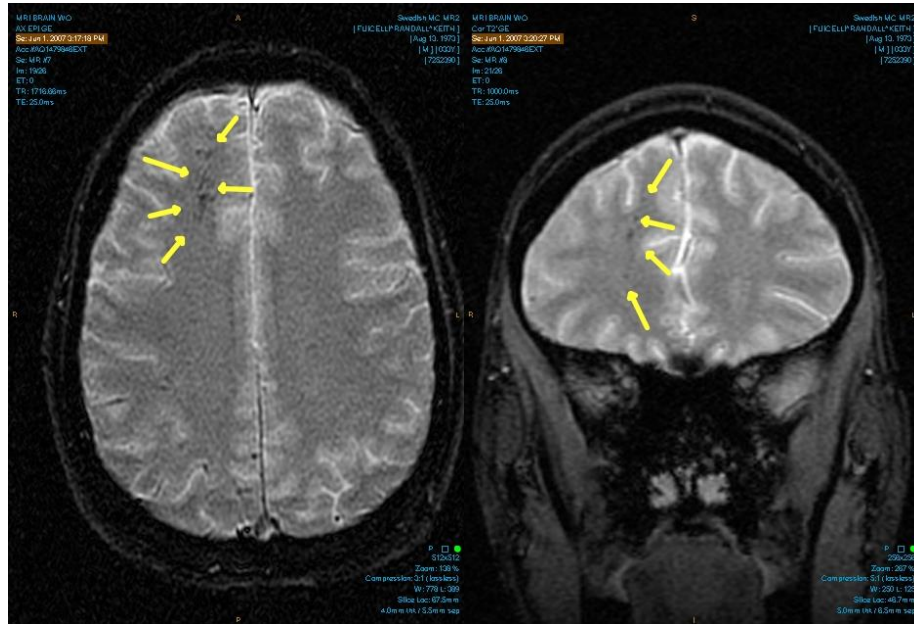
The Hippocampus is one of the most sensitive/earliest areas of the brain to show damage following head trauma. This is well accepted and documented in the peer-reviewed head trauma medical literature.

(Handratta, Hsu et al. 2010, Warner, Youn et al. 2010, Silk, Beare et al. 2013, Bigler, Anderson et al. 2002 Wilde, Bigler et al. 2007).

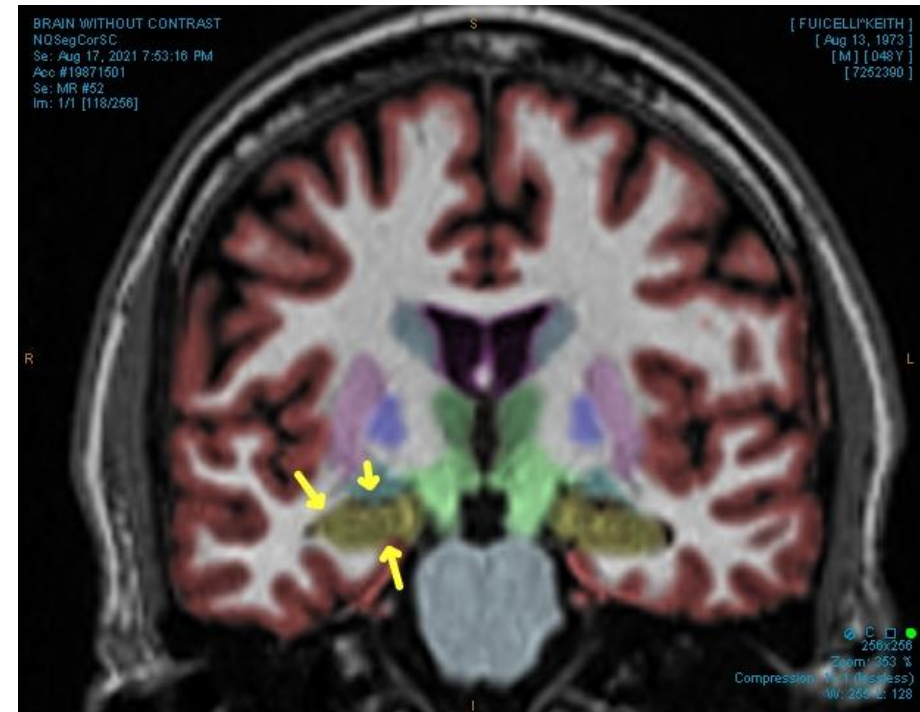
# Keith Fuicelli

## Hippocampal Atrophy Matches Right Shearing (DAI)

Brain MRI 6/1/07



Brain MRI 8/17/21



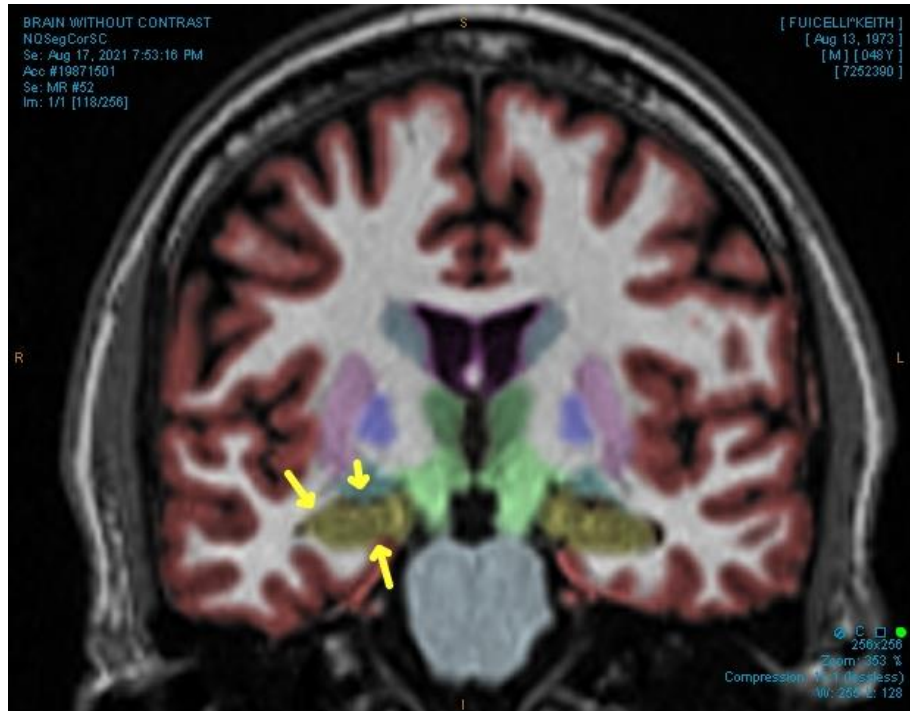
These images were provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

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## Hippocampal Atrophy

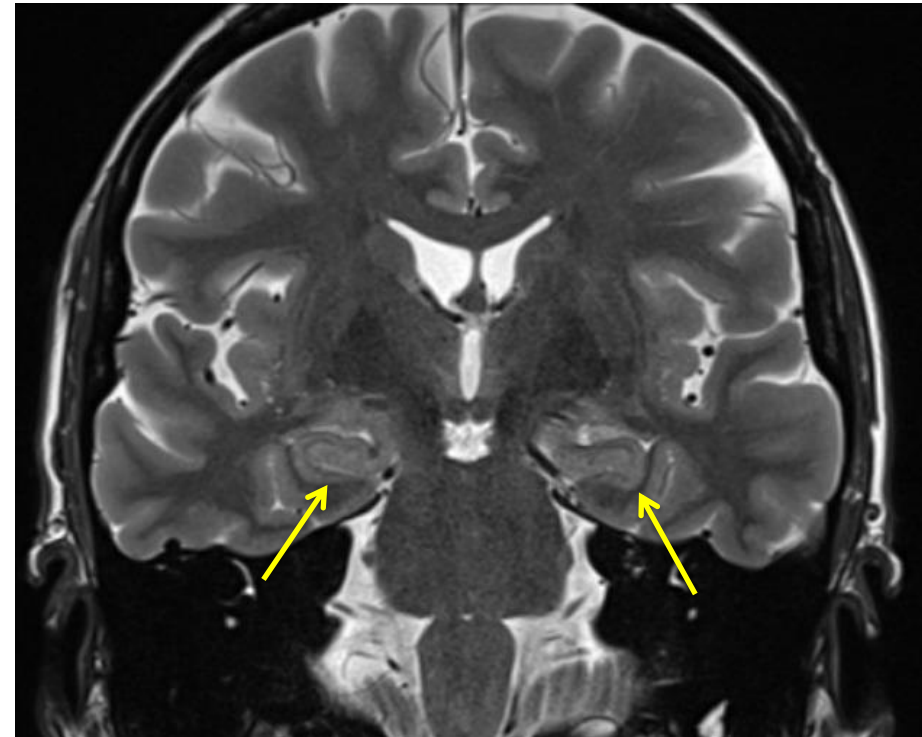
### Brain MRI 8/17/21

Patient's Scan



This image was provided by the courtesy of Travis Snyder, D.O. and SimonMed Imaging

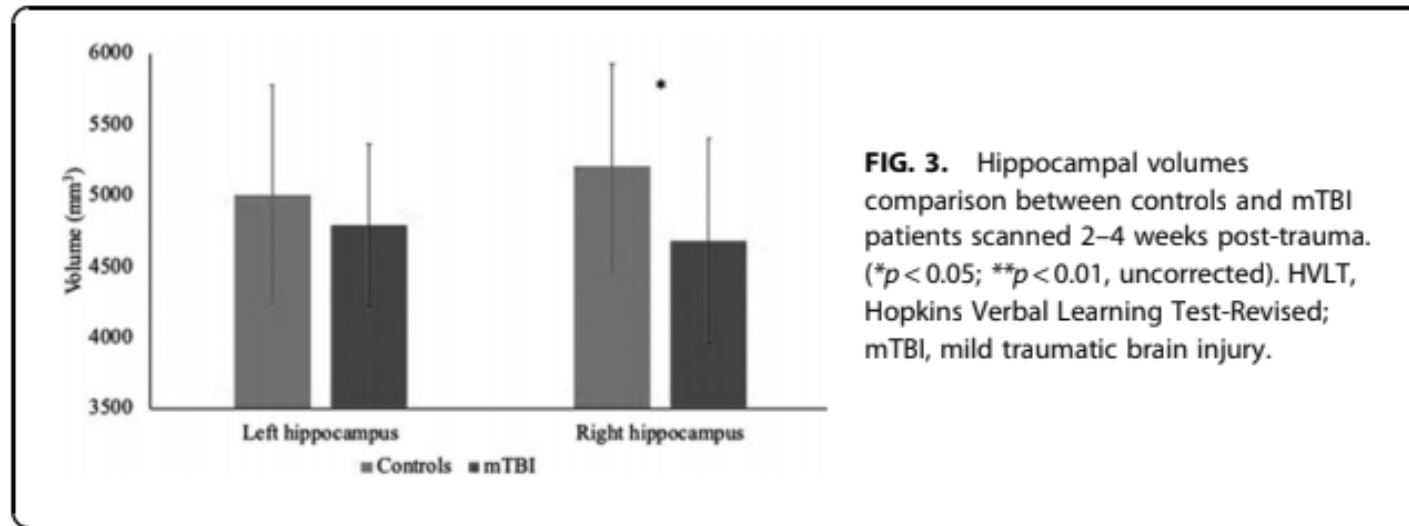
Normal





# Human Study Showing Acute Hippocampal Atrophy following Injury

*These results suggest that one single mTBI is associated with both episodic memory alteration and reduced volume of the hippocampus in the acute phase.*



Fortier-Lebel O, Jobin B, Lécuyer-Giguère F, Gaubert M, Giguère JF, Gagnon JF, Boller B, Frasnelli J. Verbal Episodic Memory Alterations and Hippocampal Atrophy in Acute Mild Traumatic Brain Injury. J Neurotrauma. 2021 Jun 1;38(11):1506-1514. doi: 10.1089/neu.2020.7475. Epub 2021 May 3. PMID: 33724054.

# Keith Fuicelli

## Summary Slide of Imaging Findings Secondary to the 2007 TBI

1. Hemorrhagic Diffuse Axonal Injury (DAI), greatest in the right Frontal Lobe
2. Diffuse Brain Scarring Adjacent to the DAI
3. Splenium of the Corpus Callosum DAI, poor prognostic sign
4. Abnormal FA values and 3D DTI in the splenium
5. Abnormal 3D DTI (tractography) matching DAI
6. Decreased FA values in the right cingulum
7. Right Hippocampal Atrophy (matching right side predominant DAI)

# Keith Fuicelli

## Recommendations

1. Clinical follow-up for Traumatic Brain Injury (TBI) is recommended.
2. Attention to frontal lobe deficits, corpus callosum deficient and limbic system dysfunction.
3. Recent literature indicates a greater than two-fold risk of dementia in patients with mild traumatic brain injury, even without loss of consciousness (Barnes et al 2018).

By Imaging Criteria, Keith Fuicelli  
has increased risk of dementia secondary to the TBI sustained in 2007

**Figure. Cumulative Incidence of Dementia by Traumatic Brain Injury (TBI) Severity**

