

NONIMPACT INERTIAL INJURIES TO THE BRAIN AND/OR ITS ACCESSORIES

Note: 60 cases are plausible -- Cases 4, 21, 25P, 32P & 38P questionably plausible -- Cases 50P, 53P & 54P are not temporally plausible

The cases are arranged in reverse order of dates --- P after the case number refers to published cases, + refers to additional information obtained

CASE Nr .	AGE SEX	YEAR	RIDE	PARK	INJURY	HEAD CONTACT	PREDISPOSITION ^[P] KNOWN BEFORE RIDE ^[S]	PREDISPOSITION ^[P] DISCOVERED AFTER RIDE ^[S]	Other factors POSSIBLY CONTRIBUTING to VULNERABILITY	INCIDENT DESCRIPTION AND SYMPTOMS	OUTCOME	COMMENTS ABOUT RIDE
1	55F	2002	Space Mtn	Disney World Magic Kingdom Orlando, Fl	Subdural Hematoma	No	No	No	----	Jerky, rough →headache, dizziness, diaphoresis, emesis, apnea, coma	Neurological sequelae	Total darkness
2	11F	2002	Many rides American Eagle	Six Flags Great America Gurnee, Ill.	Vascular Malformation rupture	No	No	Vascular malformation	----	Difficult to control head→ Dizziness, bad headache	Severe neurological sequelae	Designed for forwards Changed to backwards Did lap-bar fit???
3	31M	2002	Several Rides Dueling Dragons Ripsaw Falls One water ride	Universal Orlando, Fl	Deep Brain Hem. (extension to ventr)	?	No	No	Possible cervical instability, prior chiropractic cerv. manipulation	Nausea, "lump in throat" Short LOC, pain back of neck, Disoriented, thunderclap HA	Neurological sequelae	In Rapsaw : lifted off seat, buffeted. Sense of dread because no restraints
4	34F	2002	Speed Coaster Manhattan Express	Sahara Las Vegas NY, NY, Las Vegas, Nv	Concussional Traumatic Brain Inj.	Yes	No	No	Possible cervical instability; prior "whiplash" injury 1993	Unable to control head. Dizziness, nausea, sensitivity to noise & light, headache	Mild symptoms	Ride known rough on head & neck
5	48F	2001	Lower of Terror ----- Rock n' Roller	Disney MGM Lake Buena Vista, Fl	Latent lower spinal CSF Leak → Subdural Hematoma	No ?	No	Unrecognized lower spinal CSF leak due to saddle block 1974; again unrecognized recurrence 1993		Sick in stomach & dizzy Head turned→thrust on launch→head control lost →head/neck pain	Residual disability	Did not expect drops Did not expect LSM launch-Totally dark
6	63M	2001	Many rides Rattler Boomerang Rattler Superman	Fiesta Texas San Antonio, Tx	Subdural Hematoma	? No Yes No	No	No	-----	Rough→ nausea, headache "A bit out of it " Rough, no head control→ Head bounced side-to-side Front-back→not feeling well headache, nausea	Significant neurological sequelae	Rattler known to be rough
7	25F	2001	Montezooma's Revenge	Knott's Berry Farm, Buena Park, Calif.	Cerebral Aneurysm Rupture	?	Sickle cell anemia,	Preexistent Aneurysm	Renal disease-large Heart ---MVA Nov 2000 Chiropractor	Deep coma & respiratory Arrest on ride	Fatal	Fly-wheel launch
8	57F	2001	Top Gun	Paramount Carowinds Charlotte,N.C.	Perimesencephalic Pretruncal Subarachnoid Hemorrhage	No	No	No	Post-menopausal hormones	Dizziness,→severe head-neck ache, nausea, vomiting→stupor	Significant neurological sequelae	Intense, no braking
9	28F	2001	Goliath	Six Flags, Magic Mntn, Valencia, Calif	Cerebral Aneurysm Rupture	No	No	Preexistent Aneurysm tethered by Scar;	Labile HT	Coma on ride, CV arrest	Fatal	"...Most intense ride in the world"

10	35F	2001	Rides Magic Kingd Rock n'Roller X4 Rides Magic Kingd Back to Future Then Boat ride	Disney MGM Lake Buena, Vista, Fl. Universal Orlando, Fl.	Clinically consistent with Carotid Dissection → Embolism/stroke	probably see comment	No	No	Contraceptives,	Neck pain & tightness Unusually tired, fatigued Head/neckache different from sinus HA's→Severe→coma	Severe neurological sequelae	Cold→heavy coat, loose horse-collar, darkness, LSM launch, head turned Head/neck cramped in corner, forcibly rotated
11	53M	2000	Son of Beast Racer Son of Beast	Paramount Kings Island Ohio	Subdural Hematoma	? Yes	No	No	-----	Severe head/neck pain, sick	Long recovery Some neuro- logic residua	Very rough, jerky "Jarred" severely in helices
12	41M	2000	Son of Beast Outer Limits of Fear	Paramount Kings Island Ohio	Subdural Hematoma (also possible assoc- iated CSF leak)	? Yes	No	No	MVA 20 yrs ago with uncorrected displaced cheekbone→possible CSF leak	Severe headache x 2 days Severe immediate head pain, nausea, weakness→intense headache	Significant neurological sequelae	Rough Complete dark- ness; unable to control head
13P+	11M	2000	Many rides X:No Way Out Tidal Wave Many rides	Thorpe Park Surrey, Engl	Vert. Art. Dissection Stroke	Yes ?	No	No	-----	Sudden head/neck pain while looking to side during sudden unexpected stop→ Neurologic signs, severe headache, nausea→infarcts	Significant neurological sequelae	Total darkness Runs backwards Unexpected stops
14	31M	2000	Scrambler X 3	Carnival,Six Flags Olympic, Wash	Prob. Vert. Art. Dissection →brainstem infarct	No	No	No	-----	Looked to side, head "snapped & whipped" → Dizziness, head/neck pain	Resolved after 3 months	
15	42M	2000	Blazing Fury	Dollywood Pigeon,Tenn	Vert. Art. Damage PICA occlusion	No	Labile untreated HT	No	-----	Felt a heard neck pop during sudden descent→neurologic symptoms next morning (cerebellar infarct)	Prolonged course with sequelae	Total Darkness
16	23F	2000	Indiana Jones Ride	Disneyland Anaheim,Calif	Cerebral Aneurysm rupture	?	No	Cerebral aneurysm with fetal posterior Cerebral artery		Felt sick, dizzy, light-headed →later head-ache→coma	Fatal	Severe multiaxial jolting & jerking
17	43M	2000	Rock n' Roller	Disney MGM Lake Buena Vista, Fl	Subdural Hematoma	?	No	No	Broke nose age 14 possibly dehydrated	Head turned to daughter on unexpected launch→thrust back→woozy,dizzy→pound- ing headache, nausea	Prolonged course	LSM launch Total darkness
18	58F	2000	Manhattan Express	NY, NY Las Vegas,NV	Cerebral aneurysm rupture	?	No	Preexistent Aneurysm	HA on day before Cousin had aneurysm	Coma on ride	Fatal	
19	58F	2000	Incredible Hulk	Universal Orlando, Fl	Inertial sensori- neural hearing loss	Yes	No	No	-----	Strange feeling & loss of hearing in ear	Permanent loss of hearing	Catapult launch
20	46F	2000	ower of Terror ----- Rock n'Roller	Disney MGM Lake Buena Vista, Fl	Concussion & Cerv. Art. Dissection embolic infarcts	----- Yes	Years RX for Migraines →recent improvement	No	-----	LOC, earrings ripped off→ headaches, sick, stupor	Post concu- sive syndrome, neurologic sequelae	LSM Launch, total Darkness, horse- collar did not fit
21	30'sM	1999	Manhattan Express	NY, NY Las Vegas,NV	Cerv. Art. Dissection	?	?	Reported by Oregon treating physicians who cannot find name or medical records			?	
22	63M	1999	During 3hrs on several rides	Universal Hollywood,Ca	Subdural Hematoma	?	French tourist complained about forces on rides, developed headache & seizures – Burbank Calif. treating physician cannot find medical records				??	

23	31F	1999	Several rides Jokers Revenge	Fiesta, Texas San Antonio, Tx	Concussional Traumatic Brain Inj.	Yes	No	No	-----	Head turned, jerked forward, back into padding→head control lost→stupor→head buffeted about→ headache, woozy,disoriented→obtunded	Seizures, vestibular problems, postcon- cussion, cognitive, memory, executive deficits	Portion of ride is backwards Very hot day
24	30F	1999	Several rides Volcano Blast	Paramount's Kings Domin. Doswell, Va	Concussional Traumatic Brain Inj.	Yes	No	No	1/2pk/D	Head came forward, snapped back on launch→severe headache, nausea, stupor	Neuropsych test Post-concussion cognitive, mem- ory, executive	LIM/LSM launch Riders warned to keep head back against restraint,
25P+	30M	1999	Invertigo Top Gun x 5 Vortex	Paramount's Gr. America. St.Clara, Calif	Vert. Art. Dissection	Yes	No	No	Jet fighter pilot	4 th ride on Top Gun, turned head→felt "strange," light- headed, fatigued→head- ache next evening	Residual focal defects	<u>Backwards</u> <u>Intense</u>
26	34F	1999	One simulator Mr Freeze	Six Flags over Texas Arlington,Tx	Concussional Minor Traumatic Brain Inj.	Yes	Cervical Instability (perhaps 2° acute sinusitis)	No	-----	Leaned to assist panicked schoolchild→Head bounced on padding→sharp headpain head control lost →stupor	MRI:temporal/brain- stem concussion, seizures, cognitive memory, executive	LIM launch Forward & backward
27P+	31M	1998	J-shaped oscil- lating ride	Southern part of France	Carotid Art Dissection Infarct	??	No	No	----- No other information	Immediate neck pain at end of ride	Neurological sequelae	???
28P+	35F	1998	Space Mtn	EuroDisney Paris, France	Carotid Art Dissection Infarct	??	Migraines	No	----- No other information	Immediate "whiplash" symptoms that progressed	???	Total darkness
29	31F	1998	Manhattan Express	NY, NY Las Vegas,NV	Subdural Hematoma Intracerebral Hem	??	Anticoagulant S/P heart surgery	No	-----	Immediate Headache	Fatal	
30P+	24 F	1998	Fujiyama Moonsault Scribble One other ride	Highland Pk Japan	Subdural Hematoma	??	No	No	-----	Headache soon after rides that persisted & progressed	Apparently recovered	
31	44F	1998	Indiana Jones Matterhorn	Disneyland Anaheim,Calif	Probable initiation of Cerebral Aneurysm Rupture 4 days later	Possibly adjacent person	No	(no evidence that aneurysm preexisted ride) Atretic A-I seg.	Smokes (not that day)	No symptoms exiting Indiana Jones; walked leisurely ~1hr boarded Matterhorn→as it started, experienced pres- sure in head→ headaches	Some neurological sequelae	Severe multiaxial jolting & jerking
32P+	19F	1998	Big Dipper Nemesis Oblivion and others	Blackpool Alton Towers England	Leakage of Retinal AV malformation	Probably	No	Retinal AV malformation	-----	Visual deterioration began & progressed over 3-month period riding roller coasters	Apparent recovery	
33	7M	1998	Comet	Hershey Park Penna	Intracranial arteries "slapped" against Tentorial & falcine rigid edges→infarcts	Face re- bound off hand on Lap-bar	No	No	-----	Nose bleed — Delayed vasospasm→ Neurological deterioration	Residual neurological deficits	Lap-bar above legs of child - Allowed child to go airborne on descent & slam down at bottom
34	47F	1998	Loch Ness Monster	Busch Gardens WilliamsburgVA	Subarachnoid Hem with concussional infarcts	???	Migraines	No	-----	Leaning, arm around Daughter→Immediate severe headache, nausea	Some residual neurological deficits	Not comfortable with restraints
35	43M	1998	Drachen Fire	Busch Gardens WilliamsburgVA	Subdural Hematoma	??	No	No	-----	Very severe headache — taken directly to ER	??	

36P+	28F	1998	Log ride Texas Giant	Six Flags over Texas Arlington, Tx	Post-traumatic migraine	??	No	No	Mild whiplash 2 MVA's	Unable to control head from being "tossed about"→dizzy headache, nausea	New-onset migraine controlled by meds	Lap-bar only
37	43F	1998	Many rides Riddler's Revenge Viper	Six Flags Magic Mtn Valencia, Calif.	Subdural Hematoma	No	No	No	Transient Hx ophthalmic migraine; occ. tension HA's; ??cervical instability, Hx of low BP	Had backpack on→harness ill fit→head tossed about→ severe headache head tossed, bumpy, jerky, lurching→severe headache	Some cognitive deficits	Stand-up roller coaster Extremely rough ride
38P+	47M	1998	Portable high-speed roller coaster	Cascino Pk Florence, It.	Nonimpact contrecoup Brain Contusions Focal subarachn. Hem	??	No	No	-----	Violently swung in several directions→severe nausea, disequilibrium	??	
39	39F	1998	Many rides Outer Limits Flight of Fear	Paramount King's Island Ohio	Concussional Traumatic Brain Inj.	Yes	No	No	Occ allergic/sinus HA's, occ cig's	Launch surprise→thrown back→buffeting on restraint head & neck jarred→immediate head, neck & eye pain	?MRI brain lesions severe post-trauma concussive syndr. hyposmia, HA's	LIM launch – Total darkness; This ride is characterized as a "head-banger"
40	67M	1998	Twilight Tower of Terror	Disney MGM Lake Buena Vista, Fl	Vert. Art. Dissection	No	No	No	Stabilized coronary disease, on aspirin;	Unexpected sudden drops/reversals -leaned to child arm around her to protect→head forced rotated/extended→neck pain, woozy, ill	Residual disabilities	Sudden drops greater than "G" with sudden reversals
41	56F	1998	Manhattan Expr. Desperado	NY, NY Las Vegas, NV Primo, NV	Subdural Hematoma	??	Polycythemia Vera Severe headaches On multiple meds	No	-----	Different type of severe headache→LOC→coma	Fatal	
42P+	23M	1997	Space Mtn	EuroDisney Paris, France	Herniation of Syrxin into medulla	??	No	Chiari I Malformation with Syringomyelia Scoliosis	-----	Immediate neurological symptoms & signs	Mild residual deficits	Total darkness
43P+	29F	1997	Space Mtn	EuroDisney Paris, France	Vert. Art. Dissection Infarct	??	??	??	-----	Forced movements of neck→cervical pain	Complete recovery	Total darkness
44	42F	1997	Mind Eraser	Six Flags Elitch Gardens Denver, Co.	Traumatic Brain Inj. Vestibulo-Ocular inj.	Yes	No	No	-----	Hurled up/forward→head snapped against headrest→flexion/extension side-to-side buffeting→brief LOC →faint, sick, disoriented	Complete recovery	She has fat thighs & buttocks--improper fit of horse collar Very hot day
45	49M	1997	Viper Gr. Am. Scream Machine	Six Flags Gr. Adventure Jackson, NJ	Subdural Hematoma Brainstem Hem.	Yes	Adv'd insulin-depend diabetes, renal disease dialysis, HT, heart disease	No		Rough shaking side-to-side against restraint, unable to control head →headache, ill, sweating As ride stopped→gasp →neurologic signs	Fatal	No medical restrictions/warning on Viper Restraints inadequate
46	34F	1997	Other rides Outer Limits Flight of Fear	Paramount King's Island Ohio	Concussional Traumatic Brain Inj. Vestibular damage Post-trauma migraine	Yes	No	No	Dehydrates easily (possible role)	Head jerked around distress →brief LOC→bad headache, nausea, dizzy	Severe deficits	Stood about 1 hr in line during intensely hot humid day Complete darkness

47	32M	1997	Other rides Steel Force	Dorney Park Allentown, PA	Inertial Retinal Tear-detach'd	No	No	No	-----	Sudden unscheduled stop on 1 st line→immediate eye pain	Deficit	Train made stop because disabled train ahead
48	40F	1997	Other rides Steel Force	Dorney Park Allentown, PA	Anterior basal skull CSF Leak → Subdural Hematoma	No	No	No	Possible role of mild childhood nose injury Mild nose injury 2000 Seasonal allergic sinusitis HA's, re- mote Hx migraine	Thrown up, down, back, forth shaken→turned, arm tight- ly around son to protect him →abrupt stop→thrown for- ward & back→typical grad- g l progress of symptoms	Dx & Rx months later→ Total recovery	Steel Force had recently opened
49P+	37F	1997	Many rides _Komba	Florida amuse- ment Parks <i>Busch Gardens Tampa, Fl</i>	Inertial enlargement Intraspinal Enterogenous Cyst		No	Intraspinal Enterogenous Cyst	-----	<i>Slight neck discomfort, stiffness Turned to hold son to protect him→suddenly thrown back→sore, painful neck</i>	Recovery	
50P+	29F	1996	Space Mtn	<i>EuroDisney Paris, France</i>	Carotid Art Dissection Infarct	Case temporally not plausible						
51	5F	1996	Other rides All rides Space Mtn	Knott's Berry Disneyland Anaheim, Calif	CSF leak Iatrogenic Vert. Art. Dissection	No	No	No	Possible role of nose injury in 1982	Sudden, forceful whipping of head typical gradual symptom progress	Recovery	Total Darkness
52	42F	1995	Indiana Jones Ride	Disneyland Anaheim, Calif	Deep inner cerebral inertial hemorrhage	? head contact w/ co-rider	No	No	-----	"Terrifying" (head tossed about)→severe headache, dizziness & nausea	Severe neuro- logical deficits	Severe multiaxial jolting & jerking
53P+	52F	1995	Big Thunder	<i>EuroDisney Paris, France</i>	Carotid Art Dissection Infarct	Case temporally not plausible						
53P+	31F	1995	Space Mtn	<i>EuroDisney Paris, France</i>	Vert. Art Dissection Infarct	Case temporally not plausible						
55P+	39F	1995	Thunderation X 3	<i>SilverDollarCty Branson, Mo</i>	Spinal CSF Leak	??	3 childhood injuries to neck & back with yrs of neck/back pain	No →1995 periods of neurologic signs	-----	Postural <i>shooting</i> headache, neck ache, nausea & dizziness	Recovery	No headrests
56P+	77M	1995	Hercules Tilt-a-whirl	<i>Dorney Park Allentown, Pa</i>	Subdural Hematoma	Yes	Anticoagulants & meds – heart disease	No	-----	Rough→ head contact, no external inj. Nausea→progressive	Fatal	
57P+	64M	1995	???	???	Subdural Hematoma	???	No	No	Hx of HT	Progressively severe headaches	Recovery	
58	16F	1994	Steel Phantom	Kennywood Pk W.Mifflin, Penn	Subdural Hematoma	??	No	No	-----	Immediate progressive headaches	??	
59P+	26M	1992	Doppel Looping	<i>Can.Natl.Exhib. Toronto, Can</i>	Subdural Hematoma	No	No	No	-----	Immediate progressive headaches, nausea, vomiting	??	
60	37F	1992	Texas Giant	Six Flags over Tx Arlington, Tx	Translational otolith displacement		No	No	-----	Wheel on a car jammed→sharp unex- pected deceleration at bad angle→rid- ers plunged forward→car lurched for- ward→whipped head back & to side →no head control→"huge" headache	Severe orthostat- ic ills, vertigo, nausea, pressure in head - RX	Unable to anticipate sharp turns

61	53M	1992	The Rattler	Fiesta Texas San Antonio,Tx	Cervical CSF Leak → Subdural Hematoma	No	No	No	Degenerative cerv disc disease chiropractic	Head down, chin on chest→ at bottom of drop→excruciating neck pain	Severe disability	Presented on Internet, exceeded standards, many injuries, rebuilt
62	31M	1992	Other ride Space Mtn	Disneyland Anaheim, Calif	Vert. Art. Dissection Infarct	No	No	No	Former jet fighter pilot	Like tethered, tossed up,down,left,right→ no head control→immediate headache, nausea, vomiting	Fatal	Total darkness
63	24F	1992	Steel Phantom	Kennywood Pk W.Mifflin,Penn	Subdural Hematoma	??	No	No	-----	Immediate progressive headaches	??	
64P+	33F	1991	Scrambler	Fairground	Vert. Art. Dissection Infarct	No	???	No	-----	Immediately disoriented, neck pain	??	
65P+	34F	1990	Racer +water ride Beast Vortex	<i>Paramount</i> <i>King's Island</i> <i>Ohio</i>	Traumatic Pericallosal Aneurysm	???	No	No	-----	<i>Strong, sudden jerk</i> , hard <i>sharp turn</i> → <i>sudden massive pressure inhead</i> → <i>LOC</i>	???	
66	16M	1985	Texas Cyclone	Six Flags,Astro Houston, Tx	Vert. Art. Dissection Infarct	???	No	No	-----	Suddenly said: "that turn popped my neck"→transient LOC→vomit, blurred vision →LOC	Severe disabilities	Problems with seat & restraint design with many predictable major injuries→seats replaced
67P+	13F	1978	Lightning Loops	<i>Gr. Adventure</i> <i>Jackson, NJ</i>	Compression injury Carotid Artery	static	No	No	-----	During inversion/twist→neck forced onto restraint→neurologic signs	Recovery	Restraint not suitable for child
68P+	??M	1964	Matterhorn	Disneyland Anaheim,Calif	Subdural Hematoma	No	Anticoagulants Heart disease	No	-----	On curve felt "dull thud" in head→ headache, evolving,cognitive,deficit	???	