Functional Visual Loss and Dysfunction in a Veterans Affairs (VA) Tertiary Medical Center

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Goals of Presentation

- Describe the populations studied
  - Polytrauma
  - mTBI
- Describe the study findings
- Briefly describe rehabilitation efforts developed to address TBI-related vision impairment/dysfunction
- Discuss limitations, conclusions, and future research directions

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Background of PRC

- 4 PRCs currently established within DVA
  - located in Richmond, VA, Tampa, FL, Minneapolis, MN, and Palo Alto, CA
- Provide acute inpatient rehabilitation for patients with traumatic brain injury (TBI) and/or life-threatening injuries
- At Palo Alto, most PRC patients have moderate to severe TBI

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Methods

- Initial vision screenings were conducted at bedside
  - progressed to standard optometric testing, if able
- Techniques were modified according to patients' abilities
- If patient was able to communicate verbally, a brief series of questions was asked to obtain history of symptoms

Demographics

- N = 115 (total patients evaluated)
- Over 90% of patients seen were male (Blast: 94.7% male, MVA/Other: 93.1% male)
- Mean age 28.1 years (Blast: 28.6 years, MVA/Other: 27.6 years)

Mechanism of Injury

- Most common cause of injury in PRC was blast-related events (49.6%)
- MVA occurred in 24.3%
- Other causes of injury (falls, assault, gunshot/shrapnel injuries, and anoxia) occurred in 26.1%

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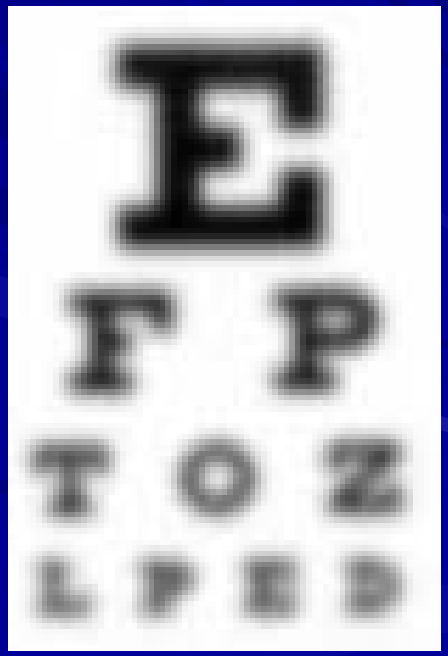
Complaints of Vision

- Change(s) noted in vision since injury
  (blurry vision, double vision, increased sensitivity to light, missing part of visual field, problems reading)
  - Blast: 77.4%
  - MVA: 59.1%
  - Other: 81.5%



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Visual Acuity Status

- Best logMAR of 0.00 (20/20)
  - Blast: 52.0%
  - MVA: 58.3%
  - Other: 55.2%
- Visual Acuity Status (20/60 or better)
  - Blast: 75.4%
  - MVA: 75.0%
  - Other: 80.0%

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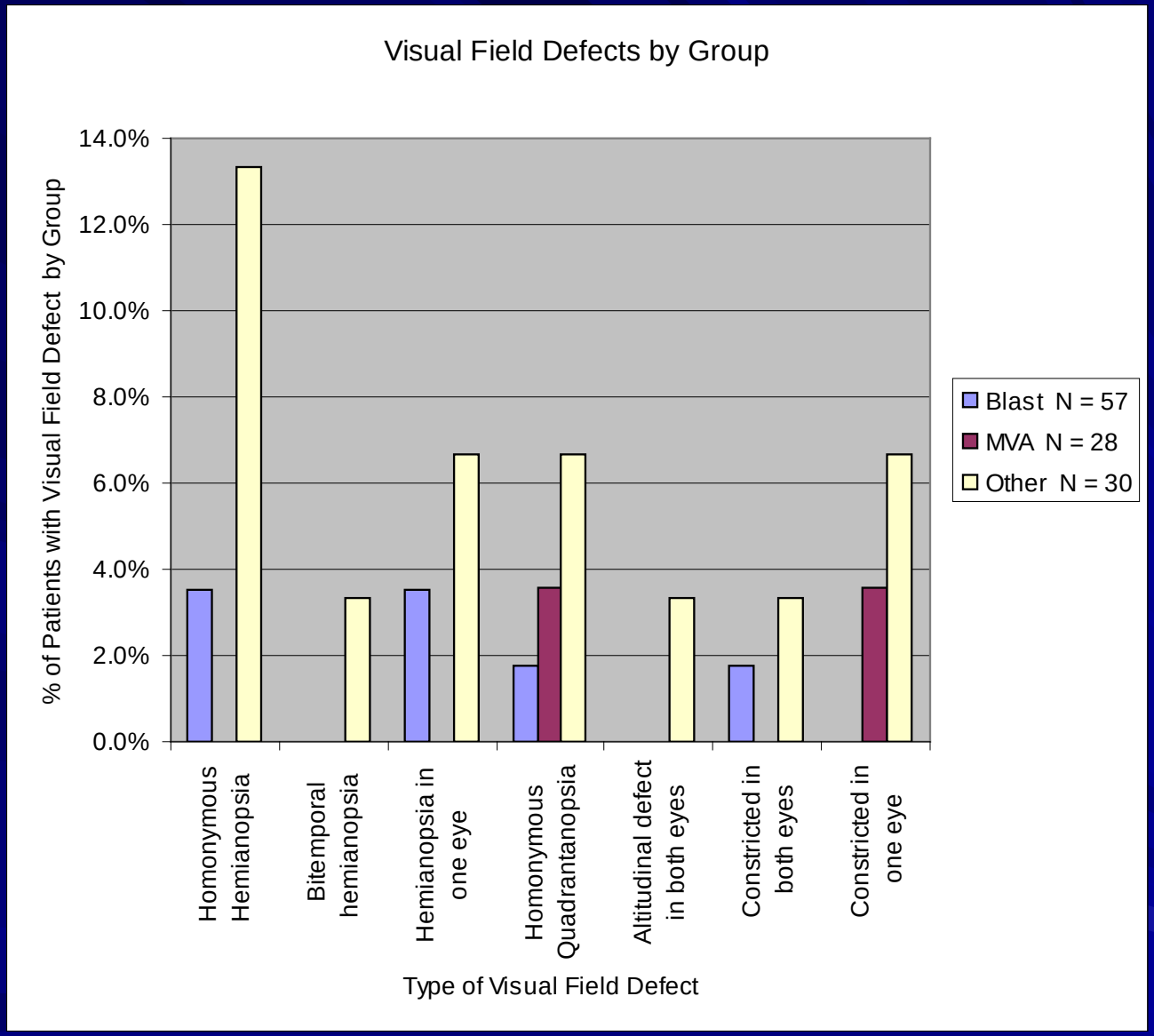

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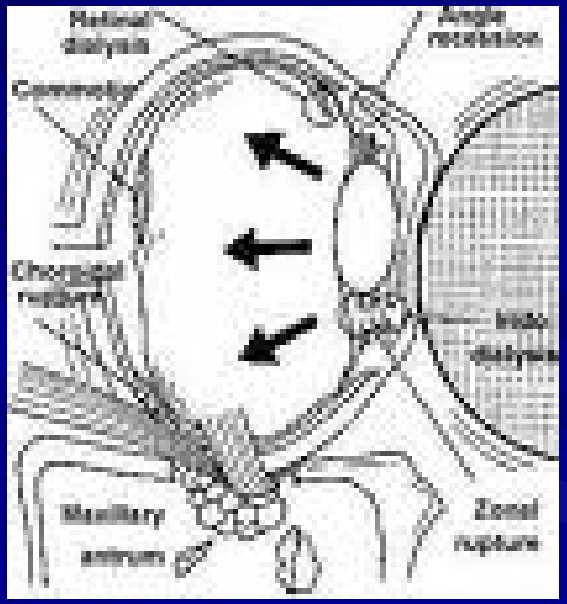
Eye/Orbit Trauma

- Ocular Injury reported
  - Blast: 43.9%
  - MVA: 10.7%
  - Other: 13.3%



www.rcsed.ac.uk/journal/vol44_5/4450002.jpg

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Monocular Status

- Monocular Visual Status (either NLP or enucleation of one eye)
  - Blast: 17.5%
  - MVA: 0%
  - Other: 3.3%

Light Sensitivity

- Reported change in light sensitivity
  - Blast: 42.1%
  - MVA: 21.4%
  - Other: 30.0%

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Dysfunctions

	Blast	MVA	Other
Accommodative Insufficiency - Amplitude of Accom. Pts. < 40 yrs. of age	42.2%	35.0%	39.1%
Convergence - InsufficiencyReduced NPC and/or abnormal cover test	38.6%	28.6%	66.7%
Occulomotor Dysfunction - Dysfunctions of Pursuits and/or Saccades	31.6%	28.6%	46.7%
Fixation Instability - Unsteady fixation during exam	38.6%	28.6%	46.7%
Strabismus – Detected on clinical exam	31.6%	28.6%	46.7%

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Reading Difficulty

- Self-reported or observed reading difficulty
  - Blast: 57.9%
  - MVA: 39.3%
  - Other: 63.3%

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Summary: Visual Impairment

- 20-25% of all PRC patients seen had a visual acuity worse than 20/60
  - Similar percentages were found in each of the groups (Blast, MVA, Other)
- More patients with blast and other injuries not MVA) had a visual field defect; the types of VF loss seen in blast-injured patients were more varied than the MVA group

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Summary Cont.: Visual Impairment

- ~40% of patients with injuries from other causes had a visual field defect
  - Within this group,
    - 80% of patients with gunshot/shrapnel injuries,
    - ~40% of patients with injuries from falls or anoxia, and
    - 33% of patients with injuries from assault had a visual field defect
  - gunshot/shrapnel injury contributed most to the total number of homonymous hemianopsias as well as the single bitemporal hemianopsia seen
  - anoxia was the second highest contributor to homonymous hemianopsia

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Summary Continued:

- Patients with blast-related injuries had higher percentages of ocular trauma, loss of one eye, and reported light sensitivity as well as a lower percentage of strabismus than patients with MVA or other injuries.

- Patients with MVA injuries had fewer complaints of vision and reading difficulties than patients with blast-related or other injuries.

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Summary Cont.: Visual Dysfunction

- Visual dysfunctions, including
  - oculomotor dysfunction (34.8% of all patients),
  - convergence insufficiency (43.5% of all patients), and
  - accommodative insufficiency (39.8% of all patients)
- Visual dysfunctions were common in all groups (Blast, MVA, Other), but most frequent among patients with injuries due to other causes.
- In addition, more patients with injuries from other causes had complaints of diplopia than patients injured by blast or MVA.
- Findings led us to examine visual function in mTBI

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Summary Continued

- Variation in the percentage of visual field defects and visual dysfunctions seen in patients with TBI due to blast, MVA, and other causes suggests that the mechanisms of injury may play a role in these findings.

- The high prevalence of self-reported as well as objective visual dysfunctions found in military personnel with a history of TBI supports the need for comprehensive eye examinations in this population.

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Polytrauma: Dual Sensory Impairment

- DSI defined as co-existing hearing and visual deficits
  - Hearing
  - Vision
- Reviewed 175 electronic records of OEF/OIF polytrauma patients
  - 62 had blast related injury and complete audiology and vision examinations

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Polytrauma DSI (n = 62)

- 19% hearing impairment only
- 34% vision impairment only
- 32% dual sensory impairment
- 15% no hearing/vision loss

Impact of DSI

- Compared admission and discharge Functional Independence Measure (FIM) score

- DSI predicted less functional improvement between admission and discharge scores
  - Suggests DSI moderates functional gain in a rehabilitation setting
  - This was independent of level of traumatic brain injury (mild, moderate, or severe)

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Polytrauma Network Site

- VA has 23 Polytrauma Network Sites
- Serves an outpatient population with over 80% diagnosed with mTBI
- Services include
  - Neuropsychology
  - Audiology screening
  - Vision screening
  - Pain Clinic
  - Medical

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Mild TBI

- Definitions (i.e., Glasgow Coma Scale) rely heavily upon self-report and relatively gross presenting symptoms
- Mild TBI – disoriented, brief unconciousness, etc. is frequently diagnosed in returning troops from Iraq and standard of care does not include visual examination
- Current literature suggests visual dysfunctions (accommodative, convergence, pursuit/sacade insufficiency, etc.) may accompany mTBI
  - Prevalence estimates range from 20% to 40% or higher, but definitive prevalence rates unknown

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Method

- Patients from Palo Alto Polytrauma Network Site Clinic
  - Outpatient
  - Presenting symptoms
    - PTSD
    - Depression
    - Hearing
    - “Things just not quite right”
- Vision screens conducted on 124 consecutive patients

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Vision Screen Findings

	All Injuries N = 124	Blast injury N =112	Non-blast N = 12
Subjective Visual Complaint	75.8% (94/124)	75.9% (85/112)	75.0% (9/12)
Ocular Injuries	8.1% (10/124)	7.1% (8/112)	16.7% (2/12)
Visual Impairment:			
Visual acuity (20/70 – 20/100)	0	0	0
Legally Blind (VA < 20/100)	1.6% (2/124)	1.8% (2/112)	0
No Light Perception	0	0	0
Significant Visual Field Defects	3.2% (4/124)	3.6% (4/112)	0
Monocular	1.6% (2/124)	1.8% (2/112)	0

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Visual Dysfunction in PNS

	All Injuries N = 124	Blast injury N =112	Non-blast N = 12
Convergence Insufficiency	48.4% (59/122)	46.8% (52/111)	63.6% (7/11)
Pursuit/Saccadic Dysfunction	23.4% (29/124)	24.1% (27/112)	16.7% (2/12)
Accommodative Insufficiency (for subjects less than 40 years)	47.5% (47/99)	45.7% (42/92)	71.4% (5/7)
Fixation Instability	6.5% (8/124)	7.1% (8/112)	0
Strabismus	7.3% (9/124)	7.1% (8/112)	8.3% (1/12)
Reading Difficulties (self-report)	87.1% (108/124)	87.5% (98/112)	83.3% (10/12)
Reading Problems New Since Injury	89.9% (89/99)	88.8% (79/89)	100% (10/10)

Conclusions

- The types of visual dysfunctions found were consistent with current literature on mTBI
- Visual dysfunctions appear to be associated with “mild TBI”
- The preponderance of injury from blast event raises the question of whether blast exposure, as opposed to other mechanisms of injury, has more severe consequences in terms of the visual system.
- The primary conclusion is that we have a lot more work to do!

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Limitations of Current Studies

- Studies reported are from a single VA site
- Relatively small population
- Lack of information on visual status prior to injury and examination
- Lack of control population
- Self-reported visual symptoms may be related to visual status, but could also be confounded by PTSD, cognitive deficits, memory loss, etc.

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Vision Rehabilitation

- Blind Rehabilitation Outpatient Specialist (BROS) within Polytrauma Rehabilitation Center – works as part of interdisciplinary team
- Comprehensive Neurological Vision Rehabilitation Program in Western Blind Rehabilitation Center
- Binocular Vision Clinic

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Future Clinical and Research Needs

- Multi-center, controlled studies to determine whether findings in this population are similar at other sites (including mechanism of injury)
- Larger population size will further delineate the impact that mechanism of injury has on various types of visual impairment and dysfunction
- Need to examine effectiveness of interventions in treating and/or rehabilitating visual impairment and dysfunction findings within this TBI population

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