Consequences of Co-morbid Substance Abuse and Traumatic Brain Injury: Research, Assessment Strategies, and Treatment Recommendations

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"The [traumatic brain injury] survivor's life emerges as an ongoing pull between the changes that occur within an altered brain and the outward repercussions that follow. It is this tension between being and becoming that begs the intimate, soulful questions posed by every brain injury. What are we other than our brains? Is there a part of me that can't be changed by a brain injury?"

– Michael Paul Mason, brain injury case manager and author of *Head Cases: Stories of Brain Injury and Its Aftermath*

Relationship between substance abuse and traumatic brain injury (TBI)

- Substance use may be a cause or a consequence of TBI[1]
- Pre-TBI history of alcohol misuse among adults ranges from 37%-51%.[2]
- Pre-TBI history of illicit drug misuse is 44%.[2]
- Alcohol abuse or dependence is the second most common psychiatric disorder following a TBI.[3]
- Up to 3/4 of TBI survivors are intoxicated with alcohol at the time of their injury.[4]
- 70% of severe and 60% of moderate TBIs were incurred by substance abusers.[5]
- Recent study found no significant differences between TBI patients and substance abusers in neuropsychological test performance.[6]

Substance intoxication at time of TBI

- Increased likelihood of second TBI if intoxicated at time of injury[9]
- Alcohol
  - Greater severity of TBI[7]
  - Lower GCS on admission[7]
  - Longer time in critical care[2]
  - Poorer neuropsychological performance 1-2 months after TBI[2]
  - Longer hospital stay[8]
  - Longer duration of agitation[8]
- Illicit drugs
  - Poorer neuropsychological performance[2]

Medical and neurological problems associated with substance abuse history prior to TBI

- More severe injury[7]
- Higher mortality rates[10]
- Lower GCS on admission[7]
- Higher volume of intracranial hemorrhage[11]
- Weaker quantitative EEG improvements[11]
- Increased brain atrophy[11-13]
  - Even in young adult sample!
- Lower probability of good treatment outcome[10]
- Increased probability of a second injury[10]
- Increased probability of later deterioration[10]

Neurocognitive consequences of substance abuse history prior to TBI

- Higher BAL among TBI patients at admission was predictive of:
  - Worse performance on a task assessing planning, organization, and visuospatial constructional abilities[14]
  - Poorer delayed verbal memory[14]
- Individuals with positive utox at time of injury performed worse than normals on:
  - Full Scale IQ[15]
  - Verbal IQ[15]
  - General, verbal, and visual memory[15]
  - Attention and delayed recall[15]

Neurocognitive consequences (cont.)

- Neuropsychological deficits were found in TBI patients among patients who were intoxicated at the time of injury *as well as* those with moderate to heavy use prior to time of injury.[13]

- Cocaine use prior to injury predictive of poorer performance on a test of learning and memory.[16]

Contradictory findings re: neurocognitive deficits related to co-morbid substance abuse & TBI

- Argument: Negative outcomes could be attributable to confounding variables[2]:
  - Chronic substance use
  - Psychiatric disorders
  - Pre-injury neurological/cognitive disorders
- Studies contesting previously mentioned research have found:
  - No negative impact of day of injury alcohol use on NP performance[7,17]
  - History of binge drinking or frequent drinking unrelated to level of cognitive and motor functioning[7]
  - Individuals intoxicated at time of injury outperform matched sample of non-intoxicated patients[17]
  - Lower mortality rates among individuals with high BAL values compared to individuals with negative BAL values[18]

Why the conflict? Research limitations…

- Null findings may be indicative of insufficient statistical power.[2]
- Failure to consider impact of cognitive remediation that takes place concurrently with study[19]
- Methodological inconsistencies, which prevent meta-analytic comparisons of study results:[2]
  - Samples
  - Measures
  - Method of data collection
  - Outcome and prognosis measure
- Difficult to control for certain variables[19]
- Dearth of data in extant literature re: drug use & TBI[2]

Assessment of head injured patients in addiction treatment

- Is patient making slow or poor progress in treatment? Maybe there's a history of TBI.[25]
- Do cognitive impairments remain, even after sustained period of abstinence?[4]
- 'Have you ever hurt your head or had a head injury that resulted in being knocked out or being taken to the hospital?'[26]
- Need multiple data points to ensure accuracy [4]
  - Patient
  - Variety of collateral informants (family, friends, co-workers, etc.)
  - Corroboration with records to compensate for limitations of self report and collateral measures
    - Work history, school performance
- Continue to monitor substance use over time with routine assessments, especially for patients at risk.[27]

Difficulty of assessment/treatment with this population

- Limited self awareness[4]
  - Unaware of their deficits[4,28] (anosognosia)
  - Unaware of seriousness of substance use[28]
- Memory deficits[4]
- Difficulty grasping and remembering concepts[28]
- Poor frustration tolerance[27]
- Limited participation in group therapy due to slow processing speed[28]

Key aspects of treatment

- Psychoeducation[4]
  - Validate and normalize patient's symptoms.
  - With mTBI, communicate the expectation of resolution of these symptoms over time (as long as patient stays abstinent).
  - Educate patients and family on how to distinguish between substance abuse-related and TBI-related problems.
  - Teach warning signs for relapse.
  - Discuss risk factors of substance use post-injury.
- Address physical complaints[29]
  - Patients should undergo a period of rest and observation.
  - Treat persistent or disabling symptoms (e.g., headache, insomnia) that may trigger substance use.
    - Both pharmacologic and non-pharmacologic interventions

Key aspects of treatment (cont.)

- Family participation and support
  - Ask about substance use of family and friends.[4]
  - Help patients and families access local community resources including 12-step programs, Al-Anon, and Alateen.[4]
- Staff training[30]
  - Include review of brain injury literature.
  - Awareness of clinician countertransference[4]
    - Avoid harshly treating patients who make unhealthy choices.
    - Patient's behavioral difficulties may be perceived as disruptive in traditional treatment settings.
    - Measure steps to recovery one day at a time. Offer praise for making good decisions and working toward goals.
- Counseling
  - Help patients process the effects of substance use on their feelings, self-esteem, and relationships.[4]

Key aspects of treatment (cont.)

- Accommodations for cognitively impaired patients
  - Present material in variety of modalities to promote learning.[4]
    - Written and oral
    - Role-play
    - Visual aids
    - Peer modeling videotaping
    - Coaching in order to promote learning
  - Proceed slowly, paraphrase, simplify, and repeat.[4]
    - Restate AA's 12-steps in simpler language to make it more understandable for cognitively impaired individuals.[30]
  - Use behavioral interventions to treat impulsivity, affect dysregulation.[30]

Key aspects of treatment (cont.)

- Community involvement and integration are integral to healing[31]
  - Encourage participation in substance-free social and recreational activities.[4]
  - Provide information to community agencies and treatment programs about the effects of TBI and the need for accommodations.[4]
- Include structured aftercare as part of discharge planning.[30]

Neuropsychological Evaluation

- Neuropsychological testing[25]
  - Weigh the pros and cons of testing before referring:
    - Testing can be problematic because tests are sensitive and results may reflect emotional disorder rather than cognitive disorder.
  - Okay to test while patients are still using - see where they're at now; then retest in 6 months.
  - NP testing can help with treatment planning.
    - Can be helpful to look at NP evaluation so as to identify a patient's strengths and weaknesses.
      - Build on strengths
      - Gain more in-depth understanding of weaknesses
        - E.g. rather than just "memory problems" could be more nuanced problems, e.g. source memory

Neuropsychological testing as intervention in substance abuse treatment

- When patients and providers understand the cause of the patients' symptoms (e.g. TBI) they may be less likely to attribute failures to their own moral deficiencies or weaknesses.[28]
- Knowing that abstinence can improve cognitive performance may serve as motivation for recovery.[28]
- Providers can consult with neuropsychologists to determine how to adjust level of intervention difficulty.[28]
- However, there is minimal empirical data on impact of providing feedback regarding cognitive functioning to enhance motivation for treatment.[28]

Well established & promising treatment interventions

- Rebound Lifestyle Adjustment Team (RELATE; Blackerby & Baumgarten, 1990) [30]
- TBI Network (Corrigan, Lamb-Hart, & Rust, 1995) [33]
- Personal Intervention Substance Abuse Program (Hensold et al., 2006)[35]
- Group therapy with mixture of interpersonal, psychoeducational, coping skills, and relapse prevention approaches (Delmonico, Hanley-Peterson & Englander, 1998)[27]
- Motivational Interviewing[32]

Treatment Research

- Review of 9 treatment studies[36] came to the following conclusions:
  - Optimal treatment program includes:
    - Multidisciplinary team
    - Community based
    - Variety of treatment modalities available (individual/group)
  - Motivational interviewing alone has limited impact.
  - Skills-based interventions are most effective.
  - Financial incentives and barrier reduction methodologies improve likelihood of treatment compliance.
  - Peer-based support is well-received by patients and their families. Benefits are knowledge, empowerment, and improved coping.
- Despite promising findings, "There is little empirical support for a direct relationship between cognitive functioning and treatment outcome."[29]

Summary

- Most studies report poorer outcomes among individuals who were either intoxicated at time of TBI or had a history of substance abuse prior to injury.
- However, there are other studies that contest these data, which suggest that confounding variables other than substance abuse account for poorer outcomes.
- Methodological limitations of existing data make it difficult to formulate solid conclusions regarding this debate.
- Individuals with this co-morbidity are challenging to assess and treat but there are several promising treatment approaches available.
- Most successful programs use multidisciplinary approach, employ multiple treatment modalities emphasizing skills building and behavioral modification, and stress community integration.

Appendices:
Treatment Interventions

Treatment Interventions

- Rebound Lifestyle Adjustment Team (RELATE) Blackerby & Baumgarten (1990)[30]
  - Staff training in addiction treatment and behavioral rehabilitation
  - Active family involvement
    - Encourage attendance at lectures and community meetings
  - AA and NA support groups
  - Counseling
  - Stimulus control techniques
  - Behavioral interventions
  - Psychopharmacological management
  - "Whole person" treatment philosophy
  - Structured aftercare program
  - Accommodations for cognitive impairments
- Results (pilot data, very small sample): Patients who engaged in aftercare after RELATE were more likely to be abstinent.

Treatment Interventions (cont.)

- Motivational Interviewing
  - 75% of head injured patients who received 1 hour MI intervention prior to discharge reported <1 drink per week at 1 year follow-up.[32]

Treatment Interventions (cont.)

TBI Network by Corrigan, Lamb-Hart, & Rust (1995) for TBI/SUDs[33]

- Services
  - Comprehensive assessment of substance use
  - Comprehensive neuropsychological assessment and monitoring
  - Integrated service planning and coordination
  - Monitoring
  - Outreach to identify clients needing treatment
  - Client, family, and employer education
  - Job development and placement
  - Support in accessing resources
  - Social and emotional support
  - Advocacy to increase awareness and policies of service providers
- At 6-month follow-up
  - 30% more subjects were employed than on initial assessment.
  - Average frequency of alcohol use decreased by 77%.
  - Use of other drugs decreased by 89%.
  - Patients abstaining from alcohol/drugs increased almost 300%.
- Increased vocational status = decreased substance use[34]
- Timing is important: Decreased substance abuse was more likely among those referred within three months post-injury.[34]

Treatment Interventions (cont.)

Delmonico, Hanley-Peterson & Englander (1998)[27]

- Group therapy model for inpatients and outpatients with TBI and substance abuse based on harm reduction.
- Interpersonal, weekly, 1 hour
- Written didactic materials
- Treatment goals:
  - Identify substance abuse problems, maladaptive coping, & triggers.
  - Recognize consequences of use.
  - Develop effective relapse prevention and coping strategies.
- Indicators of treatment success:
  - Pilot data found:
    - Reduced clinic visits
    - Fewer emergency calls for substance abuse related health problems
    - Increased stability in housing and relationships

Treatment Interventions (cont.)

- Personal Intervention Substance Abuse Program, Hensold et al. (2006)[35]
  - Three clinical levels assigned based on severity of use
  - Not required to be abstinent upon treatment entry
  - Collaboration on individualized self-management plan
  - Contingency management with incentives fading from concrete to more subtle, socially-based contingencies
  - Patients apply skills learned *in vivo* to ensure better generalization
  - Staff supervision gradually withdrawn over time
  - Clinical components
    - Mood management
    - Medical management
    - Leisure exploration
    - Progression through clinical levels
    - Group therapies (education, relapse prevention, "life impact")
  - Results (pre-post; 30 participants)
    - Gains made in residential status, level of independence, awareness, and productivity
    - No change in vocational status

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