

Case Report

Neuropsychological Assessment Informed Intervention during Liver Transplantation Evaluation: A Case Report

Price JS^{1,2*}, Zanowski SC^{1,2} and Hong JC¹¹Division of Transplant Surgery, Department of Surgery, Medical College of Wisconsin, USA²Department of Psychiatry and Behavioral Medicine, Medical College of Wisconsin, USA***Corresponding author:** Price JS, Division of Transplant Surgery, Department of Surgery, Medical College of Wisconsin, CFAC 2nd Floor, Transplant Center, 9200 W. Wisconsin Ave., Milwaukee, WI, 53226, USA**Received:** November 15, 2021; **Accepted:** December 06, 2021; **Published:** December 13, 2021**Abstract**

Aims: Pre-transplant non-adherence is associated with poorer outcomes post-transplantation. Comorbid cognitive deficits can negatively impact adherence, limiting access to transplant. We report use of an abbreviated neuropsychological assessment to inform treatment planning for a critically-ill patient with liver failure due to alcohol cirrhosis in need of liver transplantation.

Methods: The patient was a 25-year-old Hispanic male with limited education, history of daily alcohol use and 6 months abstinence. While inpatient and in transplant evaluation, he demonstrated non-adherent behaviors and poor insight into health consequences. A head CT was unremarkable.

Results: Neuropsychological testing results estimated borderline to impaired intellectual functioning. Simple attention and story memory were low average whereas other cognitive domains were borderline to impaired. There was no memory degradation over time. Etiological considerations included premorbid intellectual dysfunction, longstanding severe alcohol use disorder, and mild hepatic encephalopathy in the setting of liver failure.

Discussion: Deficits in higher order cognitive processing were consistent with observed challenges with impulse control and adherence. Intervention focused on relative strengths in simple attention and memory for structured material. The patient demonstrated improved adherence but died while awaiting transplant. This case highlights the utility of neuropsychological assessment and focused intervention in optimizing transplant candidacy.

Keywords: Liver transplantation; End stage organ failure; Adherence; Alcohol cirrhosis; Alcohol use disorder; Neuropsychological assessment

Introduction

End-Stage Liver Disease (ESLD) is an irreversible, critical illness and can result in death without orthotopic liver transplantation. Pre-transplant non-adherence is an important risk factor for poor medical and psychological outcomes post-transplantation [1]. Further, premorbid mental health and cognitive comorbidities confer increased risk for adherence challenges, and up to 60% of ESLD patients experience cognitive impairment [2]. We describe use of an abbreviated neuropsychological evaluation to inform treatment planning and transplant risk stratification. All information included in this manuscript was obtained in compliance with regulations from the institution.

History of Presenting Illness

The patient was a 25-year-old Hispanic male with ESLD due to alcoholic cirrhosis, severe portal hypertension, ascites, hepatic encephalopathy (HE), and life-threatening esophageal varices. He acutely decompensated, required hospitalization and underwent evaluation for waitlisting for liver transplant. Neurologic work up included a Computed Tomography (CT) of the head which showed normal findings.

Background

The Transplant Psychologist conducted an initial psychological

evaluation as a component of the comprehensive liver transplantation multidisciplinary patient waitlisting evaluation.

Psychiatric history

The patient was alert and oriented and expressed motivation for transplant. He had history of emotional lability related to health status and endorsed depressed mood during hospitalization. He was prescribed Effexor XR 37.5 mg/day. He had no prior neuropsychological testing. Family psychiatric history was notable for bipolar disorder (brother).

Social history

The patient was single, bilingual (English and Spanish), obtained 8 years of education and endorsed lifelong history of reading difficulty. He was unemployed and last worked as a dishwasher. He lived with his parents and relied on his mother for nearly all cares, including medications, appointments, meals and hygiene. He had a history of nonadherence and limited insurance. His mother and other family members committed to caregiver support post-transplantation.

Substance use history

The patient described longstanding, severe alcohol use disorder, including daily drinking from age 16, consuming at least half a liter of liquor/day (12-13 standard drinks), prior DUI, continued use despite medical complications and difficulty stopping. He stopped 6

Table 1: Neuropsychological Test Results.

Test	Subtest	Percentile
General Intelligence		
WTAR		1
WASI-II Full-2		<1
	Vocabulary	4
	Matrix Reasoning	<1
Attention		
WAIS-IV Digit Span Total		5
	Forward	9
	Backward	9
	Sequencing	5
Processing Speed/Executive Functioning		
Trails A		2
Trails B		<1
Language		
FAS		18
Animals		18
Memory		
CVLT-II	Trial 1	32
	Trial 5	16
	Total 1-5	7
	Trial B	2
	SD Free	7
	SD Cued	2
	LD Free	7
	LD Cued	2
	Repetitions	50
	Intrusions	32
	Recognition Hits	1
	Recognition False Positives	16
	Forced Choice	(100%)
	WMS-IV Logical Memory	Immediate Recall
Delayed Recall		16
Recognition		(26-50 Cumulative %)
RCFT	Time to Copy	11-16
	Copy	≤1
	Immediate Recall	<1
	Delayed Recall	<1
	Recognition Correct	7

months prior following umbilical hernia. He denied relapse, cravings or access to alcohol in the home. He endorsed monthly marijuana use and occasional past year cocaine use; he denied prescription drug misuse or tobacco use. He had never completed Alcohol and Other Drug Abuse (AODA) treatment.

The multidisciplinary liver transplantation committee deemed the patient suitable for waitlisting for liver transplant with an initial

Model for End-Stage Liver Disease (MELD) score of 25. In keeping with the risk-stratification assessment, the committee recommended AODA treatment, provided during admission through our mental health service.

Abbreviated Neuropsychological Evaluation

While inpatient, staff reported persistent non-adherent behaviors, including disregarding nothing by mouth (NPO) orders, sneaking food and leaving the hospital against medical advice. Transplant Psychology recommended completion of an abbreviated neuropsychological evaluation to explore cognition and potential interventions (Figure 1). A clinical neuropsychologist in our service (JP) administered testing and interpreted results. Testing was completed over three testing sessions, as the patient cited inability to tolerate longer sessions and abdominal pain (medications included tramadol and IV fentanyl). He was alert and oriented; vision and hearing were intact. He was generally cooperative and attentive but required reinforcement to complete tasks. Measures sensitive to effort indicated sufficient engagement in testing.

See Table 1. The patient’s intellectual functioning was estimated between the borderline and impaired ranges, although reported pain and limited educational attainment may have contributed to an underestimation [3,4]. While his profile was largely suppressed within the borderline to impaired ranges, he demonstrated relative strengths within the low average range in simple attention, verbal fluency and learning and memory for a story (Figure 2) [5,6]. He struggled with imposing structure and maintaining set; however, when provided with redirection and/or increased structure, performance improved [7,8]. There was no indication of delirium consistent with an overt HE episode, yet deficits in higher order cognition and visuospatial processing in the context of ESLD would support consideration of mild HE [9-11]. In fact, resting-state fMRI findings of aberrancies in the cohesiveness and connectivity of cortical and subcortical systems are thought to represent an early phenotype of brain-based dysfunction such as mild HE [12,13]. Additional diagnostic considerations included longstanding intellectual dysfunction, which may reflect a learning disorder and/or cultural factors, as well as neurocognitive contributions resulting from severe alcohol use disorder. Indeed, impairments in executive function, memory and visuospatial construction are also consistent with deficits noted among those with alcohol use disorder, including teens using substances [14].

Discussion

While the patient endorsed understanding of his medical condition and expectations set by the team (consistent with relative strengths in contextual learning and memory), he was challenged with tolerating distress (e.g., hunger, long hospitalization) and maintaining adherence, both of which are concerns for post-transplantation adherence and relapse risk. While some aspects of cognition were thought to potentially improve with medical stabilization or transplantation, other aspects, like crystallized intelligence and irreversible deficits related to chronic alcohol use disorder, were considered more fixed. Recommendations included ongoing family support, as it was unlikely that he would be able to initiate structure independently, and consistent reinforcement of expectations to support emotional and behavioral regulation.

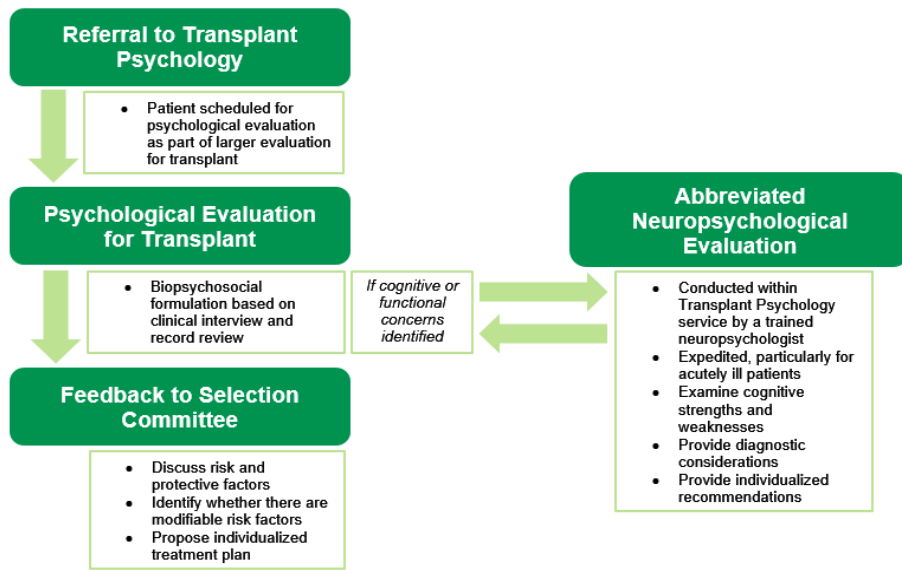


Figure 1: Neuropsychological evaluation as a component of the psychological evaluation for transplant.

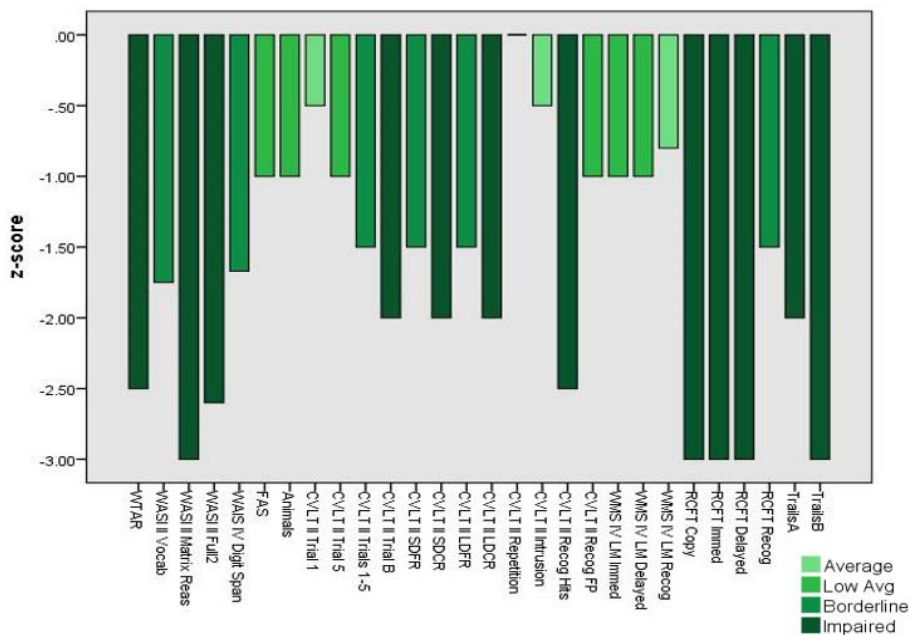


Figure 2: Bar graph representing strengths and weaknesses in neuropsychological performance.

An additional intervention goal was to structure routine behaviors to optimize success with adherence and overall engagement in the transplant process.

Intervention

To determine if the noted risk factor, inhibitory control in the face of distress, was modifiable, the patient was made inactive on the transplant waitlist due to non-adherence and recommended to demonstrate the following: AODA treatment participation, physical therapy participation and explicit adherence to NPO orders. Intervention focused on motivational interviewing and supporting relative strengths in simple attention and memory for structured

material. He was provided psychoeducation that he benefits from learning a few pieces of information at a time, with frequent repetition, and he should repeat back what he has learned from staff. A board in his room tracked daily progress with recommendations and was referred to frequently. At each session, the psychologist addressed adherence with current treatment plan and relationship with distress tolerance. Distraction techniques were encouraged to navigate distress and remain in line with recommendations. The patient was provided opportunity in each session to repeat back information reviewed to maximize retention and link behaviors with his values of improved health. He demonstrated an increased willingness to ask questions of providers which helped him achieve better understanding of

his medical condition and treatment plan. Following one week of demonstrated adherence, the patient's progress was discussed and he was reactivated on the transplant list.

Hospital Course

Following an 88-day stay and while awaiting a suitable organ, he developed sepsis, respiratory distress and multi-system organ failure and coded after an acute hypoxic episode. His family chose to make him DNR and he passed away shortly thereafter.

Recommendations for Practice

This report highlights a highly integrated mental health service in transplant. Neuropsychological evaluation occurred within the Transplant Psychology service, contributed to candidacy review and directly informed aspects of psychological intervention utilized with the patient to promote effective adherence as he awaited transplant. Neuropsychological assessment can be particularly significant for critically-ill patients in need of organ transplantation, as fluctuations in medical status are common and can inform cognition and engagement in recommendations [15]. In the case of alcoholic liver disease, it is the second most likely indication for liver transplantation, and severity of alcohol use disorder and psychiatric comorbidities are considered risk factors for relapse post-transplant [16-18]. Typically, neuropsychological assessment in the context of evaluation for transplant occurs as a consult due to specific referral question (e.g., dementia rule-out), although practice supports integration of neuropsychologists in care teams [19]. From a programmatic perspective, we have adopted involvement of in-house neuropsychological assessment with a clinical neuropsychologist as a part of the multidisciplinary review of candidacy for transplant, particularly for complex, high-risk cases (Figure 2).

Finally, this case highlights the importance of comprehensive biopsychosocial assessment within a specialized mental health team that includes neuropsychology. This model improves access to comprehensive assessments and interventions to modify identified risk factors and ensure maintenance of protective factors throughout the transplant experience. Considering liver transplantation has been shown to improve length and quality of life as well as neurocognition [13,15,20], availability of tailored psychological services to optimize candidacy is essential in ensuring fair and equitable access to lifesaving transplantation.

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