



Overuse of Head Computed Tomography in Cirrhosis With Altered Mental Status



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ABSTRACT

Background: Head computed tomography (CT) scans are ordered in patients with cirrhosis along with altered mental status (AMS) during admission, often, despite lack of evidence of any structural abnormality. Thus, we aimed to examine the use of head CT scans in patients with cirrhosis along with AMS and to correlate scan abnormalities with causes of AMS and physical findings.

Materials and Methods: We defined AMS as having impaired cognition, diminished attention, reduced awareness or altered level of consciousness or all of these, and categorized AMS into the following groups: hepatic encephalopathy (HE), sepsis or infectious, metabolic, exogenous drugs or toxins, structural lesions or psychiatric abnormalities. The primary outcome was presence of any structural brain lesion on head CT scan in patients with cirrhosis along with AMS with correlation of focal neurologic deficits, specifically in patients with HE.

Results: In total, 349 of 1,218 patients with cirrhosis who were admitted to the hospital had AMS; HE was the most common cause of AMS (164 of 349, 47%). A total of 64% (223 of 349) of patients with cirrhosis along with AMS underwent head CT scanning on admission, including 99 of 164 (60%) patients with HE. No patient with HE had focal neurologic findings, or a focal abnormality on head CT scan. Of the patients with focal abnormalities on CT scans, 100% had focal neurologic findings. Patients with cirrhosis along with AMS undergoing head CT scan had similar mortality (76 of 223, 34%) as those with AMS not undergoing head CT scans (47 of 126, 37%; $P =$ nonsignificant).

Conclusions: Nearly two-thirds of patients with cirrhosis along with AMS had head CT scans performed on admission; all patients with a structural lesion on head CT scan had abnormal neurologic examinations. The data suggest that routine brain imaging in patients with cirrhosis that do not have focal neurologic findings is likely not indicated.

Key Indexing Terms: Altered mental status; Cirrhosis; Computed tomography; Hepatic encephalopathy; Overutilization. [Am J Med Sci 2016;351(5):459–466.]

INTRODUCTION

Altered mental status (AMS) refers to the broad spectrum of disorders of mentation, including impaired cognition, diminished attention, reduced awareness or altered level of consciousness or all of these.^{1,2} These changes may be gradual or sudden in onset, fluctuating or sustained with an acute or chronic duration. The AMS has been reported to be present in 4–10% of patients admitted to emergency department (ED),^{3,4} with 1 in 8 patients undergoing head computed tomography (CT) scan,⁵ as mental status abnormalities are particularly common in older patients admitted to ED (up to 40%).²

In patients with cirrhosis admitted with a primary diagnosis of AMS, the cause is often believed to be from hepatic encephalopathy (HE), yet this is an overall challenge to physicians as AMS does not suggest a specific diagnosis, but rather a manifestation of a wide range of medical syndromes.⁶ Although the dogma that AMS and HE are synonymous in patients with cirrhosis is pervasive in clinical practice, the differential diagnosis of AMS in patients with cirrhosis is extensive. Further complicating the diagnostic dilemmas surrounding AMS

in patients with cirrhosis is that definitions of HE have varied widely. Although previous studies have provided valuable information regarding HE, most studies have examined precipitants of HE^{7–10} without evaluating the prevalence or clinical implications or both of the major clinical feature of HE, namely AMS. A consensus definition from the Working Party at the 11th World Congress of Gastroenterology in Vienna, suggested that HE is a “spectrum of neuropsychiatric abnormalities seen in patients with liver dysfunction after exclusion of other known brain disease.”¹¹ Although this definition does not take into account all the potential causes of AMS in patients with cirrhosis, altered mentation may be impaired because of common clinical events besides HE^{12–18}; however, the Working Party emphasized that focal findings on neurologic examination, infections, metabolic abnormalities, drug intoxication and intracranial hemorrhage (ICH) must be ruled out and should suggest alternate diagnoses, rather than HE.

We have recognized clinically that many patients with cirrhosis along with AMS undergo head CT scanning prior and during hospital admission,¹⁹ often in the absence of localizing neurologic physical examination

findings. We hypothesized that this occurs largely because of longstanding dogma in the care of these patients that endorses the aggressive use of head CT scanning, perhaps related to the concept that because patients with cirrhosis are often coagulopathic and thrombocytopenic. In theory, these patients may be at risk for intracerebral hemorrhages or subdural hematomas, even though the coagulopathy of cirrhosis does not appear to lead to increased bleeding,²⁰ even when prophylactic blood product transfusion strategies are not used during invasive procedures.²¹ We further postulated that outcomes in patients with cirrhosis admitted with AMS are unlikely to be influenced by the use of head CT scans, irrespective of the hemostatic profile of them. Therefore, we aimed to determine the etiology of AMS in such patients admitted to the hospital and to examine the clinical and cost utility of head CT scans in this cohort.

MATERIALS AND METHODS

We performed a retrospective cohort study of all patients admitted to Parkland Memorial Hospital with a clinical diagnosis of cirrhosis from January 1, 2003-December 31, 2006, (Figure 1). The study was approved by the institutional review board at the University of Texas Southwestern Medical Center and Parkland Health and Hospital System and met all criteria for good clinical research.²²

Patients were identified by an International Classification of Diseases, Ninth Revision Clinical Modification (ICD-9-CM) search for causes of cirrhosis, which

included the following: 571 (chronic liver disease [CLD] and cirrhosis), 571.2 (alcoholic cirrhosis), 571.3 (alcoholic liver damage unspecified), 571.5 (cirrhosis of liver without alcohol), 571.6 (biliary cirrhosis), 571.9 (unspecified chronic liver disease without alcohol), 572.3 (portal hypertension), 572.2 (HE), 573.3 (hepatitis unspecified), 456.0-456.2 (esophageal varices with and without bleeding), 789.5 (ascites), 789.59 (nonmalignant ascites), 567.23 (spontaneous bacterial peritonitis), 572.4 (hepatorenal syndrome) and 275.0 (disorders of iron metabolism). The electronic medical record (EMR) was manually reviewed by 1 author (R.R.), to confirm the diagnosis of cirrhosis, defined as consistent histology or imaging showing a cirrhotic-appearing liver with any associated signs of portal hypertension (ascites, encephalopathy, varices or splenomegaly with thrombocytopenia).²³

We abstracted over 200 unique variables for each patient at the time of presentation including demographic, clinical and historical data such as the presence of previous HE, medical comorbidities, ascites, gastrointestinal bleeding and bacteremia defined by a positive blood culture upon hospital admission, as well as laboratory data including bilirubin, albumin, prothrombin time and international normalized ratio, aspartate aminotransferase, alanine aminotransferase, blood urea nitrogen, serum electrolytes, urinalysis and radiologic data including chest x-ray, head or abdominal CT scans. Clinical and laboratory variables reported were recorded at the time of hospital admission.

Of the 2,586 patients with cirrhosis admitted during the study period, we analyzed each patient's last index admission if they presented between January 2003 and

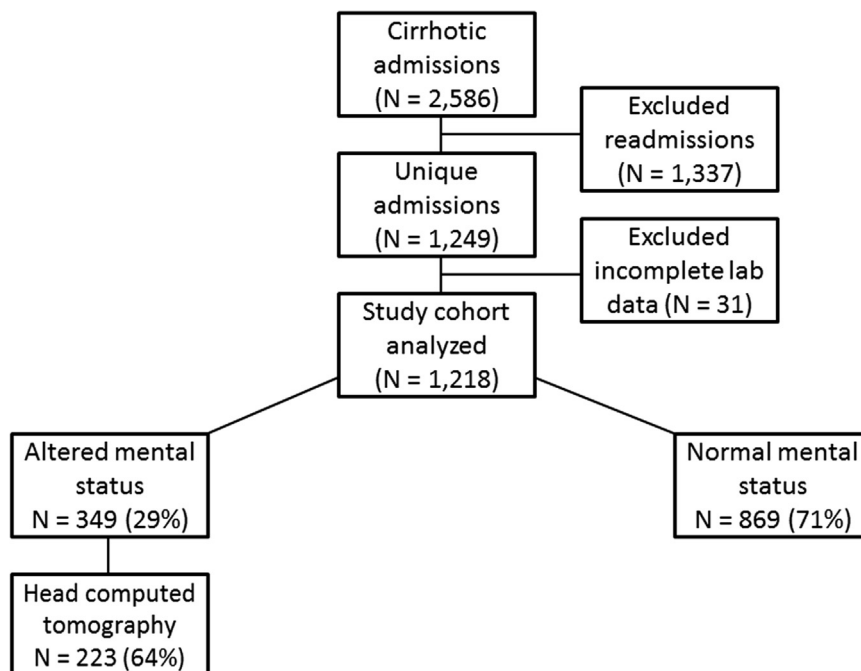


FIGURE 1. Patient flow diagram. The figure depicts the number of patients with cirrhosis admitted with altered mental status undergoing head computed tomography scan.

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