

## A “One-Two Punch” Leading to Hepatitis C Seroconversion

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**We report a case of acute hepatitis C virus infection that occurred after a traumatic altercation among prison inmates. This report has significant implications for infection control policies and procedures in prisons and jails, where the estimated prevalence of hepatitis C virus infection is ~20 times that of the general population.**

The prevalence of hepatitis C virus (HCV) infection in the United States is estimated to be 1.8% [1]. However, the estimated prevalence among incarcerated individuals in the United States prisons is much higher, ranging between 12% and 31% [2, 3, 4]. Although the most common route of HCV transmission is injection drug use, other risk factors include sex associated with trauma, receipt of blood transfusions before 1992, and occupational exposures among health care workers [4]. The common thread between these risk factors is exposure to blood. We report a case of acute HCV infection that followed a traumatic altercation among inmates in a correctional facility. This case report has significant implications for infection control policies and procedures in prisons and jails.

### CASE REPORT

A 46-year-old inmate (patient 1) was involved in a bloody altercation with 3 other inmates, 2 of whom were known to be

HCV seropositive. The altercation resulted in injuries to patient 1, including >1-inch lacerations on his nose and inside of his left ear and a 1-inch superficial laceration under his right eye. The inmate who is believed to be the source of the transmission had abrasions on his left hand. Patient 1 underwent HCV antibody testing  $\leq 7$  days of the altercation and was found to be HCV seronegative.

Approximately 11 weeks later, patient 1 complained of nausea, vomiting, right-side abdominal pain, dark urine, and light-colored stools. At the time of his symptoms, his serologic test results for hepatitis A (immunoglobulin G and immunoglobulin M antibodies) and hepatitis B (core total antibody, surface antigen, and surface antibody) were nonreactive. He underwent retesting for HCV infection and was found to be HCV seropositive, consistent with acute hepatitis C seroconversion. Abnormal laboratory findings included an alanine aminotransferase (ALT) level of 936 IU/mL, an aspartate aminotransferase level of 598 IU/mL, and a total bilirubin level of 5.3 mg/dL. His HCV RNA level was 204,000 IU/mL (as determined using the Hepatitis C Viral RNA Quant Real-Time PCR [Quest Diagnostics]), and his genotype was 3a (as determined using the Hepatitis C Viral RNA, Genotype, LiPA [Quest Diagnostics])—the same genotype as the inmate with documented abrasions. The genotype of the other HCV-seropositive inmate involved in the bloody altercation was unknown.

Patient 1 had been incarcerated for 16 years. He reported no other risk factors for HCV infection. He denied ever using injection drugs and stated that he had not had unprotected sex in the past 18 years. In fact, for several years, the patient had requested regular testing for human immunodeficiency virus (HIV) infection, hepatitis B, and hepatitis C at his annual physical examination because of fears about acquiring infections from other inmates.

Patient 1 underwent HCV RNA serial monitoring and had viral load fluctuations of >1 log and low-level viremia (ie, <100,000 IU/mL)—2 virologic features commonly noted in acute HCV infection [5]. Because of persistent viremia, which was monitored with sequential HCV RNA testing over 4 separate time points, patient 1 was counseled to start antiviral treatment. He subsequently achieved a sustained virologic response after combination therapy with pegylated interferon alfa-2b and ribavirin.

### DISCUSSION

Our patient had documented acute HCV seroconversion that occurred  $\leq 11$  weeks after exposure to blood during an

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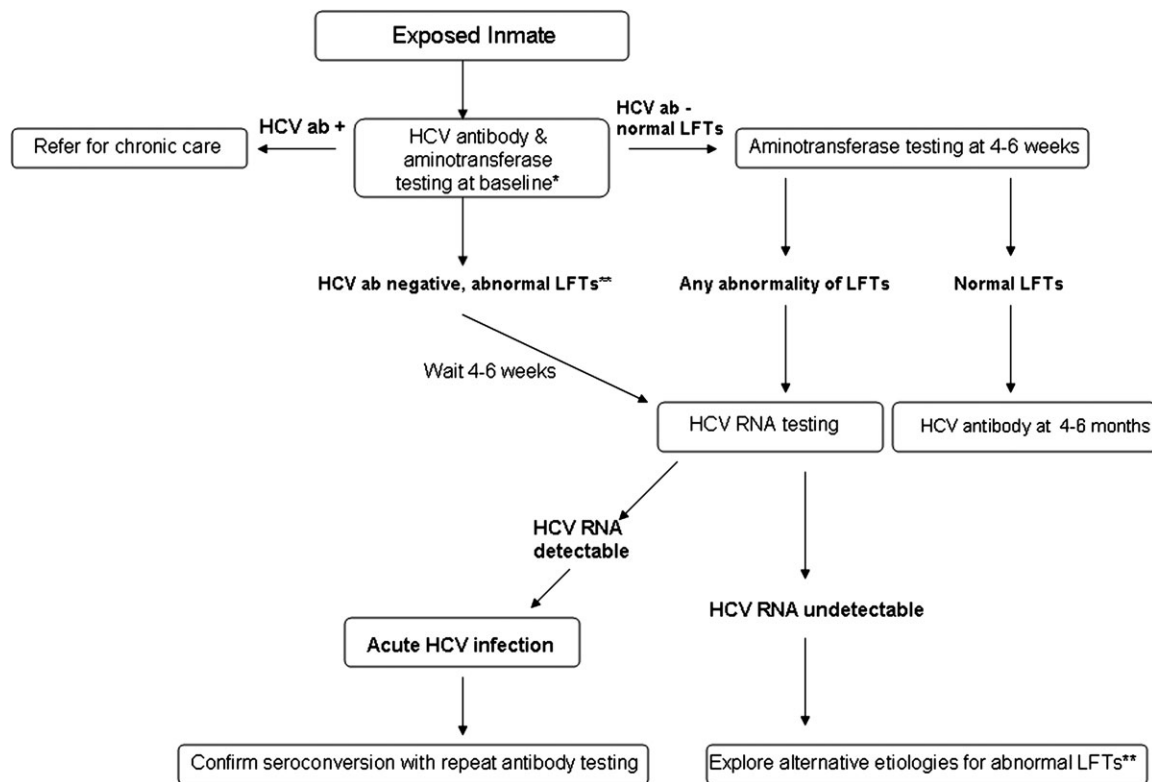
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**Figure 1.** The Prison-based Utilization of Novel, Cost-effective Hepatitis C Testing (PUNCHT) Algorithm. Ab, antibody; HCV, hepatitis C virus; LFT, liver function test. \*Hepatitis B surface antigen and surface antibody testing should also be performed. Patients who are surface antibody negative should be offered immunization for hepatitis B virus. \*\*Consider other etiologies for abnormal LFT results including, hepatitis B, alcoholic liver disease, steatohepatitis, and use of medications.

altercation with an inmate who was seropositive for the same HCV genotype. To our knowledge, there is only 1 other reported case of HCV transmission during an altercation. This case, reported in 2000, involved a 50-year-old man who acquired HCV infection after a bloody fight with his nephew, who had chronic HCV infection. This route of transmission was confirmed with viral sequencing, which demonstrated 97% homology between sequences from the source and the newly infected patient [6].

We were not able to obtain viral isolates for sequencing in our case; therefore, we cannot state with full certainty that our patient acquired HCV during this fight. However, the matching genotype of the suspected source and recipient, genotype 3a, is less common than other genotypes in the prison setting (prevalence, 20%) [7]. Furthermore, the timing of the clinical illness after this altercation is supportive of trauma with blood exposure as the transmitting event. Our patient denied any other risk factors for HCV acquisition and was HCV seronegative at baseline testing. Although unreported risk behaviors cannot be completely excluded, the timing of his seroconversion was consistent with acute HCV acquisition at the time of the bloody altercation.

This patient would have eventually been identified as having viral hepatitis because of his clinical symptoms; however, the

vast majority of patients with newly acquired HCV infection do not present with symptoms and may not be identified [8]. This novel case report describing HCV seroconversion following a bloody altercation in prison has significant clinical and public health implications for correctional facilities, where the prevalence of HCV infection is ~20 times that of the general US population [2]. Although the transmission risk following a needlestick exposure is estimated to be 2%–3%, the risk of HCV acquisition through a bloody altercation is unknown. The rates of transmission may depend on factors that include the nature of injuries and the plasma viral load of the donor inmate. Further research is necessary to better estimate the risk of HCV acquisition after bloody altercations.

Although the Centers for Disease Control and Prevention (CDC) has published guidelines for occupational exposures to hepatitis B virus and HCV, there are currently no formal recommendations for the evaluation of inmates with blood exposure after trauma, although altercations in the correctional system are a common occurrence [9]. Two sites in the Massachusetts state prison system reported a total of 533 altercations among inmates in 2008 alone [10]. The high frequency of trauma and the high seroprevalence of HCV infection in the prison setting necessitate the formation of guidelines for medical

evaluation of inmates with blood exposure who have unknown or prior negative HCV serostatus.

The CDC recommends repeating HCV antibody and ALT testing 4–6 months after an occupational exposure, with the added suggestion of HCV RNA testing at 4–6 weeks if an earlier diagnosis is desired [9]. We propose a simplified algorithm, Prison-based Utilization of Novel, Cost-effective Hepatitis C Testing (PUNCHT), for baseline testing and subsequent follow-up of inmates who are exposed to blood during fights. The algorithm takes into consideration the limited resources of the prison setting (Figure 1). On the basis of findings from our prior research, we strongly believe that patients with normal aminotransferase levels at baseline and at 6–12 weeks after exposure are at low risk of acquiring HCV infection and only require a single HCV antibody at 4–6 months of follow-up [5]. In searching our own database of 37 patients with acute HCV, 36 individuals had abnormal liver function test (LFT) results during the acute phase of infection [5]. A recent study of patients with acute HCV infection found that the sensitivity of ALT testing 3 months after HCV infection was 74% [11]. Although the cost-effectiveness of using 6-week aminotransferases as markers for acute HCV infection has not been formally investigated, HCV RNA assays are 100-fold more expensive than LFTs. Therefore, HCV RNA testing should be targeted to only a subset of patients, including those with normal aminotransferase levels at baseline who develop any subsequent abnormality and those who have abnormal LFT results at baseline. If HCV RNA is undetectable, alternative etiologies for abnormal LFT results should be explored (eg, hepatitis B infection, alcoholic liver disease, steatohepatitis, and use of medications). Further evaluation of the PUNCHT algorithm is necessary to better estimate the risk of HCV acquisition after blood exposure through trauma.

Although there are no documented cases of hepatitis B seroconversion after a bloody altercation, we also suggest additional testing for this viral infection in all inmates with blood exposure. Hepatitis B surface antigen and surface antibody testing is warranted, because patients who are surface antibody negative should be offered immunization as well [9]. HIV testing should also be considered, because transmission of this virus during a bloody altercation has also been described [12].

If acute HCV infection is identified, early antiviral therapy is associated with virologic clearance in the vast majority of patients with early infection, compared with chronic HCV infection, for which treatment response rates are much lower [7]. Our proposed management of inmates who are exposed to

blood after an altercation will allow for the early identification of HCV infection and for timely intervention among those persons at risk.

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