Early Therapy with Interferon for Acute Hepatitis C Acquired Through a Needlestick

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Because there is no effective neutralizing antibody or vaccine for preventing hepatitis C virus (HCV) transmission, HCV can be transmitted to health care workers through accidental needlesticks. Recently, two of our health care workers acquired HCV infection through needlestick accidents and developed acute hepatitis C. The route of transmission was confirmed by molecular evolutionary analysis with use of the E2 region of the HCV genome. After the clinical onset of acute hepatitis, the health care workers were treated with interferon (IFN) (total dose, ~300 megaunits). Neither individual developed chronic hepatitis. This finding raises the possibility that treatment with low-dose IFN following an accidental needlestick may be beneficial, even when it is started after the clinical onset of hepatitis.

Health care workers are at risk for occupational transmission of hepatitis C virus (HCV) through needlestick accidents [1, 2]. Unfortunately, neither neutralizing antibody nor a vaccine for preventing HCV transmission has been developed [3-5]. Two of our health care workers recently acquired acute hepatitis C through needlestick accidents. We discuss a treatment strategy with IFN that prevented both individuals from developing chronic hepatitis C.

Case Reports

Case 1. The patient was an 83-year-old woman with chronic HCV infection, and the health care worker was a 44-year-old female nurse (figure 1A). The nurse had had normal liver function and was seronegative for antibodies to hepatitis B virus (HBV) and HCV before the needlestick accident, but 1.5 months after the accident, she was found to have an elevated alanine aminotransferase (ALT) level. At 1.8 months, HCV RNA was detected in her serum, and at 2.2 months, antibodies to HCV were detected. Since her ALT levels fluctuated and her serum was persistently positive for HCV RNA, therapy with SC natural IFN-α-2a (OIFα, Otsuka Pharmaceutical Co., Ltd., Tokyo) was started at 3.8 months (dosage, 10 megaunits for 6 consecutive weeks, given daily for 2 weeks and then three times a week for 4 weeks; total dose, 260 megaunits). About 10 months after completing treatment, her ALT levels had normalized, and her serum was negative for HCV RNA.

Case 2. The patient was an 88-year-old man with chronic HCV infection, and the health care worker was a 27-year-old male surgeon who had had normal liver function and was seronegative for antibodies to HBV and HCV before the needlestick accident (figure 1B). At 1.5 months after the injury, he was found to have an elevated serum ALT level; at 1.6 months, HCV RNA was detected in his serum; and at 3 months, antibodies to HCV were detected. Since his ALT levels fluctuated and his serum was persistently positive for HCV RNA, treatment with iv natural IFN-β (Feron, Daiichi Pharmaceutical Co., Ltd., Tokyo) was started at 2.7 months (dosage, 6 megaunits for 8 consecutive weeks, given 6 days a week for 8 weeks; total dose, 288 megaunits). His ALT levels normalized, and his serum was found to be negative for HCV RNA 7.5 months after completion of therapy.

In both cases, eight HCV clones from both the patient and the health care worker formed a monophyletic cluster; these clones were genetically closely related (figure 2).

Methods

Antibody to HCV was assayed with use of ABBOTT HCV PHA 2nd Generation (DAINABOT Co., Ltd., Tokyo). HCV RNA was detected by using the Amplicor Monitor (Nippon Roche Co., Ltd., Tokyo) [6]. For the sequencing of the HCV E2 region, we performed nested PCR with use of the following primers: outer primers 5'-CAGYTRCTCCGGATCCCAAGC-3' (Y = mixture of C and T, R = mixture of A and G) and 5'-ACGTCCGTCTCATTYKCVCCCCA-3' (K = mixture of T and G, V = mixture of A and C) and inner primers...
5'-TATTCATGGGGAAGACTGG-3' and 5'-AGTCCCT-
GTGATRTGCCARCTGCG-3'. Eight HCV clones from each
HCV-infected patient and health care worker were sequenced
and analyzed as described by Suzuki et al. [7].

Discussion

We used molecular evolutionary analysis to prove that
these two health care workers acquired HCV through aca-
dental needlesticks. It is believed that the development of a
neutralizing antibody or a vaccine to prevent HCV infection
may be difficult [3, 4] and that prophylactic administration
of gamma globulin immediately after a needlestick injury is
of doubtful efficacy [5]. Nakano et al. [8] administered IFN
prophylactically at a dosage of 5 megaunits per day for 4
days immediately after an accidental needlestick [8], but this
prophylaxis did not prevent HCV infection from developing.
Thus, a method for preventing infection after exposure to
HCV has not been established. On the other hand, even small
doses of IFN are effective in treating acute posttransfusion
hepatitis C [9].

In the present study, IFN (~300 megaunits) was given to
the health care workers after the onset of acute hepatitis to
prevent them from developing chronic hepatitis. More than
6 months after completing the treatment, both individuals
had normal ALT levels, and both were seronegative for HCV
RNA. Because the findings in two cases are not enough to
confirm the efficacy of this treatment approach, further case-
controlled studies are needed. Our results support the hy-

Figure 2. Phylogenetic tree of the base sequences from recipients
in this study and previously reported cases. Case 1 donor: 1d-1 to
1d-8 and recipient: 1r-1 to 1r-8, respectively. Case 2 donor: 2d-1 to
2d-8 and recipient: 2r-1 to 2r-8, respectively. Accession numbers of
HCV nucleotide sequences in DNA Data Bank of Japan and geo­
graphic sources are as follows: HCV1, M62321 (USA); H90, M62382
(USA); H77, M62381 (USA); HCVH, M67463 (USA); HC-J1,
D00831 (Japan); HCVJK1, X61596 (Japan); HC-J4, D00832 (Japan); 
HCV-BK, M58355 (USA); HCV-JT, D11168 (Japan); HC-J6, D00944 (Japan);
HC-n, D10077 (Japan); HC-J8, D10988 (Japan).

Figure 1. Clinical course of two health care workers (A, a 44-year-
old female nurse; B, a 27-year-old male surgeon) with acute hepatitis
C caused by accidental needlesticks. In both cases, findings on exami-
nation of a needle biopsy specimen from the liver were consistent with
acute hepatitis. ALT = alanine aminotransferase; HCV = hepatitis C
virus; IFN = interferon.

References

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