Rationale for Preoperative Screening of Anti-HCV Antibody

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We investigated the incidence of the anti-HCV antibody and associated factors in 1,031 surgical patients who had received blood transfusion during or after operation from October 1988 to April 1991, at Kyushu University Hospital.

One hundred fifteen patients (11.2%) were anti-HCV positive. Sixty of the 219 patients (27.4%) with a history of transfusion were positive, as were 55 of 812 (6.8%) without it. Patients aged under 40 showed a 0.6% positive rate (1 of 175) as did 8.5% (54 of 637) of those 40 and over in the no transfusion history group. Among the 637 patients without transfusion histories and aged over 40, patients with preoperative maximum ALT value over 36 IU·l^{-1} had significantly higher positivity (16.0%, 29/181) than those with ALT values less than 35 IU·l^{-1} (5.5%, 25/456, $P < 0.01$).

The incidence of anti-HCV antibody in preoperative surgical patients in our hospital is ten times higher than that of donors. Anti-HCV are associated with transfusion, age, and liver dysfunction. Operating room personnel are at high risk because of contact with many HCV carrier patients. (Key words: anti-HCV antibody, HCV, needle-stick injury, blood-borne pathogen)

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Operating room personnel are at great risk because of blood contact as patient blood may contain several viral pathogens. Hepatitis B virus (HBV) and human immunodeficiency virus (HIV) are well known pathogens transmitted by needle-stick injury with non-A, non-B hepatitis (NANBH) also known to have transmissible pathogens[1–8]. Hepatitis B virus is currently thought to be comparatively safe because of the administration of high-titer anti-HBs globulin. Furthermore, inactivated and recombinant vaccines have been developed and the effectiveness of vaccinization has been confirmed[9–12]. Having no effective and preventable treatment for AIDS and NANBH after needle-stick injuries, prevention of blood contact is the only way to protect ourselves. Therefore, knowledge of the existence of pathogens before operation is necessary. The Chiron group has recently developed a method to detect antibodies against hepatitis C associated peptide, so called c100-3, in human serum[13,14]. In this study we investigated the incidence of anti-HCV in

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Table 1. The relationship of previous blood transfusion history to incidence of preoperative anti-HCV antibody

Previous transfusion history	Number tested	Number Anti-HCV positive	%	
positive	219	60	27.4	$P < 0.0001$*
negative	812	55	6.8	
Total	1031	115	11.2	

*Chi-square test

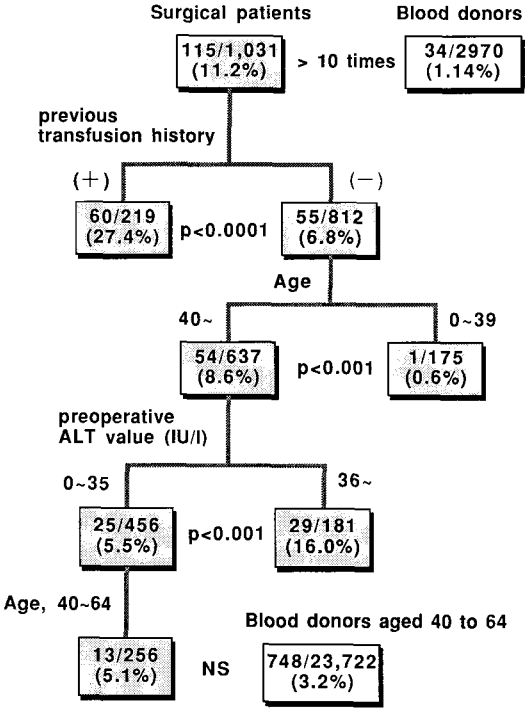

Fig. 1. Patient analysis for positivity of anti-HCV antibody.

preoperative surgical patients in our hospital and analyzed associated factors of the anti-HCV positive patients.

Patients and Methods

All 1,031 surgical patients (494 male and 537 female, mean age 51.7 ± 21.3 years) who had received blood transfusion during or after operation from October 1988 to April 1991 at Kyushu University Hospital were studied. Patients' sera for cross-match tests was stored frozen at −80°C. Anti-HCV antibody was measured using commercially available ELISA-kit ('HCV ab' ELISA, Ortho Diagnostics, Japan). Sera exceeding cut off value were re-examined by the same method and sera exceeding again were judged anti-HCV positive. Patients' profiles were studied for age, sex, previous blood transfusion history, patients diagnosis, HBs antigen and maximum serum alanine aminotransferase (ALT) level before operation. Association of these profiles with anti-HCV positivity were analyzed.

Statistical analyses were done by chi-square test.

Results

The results of patient analysis for anti-HCV antibody is shown in the flow chart (fig. 1). One hundred fifteen of 1,031 (11.2%) patients were anti-HCV positive before operation and 916 (88.8%) were negative. Nineteen patients were HBs antigen positive and, of them, 4 were both HBs and anti-HCV positive. Two hundred nineteen (21.2%) patients had a history of previous blood transfusion, and 60 (27.4%) of them were anti-HCV positive. On the other hand, 55 (6.8%) of 812 patients who had no previous blood transfusion history were antibody positive (table 1). The anti-

Table 2. Correlation between age and incidence of preoperative anti-HCV antibody in patients with no previous transfusion history

Age	Number tested	Anti-HCV positive		
		number	%	
0 ~ 9	55	0	0.0	
10 ~ 19	35	0	0.0	
20 ~ 29	39	0	0.0	
30 ~ 39	46	1	2.2	$P < 0.001$*
40 ~ 49	84	4	4.8	
50 ~ 59	168	20	11.9	
60 ~ 69	227	21	9.3	
70 ~	158	9	5.7	
Total	812	55	6.8	

*Chi-square test

Table 3. Correlation between preoperative maximum ALT levels and incidence of preoperative anti-HCV antibody in patients with no previous transfusion history aged over 40

preoperative maximum ALT (IU·l)	Male			Female			Total			
	Number		%	Number		%	Number		%	
	tested	Anti-HCV (+)		tested	Anti-HCV (+)		tested	Anti-HCV (+)		
0 ~ 35	212	15	7.1	244	10	4.1	456	25	5.5	$P < 0.001$*
36 ~	123	23	18.7	58	6	10.3	181	29	16.0	
Total	335	38	11.3	302	16	5.3	637	54	8.5	

*Chi-square test

HCV positive rate of the previously transfused patients group (BTx positive) was significantly higher than that of the non-transfused patients group (BTx negative) ($P < 0.01$).

Eight hundred twelve BTx negative patients were analyzed further. Age distribution of this group is shown in table 2. There were no anti-HCV positive patients in the under 39 age group except one 33 year-old man (0.6%, 1/175). He had a tattoo and a habit of amphetamine injection. His preoperative serum ALT level was 134 IU·l^{-1}.

Patients 40 and over had a significantly higher incidence rate of 8.5% (54 of 637) than those under 40 ($P <$ 0.001). Four point eight percent of the patients in their 40's were antibody positive (4/84), 11.9% in their 50's (20/168), 9.3% in their 60's (21/227), and 5.7% over 70 (9/158) (table 2).

Six hundred thirty-seven of the BTx negative patients over 40 were analyzed by sex and preoperative maximum ALT levels. These patients were divided into two classes at a 35 IU·l^{-1} of preoperative maximum ALT level. The high ALT value was significantly correlated with the high positive rate of anti-HCV antibody ($P < 0.001$, chi-square test, table 3). Of 181 patients who had abnormally high ALT value (> 35 IU·l^{-1}) preoperatively, 94 pa-

Table 4. Comparison of incidence between blood donors and patients without transfusion history aged 40 to 64 with ALT values below 35 IU·l^{-1}

		Anti-HCV positive		
	Number tested	number	%	
Patients	256	13	5.1	N.S.
Blood donors	23,722	748	3.1	

tients (51.9%) were diagnosed with liver or bile duct disease, and 17 patients (9.4%) with malignancies treated with anti-neoplastic drugs. The difference in anti-HCV positive rate between male and female patients was not significant (chi-square test, table 3).

Thirteen (5.1%) of 256 BTx negative patients aged 40 to 64 with ALT values below 35 IU·l^{-1} were anti-HCV positive. However, the incidence was not significantly higher than that of the blood donors from the same age group (3.2%, 748/23,722, the Fukuoka Red Cross Blood Center, November 1989 to March 1990) (table 4).

Discussion

This study revealed that the incidence of anti-HCV antibody in preoperative surgical patients in our hospital (11.2%) was ten times higher than that of volunteer blood donors in Japan (1.14%)[15]. Although patients in our study were restricted to those who had received blood transfusions perioperatively, we found no significant differences by sex, age, or surgical procedures when compared to our non-transfused patients group. Blood transfusion has been well documented as an infectious route of NANBH, and the discovery of HCV peptide has proven that the main cause of NANBH is hepatitis C virus[16]. According to a national multi-institute study, the incidence of NANBH associated with blood transfusion is estimated to be 15 to 20% in Japan[17]. The primary explanation of the high prevalence of anti-HCV in our patients' group is that 21.2% (219/1,031) had received blood transfusions in the 3 months before operation, and 27.4% (60/219) of them were anti-HCV positive. However, our patients without transfusion histories also had a high incidence (6.8%, 55/812) of anti-HCV antibody. According to a study by the Japanese Red Cross Blood Center, aged donors tended to have a high incidence of anti-HCV, with the incidence among blood donors aged over 40, 3.2% (748/23,722, the Fukuoka Red Cross Blood Center; November 1989 to March 1990). Furthermore, a post-transfusion research group has reported a very low incidence of anti-HCV (0%) in school children under age twelve[17]. Our patients also showed this tendency. There were no anti-HCV positive patients under 40 without a previous transfusion history except one (33y, male) who had two likely transmission routes, tattoo and drug abuse. Patients over 40 had a high incidence at 8.5% (54/537). According to the same study by the Japan Red Cross Blood Center[15], donors whose ALT values were over 26 Karmen Units (approximately 38 IU·l^{-1}) had significantly higher incidence (5.4%) than those with ALT values under 26 KU (1.2%). In our patients over 40 without blood transfusion histories, the frequency of elevated ALT of more than 35 IU·l^{-1} (28.4%) was much greater than that of

donors. The incidence of anti-HCV in the ALT elevated patients (16.0%) was also higher than in the ALT normal patients (5.5%) ($P < 0.001$).

Our study showed that surgical patients had a very high incidence of anti-HCV antibodies and also shows three reasons for this high prevalence; transfusion history, high age, and liver dysfunction. These three factors were common in surgical patients. In Japan, anti-HCV antibody screening of donor blood was implemented in November 1989. This will certainly decrease the transmission of HCV by blood transfusion[16,18]. However, surgery on high age patients increases every year because the improvement of medical technology allows successful operation on higher aged patients than was previously possible. Therefore, high HCV carrier rates in the operating room will continue for several years.

Operating room personnel are at high risk of infection by blood-borne pathogens through blood contact[5,7,19]. Hepatitis C is known to be transmitted by needle-stick injury[1,2]. The overall risk of contracting hepatitis B from a single needle-stick injury has been estimated to be 5%[5]. Based on transmission experiments with chimpanzees[20], hepatitis C virus seems to have a lower risk of infection than HB virus. Moreover, hepatitis C patients develop a high prevalence of liver cirrhosis and hepatocellular carcinoma (30–50%)[21]. Seventy to eighty percent of all NANB hepatitis patients detected using commercially available ELISA kits carry anti-HCV, although this kit is not completely effective in the screening of donor blood[22]. We recommend the measurement of anti-HCV in addition to other blood borne disease markers such as HBs, HIV, HTLV-I and Wasserman reaction before operation for the security of operating room personnel. Although ignorance of the risk of blood exposure in the operating room is unacceptable, if HCV transmission occurs, administration of interferon is effective[23–25]. Finally, we also recommend that not only the ALT value but also anti-HCV antibody be monitored periodically in possibly infected personnel.

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