

Peritoneal Dialysis Is the Better Therapy Choice for Successful Anti-hepatitis B Vaccination

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Patients treated with renal replacement therapy (RRT) are considered to be at higher risk for infection with hepatitis B virus (HBV). Immunoprophylaxis is therefore deemed a standard of care. Active immunization in RRT patients leads to a lower incidence of protective titers of HBV antibodies (HBABs) than the titers seen in healthy counterparts. Our hypothesis is that, for complex reasons, active immunization is more effective in patients on peritoneal dialysis (PD) than in patients on hemodialysis (HD), and that the effectiveness of immunization depends on dialysis adequacy (Kt/V).

We carried out a prospective multicenter study with an enrollment period that ran from January 1998 to December 2004. Follow-up data were analyzed as of August 2004. Inclusion criteria were an age of 18 years or older and newly indicated RRT. Exclusion criteria were a history of HBV or the presence of either HBV antigen (HBAG) or HBABs in the protective range. The choice of RRT modality (HD or PD) was based on patient preference (preceded by thorough counseling). Active immunization followed accepted guidelines for RRT patients and began after clinical and laboratory steady state had been achieved. The endpoints were the number of patients with a protective HBAB titer and the number with newly diagnosed hepatitis B. In PD patients, we calculated Kt/V on regular basis.

We enrolled 211 patients, 171 of whom chose HD treatment, and 40 of whom chose PD. Positive response to immunization (defined as a serum level of HBABs above 10 mIU/mL) was achieved in 58 HD patients (34%) and 21 PD patients (53%, $p = 0.03$). In subgroup of PD patients with a weekly Kt/V greater than 1.7 ($n = 28$), the response rate rose to 71%—as compared with just 8% in patients with a weekly Kt/V

below 1.7 ($p = 0.0003$). In the PD cohort as a whole, the level of HBABs correlated with Kt/V. No new cases of hepatitis B or HBAG positivity occurred in either group.

From the viewpoint of successful HBV immunoprophylaxis in RRT patients, PD is the better modality choice. In PD patients, the success rate of immunoprophylaxis depends on weekly Kt/V, which we propose should be 1.7 or higher.

Key words

Active immunization, hepatitis B infection, hemodialysis

Introduction

Hemodialysis (HD) is an established risk factor for infection with the hepatitis B virus (HBV). In the neighboring Czech Republic, prevalence of HBV antigen (HBAG) positivity was 16% in 1991 and about 6% in 1999 (1). In our hemodialysis unit (the largest in the country), it was 17% (13 of 75 patients) in 1999, and 6% (6 of 102 patients) in 2002.

Among measures to curtail the risk of HBV infection in patients with end-stage renal disease (ESRD), active immunization (AI) plays a central role (2). However, the success rate and duration of protection from immunization are diminished, and a considerable proportion of patients face renal replacement therapy (RRT) unprotected for other reasons, too: In one survey, only about half of patients had completed AI (3). Prolonging or enhancing an already-enhanced schedule ($4 \times 40 \mu\text{g}$ recombinant vaccine administered intramuscularly) may lead to hyposensitization response because of activation of suppressor T cells. Other attempts—such as intradermal rather than intramuscular application of vaccine, or addition of interleukin 2 or interferons, among others—have brought conflicting results (4,5).

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Patients on peritoneal dialysis (PD) have a lower risk of HBV infection (6). Hence, a preference for PD might prolong a HBV-safe period of RRT and permit completion of AI. Moreover, differences in the immune and nutrition status of PD patients as compared with HD patients might modulate the success rate of AI. We based the present study on such assumptions.

Patients and methods

We retrospectively analyzed data from two sources: a single-center prospective study started in 1999 ("Prevention of hepatitis B in patients entering renal replacement therapy without protective antibodies"), and the Logman database. Inclusion criteria were an age of 18 years or more; ESRD requiring RRT; and entering RRT without a protective titer of HBV antibodies (HBAbs). Exclusion criteria were a history of HBV infection or HBsAg positivity, a history of or a current malignancy, or current immunosuppressive therapy. After counseling and choice of starting RRT modality by the patient, AI was commenced as soon as possible. Positive response to AI was defined as a HBAbs level of 10 mIU/mL or more. We tested the hypothesis that AI is more effective in PD patients than in HD patients, and that, in PD patients, response depends on Kt/V.

Results

We enrolled 211 patients (92 women, 119 men; age range: 18–83 years) in the study. Of the 211, 40 were on PD (Table I).

We recorded positive responses to AI in 21 PD patients and in 58 HD patients (53% vs. 34%, $p = 0.03$). Among 28 PD patients with a weekly Kt/V of

1.7 or more, 71% responded positively as compared with 8% among 12 patients with lower values of weekly Kt/V ($p = 0.0003$). We saw no new cases of HBsAg positivity or of hepatitis B among these 211 patients.

Discussion

The results show that AI is more successful in PD patients than in HD patients, and that, in PD patients, the response correlates with Kt/V.

Our study was conceived in 1998 based on a three-fold impetus: the prevalence of HBV infection in HD patients attending our center was approaching 20%; the proportion of patients entering RRT unprotected was disturbingly high (25%–35%); and the HBV infection incidence did not seem to be copying the declining trend seen in the Western world. [The incidence does not seem to be doing so even now—and even after adjustment for covert HBV infection in U.S. HD centers (3).]

Uneven distribution of patients between RRT modalities has been caused by the cultural, social, and clinical limitations inherent in PD. Just as in PD patients, Kt/V in HD patients is a possible determinant of AI success; however, we were unable to measure Kt/V routinely in HD. We were also not able to control for other suspected or established variables that influence AI outcome; however, we presume that the distribution of those variables between the cohorts would dilute a one-sided cumulative effect. The influence of age is considered to be small.

Conclusions

We propose that, in countries with a high prevalence of HBV infection in HD units and with the ability to perform PD, PD should be preferred as the initial RRT.

Acknowledgment

Logman A.S. is the owner of the dialysis centers in which the present study was carried out.

References

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TABLE I Characteristics of the study group

	PD (n = 40)	HD (n = 171)	p Value
Median age (years)	55	62	0.01
Women (%)	45	43	NS
BMI (kg/m ²)	25.5	25	NS
Cause of ESRD (%)			
GN	23	14	NS
TIN	20	33	NS
DM	48	32	NS
Others	9	21	NS

PD = peritoneal dialysis; HD = hemodialysis; NS = nonsignificant; BMI = body mass index; ESRD = end-stage renal disease; GN = glomerulonephritis; TIN = tubulointerstitial nephritis; DM = diabetes mellitus.

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