Hemodialysis of Patients with HCV Infection: Isolation Has a Definite Role

S.K. Agarwal

Department of Nephrology, All India Institute of Medical Sciences, New Delhi, India

Key Words

HCV • Hepatitis • Infection control • Hemodialysis • Isolation

Abstract

HCV infection in patients on hemodialysis varies from 10 to 60% in various centers. There is controversy regarding the isolation of patients with HCV infection during hemodialysis. Guidelines developed by the Centers for Disease Control and Prevention do not suggest isolation of these patients. In this opposite view, evidence is being given to support the view that there is a definite role of isolation of HCV-infected patients during hemodialysis.

Copyright © 2010 S. Karger AG, Basel

Introduction

Patients with end-stage renal disease (ESRD) on maintenance hemodialysis (MHD) are at increased risk for acquiring HCV infection. Prevalence of HCV infection varies greatly, from < 5% to nearly 60% according to different areas of the world [1]. The prevalence is consistently associated with MHD duration and the number of transfusions. With the introduction of routine HCV screening and with increased attention to prevent spread,

HCV prevalence has declined in many dialysis centers. However, it still remains unacceptably high, ranging from 8 to 10% even in the most industrialized countries [2]. Thus, there is still scope of reduction of HCV in MHD.

HCV Spread during MHD

HCV seroconversion had been noted in patients who were never transfused. Further, clinical experience in a dialysis unit [1], outbreaks of HCV infection in a unit [3] and phylogenetic analysis of HCV isolates [4, 5] all suggest that the nosocomial route of transmission plays the key role in HCV transmission. Occasionally, a ruptured dialyzer has been put forward as a potential risk for HCV transmission [6]. Other investigators suggested the use of a lower transmembrane pressure in patients with HCV infection [7]. Sartor et al. [8] provided evidence for HCV transmission between 2 patients sharing the same machine and suggested possible transmission via accidental contamination of the venous pressure monitoring system. Presence of HCV-RNA had been demonstrated on the hands of dialysis personnel. All these lines of evidence indicate different modes of nosocomial HCV transmission in a hemodialysis unit.

Table 1. Brief details of studies showing benefit of isolation of HCV patients in a hemodialysis unit

Year	Authors	Main findings
2002	Harmankaya et al. [12]	168 Turk patients; HCV incidence 4.7% from 1992 to 2000
2003	Barril and Traver [15]	multicentric study in Spain
2003	Yang et al. [14]	325 Taiwanese patients; mean follow-up: 4.8 years HCV incidence decreased from 9.1 to 2.9%
2003	Saxena et al. [13]	189 Middle East patients; follow-up: 73 months HCV incidence decreased from 6.8 to 15%
2006	Shebeeb et al. [17]	3 Egyptian dialysis units with two approaches: with isolation, HCV seroconversion decreased from 10 to 0% without isolation, incidence increased from 10.5 to 16.7%
2006	Gallego et al. [16]	Spanish study; isolation decreased HCV incidence from 21.6% in 1995 to 6.8% in 2003
2008	Alavian et al. [18]	Iranian study, HCV prevalence decreased from 14.4% in 1999 to 4.5% in 2006
2009	Ross et al. [19]	German multicentric study; no new HCV infection in 1 year
2009	Agarwal et al. [21]	Indian study; isolation decreased HCV incidence from 42 to 4% from 1998 to 2006
2010	Mohamed [20]	Middle East; no HCV seroconversion in 36 patients followed for 5 years

Practices and Policies for the Prevention of HCV in Hemodialysis Patients

Clinical practice guidelines are systematically developed statements that aim to help physicians reach the best health care decisions. For infection control practices, guidelines developed by the US Centers for Disease Control and Prevention (CDC) are well accepted and respected. From the beginning of 1990, limited data from US studies on anti-HCV testing reported annual rates of 0.73–3% among MHD. During 1992–1999, national surveillance data indicated that the proportion of centers that tested patients for anti-HCV increased from 22 to 56%. In 1999, nationwide prevalence of anti-HCV was 8.9%, with some centers reporting prevalence rates >40% [CDC, unpubl. data; 2001]. While recommending guidelines for the prevention of infections in hemodialysis settings, CDC for the first time suggested that ‘patients who are anti-HCV positive (or HCV-RNA positive) do not have to be isolated from other patients or dialyzed separately on dedicated machines. Furthermore, they can participate in dialyzer reuse programs. Unlike HBV, HCV is not transmitted efficiently through occupational exposures’ [9]. These recommendations were based on the premise that the infection control practices recommended for hemodialysis units will reduce opportunities

for patient-to-patient transmission of infectious agents, directly or indirectly via contaminated devices, equipment and supplies, environmental surfaces or the hands of personnel. One of the important issue in ‘not isolating’ these patients is that universal precautions (UP) are strictly followed. UP implementation involves additional costs, knowledge about UP and commitment to adhere onto it. All the three factors with variable degree may be responsible for not having strict UP in place in many dialysis units, probably more so in developing countries. A study done in our hospital to understand the degree of knowledge about UP showed that though 100% nurses know them, only 70% follow them in day-to-day practice [10]. Being a public sector hospital and dialysis not being supported by the government, costs may be an important issue in our setting.

Evidence that Isolation Decreases HCV Seroconversion

In the last decade, there are many studies available in the literature showing that isolation of HCV-positive patients decreases HCV seroconversion [11–20]. Brief findings of these studies are shown in table 1. An ideal study to critically analyze the issue of isolation will consist of a

Table 2. Comparison of different guidelines on HCV during maintenance hemodialysis

Year	Association/ bodies	Guideline	Grade of evidence	Recommendation for isolation
2001	CDC	HCV-positive patients do not have to be isolated from other patients or dialyzed separately on dedicated machines	not given	not recommended
2002	European Best Practice Guidelines	in addition to universal precautions, which are the most efficacious preventive measures, treatment of anti-HCV patients in separate areas with dedicated staff is recommended in units with a high prevalence of HCV infection	C	recommended in units with high HCV prevalence
2008	KDIGO	isolation of HCV-infected patients is not recommended as an alternative to strict infection control procedures	weak	in case of continued nosocomial transmission, a local isolation policy may be deemed necessary
2009	Renal Association UK	patients with HCV do not need to be dialyzed in a segregated area but more experienced staff should be allocated to dialyze these patients	1C	not recommended

randomized trial of isolation versus no isolation in a unit having two sets of dialysis areas having the same staff. Logistically being difficult, no such study has been published so far. Most of the studies have compared their own historical control. Our own study had shown that in a same unit with same staff, we could decrease HCV seroconversion from 42% in 1995–1998 (without isolation) to 4% in 2003–2006 (with isolation) [21]. As the staff and unit were the same and as no additional training for isolation practices was implemented between 1998 and 2003, we concluded that the decrease in HCV seroconversion was primarily due to isolation practices.

In the latest guidelines published in 2008 by KDIGO (Kidney Disease: Improving Global Outcomes) [22], the following points need to be given importance:

- (1) Strength of recommendation that 'Isolation of HCV-infected patients is not recommended as an alternative to strict infection control procedures for preventing transmission of blood-borne pathogens' is a 'weak' one.
- (2) 'If nosocomial transmission continues to occur, despite reinforcement and audit of the precautions required, a local isolation policy may be deemed necessary. HCV-infected patients should be treated by dedicated staff in a separate room, area, or shift (morning, afternoon, or evening), as there is no rationale for using dedicated machines.'

In table 2, a comparison of different association guidelines in relation to isolation practices is given.

Fig. 1. Approach to HCV infection. ULN = Upper limit of normal; Lab. = laboratory.

Isolate the Machine or Isolate the Patient

Once the isolation in HCV is agreed upon, then the next issue is whether to dialyze the patient on a dedicated machine or isolate the patient. Dedicating the machine without isolation in my mind is not going to be useful. Firstly, it is mostly not the machine which is directly responsible for transmission of the virus. Secondly, remaining in same area but dedicating the staff and machine is

practically difficult and not a dependable solution. Yang et al. [14] did an interesting study where they had three sets of patients: one set without isolation, a second set with a dedicated area and a dedicated machine in the same room and a third set of patients isolated in a separate room. Of the 325 patients followed up for the next 4 months, new HCV seroconversion was noted in 7 patients in set 1, 2 patients in set 2 and nil patients in set 3, showing that isolation in a different room was better than dedicated machines.

When to Isolate?

Third-generation anti-HCV ELISA test kits screening for HCV every 6 months are recommended by CDC. However, if there is a new seroconversion, the frequency should be increased to monthly. Along with anti-HCV, liver enzymes should also be done. There are two issues in this scenario. Firstly, anti-HCV gives false-negative tests in 10–15% cases and, secondly, liver enzymes in patients on MHD do not reflect true disease activity. In fact, in one study, normal liver enzymes during MHD are reported to be 50% of the upper limit of normal [23]. We do anti-HCV and liver enzyme testing before accepting a patient in our unit and then repeat the tests on a monthly basis. The anti-HCV, liver enzyme and HCV-RNA data are managed and interpreted as in figure 1. We could reduce HCV incidence in our unit to almost 1–2% only.

Whether or Not to Reuse Dialyzers

CDC guidelines recommended reuse of dialyzer but the current KDIGO guidelines suggest that ‘dialyzer reuse should be avoided and if this is not avoidable, then strict precautions should be taken’. As such, large numbers of centers are employing single use of dialyzer and for them it may not matter. However, in developing countries where dialyzers are reused for economic reasons, it may also be difficult to have a separate area for reuse of HCV-infected dialyzers.

Conclusion

I am not of the opinion that we should forget UP: not at all. UP will be useful for many other currently unknown blood-borne infections in the hemodialysis setting. What I am proposing is that by following UP, if a unit is not able to contain HCV infection, then they must adopt isolation of HCV-positive patients in a separate room.

Disclosure Statement

None.

References

- Pol S, Vallet-Pichard A, Fontaine H, Lebray P: HCV infection and hemodialysis. *Semin Nephrol* 2002;22:331–339.
- Meyers CM, Seeff LB, Stehman-Breen CO, Hoofnagle JH: Hepatitis C and renal disease: an update. *Am J Kidney Dis* 2003;42:631–657.
- Castell J, Gutiérrez G: Outbreak of 18 cases of hepatitis C in a hemodialysis unit (in Spanish). *Gac Sanit* 2005;19:214–220.
- Spada E, Abbate I, Sicurezza E, Mariano A, Parla V, Rinnone S, Cuccia M, Capobianchi MR, Mele A: Molecular epidemiology of a hepatitis C virus outbreak in a hemodialysis unit in Italy. *J Med Virol* 2008;80:261–267.
- Carneiro MA, Teles SA, Lampe E, Espírito-Santo MP, Gouveia-Oliveira R, Reis NR, Yoshida CF, Martins RM: Molecular and epidemiological study on nosocomial transmission of HCV in hemodialysis patients in Brazil. *J Med Virol* 2007;79:1325–1333.
- Valtuille R, Fernández JL, Berridi J, Moretto H, del Pino N, Rendo P, Lef L: Evidence of hepatitis C virus passage across dialysis membrane. *Nephron* 1998;80:194–196.
- Noiri E, Nakao A, Oya A, Fujita T, Kimura S: Hepatitis C virus in blood and dialysate in hemodialysis. *Am J Kidney Dis* 2001;37:38–42.
- Sartor C, Brunet P, Simon S, Tamalet C, Berland Y, Drancourt M: Transmission of hepatitis C virus between hemodialysis patients sharing the same machine. *Infect Control Hosp Epidemiol* 2004;25:609–611.
- Recommendation for Preventing Transmission of Infection among Chronic Hemodialysis Patients. *MMWR Recommendations and Reports*. Alberta, Centers for Disease Control and Prevention, 2001, vol 50.
- Agarwal SK, Mohan MP, Varghese M: Assessment of awareness regarding universal precaution among the nursing staff of AIIMS in 1997. *J Assoc Physicians India* 1998;46:1061.
- Lombardi M, Cerrai T, Geatti S, Negroni S, Pertusini L, Pegoraro M, Di Lullo G: Results of a national epidemiological investigation on HCV infection among dialysis patients. (Survey by the Italian Branch of EDTNA/ERCA). *J Nephrol* 1999;12:322–327.
- Harmanakaya O, Cetin B, Obek A, Seber E: Low prevalence of hepatitis C virus infection in hemodialysis units: effect of isolation? *Ren Fail* 2002;24:639–644.
- Saxena AK, Panhotra BR, Sundaram DS, Naguib M, Venkateshappa CK, Uzzaman W, Mulhim KA: Impact of dedicated space, dialysis equipment, and nursing staff on the transmission of hepatitis C virus in a hemodialysis unit of the Middle East. *Am J Infect Control* 2003;31:26–33.

- 14 Yang CS, Chang HH, Chou CC, Peng SJ: Isolation effectively prevents the transmission of hepatitis C virus in the hemodialysis unit. *J Formos Med Assoc* 2003;102:79–85.
- 15 Barril G, Traver JA: Decrease in the hepatitis C virus (HCV) prevalence in hemodialysis patients in Spain: effect of time, initiating HCV prevalence studies and adoption of isolation measures. *Antiviral Res* 2003;60:129–134.
- 16 Gallego E, López A, Pérez J, Llamas F, Lorenzo I, López E, Illescas ML, Andrés E, Olivas E, Gómez-Roldan C: Effect of isolation measures on the incidence and prevalence of hepatitis C virus infection in hemodialysis. *Nephron Clin Pract* 2006;104:c1–c6.
- 17 Shebeb AM, Kotkat AM, Abd El Reheim SM, Farghaly AG, Fetohy EM: An intervention study for prevention of HCV infection in some hemodialysis units in Alexandria. *J Egypt Public Health Assoc* 2006;81:119–141.
- 18 Alavian SM, Bagheri-Lankarani K, Mahdavi-Mazdeh M, Nourozi S: Hepatitis B and C in dialysis units in Iran: changing the epidemiology. *Hemodial Int* 2008;12:378–382.
- 19 Ross RS, Viazov S, Clauberg R, Wolters B, Fengler I, Eveld K, Scheidhauer R, Hüsing J, Philipp T, Kribben A, Roggendorf M: Lack of de novo hepatitis C virus infections and absence of nosocomial transmissions of GB virus C in a large cohort of German haemodialysis patients. *J Viral Hepat* 2009;16:230–238.
- 20 Mohamed WZ: Prevention of hepatitis C virus in hemodialysis patients: five years experience from a single center. *Saudi J Kidney Dis Transpl* 2010;21:548–554.
- 21 Agarwal SK, Dash SC, Gupta S, Pandey RM: Hepatitis C virus infection in haemodialysis: the 'no-isolation' policy should not be generalized. *Nephron Clin Pract* 2009;111:c133–c140.
- 22 Preventing HCV transmission in hemodialysis units. *Kidney Int* 2008;73(suppl 109):S46–S52.
- 23 Lopes EP, Gouveia EC, Albuquerque AC, Sette LH, Mello LA, Moreira RC, Coelho MR: Determination of the cut-off value of serum alanine aminotransferase in patients undergoing hemodialysis, to identify biochemical activity in patients with hepatitis C viremia. *J Clin Virol* 2006;35:298–302.