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Case Report

A case of hepatitis C virus transmission acquired through sharing a haemodialysis machine

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Abstract

Hepatitis C virus (HCV) infection is a significant problem among haemodialysis populations worldwide. 'Horizontal' cross-infection between patients can occur, predominately through direct environmental transmission of the virus. Current guidelines thus recommend universal barrier precautions, however they do not suggest using dedicated machines for HCV-positive patients to prevent the 'sequential' transmission of virus to those who subsequently use that machine. We report a case where sequential HCV transmission occurred from a patient of low HCV infectivity with no identifiable machine fault. We suggest that current guidelines should be reviewed to encourage the use of dedicated haemodialysis machines for HCV-positive patients.

Keywords: haemodialysis; hepatitis; infection

Background

Hepatitis C virus (HCV) infection is a common finding among haemodialysis populations worldwide. Acute HCV infection significantly increases the risk of chronic HCV infection with a significant impact on the likelihood of progressive hepatic damage, hepatic failure and death [1]. Haemodialysis populations are at a heightened risk of acquiring and expressing HCV infection [2], and cross-infection between patients who undergo haemodialysis concurrently within centres has been well documented [3,4]. Several guideline bodies have advocated the use of standard infection control precautions to prevent nosocomial spread [5,6], and these practices have been shown to significantly reduce the risk of cross-infection between haemodialysis patients [7]. Transmission of HCV to sequential patients using the same haemodialysis machine, however, has not been widely reported, and thus, guideline groups do not advocate the use of dedicated haemodialysis machines for HCV-positive patients.

We report a case where viral gene sequencing and phylogenetic analysis strongly suggest HCV transmission from a patient of low infectivity to a patient who shared the same haemodialysis machine. In this situation, no fault with the dialysis machine in question was recognized either at the time or subsequently. This case brings into question the current guideline recommendations.

Case report

A 51-year-old woman with established renal failure due to diabetic nephropathy had been receiving regular haemodialysis three times per week at her regular outpatient haemodialysis unit for 7 years. A policy of routine three-monthly blood sampling for the presence of hepatitis B surface antigen and hepatitis C antibodies was in place, and this patient demonstrated consistently negative results throughout their time on renal replacement therapy.

In early September 2009, an HCV antibody titre for the patient was reported as 'equivocal'. Repeat testing 9 days later demonstrated an HCV antibody titre of 10.23 IU with a corresponding HCV polymerase chain reaction (PCR) titre of 8195 IU/mL (3.9 log copies). Retrospective analysis of the preceding sample taken in June 2009 confirmed HCV PCR positivity and thus suggested acute infection. Serum alanine transaminase titres were noted to be consistently <30 IU/mL, while hepatitis A, hepatitis B, HIV and autoantibody screening were negative.

The patient had no history of other risk factors for HCV transmission. She had never injected drugs nor undergone tattooing and had not received blood products during the 12 months prior to the first positive HCV PCR result. All patients who attended the same outpatient haemodialysis facility during the time of the possible transmission were HCV antibody negative. The index patient had however been admitted to a renal inpatient unit for a period of 10 days in late March/early April 2009 during treatment

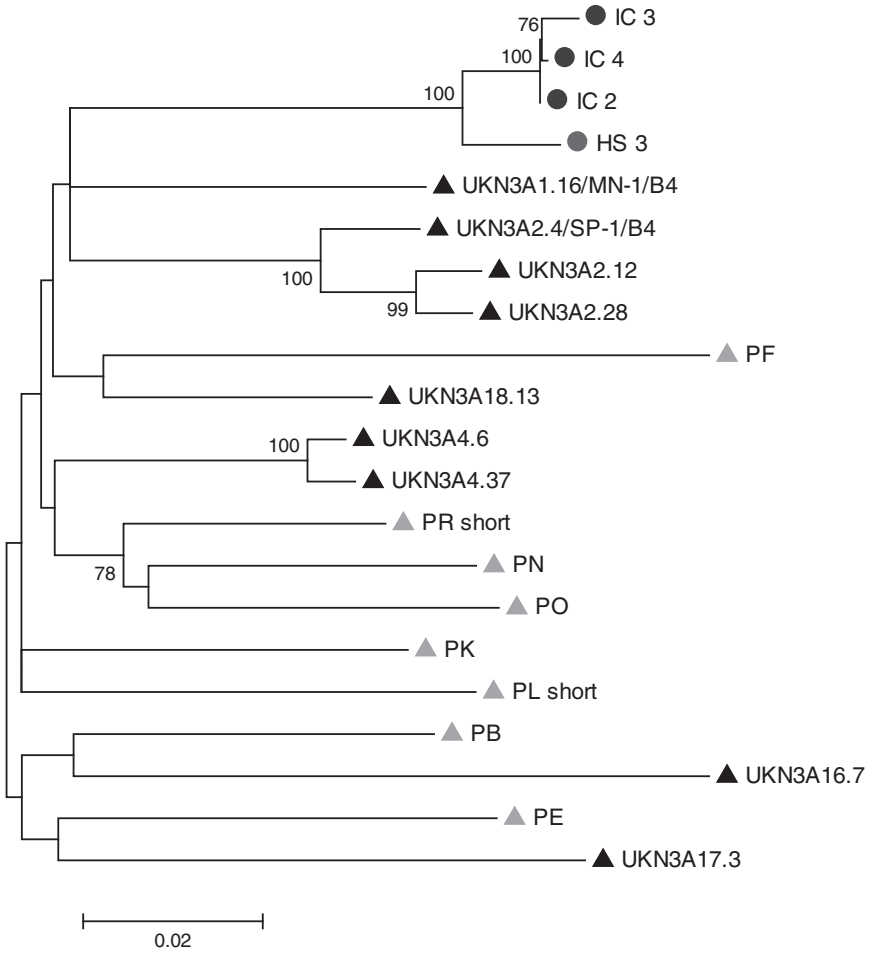

Fig. 1. Bootstrapped replicate trees for the hepatitis C nucleic acid sequencing demonstrated for the suspected source (prefix "IC"), suspected recipient (prefix "HS"), and additional samples from nine Nottingham (prefix "UKN") and eight Glasgow (prefix "P") HCV 3A genotype controls. This shows a clustering of the source and recipient viruses being supported by 100% of the bootstrapped replicate trees.

for an infected diabetic foot ulcer. At this time, she received four separate haemodialysis sessions at the hospital's inpatient dialysis facility. On one occasion, the patient underwent haemodialysis using a machine immediately following a known HCV-positive patient. Subsequent viral genotyping demonstrated HCV 3A genotype in both patients. Consensus full-length E1E2 sequencing/phylogenetic analysis on samples from the recipient and suspected source, together with nine Nottingham and eight Glasgow epidemiologically unrelated genotype 3A control samples, were conducted. Bootstrapped replicate trees for hepatitis C nucleic acid and amino acid sequencing (Figures 1 and 2) were generated for the suspected source, recipient, and the nine Nottingham and eight Glasgow HCV genotype 3A controls. This demonstrated a clustering of the source and recipient viruses. These findings indicate infection with the same strain of virus.

The index case was known to be of low infectivity and dialysed at a different time from the affected patient. Neither had ever undergone haemodialysis in the same facility at the same time. On the date of transmission, there was a time period of over 1 h between the index case leaving the unit and the recipient arriving with both patients supervised by different members of nursing staff. Standard infection control policies were adhered to and were observed to be complied with. The haemodialysis machine in question had undergone a standard single cycle of chemical decontamination between patients and functioned without evidence of a fault. Despite these practices, transmission of HCV via the haemodialysis circuit is the most plausible explanation of this event.

Discussion

HCV infection in haemodialysis units can be relatively common. Prevalence varies with geography and remains relatively high despite a decrease being demonstrated in European countries following the introduction of routine blood product screening in the early 1990s [2]. Prevalence estimates in the Dialysis Outcomes and Practice Patterns Study (DOPPS) averaged 13.5%, although they varied from 2.6% to 22.9% between participating countries [8]. Similar variation in prevalence has recently been reported in Asia-Pacific countries [9].

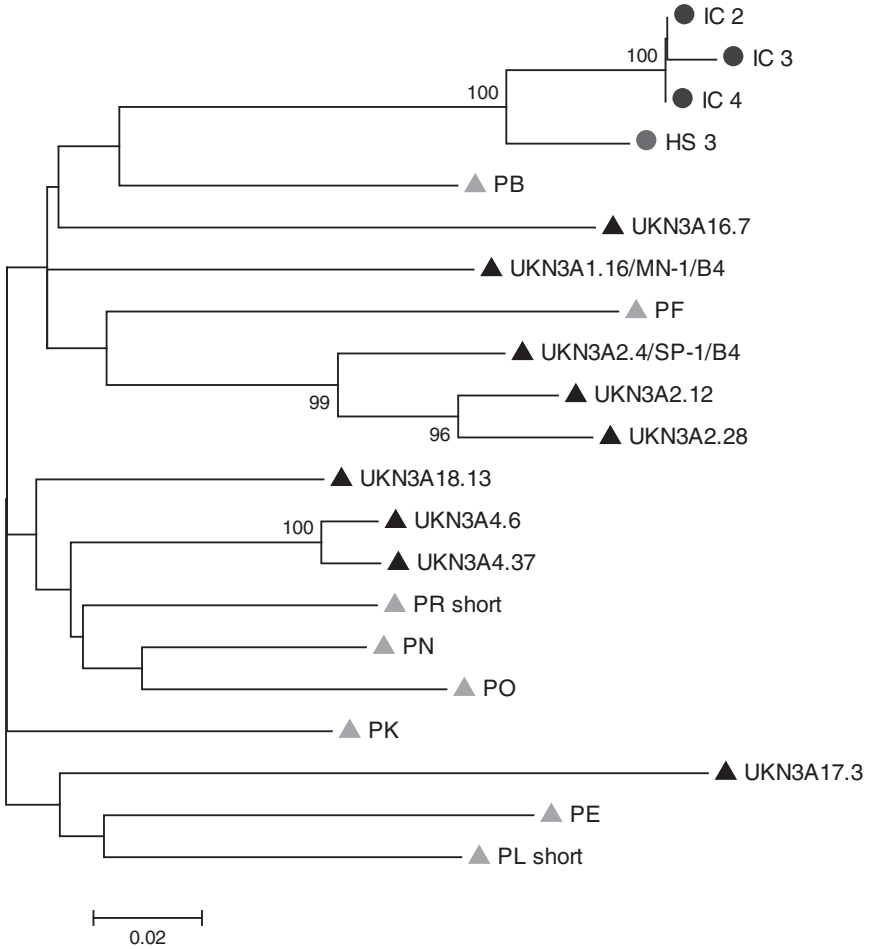

Fig. 2. Bootstrapped replicate trees for the hepatitis C amino acid sequencing demonstrated for the suspected source (prefix "IC"), suspected recipient (prefix "HS"), and additional samples from nine Nottingham (prefix "UKN") and eight Glasgow (prefix "P") HCV 3A genotype controls. This shows a clustering of the source and recipient viruses being supported by 100% of bootstrapped replicate trees.

'Horizontal' cross-infection between haemodialysis patients can occur, predominately through direct environmental transmission of the virus. This is evidenced through the finding of higher rates of seroconversion in haemodialysis patients compared with peritoneal dialysis patients [9], increased seroconversion in those who were dialysed immediately adjacent to HCV-positive patients [7], and lower rates of seroconversion where physical isolation of the patients has occurred [3,10]. HCV incidence has decreased in units where rigorous infection control policies targeting nosocomial spread have been applied [7]. HCV outbreaks have also occurred where poor compliance with standard infection control measures has been found [4].

These findings have translated into guideline bodies recommending that universal precautions to prevent nosocomial spread be applied [5,6]. Guideline bodies have, however, stopped short of recommending the use of dedicated machines to prevent sequential transmission of HCV.

In this case, sequential HCV transmission seems to have occurred despite conforming to current guidance in practice. Our local response to this case has been to ensure that all HCV-positive patients use dedicated haemodialysis machines that are not to be used in patients who are HCV negative. Our standard infection control practices have remained in place, but we have not sought to isolate physically the HCV-positive population from the HCV-negative population within our units.

We recommend that, in the light of this case, future blood-borne virus guidelines be extended to advocate the use of dedicated machines in the HCV-positive population.

Conflict of interest statement. None declared.

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