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Comparison of Serological and Nucleic Acid Tests in Hepatitis B and Hepatitis C Blood Donor Screening

Donor Taramalarında Hepatit B ve Hepatit C Tanısında Serolojik ve Nükleik Asit Testlerinin Karşılaştırılması

Yeşim Gürol

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Zuhal Tekkanat Tazegün

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Burcu Öksüz

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Sesin Kocagöz

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Tanıl Kocagöz

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Gülden Yılmaz

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul

Corresponding Author

Yeşim Gürol, Assist. Prof. Dr.

Department Microbiology and Clinical Microbiology, Faculty of Medicine, Yeditepe University, Istanbul
E-mail: yesimg@yeditepe.edu.tr

ABSTRACT

Objectives: To compare Hepatitis B virus (HBV) and Hepatitis C virus (HCV) serological test results with the nucleic acid amplification tests in the blood donor patients screening.

Methods: During December 2005- January 2008 in Yeditepe University Hospital Microbiology Laboratory, HBV DNA in 136 patients and HCV RNA in 83 patients were tested by real-time PCR and the serums were also tested for HBsAg and anti-HCV respectively by MEIA .

Results: Although in HBs Ag positive patients (n=64) HBV DNA was mostly positive, 34% negative patients were also detected(n=22). In 31% of anti-HCV positive patients HCV RNA was positive. In 16% of anti-HCV negative patients (n=61) HCV RNA was positive (n=10). In 72 HbsAg negative patients 6 HBV DNA positivity; in 61 anti-HCV negative patients 10 HCV RNA positivitiy was detected.

Conclusion: In routine blood donor HBV and HCV screening, HBV DNA and HCV RNA is recommended to be tested. These tests would be cost effective, not an additional burden.

Keywords:*HBV,HCV,NAT,donor screening*

ÖZET

Amaç: Kan donörlerinin taranmasında, Hepatit B Virüsü (HBV) ve Hepatit C Virüsü (HCV) serolojik testlerini nükleik asit amplifikasyon testleri ile karşılaştırmak.

Gereç ve Yöntem: Yeditepe Üniversitesi Hastanesinin klinik mikrobiyoloji laboratuvarına başvuran 136 hastada HBV DNA ve 83 hastada HCV RNA real-time PCR kullanılarak araştırıldı. Hastaların serumları aynı zamanda MEIA yöntemiyle sırasıyla HBs Ag ve anti-HCV pozitiflikleri açısından incelendi.

Bulgular: HBs Ag pozitifliği saptanan hastalarda (n=64) HBV DNA büyük oranda pozitif olmasına karşın %34 oranında negatif olan hastaya (n=22) rastlandı. Anti-HCV pozitif olan hastaların %31'inde HCV RNA pozitif bulundu. Anti-HCV negatif hastaların %16 sında (n=61) HCV RNA pozitif idi (n=10). 72 HbsAg negatif hastada 6 HBV DNA pozitifliği, 61 anti-HCV negatif hastada 10 HCV RNA pozitifliği saptandı.

Sonuç: HBV ve HCV için yapılan donor taramalarında HBV DNA ve HCV RNA'nın da bakılması uygundur. Bu testlerin yapılması ek yük yerine kazanç sağlayacağı öngörülebilir.

Anahtar Kelimeler: *HBV,HCV,NAT, donor taraması*

INTRODUCTION

The prevelance of Hepatitis B virus carriage in general population is 10-20% in Africa, China and South Asia; 0.1-0,5% in Western Europe and North America. Hepatitis B was used to be the most common complication of therapeutic use of blood transfusion and blood derivatives in the past; but is less now because of specific blood screening and the other preventive precautions. The precautions in prevention of HBV spread include the use of nonautologus blood transfusions, the

effective choice of blood and organ donors, the regular education of healthcare workers, decontamination of high risk environment, use of HBV spesific immunglobulin and vaccination.

In general population Hepatitis C virus is seen 1% in Western Europe and Northern America; 20%in some Africa countries. Post tranfusion infections were dramatically decreased in recent years. In preserological phase of the infection, HCV RNA detection in donor blood is discussed (1).

Hepatitis B virus (HBV) and Hepatitis C virus (HCV) are the mostly common viruses that cause chronic hepatitis. Symptoms may not be seen during chronic illnesses in these two viruses. For example, the presence of these viruses in many patients, is detected during screening in blood donation. In daily routine, the serological tests like ELISA for HBs antigen (HBs Ag) and anti-HCV is used.

Although the serological viral agent screening is applied during blood donation to minimize the transmission, there is still a seronegative window phase between donor infection and detection of serological markers. This window phase is 66 and 59 respectively in HCV,HBV (2).

In donor screening PCR, the amplification test of nucleic acids and similar tests are called as NAT (nucleic acid amplification testing) and in some countries it became a must (3)

In donor screening to contribute to the algorithma, we compared the results of serological tests and nucleic acid amplification tests in our limited number of patients.

MATERIALS AND METHODS

During December 2005 - January 2008 in Yeditepe University Hospital Microbiology Laboratory, HBV DNA in 136 patients and HCV RNA in 83 patients were tested by real-time PCR (Fluorion HCV and HBV kit (Iontek)). The serum samples were also tested for HBs Ag and anti-HCV positivity by MEIA (Axsym,USA).

RESULTS

Although in HBs Ag positive patients (n=64) HBV DNA was mostly positive, %34 negative patients were also detected (n=22) (Table 1). In 31% of anti-HCV positive patients HCV RNA was positive. In 16% of anti-HCV negative patients (n=61) HCV RNA was positive (n=10) (Table 2). In 72 HbsAg negative patients 6 HBV DNA positivity; in 61 anti-HCV negative patients 10 HCV RNA positivitiy was detected.

Table 1: Hepatitis B serological and nucleic acid amplification test results

	HBsAg (+)	HBsAg(-)	TOTAL
	Number of samples		
HBV DNA (+)	42	6	48
HBV DNA (-)	22	66	88
TOTAL	64	72	136

Table 2: Hepatitis C serological and nucleic acid amplification test results

	Anti HCV (+)	Anti HCV (-)	TOTAL
	Number of samples		
HCV RNA (+)	7	10	17
HCV RNA (-)	15	51	66
TOTAL	22	61	83

DISCUSSION

In blood products despite of anti-HCV negativity, the use of molecular methods help to detect the potential infectious donors (4,5). Laperche and et al. studied 44 PCR positive samples with HCV antigen-antibody enzyme immunoassay and found 31 positive and suggested this method to the laboratories that cannot apply PCR (6). Goncales and et al. found a correlation with anti-HCV positivity and HCV RNA positivity; confirmed RIBA (recombinant immunoblot assay) equivocal samples with PCR (7).

There are many studies that detect HbsAg and anti-HCV seroprevelance in our country as respectively 1.26-3.03%, 0.16-1.3% (8-16). Unfortunately the studies including the comparison with serology and molecular tests are very rare. The most extensive study undertaken in Turkish Red Crescent was about 10189 samples and number of samples with HCV and HBV serology positive, PCR negative was 40,12; serology negative, PCR positive was 2,4 respectively (3). The infectivity is based on viral factors like DNA copy and HBV particule unity in anti-HBc positive, HbsAg negative individuals (17) Kuhns and et al. detected HBV PCR negativity in 6% of HbsAg positive donors (18).

Although HBV DNA is mostly positive in HbsAg positive, in HBV DNA negative patients HbsAg may be positive. In some anti-HCV negative patients HCV RNA was found positive. If HCV RNA is positive while anti-HCV negative, the infection has just begun or antibody has not occurred or these patients may not have an ability to make antibody against HCV. These two tests are mostly compatible, but in some patients it fails so to increase the number of patients with true diagnosis, these two methods should be studied together. It is stated in blood transfusion the most reliable tests are Anti-HBc and HBV PCR and the related studies are not enough (19-21). In variable countries the effect of

HIV, HCV and HBV NAT application in blood donation was searched and especially in HIV and HCV tests successful results were gained (22,23).

The hepatitis may transmit by infected blood; and this leads very great damage in health and economical affairs. So in routine HBV and HCV screening, HBV DNA and HCV RNA tests should be applied. These additional tests are cost effective if prevention of a great transmission rate is concerned.

REFERENCES

1) Bendinelli M, Pistello M, Mapsi F, Vatteroni M. Bloodborne hepatitis.In Specter S, Hodinka RL., Yong SA. editors. Clinical Virology Manual. 3rd ed.USA: ASM Press:,2000.p.310-314.

2) Grant P.R, Busch M.P. Nucleic acid amplification technology methods used in blood donor screening. Transfus Med. 2002;12(4):229-42.

3) Kılıç BP. Tarama Testlerinde Moleküler Yöntemler. In 5.Ulusal Moleküler ve Tanısal Mikrobiyoloji Kongresi Program ve Bildiri Özetleri Kitabı 24-28 Haziran 2008 Bilkent, Ankara p.70

4) Roth WK, Weber M, Petersen D, Drosten C, Buhr S, Sireis W and et al: NAT for HBV and anti-HBc testing increase blood safety; Transfusion 2002;42:869-875

5) Eiras A, Sauleda S, Planelles D,Sedeno M,Iberrra A,Vesga MA and et al: HCV screening in blood donations using RT-PCR in mini-pool: the experience in Spain after routine use for 2 years. Transfusion 2003; 43:713-720.

6) Laperche S,Elghouzzi MH, Morel P, Asso-Bonet M, Le Marrec N, Girault A et al: Is an assay for simultaneous detection of Hepatitis C virus core antigen and antibody a valuable alternative to nucleic acid testing?. Transfusion 2005;45:1965-1972.

7) Goncales NSL, Costa FF, Vassalo J,Goncales FL: Diagnosis of Hepatitis C Virus in Brazilian blood donors using a reverse transcriptase nested polymerase chain reaction: Comparison with enzyme immunoassay and recombinant protein immunblot asssay. Rev.Ins.Med.Trop.S.Paulo 2000;42(5):263-267.

8) Sakarya S,Tuncer G, Yaşa H,Çiçek C,Kadıköylü G et al :Aydın bölgesindeki kan donörlerinde HbsAg ve anti-HCV seroprevelansı ve yaş ve cinsiyetle ilişkisi.KLİMİK Derg 2001:14,1: 22-24.

9) Arabacı F, Şahin HA, Şahin İ, Kartal Ş: Kan donörlerinde HBV, HCV, HIV ve VDRL seropozitifliği.Klimik Derg 2003: 16(1):18-20.

10) Dilek İ, Demir C, Bay A, Akdeniz H, Öner AF: Seropositivity rates of HbsAg, anti-HCV, anti-HIV and VDRL in blood donors in Eastern Turkey. Turk J Hematol 2007;24:4-7.

11) Gül M, Çıragil P, Aral M, Doğramacı N. Gönüllü ve gönüllü olmayan kan donörlerinde HBV, HCV ve sifiliz tarama test sonuçlarının değerlendirilmesi. Türk Mikrobiyol Cem Derg 2006:36(1):35-39.

12) Ağuş N, Yılmaz NÖ, Cengiz A, Şanal E, Sert H: Kan donörlerinde HbsAg, anti-HCV, anti-HIV seroprevelansı. ANKEM Derg 2008, 22 (1):7-9.

13) Keskinler DÜ: Erzurum Kızılay Kan Merkezine başvuran kan donörlerinin HBV ve HCV yönünden serolojik değerlendirilmesi. İnönü Üniversitesi Tıp Fakültesi Dergisi 2003,10 (4): 195-198.

14) Tekay F: Hakkari ilinde HBV, HCV ve HIV seroprevelansı. Dicle Tıp Dergisi 2006:33,3;170-173.

15) Uzun C. Kan donörlerinde HbsAg, anti-HCV, anti-HIV ve RPR sonuçlarının değerlendirilmesi. Türk Mikrobiyol Cem Derg 2008; 38 (3-4):143-146.

16) Gürol Y,Öztürk Y, Karaltı İ, Tazegün ZT, Kocagöz S, Kocagöz T, Yılmaz G. Yeditepe Üniversitesi Hastanesine başvuran hastalarda Ocak 2006-Şubat 2009 tarihleri arasındaki HbsAg ve Anti-HCV seroprevalansının retrospektif olarak değerlendirilmesi. ANKEM Derg 2009;23(ek 1):107.

17) Obrien SF, Fearon MA, Yi QL, Fan W, Scalia V, Muntz IR et al. Hepatitis B virus DNA-positive, hepatitis B surface antigen negative blood donations intercepted by anti hepatitis B core atigen testing: the Canadian Blood Services experience. Transfusion 2007;47:1809-1815.

18) Kuhns MC, Kleinman SH, McNamara AL, Rawal B, Glynn S, Busch MP. Lack of correlation between HbsAg and HBV DNA levels in blood donors who test positive for HbsAg and anti-HBc: implications for future HBV screening policy. Transfusion 2004;44:1332-1339.

19) Roth WK, Weber M, Petersen D, Drosten C, Buhr S, Sireis W and et al. NAT for HBV and anti-HBc testing increase blood safety. Transfusion 2002;42:869-875.

20) Busch M.P: Should HBV DNA NAT replace HbsAg and/or anti-HBc screening of blood donors? Transfusion Clinique et Biologique 2004;11:26-32.

21) Allain J.P et al: Occult Hepatitis B virus infection. Transfusion Clinique et Biologique 2004;11:18-25.

22) Heyns ADP , Swanevelder JP, Lelie PN, Crookes RL , Busch MP: The impact of individual donation NAT screening on blood safety- the South African experience. ISBT ScienceSeries 2006; 1:203-208.

23) Glauser A, Hardegger K, Gottschalk J, Frey B.M.: Four parameter NAT screening by Taqscreen MPX with Cobas S201 in Switzerland: Validation, implementation and first experiences. In ISBT XIXth Regional Congress, Eastern Mediterrenean & Europe, Cairo, Egypt, March 21-25,2009.