Brief Report

The Value of Fingertip Blood Impregnated Paper in Hepatitis B Surface Antigen Screening*

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Abstract

Hepatitis B surface antigen (HBsAg) screening is an important procedure to determine the prevalence of hepatitis B (HBV) in a community. However, it is difficult, time consuming and expensive. In this study we aim to investigate the efficacy and usefulness of fingerprint blood impregnated paper in HBsAg screening. To our knowledge, blood impregnated paper is a practical, useful method for HBsAg screening in the community.

Keywords: Blotting paper, community, efficacy, fingertip blood, HBsAg screening

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Introduction

Hepatitis B virus (HBV) infection is one of the leading health problems worldwide. It is estimated that approximately 350 million people throughout the world are chronically infected with HBV. Annually one million people die due to chronic HBV-related liver cirrhosis and hepatocellular cancer (HCC).[1]

HBV infection is asymptomatic in 90% of those under 4 years of age and in two-thirds of those over 30 years of age.[2] Thus, many people are not aware of being infected. HBV infection is usually detected by serological examinations before operations and blood donations, as well as by examinations performed due to abnormal liver function tests.[3] Worldwide, the HBV prevalence varies between 1% and 15% according to regions.[4]

The most accurate data concerning the prevalence of HBV in an endemic region can be obtained through prevalence studies. However, prevalence studies are usually compelling and troublesome.[5]

Numerous difficulties are encountered in record keeping, obtaining blood samples, transfer and storage of these samples at convenient temperature and suitable locations. Therefore, few people can be screened during prevalence studies. The numbers of required staff and relevant cost increases when these difficulties are solved. In order to overcome these difficulties, we plan to conduct hepatitis B surface antigen (HBsAg) screening with blotting paper onto which fingerprint blood has been absorbed.

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Materials and Methods

Subjects

Subjects consisted of patient volunteers under follow-up at our clinic, for whom all serologic tests for HBV were pre-determined.

Sampling

A drop of blood was taken from the fingerprint of the subjects and allowed to absorb onto blotting paper. The blood samples were stored at room temperature.

Tests

On the study day, samples were dissolved in 2 mL of 0.9% NaCl. The existence of HBsAg in the liquid was tested by the enzyme immunoassay (EIA) method using commercial kits (Axsym, Abbott, USA).

Statistical analyses

We adapted the results to a 2 × 2 table in order to estimate the accuracy, specificity, positive predictive and negative predictive rates.

Ethics

This study was approved by the Ethics Board of the Medical Faculty at Duzce University, Turkey.

Results

The fingertip blood samples of previously known 42 HBsAg-positive and 40 HBsAg-negative subjects were included in the study. After conducting the test, 40 of the 42 (95.2%) HBsAg-positive samples were determined to be positive while 40 (100%) negative samples were all determined to be negative. Our results showed the following: true positives (40), false negatives (2), true negatives (40) and false positives (0). According to the Wilson

score interval, the sensitivity was 95.2 (95% CI: 84.21–98.68) and specificity was 100% (95% CI: 91.24–100).

Discussion

The EIA and radioimmunoassay (RIA) kits are widely used to detect HBsAg in serum.[6] Due to the fact that HBsAg can not be detected in some circumstances, nucleic acid amplification tests have been developed that measure HBV DNA in place of HBsAg.[7] There are a limited number of studies that have investigated HBsAg in dried blood samples. In a study of 47 patients, it has been shown that HBV DNA screening could be performed with blood samples absorbed onto paper.[8] In another study, alpha fetoprotein together with HBsAg were investigated in dried blood samples, with an accuracy of 96% and specificity of 100%.[9] However, in previous studies dried blood samples were stored under special conditions, such as temperatures of either 4°C or -70°C. In the current study dried blood samples were stored at room temperature for one month. The HBsAg results were not affected by storage at room temperature. Previously, it was a significant problem to store hundreds of serum samples in appropriate conditions until the study day.

Mostly, it is difficult to provide an environment of -20°C for the storage of blood samples. In our study, after having absorbed the fingertip blood onto the paper and then storing the sample at room temperature for one month, we tested for the presence of HBsAg. With this method, HBsAg was detected with an accuracy of 95.2% and specificity of 100%. According to the obtained data, it was seen that dry blood samples taken for HBsAg screening did not lose value when stored at room temperature for one month.

The advantages of this method include the ease of obtaining blood from the fingertip without the need to perform venipuncture; ease in recording patient data after having absorbed the blood by working of only one staff for this process, without the need to employ two separate staffs for collecting blood and recording patient data; blood samples may be stored in most places without the need for special conditions; and cost-effectiveness, where there is no need to use syringe for taking blood, no need to transport the tube for transferring blood, and less effort to obtain serum samples, thus decreasing staff expenses.

In many countries, including Turkey, the frequency of HBV infection in the society is determined by prevalence studies which increases peoples' awareness of the disease.[10] Numerous difficulties are encountered during prevalence studies such as taking blood from the peripheral vein, transferring blood into the tube without hemolysis, transferring the blood samples to the laboratory where the study is to be performed, decomposing of serum in the laboratory, and storage of the separated sample until the study day.

The accuracy and specificity rates of HBsAg results obtained with this method are promising. By using this method, blood samples for HBsAg testing as well as the transfer and storage of these samples can be performed practically. The need for qualified staff for sampling the blood may decrease, thus enabling screening the society for HBsAg to become easier.

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