

Research Progress of Hepatitis C Epidemiology and Clinical Laboratory

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Abstract

Hepatitis C refers to a group of diseases caused by hepatitis C virus infection and mainly transmitted by blood. Hepatitis C virus is an RNA virus with highly heterogeneous and insidious characteristics. Epidemiology shows that the virus has a high infection rate worldwide and affects human physical and mental health. With the development of clinical medicine, laboratory detection plays an important role in the diagnosis and treatment of hepatitis C. This paper reviews the epidemiology and related testing techniques of hepatitis C in order to lay a theoretical foundation for the later clinical diagnosis and treatment.

Keywords

Hepatitis C; Testing Technique; Epidemiology; Research Progress.

1. INTRODUCTION

Hepatitis C is a worldwide infectious disease with more ways of transmission, mostly through blood, but also through family and sexual contact. However, there are still 50% HCV transmission channels that have not been confirmed. It is considered that the virus has a comprehensive or recessive pathway of transmission [1]. According to the WHO report, 3 out of every 100 people in the world are infected with the virus. As no specific hepatitis vaccine has yet been developed at present, it is necessary to find an efficient and scientific way to test the virus, prevent and cure the disease and find the virus early to ensure the safety of human life and reduce the prevalence of hepatitis C [2]. This paper reviews the epidemiology of hepatitis C virus and its common testing techniques.

2. CURRENT STATUS OF THE INTERNATIONAL EPIDEMIC OF HEPATITIS C

As can be seen from the above, the hepatitis C virus is quite insidious, and almost half of infected persons will progress to hepatitis C, while 0.1% of those infected may develop cirrhosis, and even liver cancer. Not only that, a large number of research reports in recent years have pointed out that 0.3% of these patients are likely to progress to liver cancer, so clinical prevention and treatment and early differential diagnosis are particularly important [3]. WHO pointed out that the prevalence rate of hepatitis C reached 3.0%, with about 3 million new cases of infection every year. Roughly estimated, there are 130 to 160 million cases of chronic infection, based on such data, about 350,000 deaths per year. The infection rate varies significantly in different regions and countries. For example, the prevalence rate in Europe and Africa is 1% and 5.3% respectively. A study on the infection among pregnant women found that it was significantly lower in London, Saudi Arabia and Switzerland than in the general population, but significantly higher in Egypt and Yemen [4]. In addition, it was found in relevant data that the incidence of hepatitis C in China multiplied from 2004 to 2011, and the incidence of hepatitis C in males was higher than that in females. The high incidence of infection is mainly

in Northwest, North and Northeast China. The analysis found that differences in prevalence may be due to the history of unclean blood transfusion and drug abuse in these areas [5].

3. PROGRESS IN HEPATITIS C TESTING TECHNIQUES

Hepatitis C testing techniques involve preliminary screening and validation test, including chemiluminescence test, Western blotting, HCV-RNA test and enzyme-linked immunosorbent assay. Currently, the clinical test for hepatitis C virus is mostly HCV antibody and HCV-RNA method.

3.1. Anti-HCV Detection

Anti-HCV detection is the earliest test technique. As the patient's peripheral blood virus level is relatively low, conventional methods show poor efficacy. After several years of research, the ELISA detection method has entered the medical industry and has been widely used. The anti-HCV detection has undergone three generations of reforms. The first generation can measure the non-structural regions of viral genes. The second generation adds HCV peptide C22-3 based on the C100 antigen, which promotes the anti-C22 infection to be displayed in advance, improving the sensitivity and specificity. In the third-generation ELISA reagents, the antigen ratio of core zone and recombinant NSS polypeptide decrease, and the proportion of non-structural zone NSS antigen is amplified, which further improves its sensitivity.

3.2. Chemiluminescence Test

Chemiluminescence microparticle immunoassay can promote the organic combination of chemiluminescence technology and high specific immunological effect, and it is suitable for testing a variety of antigens, hormones, antibodies and fatty acids. Combine the paramagnetic particles in the hepatitis C virus recombinant antigen in the specimen with the item diluent, and then flush; take the acridinium ester marker, add to it, perform a second flushing, and add excitation liquid to the reaction mixture. The antibody content of hepatitis virus is determined by the luminescence signal in the reaction, so that the antibody content of hepatitis virus in the specimen is determined. This method is convenient and simple, and no catalyst is needed. The competitive method is used for the determination of small molecular antigen and sandwich method is applied to the determination of large molecular antigen. Organic combination with macromolecules will not affect the lucency, with high sensitivity.

3.3. HCV-RNA

Nucleic Acid Amplification Testing (NAT) has been gradually regarded as the main tool to identify the channel of infection in clinical practice. HCV-RNA can change with the dietary structure of patients. When patients eat protein and high-fat food, the examination results are significantly higher than the normal level, leading to deviation in the determination results. In addition, in the actual operating process of NAT determination technique, its equipment needs to be completed by experienced personnel. However, this technique takes a relatively long time and its operation is cumbersome, so it is not very feasible with low popularity because the results will be affected by external factors.

3.4. HCV Antigen Detection

With the development of modern chemistry, the hepatitis C virus antigen determination method is also in continuous innovation and improvement, especially in western countries, which attempt to develop a quantitative and qualitative method of double antibody sandwich method, in order to release HCV in serum samples. For this new technology, compared with RT-PCR technology, it simplifies the operation steps, promotes enhanced environmental adaptability, shortens the test time, reduces or avoids false positive problems. The new

detection technique has made up for the defects and deficiencies of the existing technologies, especially in the serology of HCV and the early analysis of anti-HCV positive infection virus, which is of great significance. Limited by the HCV antigen's own existence time of 27 to 70 days, the determination of HCV antigen must be carried out based on the results of anti-HCV detection.

3.5. Simultaneous Determination of Anti-HCV and HCV Core Antigen

The synergistic assay of antigen and antibody is a new technique explored by experts through many practices, involving the detection of serology + HCV screening kit. At the present stage, the more mature result is a kit where the HCV core antigen is bound to the peripheral protein antibody. HCV core antigen refers to the indicator of early formation of HCV infected persons, and it appears almost simultaneously with HCVRNA, indicating that there is a close relationship between core antigen and the dynamic changes of HCVRNA. The detection and analysis of HCV core antigen mainly depend on the quantitative determination of HCV core antigen content in serum samples. The method is less affected and the results are more accurate, so it can be used in the early clinical diagnosis and differentiation of HCV [6].

3.6. Rapid Test by Colloidal Gold Method

This method involves immunochromatography and immunofiltration assay. Immunochromatography: The nitrocellulose membrane is regarded as a carrier, and the HCV antigen is properly fixed on the membrane in a linear manner. When the sample to be tested moves along the solid phase carrier, a colored band appears on the antigen position on the membrane, which is a positive result. The key point of an effective test is that the quality control line needs to have a chromogenic reaction. Immunofiltration assay: Similarly, the nitrocellulose membrane is regarded as a carrier and HCV antigen spots are fixed on the membrane. The sample is to be tested, and the colored spots appear in the antigen location, which is positive. Reaction time <10min, the key point of an effective test is that the quality control line needs to develop color [7].

4. CONCLUSION AND PROGRESS

Hepatitis C virus has relatively high prevalence in China, and the transmission through blood products is considered to be a pivotal channel for virus infection. The virus is highly occult, and most patients ignore it due to the lack of significant manifestations during the initial infection, and then miss the best time for diagnosis and treatment. Typically, patients have a 5-year cure rate of 82% and a 10-year cure rate of 60%. All of its detection techniques, such as enzyme-linked immunosorbent assay, simultaneous determination of anti-HCV and HCV core antigens and HCV antigen detection, have certain limitations. The advantages and drawbacks of different technologies can be compared, and two or more methods can be used to carry out joint determination to reduce the window period, and lower the false negative rate. At the same time, relevant departments should strengthen the disinfection intensity of blood products and blood, strictly control the alleviation of blood transfusion, and prevent the occurrence of infection from the source, so as to achieve the effect of early detection and early diagnosis of patients with initial infection.

In conclusion, in the process of hepatitis C detection, its determination shall be combined with various indicators of the body to meet clinical requirements, vigorously popularize disease knowledge, and achieve timely prevention, treatment and effective circumvention, providing scientific basis for clinical in-depth research.

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