ENDEMICITY OF THE HEPATITIS B VIRUS IN HOSPITAL STAFF; ITS PREVENTION

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EPIDEMIOLOGY OF HEPATITIS B

Serological studies have shown that the predominant feature of hepatitis B virus (HBV) epidemiology is continuous cycle of subclinical infections resulting in a appreciable percentage of overtly healthy, hepatitis B surfage antigen (HBsAg) reactive persons and even greater proportion of population with antibodies denoting prior HBV infection.

Overall 30 % of HBV infections give clinical symptoms (aminotransferase elevation, with or without icterus...). Thereby asymptomatic contamination is the most common manifestation of HBV infection since it represents 70 % of cases... As far as evolution is concerned, about 0.2 % of patients die with fulminant hepatitis while 90 % recover completely. 10 % become chronically infected (with HBsAg detectable beyond 6 months) as well after asymptomatic contamination than acute initial episode. Among them, 7% are asymptomatic carriers and 3 % suffer from chronic hepatitis (chronic persistent or active hepatitis).

The risk of becoming asymptomatic carrier is much higher as the infection is acquired in early infancy when the mechanisms of immune defence are not yet perfectly developed. The carrier state risk is also high for immunosuppressed subjects (for example, for haemodialyzed patients). Asymptomatic carriers are the principle reservoir of infectivity.

Screening of HBV infection involves the characterization of 3 viral markers in the sera: anti-HBc antibody, anti-HBs antibody and HBsAg. For this purpose, different modalities can be used but the most sensitive techniques that have to be practized are the immunoenzymatic or radioimmunologic techniques and accessorily, the reverse haemagglutination. (Last reaction is less sensitive but it may be useful when an HBsAg detection is to be performed after short delay as in case of needlestick).

HBsAg appears in serum after an incubation period of up to 6 months. Eventually this antigen becomes undetectable with resolution of viral replication. Presence of anti-HBs signifies recovery and persisting immunity; there is no immediate seroconversion from HBsAg to anti-HBs coincident with early convalescence. Usually a period of some weeks to one year or more exists where neither HBsAg nor anti-HBs is in excess and detectable. When the surface antigen is found to be negative during acute and chronic hepatitis, the question arises whether the case represents B type hepatitis with undetectable levels of HBsAg. Between the disappearence of HBsAg and the appearance of anti-HBs, anti-HBc can be a sensitive indicator of viral replication. In fact, anti-HBc arises during early HBs antigenemia and is at high titer during early convalescence. But anti-HBc is also a long persisting antibody and may in some cases persist longer than anti-HBs.For these reasons, the anti-HBc is a valuable diagnostic marker both for assessing acute as well as chronic phases of the disease and also, for identifying healthy individuals with exposure to the virus.

Three routes are perfectly documented for the transmission of HBV: blood, saliva and semen. These three biological fluids have been shown to transmit HBV to chimpanzees. Blood is the richest source of HBV, particularly if HBcAg (marker of viral replication) is present. In the health care personnel, the HBV contamination is consecutive of exposure to blood of blood products. A rupture of cutaneous coating is necessary because the virus does not cross skin.Nevertheless blood projection to eyes can induce the disease. Thus, as it would be experted, personnel working in surgical specialities are at substantially greater risk than those in non surgical specialities, like practice of medicine and dentistry. A strong correlation exists between the increasing number of years spent working in health care units and increasing prevalence of HBV markers in health care workers, supporting the fact that the health care environment is a definite risk factor for HBV exposure. There are reports of episoden of exposure of individual surgeons and other health care personnel to infectious patients where the transmission event could be documented. More commonly, exposure resulted from handling contaminated blood or tissue samples or other materials, including surfaces and instruments contaminated with HBV-positive blood. In these instances, there was a definite history of antecedent accidental inoculation with infectious blood, such as a needlestick, a cut on broken glass, or a splash of blood onto mucous membranes. Nevertheless, many infections of health care personnel occur without any recognized exposure incident.

For health care personnel, salivary transmission appears rarely involved, except for people working in dentistry. This mode of transmission could be responsible of horizontal transmission in the families, communities... and in patients round HBV carriers among health care personnel.

Digestive route is generally not infectious.The gastric acidity and the enzymes of stomach fluid distroy the ingested virus. If oral and respiratory route are possible ways, small mucosal lesions seem to be incriminated. The classical treatment for apparatus disinfection (2% glutaraldehyde for example) are efficient and under these conditions, there is no infection by the fibroscopes during endoscopic examination.

EPIDEMIOLOGIC SURVEY OF HOSPITAL STAFF

In Western countries hospitals, prevalence of HBV infection appears as decribed below (in decreasing order):

- ❑ Dialysis or transplant nurses (35 - 47 %),
- ❑ Emergency ward nurses (30 %),
- ❑ Surgeons (28 %),
- ❑ Blood banks technicians or Haematology-Biochemistry Immunology technicians (26 %),

❑ Pathologists and dentists (20 %),

Technicians who do not handle blood (laboratories of Bacteriology or Histopathology) and nurses from hepatology or gastro-enterology departments did not display an increased risk of HBV infection.

PROPHYLACTIC CONSIDERATIONS

Studies in immunocompetent adults consistently show that HBV vaccine is safe and highly immuongenic and protective against HBV infection. Therefore, vaccination will be the basic way of HBV prophylaxis in high risks populations, in future. Two situations are to be considered for the health care personnel.

1- In the first, a member of the hospital staff is exposed, through accidental needlestick or any other inoculation or any mucosal membrane contact. If the contaminating patient and the contaminated person have not been recently investigated for HBsAg and the other markers, HBsAg should be detected by a simple and rapid technique like reverse haemagglutination. In two or three hours, the results are known. If the contaminating patient is without HBsAg and if the contaminated person appears HBs Ag positive, no prophylactic measure is to be envisaged. If the contaminating patient is known or detected as HBV carrier and if the contaminated person is known as susceptible or found HBsAg free,immediate administration of specific gammaglobulins (HBIG, gammaglobulins prepared from people with high anti-HBs amount in their sera), is asked for. A dose of 0.06 ml/kg must be injected followed by the same dose 1 month later. If the source and HBsAg status of biological product contaminating is unknown, the same approach is recommended. In all case the HBIG administration must be realized as soon as possible; post exposure prophylaxis beyond 48 hours is inefficient. In present circumstances, HBIG administration for the prevention should be always combined with simultaneous active immune response. In fact, like the rabies vaccine, the only HBV vaccine appears to provide limited protection when administered after exposure has already occurred. Thus vaccine seems able to potentialize the prevention effect of HBIG administration.

2- The second situation concerns the people who have to be chosen for vaccination because accidental exposure may occur in the feature.

Health care personnel with frequent contact with blood or needles include particularly (WHO indications):

❑ Personnel including teaching and training staff, directly involved over a period of time in patient care in those residential institution for the mentally handicapped where a known high incidence of hepatitis is suspected;

❑ Personnel directly involved in patient care over a period of time, working in units giving treatment to know carriers of hepatitis B infection;

❑ Personnel directly involved in patient care working in haemodialysis, haemophilia and other centres regularly performing treatment of patients with blood or blood products;

❑ Laboratory workers regularly exposed to increased risk from infected material;

❑ Health care personnel assigned to work in areas of the world where there is a high prevalence of HBV, if they are to be directly involved in patient care;

❑ Dentists and auxiliary dental personnel with direct patient contact.

It is now apparent that the HBV vaccine can be administred with impunity to sero-negative and sero-positive persons alike, but its extremely high cost militates against this strategy. On the other hand, the cost of pre-vaccination serological screening for evidence of pre-existing immunity is also considerable. One major component of the decision tree is the estimated or calculated rate of immunity within a given population selected for vaccination. It may be calculated that acceptable cost/benefit is achieved by limiting screening to populations in terms of HBV markers prevalence. Ct: cost term, Cv: vaccine cost,it becomes saving screening the individuals to be vaccinated if Ct/Cv is below percentage of the HBV markers in this population. In France, it is cheaper to screen the health care personnel because the prevalence of HBV markers exceeds 20 % within this population.

The question regarding which antibody has to be measured must be discussed. Because seropositive individuals almost always have both anti-HBs and anti-HBc detectable, it seems unnecessarily costly to screen for both of them on a routine basis. If the costs needs to be cut, a unique antibody marker can be looked for. In this case, anti-HBc screening seems to be preferred to anti-HBs for 3 reasons:

1) In a large majority of HBsAg negative individuals, anti-HBc and anti-HBs are coexistent (about 90 - 92 %);

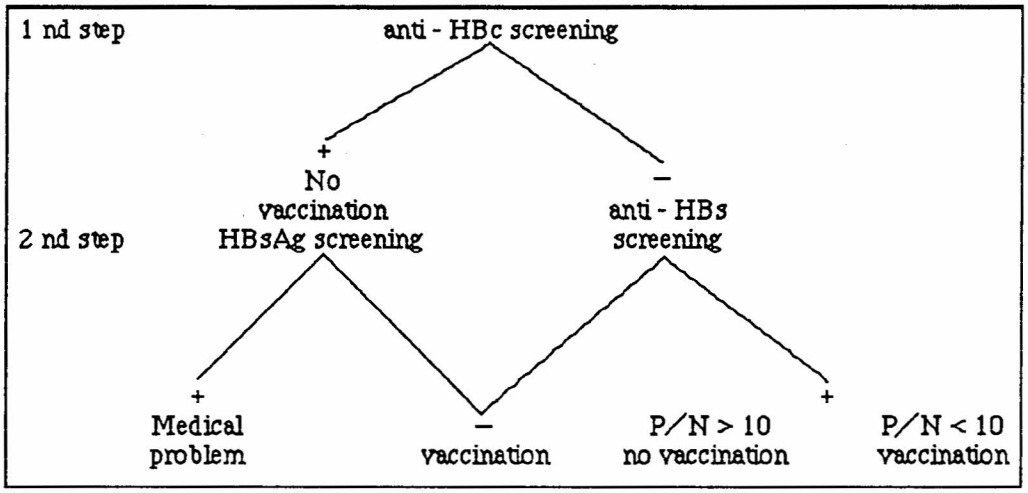
2) anti-HBc alone is more frequent than anti-HBs alone;

3) anti-HBc appears to be a more specific indication of post infection because anti-HBs screening has a significant number of false-positive reactions if low titers are accepted. A sample/negative (S/N) value of 10 rather than 2.1 should be used as the cut off point in enzyme or radioimmunoassay; furthermore, anti-HBc correlates with higher anti-HBs titers (the three quarters of anti-HBs alone have a S/N<10).

Unfortunately, the detection of anti-HBc on its own fails to distinguish between the relatively few individuals who are simultaneously HBsAg carriers and those who have coexistent anti-HBs. With such a strategy, the HBsAg carriers will not be identified and will escape from the medical surveillance.If the limitation of HBV tests is not an economic problem, this does not dispense from the necessity of performing screening under the cheapest conditions. In this aim, we propose the following schedule (table 30).

Nevertheless, policies for immunization against hepatitis B should be reviewed regularly according to local requirements and circumstances and revised as further experience and knowledge is acquired. Furthermore it is clear that people entering in hospital staff with a potential risk of exposure to HBV, have be to be vaccinated as soon as possible before their professional activity.

Table 30. Schedule for screening of hepatitis B.



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