WAYS AND INTENSITY OF VERTICAL TRANSMISSION OF THE HCV FROM INFECTED MOTHERS TO CHILDREN

Ways and intensity of vertical transmission HCV have been studied before sorts in 29 lying-in women, positive on HCV-RNA. Among newborns from these mothers in serum of blood of umbilical cord at the moment of birth, HCV-RNA is found in 6.8%. The infection of newborns from HCV-RNA positive mother occurs through a placenta and at the time of delivery.

Keywords: HCV, vertical transmission, intranatal.

Introduction

Possible transmission of HCV (hepatitis virus) from mother through a placenta has been shown by revealing HCV-RNA at children (Takase et al., 1993; Chang, 1996; Tahara, 1996). Intensity of infection of the child from infected mothers according to different authors fluctuates from 5.1% to 13%. And higher intensity of infection is observed at presence at mothers HCV-RNA. According to a number of authors (Conte et al., 2000; Taijiri et al., 2001; Jonas, 2002) frequency of infection of children from mothers infected only with HCV averages 4.5-5.0%. It is suggested (Heintges et al., 1994; Sorinson, 1998) that such low intensity of HCV transmission doesn’t play particular role in virus distribution; rather low disease of a hepatitis C among children testifies to this. At the same time, some researchers predict the growth of a HCV-infection despite all amplifying actions aimed to control over blood and its preparations, and also on prevention of HCV transmission in the process of medical and other interventions.

Kazakhstan demonstrates annual growth of newly diagnosed cases of a chronic hepatitis C (Shuratov et al., 2009). In the light of told we have studied ways and intensity of HCV transmission from infected mothers to children in the conditions of Kazakhstan.

Materials and methods

54 lying-in women found before childbirth with the anti-HCV in blood serum were selected. Control group comprised 31 lying-in women who did not contain anti-HCV. The age of women in both groups ranged from 21 till 36 years. Maternal serum of lying-in women, umbilical cord blood in newborns, and also in children of 2-3 and 8-10 months after a birth were examined using enzyme-linked immunosorbent assay (ELISA) for the presence of anti-HCV IgG. Serum positive on anti-HCV IgG was checked in the confirmative test. Anti-HCV IgG was defined by means of test sets “RekombiBest anti-HCV IgG” (Novosibirsk, Russia). Optical density was measured at a wavelength of 620-450 nm on reader ELx800 “Vio-Tek Instruments Inc” (USA). Presence of HCV-RNA was found in the investigated serum. For indication of HCV-RNA in serum there were used PCR test kits of “Amplisens-100” (Moscow, Russia) and the complete PCR kit produced by “Bio-Rad Laboratories” (USA).

Results and discussion

PCR tests in 54 lying-in women the HCV-RNA was found in 29 (53.7%) cases. HCV-RNA was not found in control group of lying-in women.
Results of research on anti-HCV and HCV-RNA in the serum cord blood of newborns are shown in Table 1.

**TABLE 1. PRESENCE OF ANTI-HCV AND HCV-RNA IN SERUM OF UMBILICAL CORD BLOOD OF NEWBORNS**

<table>
<thead>
<tr>
<th>Umbilical cord blood serum of children</th>
<th>Quantity</th>
<th>Are revealed markers (abs., M ± m %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>anti-HCV</td>
</tr>
<tr>
<td>Surveyed group</td>
<td>54</td>
<td>54 (100.0)</td>
</tr>
<tr>
<td>Control group</td>
<td>31</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Anti-HCV was found out in umbilical cord blood of all newborns. Obviously, it is maternal anti-HCV. HCV-RNA was found out only in 2 (3.7%) newborns. Probably, they are truly infected through the placenta in utero. According to Resti et al. (1998), revealing HCV-RNA in umbilical cord blood of children at the moment of birth testifies to infection in utero.

At a following stage, the umbilical cord blood received from 17 children in 2-3 months after their birth was examined by PCR. These children had at the birth only anti-HCV, and HCV-RNA was absent (Table 2). As seen from the table, maternal anti-HCV was still present in all children at 2-3 months after their birth; HCV-RNA appeared in 1 (5.9%) child only. It is likely that the child caught the virus during passage through the birth canal. According to some researchers (Zanetti et al., 1999; Ketjzel-Gilad et al., 2003) the emergence of RNA-HCV in children of 2-3 months after birth is an indicator of intra-partum infection.

**TABLE 1. REVEALING ANTI-HCV AND HCV-RNA IN SERUM OF CHILDREN IN 2-3 MONTHS AFTER A BIRTH**

<table>
<thead>
<tr>
<th>Serum of children</th>
<th>Quantity</th>
<th>Is revealed markers (abs., M ± m %)</th>
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<tr>
<td></td>
<td></td>
<td>At the moment of a birth</td>
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<tr>
<td></td>
<td></td>
<td>anti-HCV</td>
</tr>
<tr>
<td>Surveyed group</td>
<td>17</td>
<td>17(100.0)</td>
</tr>
<tr>
<td>Control group</td>
<td>15</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Further, examination was made for umbilical cord blood serum in 16 8-10 months children not having HCV-RNA in 2-3 months after their birth. So, HCV-RNA was found in 1 (6.2%) child and anti-HCV was not revealed anymore. Apparently, HCV-RNA infection was transmitted from infected mother within the first year of life of the child.

It is necessary to underline that all children found with HCV-RNA during surveying period were born from mothers having HCV-RNA in blood.

Thus, in our survey 3 (10.3%) children, from 29 lying-in women with presence of HCV-RNA in blood, were infected through vertical transmission; in 2 cases the infection occurred through a placenta, in 1 case - at the time of delivery.

The study of Caudai et al. (2003) also demonstrates revealing HCV-RNA in blood of newborn at the birth and in 1.5-2 months after birth; the infection detection made 6.8%. According to some authors (Resti et al., 1998; Rapicetta et al., 2000) presence HCV-RNA in children at the birth testifies to infection in utero, and in 2 months - about infection at the time of delivery.

A number of researchers (e.g., Rapicetta et al., 2000) also found out HCV-RNA in blood serum of newborns during the first hours after birth and in 1-3 months. Authors consider that maternal antibodies nevertheless perform protective effect, and not all children born from HCV-RNA positive mothers, caught the virus. Though it is difficult to disagree with this opinion, it seems impossible to exclude influence of initial level of virus at mother on infection of newborns.

In our opinion, intensity of infection in newborns can depend on mechanisms of transmission of the virus (through a placenta or at the time of delivery), and also from
complexity of structural forms HCV circulating in organism of lying-in women. So, recently it has been described that in the infected organism HCV virions circulate in different forms: connected with lipoproteins, free of lipoproteins, surrounded with a cover, and without cover. It has appeared that HCV virions connected with lipoproteins possess the greatest infectivity whereas the virions free of lipoproteins demonstrate weak infectious activity (Dietrich, 2006).

It is natural to assume, that different forms of HCV virions can differ in their ability to get through a placenta, to be neutralized by maternal anti-HCV, and also in ability to attach, penetrate and replicate in sensitive cages of child organism. Whatever mechanisms develop the infection in children from mothers in the early period of a life (till 1 year), for public health services that fact is adverse when the HCV infection in such children could develop in chronic and latent form and has long persistence. Shuratov et al. (2009) show that accumulation of asymptomatic HCV carriers up to 14% is observed, though few cases of sharp hepatitis C occur among children till 14 years. Such persons, being long-term carriers and maturing, provide HCV transmission by natural and artificial ways. This in turn supports growth for the first time revealed cases of chronic HCV infection among the population.

References


Sorinson, S., 1998. Virus hepatitis, Hepatitis C [Virusnie gepatiti, Gepatit C], in Russian, St-Petersburg, pp.201-45.


