THE INTERESTING VARIATION OF PROACTIVATOR OF PLASMINOGEN IN AN EARLY INFANT

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In 1964 Takada et al reported on the fractionation of proactivator from the human plasma by means of Sephadex gel filtration,1) and showed that there exist two kinds of proactivators, A and B in the human plasma. In 1965, they also published a paper, which reported that there was a difference in elution pattern of proactivator between rabbit and human plasma.2) The different pattern of proactivator led them to the study of the development of proactivators after birth, of which results will soon be published.3)

In this paper, the authors dealt with an interesting case of cephalohematoma, of which the plasma had larger amounts of proactivator soon after birth and later it decreased under the normal level, then it increased to the normal level.

MATERIALS AND METHODS

Fibrinogen, thrombin and streptokinase were the same as those used in the previous papers.1, 2

Sephadex gel filtration and the procedure of the fractionation were also reported in the previous papers.1, 2

Determination of fibrinolytic activity: Effluent (0.9 ml) of each fraction tube was mixed with 0.1 ml of streptokinase solution (500 u/ml) and incubated for 10 minutes at 37°C. After the incubation, 0.2 ml of the mixture was added to 0.4 ml of phosphate saline buffer (pH 7.4), 0.3 ml of 0.33% fibrinogen solution and 0.05 ml of thrombin solution (100 u/ml). The time (in minutes) required for the complete lysis of the formed clot was measured, and the reciprocal of the lysis time × 10³ was tentatively defined to be proactivator

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units contained in the original effluent of 1 ml. Proactivator units of each fraction were expressed by multiplying the effluent volume of the fraction, therefore total proactivator units were indicated by summing up the proactivator units of each fraction.3, 4

Blood samples: Blood taken from a jugular vein of patients was poured into an oxalated test tube and 1/3 ml of the plasma was added on the Sephadex gel bed, and eluted with 0.1 M Tris-HCl buffer (in 0.2 M NaCl).

Case: This material was obtained from a male infant, who was admitted to the hospital on 7th postnatal day because of cleft palate. The pregnancy was full term and normal. The birth weight was 3.050 kg. Delivery was spontaneous. When the infant was admitted, he had a cephalohematoma, the size of which was 10 × 12 cm. This tumor remained of the same size for 22 days and then began to decrease and disappeared by 50th day of life. No other remarkable changes were observed.

RESULTS

Fig. 1 shows the variation of proactivators of the patient with cephalohematoma after birth. The normal development curve is shown in the same figure, details of which will be published elsewhere.3

![Fig. 1 Shadowed area indicates a normal range of proactivator units after birth. Filled circles show proactivator units of the infant stated in the text. Open circle shows proactivator units of the other infant.](image-url)
Total proactivator units were very high soon after birth and at this time, a large cephalohematoma was existing. Then the decreasing proactivator units were indicated and became under the normal level around 130 days after birth.

Table 1 shows the value of proactivator A and B of this patient.

<table>
<thead>
<tr>
<th>Days after birth</th>
<th>Proactivator A units</th>
<th>Proactivator B units</th>
<th>Total proactivator units</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0</td>
<td>940</td>
<td>940</td>
</tr>
<tr>
<td>17</td>
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<td>698</td>
<td>707</td>
</tr>
<tr>
<td>116</td>
<td>72</td>
<td>643</td>
<td>715</td>
</tr>
</tbody>
</table>

Proactivator A of this patient was deficient by this method soon after birth, although high proactivator B activity was shown. Seventeen days after birth, proactivator A appeared once but at this time proactivator B units were lower than the units of the preceding sample. Twenty-four days after birth, proactivator A disappeared once more and 60 days after birth proactivator A appeared, at that time the plasma of many normal infants usually showed proactivator A activity. The state of cephalohematoma was gradually decreasing and by 50 days after birth almost disappeared.

The authors studied on the total proactivator levels of the other infant with large cephalohematoma and found a high level of proactivator was also shown soon after birth, which was shown also in Fig. 1.

DISCUSSION

In 1940, Boisvert reported that there was a difference in fibrinolytic system between infant and adult plasma and that the plasma showed resistance to the activation by streptococcal culture supernatants. Later, Phillips and Skrodelis, Quie and Wannamaker demonstrated the same low fibrinolytic activity soon after birth.

In 1965, Y. Takada has shown that the proactivator activity was low soon after birth and increased to the lower limit of the adult proactivator level around
6 months after birth.

The infants reported here with large cephalohematoma showed a high proactivator activity soon after birth. It could not be concluded if this phenomenon was the cause or the result of the hematoma. If it was the cause, the hard labor will have produced hyperfibrinolytic tendency and hematoma. If it was the result, an absorption mechanism of the hematoma will have elevated the activity of the fibrinolytic system.

It has been found by the authors that proactivator A was generally very small soon after birth, and it could not be detected by the clot lysis method reported above. Although this case showed a high total proactivator activity soon after birth, it did show no proactivator A activity by the same method. This indicates that proactivator A was very small soon after birth in spite of the high total activities of proactivator B.

The course of proactivator activity of this infant was decreasing and crossed the normal development curve and later became higher to the normal level. This decreasing phenomenon may well be called by the term "exhaustion of proactivator synthesis." The high rate of proactivator synthesis soon after birth is considered to have made the synthesis exhaust later.

As Ambrus et al studied plasminogen, antiplasmin and tissue activator in the case of hyaline membrane disease, the study of the fibrinolytic system in such a pathological case as cephalohematoma will help us to study the variation of fibrinolysis in pathological states.

SUMMARY

1) Two cases with large cephalohematomas and with high proactivator activities were reported.

2) The total proactivator level of the infant was very high soon after birth, later decreasing and once more higher to the normal level.

3) Proactivator A level of this infant soon after birth was very low (not detected by the clot lysis test) in spite of high proactivator B level.

REFERENCES


3. Takada, Y.: Postnatal development of plasminogen proactivator in human fibrinolytic system. Submitted for publication.


