TITLE:
Urinary tract infection and blood P1 antigen: preliminary report

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CITATION:

ISSUE DATE:
1984-01

URL:
http://hdl.handle.net/2433/118101

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A clinical study was made on the relationship between the blood type P\textsubscript{1} antigen and urinary tract infection (UTI).

The blood type P\textsubscript{1} antigen could be detected in 3 out of 11 healthy Japanese volunteers (27.2\%), and in 54\% of the UTI patients as a whole. Classified by the type of infection, it could be detected in 3 out of 4 patients with upper UTI (75\%) and in 11 out of 22 patients with lower UTI (50\%). These incidences were higher than that of healthy volunteers, the difference being statistically significant.

The relationship between the annual frequency of UTI and the positive detection of P\textsubscript{1} antigen was examined. The patients who had been exposed to UTI twice or more a year proved to have a higher detection rate (61\%), than the other group of patients, the difference being statistically significant.

Two of the patients with \textit{E. coli} detected as a clinical isolate proved to have the P\textsubscript{1} antigen.

\textbf{Key words}: Urinary tract infection, Blood P\textsubscript{1} antigen

\textbf{INTRODUCTION}

Since the blood type P\textsubscript{1} antigen was detected by Landsteiner in 1927, this blood type has been known to have some connection with certain illnesses such as habitual abortion\textsuperscript{12} and parasitic infection\textsuperscript{13}. In recent years its connection with urinary tract infections (UTI) has also been suggested. We thus made a study on the relation of the blood type P\textsubscript{1} antigen with cases of UTI that we often encounter in our daily practice.

\textbf{PATIENTS AND METHODS}

The study involved 26 patients (4 males and 22 females) who visited the Urological Department of Osaka City University Hospital and its related hospitals. Five healthy male and 6 healthy female volunteers were also included in the study as a control group. (Table 1)

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
 & male & female \\
\hline
control group (n=11) & 5 & 6 \\
\hline
UTI group (n=26) & 4 & 22 \\
\hline
upper UTI (n=4) & 0 & 4 \\
\hline
lower UTI (n=22) & 4 & 18 \\
\hline
\end{tabular}
\caption{Patients profile}
\end{table}

Anti-P\textsubscript{1} serum (Ortho) was used for detection of the blood type P\textsubscript{1} antigen, and P\textsubscript{1} antigen was judged as positive or negative on the basis of positive or negative hemagglutination of red blood cells (Fig. 1).
Erythrocytes washed three times in phosphate buffered saline
resuspended to a 3% solution
mixed with anti P1 antiserum
incubated at 17℃ for 30 min.
hemagglutination was studied by light microscopy.

Fig. 1. Figure for method of determining blood P1 antigen

RESULTS

1. The positive rate of P1 antigen in healthy volunteers (Table 2)
   P1 antigen could be observed in 3 of the 11 volunteers (27.2%).

Table 2. The positive rate of blood P1 antigen in healthy volunteers and the group of UTI

<table>
<thead>
<tr>
<th></th>
<th>Blood P substance positive (+)</th>
<th>negative (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=11)</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>UTI group (n=26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>upper UTI</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>lower UTI</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

UTI: Urinary Tract Infection
* : p<0.01
ns : no significance

2. The positive rate of P1 antigen in the group of UTI
   Table 2 shows the positive rate of P1 antigen in the 26 patients belonging to the group of UTI. As a whole, it was positive in 54%. If classified by the type of infection, it was positive in 3 out of 4 patients with upper UTI (75%) and in 11 out of 22 patients with lower UTI (50%), and the incidences were significantly higher than that in healthy volunteers (P<0.01).

3. The annual frequency of UTI and the positive rate of P1 antigen (Table 3).

   The relationship between the annual frequency of UTI and the positive rate was next examined. The positive rate of P1 antigen was significantly higher in patients who had suffered from UTI twice or more a year than the other patients (P<0.05).

   4. The clinical isolates of bacteria and the positive rate of P1 antigen (Table 4).

   The clinical isolates that could be identified were five kinds. The most common pathogen was E. coli which was isolated in 7 patients, followed by Proteus, Klebsiella, Serratia and Pseudomonas which were detected in 1 patient each. Among these patients, P1 antigen was found positive in only 2 of the patients with E. coli.

Table 3. The annual frequency of UTI and the positive rate of blood P1 antigen

<table>
<thead>
<tr>
<th>UTI group times/year</th>
<th>Blood P substance positive (+)</th>
<th>negative (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial (n=8)</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2 (n=12)</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>2 ~ (n=6)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Control group (n=11)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

( * : vs Control, P<0.001
ns : no significance )

Table 4. The clinical isolates of bacteria and the positive rate of blood P1 antigen

<table>
<thead>
<tr>
<th>Percentage of Blood P substance of isolated bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>YASUMOTO ('83) Roland ('81)</td>
</tr>
<tr>
<td>E. coli 2/7 (28.5) (25)</td>
</tr>
<tr>
<td>Proteus 0/1 (0.0) (42.8)</td>
</tr>
<tr>
<td>Klebsiella 0/1 (0.0) (44.1)</td>
</tr>
<tr>
<td>Enterobacter — (46.6)</td>
</tr>
<tr>
<td>Serratia 0/1 (0.0)</td>
</tr>
<tr>
<td>Pseudomonas 0/1 (0.0)</td>
</tr>
</tbody>
</table>

DISCUSSION

As mentioned above, the blood type P1 antigen is supposed to be connected with various illnesses. Its relation with urinary
tract infections, among others, was first described by Lomberg\(^2\) in 1981, and later similar results were reported by Roland\(^3\). The results of our study seem to support Lomberg's view that people having the blood type P\(_1\) antigen are more vulnerable to urinary tract infections.

On the other hand, there is no definite theory yet about where bacteria begins to adhere to epithelial cells of the urinary tract as the first step in inducing a urinary tract infection. Roland, who noticed the similarity between the glycolipid composition and the blood type P\(_1\) antigen on the bacterial surface, hypothesized that adhesion of bacteria might begin in that structure.

REFERENCES

1) Naiki M: Recent advance in human blood group P system. Biochemistry 51 1240~1248, 1979
3) Roland FP: P\(_1\) blood group and urinary tract infection. Lancet i: 946, 1981

(Accepted for publication, July 1, 1983)