BIKEN JOURNAL Vol. 23 157–161, 1980

## SHORT COMMUNICATION

# SPREAD OF VARICELLA IN HOSPITALIZED CHILDREN HAVING NO DIRECT CONTACT WITH AN INDICATOR ZOSTER CASE AND ITS PREVENTION BY A LIVE VACCINE

YOSHIZO ASANO, SEIZO IWAYAMA, TAKAO MIYATA and TAKEHIKO YAZAKI

Department of Pediatrics, Nagoya Hoken-Eisei University School of Medicine, Toyoake, Aichi 470-11, Japan

TAKAO OZAKI

Department of Pediatrics, Nagoya University School of Medicine, Nagoya 466, Japan

KAZUO TSUZUKI and SHIGEMITSU ITO

Department of Pediatrics, Chukyo Hospital, Minami-ku, Nagoya 457, Japan

MICHIAKI TAKAHASHI

Department of Virology, Research Institute for Microbial Diseases, Osaka University, Suita, Osaka 565, Japan
(Received April 14, 1980)

Varicella spread from a child with zoster to a total of 3 susceptible infants in another room in a children's ward, although they had been strictly isolated. To prevent spread of the disease, the staffs and patients were doing their own washing and no source of natural infection could be found. The cases indicate that it is difficult to predict nosocomial varicella infection or to prevent spread of the disease simply by isolation in a children's ward.

A total of 11 other children without history of varicella in the ward were given live varicella vaccine before or immediately after this event. None of these children developed symptoms of varicella and all the susceptible children who were vaccinated showed an antibody response.

A 14-year-old boy with the nephrotic syndrome (in room No. 1 in Fig. 1) in the children's ward of Chukyo Hospital received prolonged treatment with adrenocortical steroid hormone and cyclophosphamide. He developed the complication of severe pyothorax of the left lung due to *Klebsiella* infection during this treatment and therefore received continuous drainage of the thorax. On June 25, he developed a vesicular skin rash of the left leg, which was diagnosed clinically as herpes zoster. Vesicular fluids taken on June 29 and July 1 gave a positive reaction for varicella-zoster (VZ) virus on inoculation into HEL cell

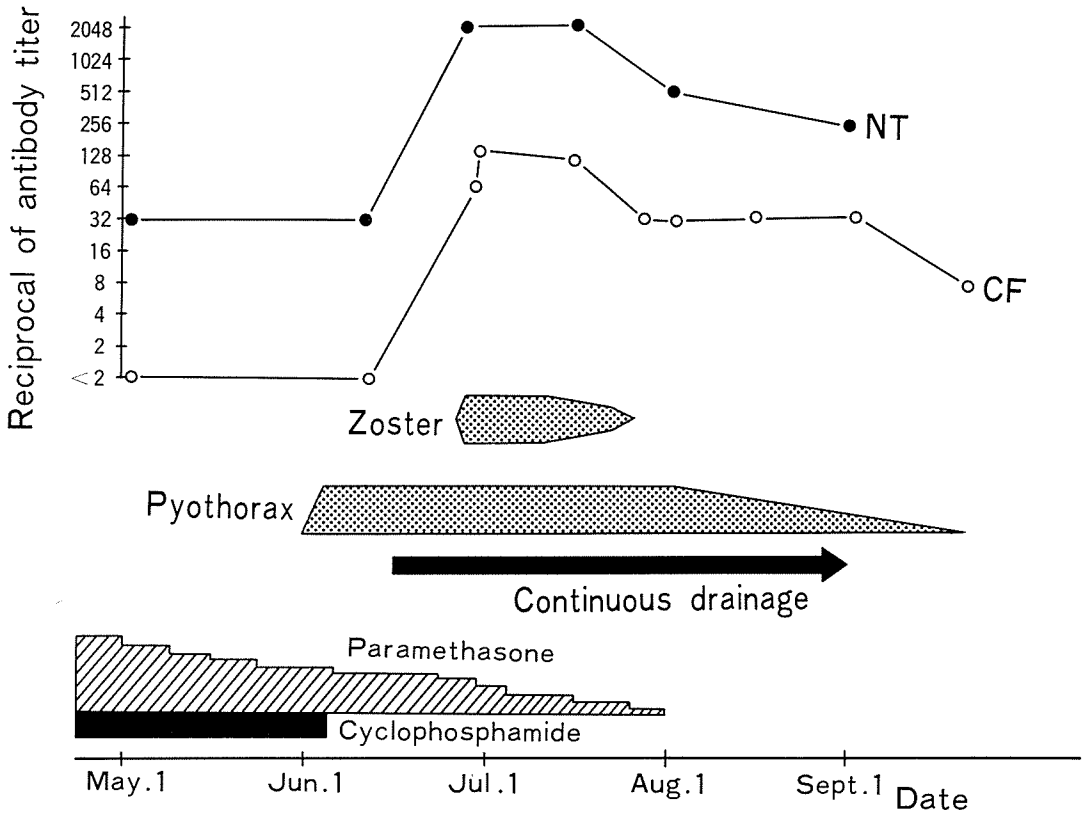


FIGURE 1. The clinical course and antibody titer of the indicator zoster case.

cultures. Serological examination by CF and NT tests also revealed that he had herpes zoster. The clinical course and antibody titers of this patient are shown in Fig. 1.

At that time, there were 23 other children in the ward. Their positions in the ward and histories of varicella are given in Fig. 2. Thirteen of the 23 had no history of varicella. Of the 13, 4 had been vaccinated a months before and 3 were given the live vaccine (Takahashi et al., 1975) on June 29. Two of the 3 were in the same room as the indicator zoster case (room No. 1). One child (room No. 2) had Kawasaki disease with a fever and was not vaccinated, but she was later found to be varicella-seropositive. Five infants (room No. 7) were not vaccinated because they were under 1 year old and could not yet walk, and thus could not have been in direct contact with the indicator zoster case. The patients and staffs in this ward were asked to do their own washing.

On July 13, 18 days after the onset of the indicator zoster case, a 3-month-old infant in room No. 7 who had anhidrosis exhibited typical manifestations of varicella. At about the same time, 2 children with no history of varicella were admitted to the ward (rooms No. 1 and 6) and were immediately vaccinated. On July 26, 13 days after the onset of the second case (room No. 7), a 8-month-old infant with congential heart disease and a 3-month-old infant with hepatitis in the same room (room No. 7) developed typical varicella. Two children with no history of varicella, who were newly admitted to the ward (rooms No. 1 and

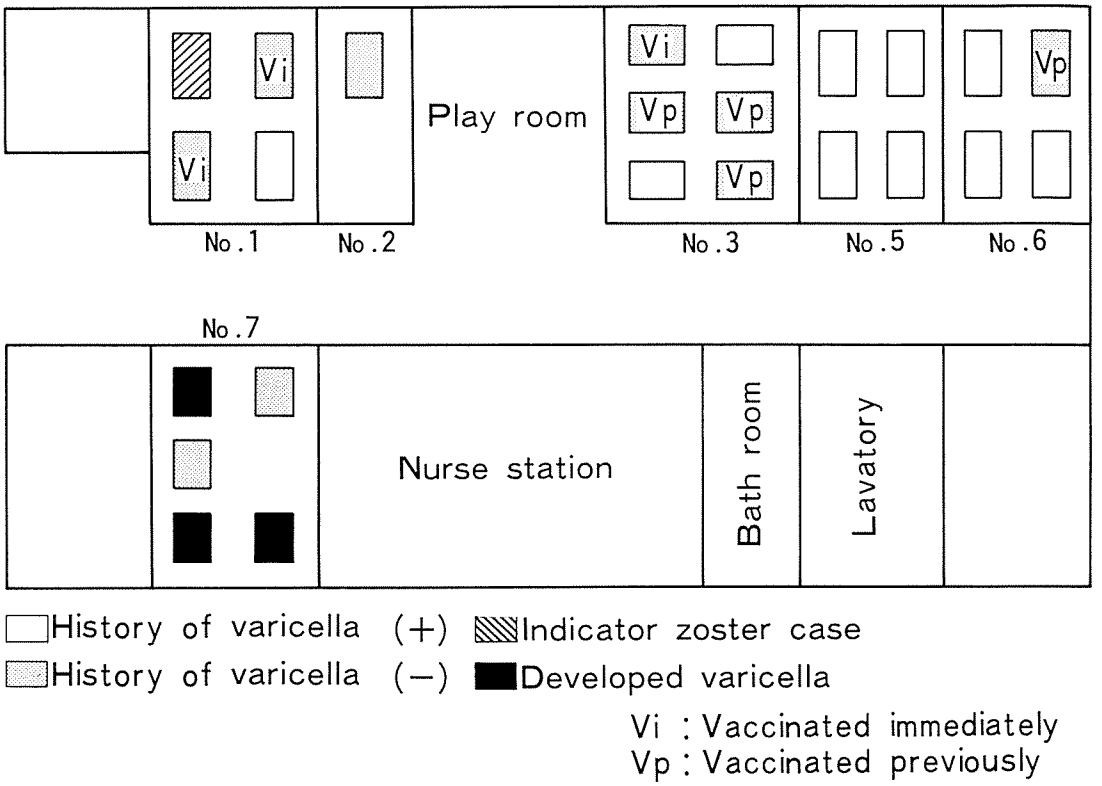


FIGURE 2. The position of patients in the children's ward at the occurrence of a case of zoster.

3) at that time, received vaccination immediately.

In all, 11 children with no history of varicella were vaccinated before or immediately after the occurrence of zoster or varicella cases. During the course of this episode, none of the vaccinated children exhibited any clinical symptoms of varicella. In contrast, 3 of 5 unvaccinated infants developed typical varicella symptoms although they had never been in direct contact with the indicator zoster case. As for two other infants, one was 1-month-old with maternal antibody, and another seemed to have been passively immunized by receiving repeated blood transfusions.

All the vaccinated children, whose sera had been seronegative by CF and NT tests (Asano and Takahashi, 1978), became seropositive, and none of them showed any abnormalities in hematological, chemical and urinary examinations after vaccination. The clinical course and serological responses of the children without a history of varicella are given in Table 1.

In the present study, varicella infection seemed to originate from a zoster case who had been kept in bed, receiving continuous drainage for treatment of pyothorax. Five infants in one room (No. 7) were not able to leave their room alone because they were under one year old. Therefore, these infants could not have been exposed to the indicator zoster case. Moreover, in careful investigations we could not find any other sourse of infection. Nevertheless, 3 of the 5 infants, who had been carefully isolated, developed varicella. In varicella infections, the exact mechanism and route of transmission from the infected person has not been determined, and transmission has

TABLE 1. *Clinical and serological responses of children without a history of varicella during spread of varicella in the children's ward*

| Room No. | Patient | Age (yr) | Sex | Underlying disease | Vaccination (Date) | Clinical symptoms | Antibody titer (CF/NT) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pre | Post (4–6 w) |
| 1 | SS | 14 | M | NS,[a] Pyothorax | Indicator case | + | <2/32 | 128/2048 |
| | SS | 3 | M | NS (S)[d] | June 29 | − | <2/<2 | 8/16 |
| | KA | 2 | M | Kawasaki | June 29 | − | <2/<2 | 2/2 |
| | MA | 2 | F | AGN[b] | July 15 | − | <2/<2 | 4/16 |
| | TE | 5 | M | AGN | July 26 | − | <2/<2 | 2/4 |
| 2 | SN | 4 | F | Kawasaki | — | − | 2/4 | — |
| 3 | MS | 6 | F | AGN | May 26 | − | <2/<2 | 2/16 |
| | KW | 13 | F | Anemia (S)[a] | June 29 | − | 2/— | 4/— |
| | MK | 5 | F | AGN | May 26 | − | <2/4 | 4/64 |
| | MA | 12 | F | AGN | May 26 | − | 16/— | 16/— |
| | UK | 9 | F | AGN | July 26 | − | <2/<2 | 4/8 |
| 6 | MK | 2 | F | AGN | May 26 | − | <2/<2 | 8/16 |
| | CT | 5 | F | AGN | July 15 | − | <2/<2 | 8/16 |
| 7 | MI | 1 | F | Inborn error[e] of metabolism | — | − | <2/4 | — |
| | NY | 8 mo | F | CHD[c] | — | + | <2/<2 | 16/128 |
| | HY | 3 mo | M | Anhidrosis | — | + | <2/<2 | 32/32 |
| | HT | 3 mo | F | Hepatitis | — | + | — | 64/256 |
| | YM | 1 mo | M | Low birth[f] weight | — | − | 2/32 | — |

[a] NS: Nephrotic syndrome.
[b] AGN: Acute glomerulonephritis.
[c] CHD: Congenital heart disease.
[d] Receiving steroid therapy.
[e] Receiving repeated blood transfusion.
[f] Maternal antibody positive.

been supposed to be by airbone droplet infection or indirect contact infection. In this episode, the virus may have been transmitted to the first case by staffs of the ward. On the other hand, none of the vaccinated children exhibited any clinical manifestation of varicella during the course of spread of varicella in the ward. The results of the present study indicate that it is difficult to predict nosocomial varicella infection or to prevent spread of the disease by isolation only. In contrast, live varicella vaccine was found to be effective for preventing spread of the disease in the ward.

ACKNOWLEDGMENTS

The authors are greatly indebted to Hiroko Nakayama, B.S., Department of Clinical Investigation, Chukyo Hospital, for her skillful technical assistance.

REFERENCES

Asano, Y., Takahashi, M. 1978. Studies on neutralization of varicella-zoster virus and serologial follow-up of cases of varicella and zoster. Biken J. 21: 15–23.

Takahashi, M., Okuno, Y., Otsuka, T., Osame, J., Takamizawa, A., Sasada, T., Kubo, T. 1975. Development of a live attenuated varicella vaccine. Biken J. 18: 25–33.