

Neonatal Aspect of SARS

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Introduction

Since the outbreak of the Severe Acute Respiratory Syndrome (SARS), more than 1700 people were infected in Hong Kong. During the height of the epidemic in early April, three infected pregnant women delivered their preterm babies by Caesarean section in Princess Margaret Hospital because of deteriorating maternal condition. In the Seminar of Paediatric SARS held in 20th April 2003, the early clinical courses of the world's first three neonates of mothers with SARS were reported and the infection control measures for the delivery and caring of these newborns were also discussed. The following is a brief account of the discussion.

Brief Summary of the Clinical Courses of the Three Neonates

Three premature neonates were delivered by Caesarean section from 3 pregnant women with SARS in April 2003.¹ The maturity and the birth weight of these neonates ranged from 26 to 32 weeks and 975 to 1650 gram respectively. All three mothers had received treatment with Ribavirin and Corticosteroid and required mechanical ventilation at the time of delivery. These neonates did not show any feature of SARS after birth. The laboratory investigations and the reverse transcription polymerase chain reaction (RT-PCR) studies for SARS-CoV infection were all negative up to the second week of life. Two of these neonates developed illness of the intestine with one got necrotising enterocolitis affecting the ileum on day 10 of life and the other one had isolated perforation of jejunum on day 3 of life. The definite cause of these complications was still undetermined.

Infection Control Measures for the Delivery and Caring of Newborns of SARS Mothers

As the secretions and body fluid of the infected mothers would be very contiguous and it cannot be certain whether the newborns have been infected in utero or not, the infection control measures should be aimed at protecting the staff as well as the newborns from being infected by the mothers.

The infection control measures include several aspects:

1. Venue

- a. The delivery and resuscitation of the newborns should be conducted in facilities equipped with negative pressure ventilation system to prevent the spreading of the virus as the procedures would involve handling of large amount of body fluid such as amniotic fluid and blood. Also artificial ventilation of the mothers and the babies would generate significant amount of aerosol of the respiratory secretion which is very infectious. Ordinary operating theatre having positive pressure ventilation design should never be used.
- b. The newborn resuscitation should be carried out in a room near but separated from the maternal room. This will minimise the exposure of the newborns and the staff to the maternal secretion after delivery thus decreasing the chance of acquiring the virus from the mothers.

2. Personal Protective Equipment

- a. All personnel involved should wear proper protective equipment including caps, goggles, waterproof disposable gowns, shoes covers, gloves and masks.
- b. As aerosol of the body fluid may be generated during the delivery and resuscitation, the minimum requirement for masks must be N95. Use of masks with higher degree of protection such as Powered Air Purifying Respirator (PAPR) is preferable. If PAPR is used, the staff should also wear a N95 mask within the PAPR to prevent the passage of unfiltered exhalation gas of the staff to the environment.
- c. If the team performing newborn resuscitation needs to transport the newborns to the nursery, the team must ensure that proper protective gears should also be used during the transportation while the protective clothing contaminated during the delivery or resuscitation should be removed before stepping out of the venue to prevent environmental contamination. If time is not allowed for proper changing of protective gears, wearing 2 layers of each item of protective gears initially may help to reduce the time needed. The team can remove the outer layer of protective gears after the delivery and resuscitation while keeping the inner layer for the transportation of the newborns.

3. Equipment

a. Suction equipment

- i) Wall vacuum rather than the built-in electric pump of the radiant warmer or simple bulb syringe should be used for suction, as the gas sucked in will be expelled to the environment in the latter two methods.
- ii) Viral/bacterial filter should be connected to the suction unit before entering the wall suction port to prevent contamination of the hospital suction plant (Figure 1).
- iii) Closed suction system that can prevent disconnection of the tubing during suction should be used once the patient was intubated.

b. Resuscitation bag

- i) Viral/bacterial filter (Hygrobaby) should be connected between the resuscitation mask/endotracheal tube and the resuscitation bag to capture the exhaled virus.
- ii) Use of bag and mask ventilation should be minimised, as leaking of gas through the mask is inevitable. Early intubation should be considered if needed.
- iii) Connect the patient to a modified ventilator once intubated to minimize using of the resuscitation bag. The ventilator should be set by the side of the radiant warmer for use during resuscitation.

c. Ventilator

- i) Gas from the expiratory limb of the circuit should pass through a viral filter before returning to the ventilator (Figure 2).
- ii) Exhalation gas from the ventilator should be diverted away from the ward atmosphere by the use of scavenger system.
- iii) Scavenger system of infant star ventilator can be made by applying wall suction to the exhalation port through a T tube or a similar adaptor (Figure 2).
- iv) The ventilator of the transport incubator should also have a viral filter connected to the expiratory limb (Figure 3).

4. Isolation

- a. The newborns should be separated from their mothers and nursed in an isolation room.

- b. Keeping the babies inside the incubators can help to reduce the spreading of the virus from the babies.
- c. A mini negative pressure chamber can be created by applying wall suction to a headbox covering the head and shoulder of the baby (Figure 4). If the baby is too vigorous for the headbox, putting the suction catheter inside the incubator with maximum suction force applied would also help to reduce the aerosol from going out of the incubator.

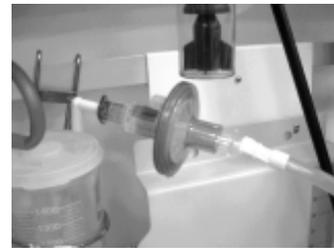


Figure 1.



Figure 2.



Figure 3.



Figure 4.

5. *Mode of Delivery*

The delivery should be conducted in a well-controlled manner to ensure better infection control. Therefore, for non-emergency cases, delivery by elective Caesarean section at near term is preferred to allowing vaginal delivery after onset of labour. The risk of vaginal delivery may be higher in the following aspects,

- a. The first and second stage of the labour may last for hours, therefore the staff attending the delivery will have a longer exposure to patient's secretions.
- b. The struggling of the mother during the labour will cause shedding of secretion and thus the virus.
- c. Mothers with poor respiratory reserve would have poor effort during labour. This may lead to the use of instrumental delivery. The use of vacuum extraction may induce wound over scalp of the newborns and so increase the chance of infection.
- d. Emergency delivery by Caesarean section may be needed during the first and second stage of the labour such as in cases of cord prolapse and foetal distress. There may not be sufficient time to prepare and put on the protective clothing.
- e. The chance of having meconium stained liquor is higher when the pregnancy is full term or even post term. The procedure of clearing the meconium from the trachea of the newborns by repeated intubation and suction would impose a great risk to the staff.

Conclusion

The neonatal section of the Seminar of Paediatric SARS served the purpose of sharing the experience of the Princess Margaret Hospital in the management of newborns of mothers with SARS. The importance of infection control in the delivery suite and the neonatal intensive care unit has also been raised.

Reference

1. Shek CC, Ng PC, Fung PG, et al. Infants born to mothers with Severe Acute Respiratory Syndrome (SARS). Pediatrics (unpublished).

Infection Control and Staff Protection

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The virus causing SARS is identified to be Coronavirus. It is detected in respiratory tract secretion, urine and stool. It should be stressed that standard droplet and contact precautions should be strictly enforced. From the up to date information of epidemiological study, the mode of transmission is by droplets and direct contact with patient's secretions and subsequent inoculation into mucous membranes e.g. oral mucosa, conjunctiva etc.

We should practice infection control precautions in all healthcare settings. All staffs (including working in ancillary areas) working in healthcare settings should receive proper infection control training. The staffs should be informed the latest guidelines in infection control and there should be an enforcement group in hospital to reinforce the infection control policy among the front line staffs.

Negative Pressure Room

SARS patients should preferably be nursed individually in rooms with negative pressure, the contaminated air will be drawn outside to the environment and not recirculate into the ward. The air exchange in these rooms should be up to at least 12 exchanges per hour. These can markedly decrease the viral load present in the nursing environment and the chance of staff getting infected.

If the negative pressure rooms is not available. The isolation rooms should be well ventilated with adequate fresh air exchange. Consultation with and advices from aerodynamic and architectural specialists is useful.

Environmental Control and Decontamination

There should be a good environmental control. The ward environment should be divided into Dirty Zone (the viral load is high) and Clean Zone (it should be a clean area, the viral load should be zero). Inside the Dirty Zone is where the patient was nursed whereas the Clean Zone is the changing and resting area for staffs.