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Vivo 60 case study

Application and benefit of mechanical ventilation using the Breas Vivo 60 ventilator in paediatric mode in a hospital environment with a view to the patient being discharged home

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Introduction

Today, the main reasons for performing a tracheotomy in children are chronic obstruction of the airways and prolonged mechanical ventilation mostly due to a chronic pulmonary or neuromuscular disease. Consequently early decannulation rarely occurs, with these children increasingly returning home with mechanical ventilation combined with their tracheotomy. The age of the children varies between studies, but it is not uncommon for a tracheotomy to be performed during the first year of their life. In a retrospective review of 282 children who underwent a tracheotomy, 23% of them were less than 1 year old ([1]).
Our case concerns a child who underwent a tracheotomy during the neonatal period due to prolonged mechanical ventilation and who was able to be discharged home thanks to using the Vivo 60 ventilator (Breas Medical, Sweden) in paediatric mode.

Clinical case

The child was male and was born vaginally at 38 weeks' gestation and weighed 3200g. A median-type atypical right diaphragmatic hernia was detected during the 2nd trimester of the pregnancy. The baby was intubated and ventilated in the delivery room and underwent surgery on this hernia on D1 of life. There was no right or left anterior diaphragm or any pericardium present. A plate was fitted at the site of the total anterior defect and a pericardial sac was initially created using the triangular ligament of the liver. Post-operatively, he presented an acute coronary syndrome, requiring revision surgery involving ablation of the pericardial sac. Pentalogy of Cantrell was diagnosed (including a diaphragmatic hernia and no pericardium).

The child's progression was highlighted by failed extubation attempts due to severe diaphragmatic insufficiency, which resulted in a tracheotomy being performed to provide continuous invasive ventilation at the age of 2 months. This child was unable to breath independently up to the age of 9 months. Every attempt at mechanically ventilating the child using different home ventilators failed (whether a single-limb with an exhalation valve or leakage valve was used, or a double-limb circuit). These failures were evident either immediately with the child showing signs of struggling, an increase in oxygen requirement and hypercapnia, or within a few days, with signs of fatigue and a change in his general condition due to asynchrony. Gradually from the age of 9 months, as the child learned to sit up, he could tolerate periods of spontaneous ventilation thanks to using his accessory respiratory muscles. These periods (initially lasting a few minutes) gradually increased up to a few hours by the age of 18 months. Now that the child had gained this independence, tests were resumed using home ventilators with the aim of discharging him home. There was still a significant degree of asynchrony resulting in the duration of the periods of spontaneous ventilation being reduced after a few days, along with fatigue and a decrease in the child's motor activity. This tendency to fatigue meant that there was no prospect of discharging the child home. At the age of 16 months the Vivo 60 ventilator was tried, initially by means of using a double-limb circuit with an active exhalation valve, which was consistently tolerated very well clinically and gasometrically over time. With the aim of withdrawing the tracheotomy tube in time, a cuffless tube had been inserted to preserve the integrity of the trachea and facilitate vocal function during the day. Leaks around the tracheotomy tube made it impossible to set alarms indicating when this ventilatory mode became

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disconnected. In fact, alarms were triggered by the leaks around the tracheotomy tube, which varied according to the position of the child while sleeping. Subsequently, this child was ventilated in leakage ventilation mode using the Vivo 60 ventilator with a single-limb circuit fitted with a leakage valve. No asynchrony was observed and the child showed no signs of fatigue. The disconnection alarm was operational. The ventilation mode (PSV) as well as the applied settings (Insp Pressure 12mbar, PEEP 4mbar) were similar during the use of both circuit types. Ventilating the child using the Vivo 60 in paediatric mode with a single limb leak circuit enabled the child to return home after 19 months in hospital.

Conclusion

Some indications for prolonged mechanical ventilation during the neonatal period, especially chronic pulmonary disorders, may improve with the child's growth, allowing the child to be weaned off the ventilator at some time. Enabling these children to return home with mechanical ventilation is the best option for them to ensure their proper psycho-social development (family life, going to school etc.). In practical terms, there is little paediatric data available about the ventilation types, modes and the most appropriate parameters to set for each type of illness children may have. Most of the data available on paediatric ventilation at home relates to non-invasive ventilation, neuromuscular conditions and often to older children ([2-5]). Furthermore, there is not a lot of equipment available specifically for children. This clinical case highlights a positive experience using the Breas Vivo 60 ventilator with leakage ventilation in an infant with a chronic pulmonary disorder and severe diaphragmatic insufficiency who underwent a tracheotomy.

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