Summary:
Conjoined twins who had been successfully separated were given standard postoperative ventilator treatment, but began experiencing severe problems shortly after. Airway pressures and PCO₂ were rising despite corrective actions. The decision was made to change the ventilation mode to NAVA. This immediately improved the situation and both babies relaxed. The twins were discharged 24 days after the operation. A three month follow up showed both babies doing well, having gained an average of 500 grams each per month.

Background:
Two female thoraco-omphalopagus twins were born at week 37 of gestation. They were delivered by Cesarean section and had a combined weight of 4.6 kg. The babies were joined from the suprasternal notch to the umbilicus (Fig. 1). Their respiratory status were stable and they were thriving well. Their combined weight was 9.4 kg at four months.

The investigation for separation was started immediately after birth by a multi disciplinary team. It was found that the twins had separate intestines. But, the hearts had a fused pericardium. The liver, the pleura and the diaphragm was shared. The kidneys and the urinary bladders were well functioning. There were no sign of respiratory distress.

Planning included both the intraoperative approach and the immediate postoperative and long term care of the babies. Hence, the order of separating the different organs were evaluated, while intensivists and social workers discussed the immediate and long term consequences of the separation.

Intraoperative approach
The liver was initially split, after which the pericardium and the diaphragm was successfully separated. The chest and abdominal wall could then be divided and the defects closed. The abdominal walls were closed directly, while the thoracic walls were closed with shield shaped titanium patches.

Postoperative care
The early postoperative plan was set on stabilizing the hemodynamic situation, while preventing complications after recovery from anesthesia. Controlled Mechanical ventilation with PRVC, targeting a tidal volume of 40 ml, was started on arrival to the ICU. PEEP was set to 5 and 6 cm H₂O respectively. This corresponds to the standard postoperative ventilatory practice of the clinic. However, this initial approach, presented severe problems as airway pressures and PCO₂ was rising despite efforts to correct the situation by control of the endotracheal tubes, suctioning and trials with Pressure Controlled Ventilation. It was decided to immediately change the ventilation mode to NAVA® as protection of the lungs and maintenance of a normal PCO₂ was considered important to avoid strain for the right heart and Ventilator Induced Lung Injury (Fig. 2).

Due to the chest wall patches, the NEX measurement for the positioning of the NAVA catheter, was hard to obtain and the position of the catheter was verified by means of the esophageal ECG displayed in the catheter position window. For further details, please see the NAVA manual.

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On commencement of NAVA the situation immediately improved, with both babies relaxing (Fig. 3). The respiratory rate increased, while the tidal volume decreased. PCO₂ was normalized in both babies. An immediate and sharp decline in airway pressure was seen in both babies. Oxygen saturation stayed between 95–100 % at all times (not shown).

The babies stayed on NAVA for nine days as extubation was a team decision. Neither baby had any respiratory problems, retaining food and thriving during the early postoperative period. The babies were discharged from the hospital on postoperative day 24.

One month follow up after discharge showed well healed incisions in the babies. At three months follow up both girls were doing well, gaining an average of 500 grams in weight per month.

**Conclusion**

The lung protection offered by NAVA presents a viable alternative for very complicated patients with respiratory distress. The case/cases, illustrates how synchronized ventilatory assist with NAVA can protect the lung and maintain homeostasis, in situations where controlled mechanical ventilation is likely to fail.

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Fig. 3 Daily trends showing considerable improvements of respiratory variables after application of NAVA in both twins.