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CASE REPORT

Neonatal extracorporeal membrane oxygenation: Initial experience of Hospital de São João

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KEYWORDS
Extracorporeal membrane oxygenation;
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Bordetella pertussis infection

Abstract The purpose of this series is to report the initial ECMO experience of the Neonatal Intensive Care Unit of Hospital de São João. The first three clinical cases are reported. Case report 1: a 39 weeks gestational age girl with severe lung hypoplasia secondary to a bilateral congenital diaphragmatic hernia. Case report 2: a 39 weeks gestational age girl with a right congenital diaphragmatic hernia and a tracheal stenosis. Case report 3: a 34 weeks gestational age boy, with 61 days of life, with a *Bordetella pertussis* pneumonia, severe pulmonary hypertension, shock, hyperleukocytosis and seizures.

PALAVRAS-CHAVE
Oxigenação por membrana extracorporal;
Recém-nascido;
Hérnia diafragmática congénita;
Estenose traqueal;
Infeção por *Bordetella pertussis*

Oxigenação por membrana extracorporal Neonatal: Experiência inicial do Hospital de São João

Resumo O objetivo desta série é apresentar a experiência inicial da Unidade de Cuidados Intensivos Neonatais do Hospital de São João com ECMO no recém-nascido. São apresentados os 3 primeiros casos. Caso 1: recém-nascido de 39 semanas de idade gestacional, com hipoplasia pulmonar severa secundária a hérnia diafragmática congénita bilateral. Caso 2: recém-nascido de 39 semanas de idade gestacional, com hérnia diafragmática congénita direita e estenose traqueal. Caso 3: pré-termo de 34 semanas de idade gestacional, sexo masculino, com 61 dias de vida, com pneumonia por *Bordetella pertussis*, hipertensão pulmonar severa, choque, hiperleucocitose e convulsões.

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Introduction

Extra corporeal membrane oxygenation (ECMO) describes prolonged extracorporeal cardiopulmonary support for acute reversible respiratory and/or cardiac failure unresponsive to maximal conventional medical management.[1]

The first neonate successfully treated with venoarterial bypass was in 1975 by Bartlett' group, and was treated for severe meconium aspiration syndrome.[2]

In Portugal, ECMO was used for the first time in the newborn in 2010, following the start of the adult ECMO program at Hospital de São João, in 2009. In 2012, two other newborns were treated with ECMO for respiratory failure.

The purpose of this series is to report the initial ECMO experience of the Neonatal Intensive Care Unit of Hospital de São João. The first three clinical cases are reported.

Case report 1

A 39 weeks gestational age girl, birthweight 2520 g, was born by C-section to a 41 years old, five gesta gravida. At 25 weeks of gestation, the diagnosis of left congenital diaphragmatic hernia (CDH) with liver up and severe lung hypoplasia was made on obstetrical ultrasound and by magnetic resonance image (MRI). Fetal echocardiographic exam was normal, karyotype was 46,XX, and no other structural anomalies were detected. The couple expressed to the obstetrical team their desire for full investment in the pregnancy and that ECMO should be offered after birth, if necessary.

The baby was born in September 2010. She was immediately intubated after birth, the Apgar score (1st and 5th minutes) was 3/6, and she was started on mechanical ventilation (SIPPV; frequency = 60 min^{-1}; inspiratory pressure = 25 cmH_2O; FiO_2 = 1.0). The initial arterial blood gas sample after admission to the neonatal intensive care unit (NICU) reported abnormal values: pH = 6.8, PaO_2 = 43 mmHg, $PaCO_2$ = 99 mmHg, HCO_3 = 16; BE = −26; lactate = 6 mmol/L. She was changed to high frequency oscillatory ventilation (HFOV) and started inhaled nitric oxide (20 ppm). The echocardiogram 2D revealed a normally structured heart and severe pulmonary hypertension. The baby presented systemic arterial hypotension and inotropic and vasopressor support was started with dopamine + dobutamine. The oxygenation index was 44 and venoarterial ECMO (VA-ECMO) was started at hour five of life, with normalization of pH and blood gases. She underwent surgical correction of the left diaphragmatic defect with prosthesis, on day two of life. The chest X-ray never showed air filled lungs (Fig. 1). The baby was kept on VA-ECMO for 16 days, when the team decided to stop treatment, after several failed trials to wean from ECMO. The baby died and the autopsy revealed not a left but a bilateral diaphragmatic defect and confirmed very small volume with histological characteristics of hypoplastic lungs.

Case report 2

A right CDH with liver up was diagnosed at 31 weeks of gestation in a female fetus of a 23 years old, two gesta gravida. The echocardiogram 2D was normal, and no other anomalies were detected on MRI. The gravida was referred to Hospital de São João and the ECMO team was contacted at parents' request. A 39 weeks gestational age girl, birthweight 2900 g, was born by vaginal delivery. The Apgar score was 4/6 (1st and 5th minutes), the baby was immediately intubated in the delivery room, and transported to the NICU under mechanical ventilation. The initial arterial blood revealed abnormal values: pH = 7.21; $PaCO_2$ = 64 mmHg; PaO_2 = 40 mmHg; with significant ventilatory settings (frequency = 60 min^{-1}; inspiratory pressure = 25 cmH_2O; FiO_2 = 1.0). She was started on HFOV, with transient improvement of respiratory acidosis. VA-ECMO was started at 20 h of life when an oxygenation index of 47 was registered. The surgical repair was done with prosthesis on day four of life. After the start of active bleeding by the chest drain, a trial to wean from ECMO was successful in day seven of life.

In day eight of life, the clinical state was characterized by a progressive worsening respiratory course with hypoxia, maintained after increasing ventilatory settings. She was changed to HFOV, and nitric oxide (20 ppm) was started owing to severe pulmonary hypertension, hypoxia and an

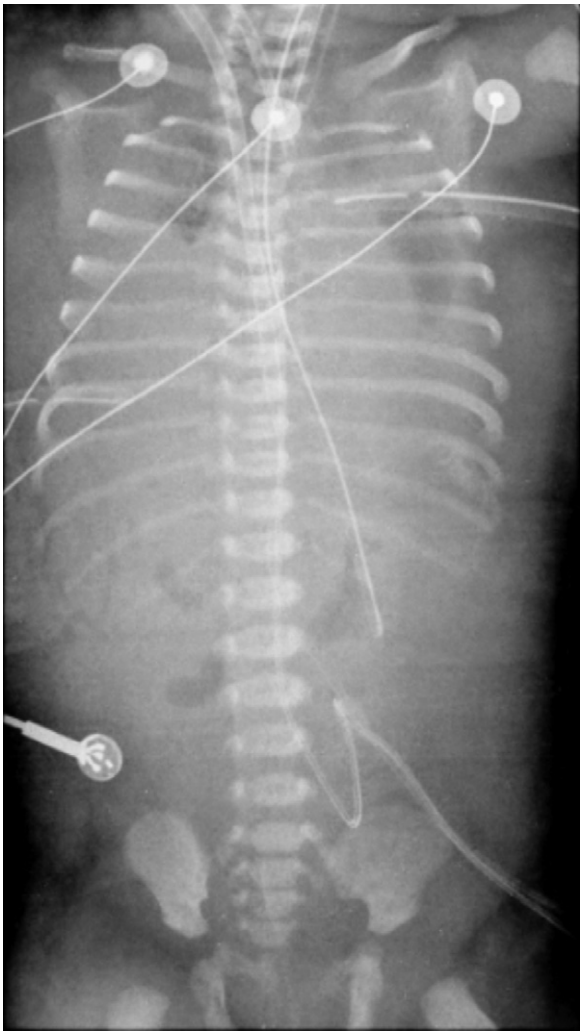

Figure 1 Case report 1. Chest X-ray of a 39 weeks gestational age girl on VA-ECMO: severe lung hypoplasia secondary to a bilateral congenital diaphragmatic hernia.