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Case Report

Ipsilateral Diaphragmatic Paralysis Secondary to Brachial Plexus Injury: About a Neonatal Case

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Abstract

Diaphragmatic paralysis secondary to obstetric trauma during an obstructed delivery is rare, it can be life-threatening to the newborn due to the delay in diagnosis.

We report a case of ipsilateral phrenic palsy secondary to brachial plexus injury following obstetric trauma, in a newborn born of a breech dystocic delivery, admitted on day 4 of life for respiratory distress with feeding difficulties and decreased mobility of the left upper limb. The neonate was treated with antibiotic therapy and oxygen therapy with continuous positive airway pressure. The surgical indication was not indicated in our patient. The respiratory evolution was marked by dependence on low oxygen flows and then successful weaning.

Keywords: *Ipsilateral Diaphragmatic Paralysis; Brachial Plexus Injury; Obstetric Trauma*

Introduction

Stretching of the phrenic nerve during a dystocic delivery most often results in brachial plexus paralysis [1,2]. Thus, rare cases described can lead to paresis or paralysis of the diaphragm responsible for a decrease in respiratory capacity, or respiratory failure [3,4].

The incidence of diaphragmatic paralysis in newborns following obstetric trauma is between 1/15,000 and 1/30,000 live births [5]. The differential diagnosis is made with neuromuscular pathologies, especially if the respiratory symptoms are dragging on.

The mortality of this pathology is estimated at between 10 and 15% [5-7], its management has not been standardized, but the majority of patients require mechanical ventilation, surgery is indicated in specific situations.

Through our observation, we report a case of ipsilateral phrenic palsy secondary to a brachial plexus injury following obstetric trauma.

Observation

A female newborn born to a presumptive full-term pregnancy, from a mother aged 35 years 5 gestity 5 parity, the delivery was vaginally, breech presentation, complicated by shoulder dystocia, requiring obstetric maneuvers without the use of instruments. The birth weight was 2900g. The newborn was admitted on day 4 of life for respiratory distress with feeding difficulties and reduced mobility of the left upper limb.

The examination showed tachypnea at 66 cycles/minute, a heart rate at 127 beats/minute, oxygen saturation at 81% in the open air and 94% under oxygen with a Silverman score of 2/10. The neurological examination noted a paresis of the left upper limb with one hand in adduction and internal rotation. There was no obvious deformity of the collarbone or humerus, the pulses were intact. The right arm was normal.

The chest X-ray (Figure 1) showed an ascent of the left diaphragmatic cupola projecting onto the 5th left intercostal space, with ascent of the abdominal viscera and a right pulmonary focus without bone involvement with a doubt of a diaphragmatic hernia.

Figure 1: *Chest X-ray face: ascent of the left diaphragmatic cupola projecting onto the 5 left EIC with ascent of the abdominal viscera and a right pulmonary focus without bone involvement with a doubt of a diaphragmatic hernia.*

Thoracic CT (Figure 2) showed an ascent of the left diaphragmatic cupola without parietal defect associated with a mediastinal deviation to the right suggestive of diaphragmatic eventration, with a focus of right and left lingular diffuse alveolar pneumonitis.

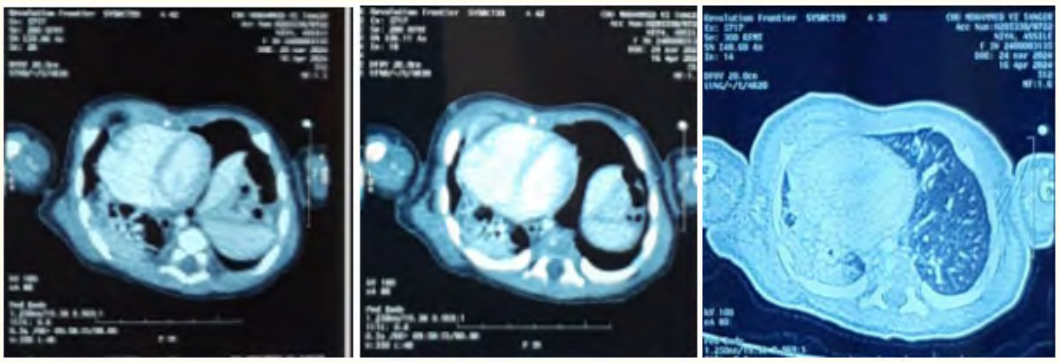

Figure 2: *Thoracic CT: an ascent of the left diaphragmatic cupola without parietal defect associated with a mediastinal deviation to the right suggestive of diaphragmatic eventration, with a focus of right and left lingular diffuse alveolar lung disease.*

The cardiac ultrasound was normal.

We concluded that left phrenic palsy was associated with left brachial plexus paralysis secondary to obstetric trauma.

The neonate was treated with antibiotic therapy and oxygen therapy with continuous positive airway pressure.

The surgical indication was not indicated in our patient, moreover physiotherapy of the affected limb was started with a gradual recovery.

The respiratory evolution was marked by dependence on low oxygen flows, with successful weaning, the follow-up was 7 months.

Discussion

phrenic palsy to the brachial plexus secondary to obstetric trauma is a rare entity. 2 - 6% of infants with brachial plexus palsy develop diaphragmatic paralysis with large differences in spontaneous recovery [8,10,11].

Most phrenic nerve injuries are ipsilateral paralysis to brachial plexus palsy [9,10]. The right hemidiaphragm is the most affected in 70 to 80% of cases [11,12].

Risk factors for phrenic nerve injury and brachial plexus palsy are: breech presentation, instrumental extraction, shoulder dystocia, macrosomia, maternal diabetes, and uterine malformations [8,9,12].

Diaphragmatic paralysis presents as respiratory distress with paradoxical breathing, gastrointestinal manifestations such as gastroesophageal reflux disease, vomiting, or digestive intolerances due to stomach malposition [13]. Increased need for oxygen, weaning difficulties, persistent pulmonary hypertension are signs that can reveal paralysis [12].

The chest X-ray is the first examination to be performed that objectifies an abnormally high diaphragm. An elevation of more than one intercostal space on the left side and more than two intercostal spaces on the right side is sufficient. Thoracic ultrasound allows the qualitative evaluation of diaphragmatic function.

In a pediatric series, Epelman., *et al*. showed that chest X-ray had a low sensitivity of 34% to detect abnormal diaphragmatic movement, a specificity of 86%, a positive predictive value of 85%, and a negative predictive value of 37% [14]. In our case, the chest X-ray showed an ascent of the abdominal viscera suggesting a diaphragmatic hernia. Confirmation of the diagnosis was carried out by chest CT.

Fluoroscopy is a gold standard technique for diagnosing diaphragmatic paralysis, but a prospective study has shown that the mean time is 17 hours, compared to 15 minutes for ultrasound [15].

The electrophysiological study of the phrenic nerve has made it possible to distinguish contusion from laceration, thus guiding the therapeutic choice between conservative or surgical treatment [5].

The management of these patients has not been standardized, the first objective is respiratory stabilization, then ensuring adequate nutrition.

CPAP alone is known to relieve respiratory distress in these patients [10]. Regarding mechanical ventilation, it can induce diaphragmatic atrophy in the long term even on the healthy side [16], similarly, long-term oxygen therapy promotes chronic lung diseases.

In our case, we opted for a treatment based on oxygen therapy with continuous positive airway pressure.

Concerning surgery, the indication is made in view of the visceral repercussions of the eventration [17]. These include gastric emptying disorders, acute gastric volvulus attacks, dependence on respiratory assistance, withdrawal failure and growth retardation.

Surgical folding of the diaphragm under laparoscopy is the most common procedure. It consists of reducing pulmonary compression, stabilizing the thoracic base, the mediastinum, and supporting the respiratory and abdominal muscles [18]. There is no consensus on the timing of surgical repair, early bending appears to be beneficial for respiratory improvement compared to slow spontaneous recovery.

The suggested optimal age for surgery for obstetric trauma with diaphragmatic paralysis ranges from 19 days to 45 days [8].

Recent studies suggest that surgical repair should be considered quickly despite the possibility of spontaneous recovery, especially for infants with respiratory failure.

In our case, the decision to abstain from surgery was made with increased monitoring.

Atelectasis and recurrent pneumonia are the most common medium-term complications [13]. In the most severe cases, it can include persistent pulmonary hypertension, delayed neurological development and growth, and even death [19].

In general, spontaneous recovery is achieved between 7 days and 6 months [15]. Mortality is estimated at 10 - 15% [9,11].

The severity of brachial plexus palsy is not correlated with the severity of respiratory disease [9], but the concomitant combination of the two disorders predicts poor recovery of the motor brachial plexus injury [10].

Conclusion

The management of diaphragmatic paralysis includes supportive care, respiratory and dietary management for a favorable conservative course. Its therapeutic management is discussed on a case-by-case basis.

Phrenic injury following obstetric trauma is preventable through pregnancy monitoring, planning of high-risk deliveries in an appropriate hospital setting, and close monitoring in the event of brachial plexus injury.

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