CASE REPORT

Successful application of helmet non-invasive ventilation in a parturient with acute respiratory distress syndrome

L. FRASSANITO, G. DRAISCI, R. PINTO, R. MAVIGLIA, S. M. MAGGIORE

Department of Anesthesiology and Intensive Care, Policlinico Agostino Gemelli, Sacro Cuore Catholic University, Rome, Italy; Policlinico Agostino Gemelli, Sacro Cuore Catholic University, Rome, Italy

ABSTRACT

Acute respiratory distress syndrome (ARDS) is an important cause of morbidity and mortality during pregnancy. The case of a twin pregnant woman in her 28th week who developed infection-related ARDS, undergoing a cesarean section for premature membrane rupture is described. It was performed epidural anaesthesia and helmet non-invasive ventilation (NIV) during the postoperative period. The combination of epidural anesthesia with NIV helped to restore physiological gas-exchange and to prevent common complications associated with a more invasive approach. *(Minerva Anestesiol 2011;77:1-2)*

Key words: Respiratory distress syndrome, adult - Pregnancy - Ventilation.

Acute respiratory distress syndrome (ARDS) is an important cause of morbidity and mortality during pregnancy, and it has been related to pyelonephritis, tocolitic use, sepsis, abruptio placenta, disseminated intravascular coagulopathy, chorioamnionitis, sickle cell disease, and preeclampsia-eclampsia[1,2]. We report a case of a 28th week-pregnant woman with ARDS who underwent a cesarean section under regional anesthesia for premature membrane rupture, and was successfully managed with noninvasive ventilation (NIV) in the post-operative period.

Case report

a 32-year-old twin pregnant woman was admitted for preterm labor at 24 weeks. After 12 days of IV Ritodrine therapy, cervical cerclage was performed with no complications. Gynecological examination showed no membrane rupture; coproculture, vaginal stub and blood cultures were negative. The patient was discharged from hospital to home with oral Ritodrine therapy. After a month, the patient was admitted to the emergency department with tachypnea and fever, acute onset of dyspnea and bilateral mid-basal crackles at thorax auscultation. Chest X-ray showed bilateral basal alveolar infiltrates and pleural effusion, while arterial blood gases revealed a severe hypoxemia ($PaO2/FiO_2$=175) and hypocapnia ($PaCO_2$=28.9 mmHg). Hemodynamics was stable, with no clinical evidence of left ventricular failure. The only, significant biochemical alteration was a leukocytosis ($12.80x10^9$/L). Blood and sputum specimens for microbiological cultures were obtained, and antibiotic therapy with intravenous ceftriaxone and claritromicyn was started. Gynecological and ultrasound examination showed membrane rupture for one of the twins, and it was decided to perform urgent cesarean section under regional anesthesia. Previous test-dose lidocaine 2% 3

ml plus Epinephrine 1: 200000, ropivacaine 0.75% 20 ml plus sufentanyl 10 micrograms was then given in refracted doses via an epidural catheter placed at L3-L4 level. O_2-therapy was started by facial mask at FiO_2=1. Hemodynamic and respiratory parameters were continuously monitored and remained stable throughout the caesarean section.

The clinical conditions of the twins at birth were satisfactory (weight: 1 170 and 1 130 g, APGAR score: 8-9 and 7-8 the first and the second twin, respectively). After one hour, however, the second twin developed hypoxia and bradycardia necessitating oro-tracheal intubation and mechanical ventilation. After caesarean section, the patient's respiratory condition worsened, with severe oxygenation impairment (PaO_2/FiO_2<100), dyspnea and tachypnea (respiratory rate 39/min). A NIV trial through an helmet was started (pressure support of 12 cmH_2O, PEEP 10 cmH_2O, FiO_2 0.6) and she was transferred to the Intensive Care Unit (ICU). Blood and sputum cultures were negative. NIV was well tolerated and, after 12 hours of continuous application, dyspnea, tachypnea (respiratory rate 15/min), and oxygenation (PaO_2/FiO_2=479 with FiO_2=0.28) remarkably improved. NIV was interrupted, and after 48 hours the patient was transferred to the obstetric ward. After 7 days, chest X-ray showed the complete resolution of opacities and pleural effusions and the patient was discharged at home.

Discussion

The prevalence of ARDS during pregnancy has been estimated at 16-70 cases per 100 000 pregnancies[2]. Most of the available data come from case reports or small series in which pregnancy-related ARDS is attributed to pyelonephritis, tocolitic use, sepsis, abruptio placenta, disseminated intravascular coagulopathy, chorioamnionitis, sickle cell disease, or preeclampsia-eclampsia.[1, 2]

Since oral ritodrine treatment is unlikely to cause respiratory failure[3] and there was no evidence of cardiac failure, ARDS in our patient was presumably triggered by an infection consequent to premature membrane rupture. Indeed, the cervical cerclage performed during the 24th week is a known risk factor for such complication,[1] although microbiological samples were negative. The timing of delivery is crucial when ARDS develops during pregnancy, and delivery is considered as a therapeutic option[4]. In our case, the choice of regional anesthesia for the cesarean section was taken to prevent potentially fatal consequences of difficult airway management in an already hypoxemic patient.[5-7] Moreover, some data suggest that epidural analgesia can have a beneficial effect on oxygen balance in critically ill parturients, by increasing oxygen delivery and decreasing oxygen consumption.[8]

Performing loco-regional anesthesia in the presence of systemic infection is still a controversial topic. Many authors suggest that this technique is acceptable only with antibiotic coverage.[9-11]

We decided to apply a non-invasive ventilatory approach to treat this pregnancy-related case of ARDS. Several studies have shown that in conscious and collaborative patients NIV can be a safe and effective option in the treatment of acute hypoxemic respiratory failure, since it improves gas exchange and reduces the incidence of complications related to invasive mechanical ventilation.[12, 13] The application of NIV through an helmet led to a rapid improvement in clinical conditions. It has been reported that the use of helmet is associated with better tolerance and less complications than face mask, thus allowing to deliver NIV continuatively, for a longer period of time.[13, 14] It is likely that the prolonged and continuative administration of NIV with helmet contributed to the rapid improvement of acute respiratory failure in our patient. Non invasive ventilation has been poorly evaluated for the treatment of hypoxemic respiratory failure during pregnancy, but it does seem to be a safe and effective treatment for sleep-disordered breathing during pregnancy, pulmonary edema due to tocolytic drugs, and has been found to minimize the hemodynamic changes that accompany preeclampsia.[2, 15]

To our knowledge, this is the first case in which a non-invasive ventilatory support was applied in a pregnancy-related case of ARDS. The application of NIV proved to be successful, with a

rapid restoration of physiological breathing and potentially preventing complications associated with a more invasive approach.

References

1. Catanzarite V, Willms D, Wong D, Landers C, Cousins L, Schrimmer D. Acute respiratory distress syndrome in pregnancy and the puerperium: causes, courses and outcomes. Obstet Gynecol 2001;97(5 Pt 1):760-4.
2. Cole DE, Taylor TL, McCullough DM, Shoff CT, Derdak S. Acute respiratory distress syndrome in pregnancy. Crit Care Med 2005;33(10 Suppl):s269-78.
3. Kayacan N, Dosemeci L, Arici G, Karsli B, Erman M. Pulmonary edema due to ritodrine. Int J Clin Pharmacol Ther 2004;42:350-1.
4. Daily WH, Katz AR, Tonnesen A, Allen SJ. Beneficial effect of delivery in a patient with adult respiratory distress syndrome. Anesthesiology 1990;72:383-6.
5. Cavaliere F, Mascia L, Terragni P. Year in review in Minerva Anestesiologica, 2008. Minerva Anestesiol 2009;75:163-7.
6. Caraceni A, Cavaliere F, Galante D, Landoni G. A year in Review in Minerva Anestesiologica, 2009. Minerva Anestesiol 2010;76:158-68.
7. Morgan BM, Aulakh JM, Barker JP, Reginald PW, Goroszeniuk T, Trojanowski A. Anesthetic morbidity following Cesarean section under epidural or general anesthesia. Lancet 1984;1:328-30.
8. Ackerman WE 3rd, Molnar JM, Juneja MM. Beneficial effect of epidural anesthesia on oxygen consumption in a parturient with adult respiratory distress syndrome. Southern Med J 1993;86:461-4.
9. Goodman EJ, DeHorta E, Taguiam JM. Safety of spinal and epidural anesthesia in parturients with chorioamnioitis. Regional Anesthesia 1996;21:436-41.
10. Philip J, Alexander JM, Sharma SK, Leveno KJ, McIntire DD, Wiley J. Epidural analgesia during labor and maternal fever. Anesthesiology 1999;90:1271-5.
11. Gonen R., Korobochka R, Degani S, Gaitini L. Association between epidural analgesia and intrapartum fever. Am J Perinatol 2000;17:127-30.
12. Chiumello D, Caironi P, Colombo R, Grasso S, Gattinoni L. A year in review in Minerva Anestesiologica, 2008. I Critical Care. Experimental and clinical studies. Minerva Anestesiol 2009;75:47-57.
13. Antonelli M, Conti G, Esquinas A, Montini L, Maggiore SM, Bello G *et al.* A multiple-center survey on the use in clinical practice of noninvasive ventilation as a first-line intervention for acute respiratory distress syndrome. Crit Care Med 2007;35:18-25.
14. Chiumello D, Caironi P, Grasso S, Terragni PP, Mascia L, Suter P. A year in review in Minerva Anestesiologica 2009. I critical care. Experimental and clinical studies. Minerva Anestesiol 2010;76:73-84.
15. Perbet S, Constantin JM, Bolandard F, Vignaud M, Gallot D, Chanséaume S *et al.* Non-invasive ventilation for pulmonary edema associated with tocolytic agents during labour for a twin pregnancy. Can J Anesth 2008;5:769-73.

Received on April 30, 2010 - Accepted for publication on November 23, 2010.

Corresponding author: Dr. L. Frassanito, Department of Anesthesiology, Policlinico A. Gemelli, Sacro Cuore Catholic University, Largo A. Gemelli 8, 00168 Rome, Italy. E-mail: lucfras75@hotmail.com