LETTER TO THE EDITOR

Prolonged prone position in pregnant woman with COVID-19 pneumonia

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Abstract

The manuscript describes a case report of 2 prolonged prone position cycles (72 h each) of a coronavirus disease 2019 pneumonia in an intubated pregnant woman (at 22 weeks of gestational age), being successfully discharged from intensive care unit after 20 days. There were no signs of fetal sufferance at daily obstetric monitoring during prone position, and the fetus was born fully vital and without consequences.

At our knowledge, this is the first case of prolonged prone position in a pregnant woman, and we feel that our manuscript could be a valuable contribution to the literature and help intensivists in providing intensive care in these patients, confirming that prone position seems to be a valid therapeutic choice, limiting maternal and fetal hypoxia, and reducing their morbidity, even if the oculate risk/benefit should be performed. Further studies are however necessary to increase the knowledge and the good management of COVID-19 in pregnancy.

Keywords: COVID-19, Prone position, ARDS

To the Editor,

From the beginning of COVID-19 (coronavirus disease-19), we gained more data on disease severity, course, and treatment of patients affected by this disease. However, limited data are available about intensive care unit (ICU) conduct particularly on the application of prolonged prone position ventilation [1] in severe acute respiratory distress syndrome (ARDS) pregnant patients [2, 3].

Here we report a case of a 40-year-old Moroccan woman, at the 22th week of gestational age, with only hypothyroidism in anamnesis. She was admitted to our Emergency department for COVID-19 bilateral pneumonia, after 10 days from the beginning of symptoms (fever and cough), and after 2 days of hospitalization in the medical department, where respiratory dynamic and exchanges worsened, although incremental FiO2. At ICU admission (day 0, D0) she had tachypnea and severe hypoxia (PaO2/FiO2 of 60 in high flow nasal cannula (HFNC)). She was initially treated with steroids (dexamethasone 6 mg daily for 7 days), prophylactic Low Molecular Weight Heparin and non-invasive ventilation with full-face mask, reaching a PaO2/FiO2 of 116. Lung ultrasounds were provided daily to the patient [4], documenting multiple subpleural anterior, posterior and inferior lung consolidations, without pneumothorax or pleural effusion occurrence. Her first chest radiography is reported in Fig. 1A. But on D2, for clinical worsening and an increasing severe dyspnea and after a collegial discussion involving also our gynecological department, she was intubated and pronated, undergoing a first long-prone position cycle (72 h, according to our hospital protocol), limiting abdominal and pelvic compression with proper positioning and cushions. The patient was firstly treated with prophylactic dosage of ceftriaxone (5 days), then with vancomycin for increase in inflammation indices and an isolation of a Staphylococcus Aureus in a Braoncoaspiratus. Best PEEP was determined every 12 h, determining it according to our protocols [5]. During the first cycle of the prone position she initially required high Positive End-Expiratory Pressure (PEEP of 14 cmH2O, after 36 h reduced to 12 cmH2O), with a driving pressure of 12 cmH2O, after 48 h (D4) reduced to 10 cmH2O, and a respiratory rate of 16, on D4 reduced to 14, reaching a PaO2/FiO2 of 234 when she was...
supinated (after 72 h, on D5); However during the first 24 h of supination (still curarized, on D6) her respiratory parameters worsened, so she underwent a second cycle of prolonged prone position, requiring similar ventilation settings. After another 72 h, she reached a P/F of 290, so she was finally supinated at D9. PaCO$_2$ was always maintained at a range 35–45 cmH$_2$O. Daily intra-abdominal pressure (IAP) was also performed, starting from an IAP of 10 cmH$_2$O (in the supine position) and reaching a maximum of 13 during prone position. However, since the best PEEP titration in patients with increased IAP is still debated [6], we titrated it on the sole base of ARDS protocols [5]. No maternal complications due to prolonged prone position were observed, and daily and obstetric monitoring of fetal well-being with cardiotocography and weekly ultrasounds and maternal uterine artery Doppler flow velocimetry were performed; Even if an umbilical arterial systolic/diastolic ratio decrease can be expected in the prone position [7], we did not observe them, maybe because obstetric evaluations were performed in right lateral decubitus when the patient was in the prone position. However, no fetal sufferance signs were shown.

She was finally extubated on D15 (Fig. 1B), supported with HFNC until discharge in the medical department (D20), and finally discharged from the hospital on D26. All of the obstetric monitoring showed fetal activity, compatible with the maternal sedation status.
This woman underwent a cesarean section at 38 weeks and 6 days of pregnancy, with a female newborn who was fully vital (5 min—Apgar score of 10).

According to our case, intubation and prolonged prone position seems to be compatible with fetal survival, at least within the second quarter of pregnancy; intubation and prolonged prone position have to be considered as the “last chance” for pregnant women, performing an oculate risk/benefit evaluation; however, we can confirm their rule in limiting maternal and fetal hypoxia, and in reducing their morbidity [8, 9].

Further studies are however necessary to increase the knowledge and the good management of COVID-19 in pregnancy.

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Authors’ contributions
Study concept: F.L., M.C., M.P. Data analysis: all authors. Discussion of results: all authors. Manuscript drafting and final manuscript revision: F.L., M.C, M.P. Critical revision of the final manuscript: E.B., V.O. The authors read and approved the final version of the manuscript.

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Authors declare that the datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
The authors declare that the patient has given full informed consent to publish her data.

Competing interests
The authors declare that they have no competing interests.

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References
1. Casetti A, Damia Paciarini A, Marini B, Pantanetti S, Adrario E, Donati A (2020) Prolonged prone position ventilation for SARS-CoV-2 patients is feasible and effective. Critical care (London, England) 24(1):225. https://doi.org/10.1186/s13054-020-02956-w
2. Thompson JL, Nguyen LM, Noble KN, Aronoff DM (2020) COVID-19-related disease severity in pregnancy. Am J Reprod Immunol (New York, NY: 1989) 84(5)e13339. https://doi.org/10.1111/aji.13339
3. Wang CL, Liu YY, Wu CH, Wang CY, Wang CH, Long CY (2021) Impact of COVID-19 on Pregnancy. Int J Med Sci 18(3):763–767. https://doi.org/10.7150/ijms.49923
4. Vetrugno L, Sala A, Orso D, Merci F, Fabbro S, Boero E, Valenti F, Cammarota G, Restaino S, Vizzielli G, Girometti R, Merelli M, Tascini C, Bove T, Driul L; PINK-CO study investigators. (2022) Lung Ultrasound Signs and Their Correlation With Clinical Symptoms in COVID-19 Pregnant Women: The “PINK-CO” Observational Study. Front Med. 218(1768261. https://doi.org/10.3389/fmed.2021.768261. PMID: 35127744; PMCID: PMC8814327.
5. Gattinoni L, Collino F, Maolo G, Rapetti F, Romitti F, Tonetti T, Vasques F, Quintel M (2017) Positive end-expiratory pressure: how to set it at the individual level. Ann Transl Med 5(14):288. https://doi.org/10.21037/atm.2017.06.64
6. Regli A, Pelosi P, Malbrain MLNG (2019) Ventilation in patients with intra-abdominal hypertension: what every critical care physician needs to know. Ann Intensive Care 9(1):52. Published 2019 Apr 25. https://doi.org/10.1186/s13613-019-0522-y
7. Nakai Y, Mine M, Nishio J, Maeda T, Imanaka M, Ogita S (1998) Effects of maternal prone position on the umbilical arterial flow. Acta Obstet Gynecol Scand 77(10):967–969
8. Guérin C, Reignier J, Richard JC, Beuret P, Gacouin A, Boulain T, Mercier E, Badet M, Mercat A, Baudin O, Clavel M, Chatellier D, Jaber S, Rosselli S, Mancebo J, Sirotot M, Hilbert G, Bengler C, Richette J, Gainnier M, PROSEVA Study Group (2013) Prone positioning in severe acute respiratory distress syndrome. New Engl J Med 368(23):2159–2168. https://doi.org/10.1056/NEJMoa1214103
9. Galatsou E, Kostanti E, Svarna E, Kitsakos A, Koulouras V, Efremidis SC, Nakos G (2006) Prone position augments recruitment and prevents alveolar overinflation in acute lung injury. Am J Respir Crit Care Med 174(2):187–197. https://doi.org/10.1164/rccm.200506-899OC

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