

Cesarean Delivery for Life-Threatening Status Asthmaticus

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BACKGROUND: Asthma remains a common chronic illness in pregnancy with the potential for catastrophic complications. Most women with asthma exacerbation can be treated with medical management and continuation of pregnancy. However, refractory cases may necessitate delivery for fetal or maternal indications.

CASE: We report a case of status asthmaticus at 33 weeks of gestation with significant maternal respiratory acidosis and difficulty with ventilation necessitating delivery by cesarean delivery in the medical intensive care unit. The patient was unresponsive to standard medical therapies. Delivery resulted in immediate improvement in maternal ventilation parameters.

CONCLUSION: In cases of life-threatening status asthmaticus refractory to standard medical and ventilatory therapies in the third trimester, cesarean delivery should be considered as a final effort to increase tidal volumes and improve maternal gas exchange.

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Asthma is the most common potentially serious chronic illness that complicates pregnancy.¹ It affects approximately 4–8% of pregnancies and has been associated with poor pregnancy outcomes such as preterm delivery, perinatal mortality, preeclampsia, and low birth weight.¹ A prospective cohort of women with asthma in pregnancy demonstrated that poor out-

comes are relatively rare, and adherence to asthma therapy can result in improved perinatal and maternal outcomes.² However, approximately 8% of women with mild asthma and 65% of women with severe asthma have a severe asthma exacerbation during the pregnancy¹ and less than 4% have refractory or difficult-to-control asthma.³ There are four reports of status asthmaticus in pregnant women requiring intubation and delivery as life-saving measures.^{4–6} Descriptions of these cases are lacking in the obstetric literature. We therefore describe a case of severe status asthmaticus refractory to maximum medical and ventilatory treatment requiring cesarean delivery followed by immediate improvement in ventilatory parameters.

CASE

A 32-year-old African American woman, gravida 3 para 2, at 33 weeks of gestation was brought in by emergency medical services in severe respiratory distress. At the time of arrival, her oxygen saturation was 95% on bilevel positive airway pressure. She was tripodding, tachypneic, tachycardic, and fatigued. Her medical history was significant for severe persistent asthma, a history of noncompliance with asthma therapy, intubation before her current pregnancy, and five hospitalizations for asthma exacerbations during this pregnancy. These five hospitalizations required medical intensive care unit (ICU) admission, intravenous steroids, continuous nebulized albuterol treatments, and bilevel positive airway pressure. Her current asthma medication regimen included albuterol, high-dose inhaled corticosteroid and long-acting beta-agonist combination, and montelukast.

On her arrival to the emergency department, continuous inhaled albuterol was initiated in addition to subcutaneous epinephrine and intravenous Solu-Medrol. A rapid respiratory viral panel was negative. Her arterial blood gas demonstrated respiratory acidosis with a pH of 7.16, PaCO₂ 68 mm Hg, and PaO₂ 94 mm Hg. She was intubated with a paralytic agent for respiratory failure and transferred to the medical ICU.

In the medical ICU she remained extremely difficult to ventilate despite paralytics, continuous albuterol, and intermittent ipratropium. Sodium bicarbonate was administered for severe refractory respiratory acidosis. Despite positive inspiratory pressure of 45 cm H₂O and positive end expiratory pressure of 8 cm H₂O, the patient's tidal volume was 200 mL per inspiration and a repeat arterial blood gas noted pH 7.19, PaCO₂ 79 mm Hg, and PaO₂ 36 mm Hg. She then developed shock requiring vasopressor support with norepinephrine likely resulting from increased intrathoracic pressure causing decreased cardiac output and increased pulmonary vascular resistance.⁷ Electronic fetal monitoring demonstrated a normal heart rate with decreased variability and no accelerations or decelerations. Given the patient's critical condition,

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the decision was made to proceed with a cesarean delivery. She was felt to be unstable for transport to the operating room, so the delivery was performed in the medical ICU with intensivists, neonatologists, and anesthesiologists present.

A 33-week male neonate weighing 1,810 g with Apgar scores of 3 at 1 minute and 4 at 5 minutes was delivered and transferred to the newborn ICU. Umbilical artery cord gases revealed a pH of 7.19 and base excess of negative 0.6. The neonate is currently doing well, with no evidence of neurologic compromise.

Immediately after delivery of the neonate, the patient's tidal volumes improved to 450–500 mL per inspiration. Peak inspiratory pressures decreased from 45 cm H₂O to 28 cm H₂O, and FiO₂ decreased from 80% to 40% within minutes of delivery. Her respiratory condition improved dramatically within the next 24 hours with arterial blood gases 8 hours later as follows: pH 7.43 and PaCO₂ 26 mm Hg. The patient was extubated on postpartum day 1 and started on prednisone, albuterol, and an inhaled corticosteroid and beta-agonist combination. She was discharged on postpartum day 10 in stable condition without respiratory complaints.

COMMENT

Status asthmaticus is a life-threatening event for the pregnant woman and her fetus, often requiring intubation and ICU admission. Existing literature notes that most patients improve after intubation and treatment with albuterol and intravenous corticosteroids with subsequent delivery at term.^{6,8} It is rarely necessary to perform a cesarean delivery for an acute asthma exacerbation.¹ However, in refractory cases, cesarean delivery may improve tidal volumes by increasing diaphragmatic excursion thereby improving maternal ventilation, as was the case with our patient.

Respiratory physiology is unique in pregnancy because the maternal cardiorespiratory system undergoes significant changes to optimize oxygen delivery to the fetus and maternal tissues.¹ Physiologic changes of the respiratory system in pregnancy include an increase in maternal minute ventilation resulting from an almost 50% increase in tidal volume, from approximately 500 to 700 mL per inspiration, because the respiratory rate remains unchanged.¹ In addition, there is approximately a 20% decrease in the functional residual capacity from 1,200 mL to 1,000 mL. The consequence of the resulting hyperventilation of pregnancy is a compensated respiratory alkalosis.

The management of status asthmaticus in pregnancy consists of first maximizing medical treatment with the administration of bronchodilators, intravenous magnesium, and systemic steroids. Initial attempts at noninvasive ventilation should be made before proceeding with intubation given the increased risk of

aspiration and laryngeal edema associated with pregnancy. If women are refractory to these treatments, intubation and mechanical ventilation can be used. The use of mechanical ventilation attempts to limit hyperinflation and barotrauma by providing a low respiratory rate and permissive hypercapnia. Autopositive end-expiratory pressure should be measured with end-expiratory pause and positive end-expiratory pressure set to approximately 80% of the measured value to decrease patient effort needed to trigger a breath.⁹

In the literature, we found only four case reports of pregnant women with life-threatening refractory status asthmaticus necessitating delivery (PubMed search for asthma, status asthmaticus, pregnancy, cesarean on July 15, 2012).^{4–6,10} Significant improvement was observed after cesarean delivery in all cases. In 1984, Gelber et al⁴ reported two cases of severe maternal asthma exacerbations at 26 and 32 weeks of gestation with significant improvement of pulmonary status within 24 hours of delivery. Similarly, Siddiqui et al⁵ report a case of a woman at 30 weeks of gestation who was intubated for 6 days and ultimately delivered for a nonreassuring fetal heart rate tracing with rapid improvement of maternal status within 24 hours of delivery. One additional reported case at 34 weeks of gestation demonstrated improvement with cesarean delivery.⁶ None of these cases were reported in the obstetric literature, and only one other case at 18 weeks of gestation documents the dramatic improvement in ventilatory requirements that we witnessed immediately after delivery.⁵

Obstetricians are an integral part of the multidisciplinary team who will care for these women and should be aware of the potential for increased tidal volumes and improved ventilation if delivery is undertaken in the third trimester for refractory cases of status asthmaticus. If medical and ventilatory management has been maximized with no improvement or clinical deterioration, cesarean delivery should be considered as a final potentially life-saving effort on maternal and fetal behalf.

REFERENCES

1. Creasy RK, Resnik R, Iams JD, Lockwood CJ, Moore TR, editors. *Creasy and Resnik's maternal-fetal medicine: principles and practice*. 6th ed. Philadelphia (PA): Saunders; 2009.
2. Dombrowski MP. Should the definitions of asthma severity be modified during pregnancy? *Am J Obstet Gynecol* 2000;182:S167.
3. Proceedings of the ATS Workshop on Refractory Asthma. Current understanding, recommendations, and unanswered questions. *Am J Respir Crit Care Med* 2000;162:2341–51.
4. Gelber M, Sidi Y, Gassner S, Ovadia Y, Spitzer S, Weinberger A, et al. Uncontrollable life-threatening status asthmaticus—an indicator for termination of pregnancy by cesarean section. *Respiration* 1984;46:320–2.



5. Siddiqui AK, Gouda H, Multz AS, Steinberg H, Kamholz SL. Ventilator strategy for status asthmaticus in pregnancy: a case-based review. *J Asthma* 2005;42:159–62.
6. Elsayegh D, Shapiro JM. Management of the obstetric patient with status asthmaticus. *J Intensive Care Med* 2008;23:396–402.
7. Rosengarten PL, Tuxen DV, Dziukas L, Scheinkestel C, Merrett K, Bowes G. Circulatory arrest induced by intermittent positive pressure ventilation in a patient with severe asthma. *Anaesth Intensive Care* 1991;19:118–21.
8. Gilchrist DM, Friedman JUM, Werker D. Life-threatening status asthmaticus at 12.5 weeks gestation. Report of a normal pregnancy outcome. *Chest* 1991;100:285–6.
9. Gladwin MT, Pierson DJ. Mechanical ventilation of the patient with severe chronic obstructive pulmonary disease. *Intensive Care Med* 1998;24:898–910.
10. Topilsky M, Levo YI, Spitzer SA, Lewinski U, Atsmon A. Status asthmaticus in pregnancy; a case report. *Ann Allergy* 1974;32:151–3.

Management of Uterine Bleeding During Hematopoietic Stem Cell Transplantation

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BACKGROUND: Hematopoietic stem cell transplant is an effective treatment strategy for a variety of hematologic disorders, but patients are at risk for dysfunctional coagulation and abnormal bleeding. Gynecologists are often consulted before transplant for management of abnormal uterine bleeding, which may be particularly challenging in this context.

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CASE: A premenopausal woman with MonoMAC (a rare adult-onset immunodeficiency syndrome characterized by monocytopenia and *Mycobacterium avium* complex infections resulting from mutations in *GATA2*, a crucial gene in early hematopoiesis) presented with pancytopenia, evolving leukemia, and recent strokes, necessitating anticoagulation. During preparation for hematopoietic stem cell transplant, she experienced prolonged menorrhagia requiring transfusions. Surgical therapy was contraindicated, and medical management was successful only when combined with balloon tamponade.

CONCLUSION: Balloon tamponade may be a potentially life-saving adjunct to medical therapy for control of uterine hemorrhage before hematopoietic stem cell transplant.

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Regardless of the indication for hematopoietic stem cell (HSC) transplant, the management of patients in the peritransplant period is complex and benefits from an interdisciplinary approach. Gynecologists are often consulted before transplant for contraception counseling and also for menses suppression because underlying disease-related cytopenia, coupled with thrombocytopenia occurring with conditioning chemotherapy, predisposes patients to potentially life-threatening menorrhagia.¹ The management of uterine bleeding in the context of HSC transplant can be difficult because typical methods of menses suppression may be contraindicated and others may not be successful.

“MonoMAC” is a recently described adult-onset immunodeficiency syndrome characterized by monocytopenia and *Mycobacterium avium* complex infections resulting from mutations in *GATA2*, a crucial gene in early hematopoiesis.^{2,3} In addition to peripheral monocytopenia, patients with MonoMAC have profound B and NK lymphocytopenia. They are susceptible not only to disseminated nontuberculous mycobacterial infections, but also to viral infections, specifically severe extensive human papillomavirus disease, and disseminated fungal infections. Development of myelodysplasia and leukemic transformation are common. HSC

