

Continuous Hemofiltration as an Alternative to Therapeutic Plasma Exchange Therapy in the Management of Acute Fatty Liver of Pregnancy: A Case Report

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Abstract

Case Report

Acute Fatty Liver of Pregnancy (AFLP) is a rare but serious condition that can result in significant maternal and fetal morbidity and mortality. Although fetal extraction is currently the only curative treatment, advances in extrarenal purification techniques such as plasmapheresis have helped to significantly decrease associated mortality rates. However, in cases where major organ dysfunction is present with major hemodynamic instability, plasmapheresis alone may not be adequate or even detrimental, thus imposing alternative therapeutic options. In this report, we present a case study of a 51-year-old primiparous patient who was 34 weeks pregnant and developed AFLP complicated by postpartum hemorrhage, multi-organ failure, and hemodynamic instability. The patient was successfully treated with isolated continuous venovenous hemofiltration (CVVH) resulting in a favorable clinical outcome.

Keywords: Acute hepatic steatosis of pregnancy; continuous hemofiltration; multiorgan failure; Sheehan's disease; hemostasis disorder.

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INTRODUCTION

In 1940, Sheehan identified acute fatty liver of pregnancy (AFLP) as a distinct clinical entity [1]. However, the exact causes and mechanisms of this condition remain unclear. Maternal mortality in AFLP is associated with serious complications such as disseminated intravascular coagulation, hepatic encephalopathy, and acute renal failure [2]. AFLP is a severe disorder that typically arises during the third trimester of pregnancy or in the postpartum period. The incidence of AFLP is estimated to affect one in every 7,000 to 16,000 pregnancies [3]. Although the mainstay of treatment for AFLP is prompt fetal delivery, complications may require additional therapies, including continuous extrarenal purification techniques.

We present a case report of a patient with acute fatty liver of pregnancy complicated by multi-organ failure in the intensive care unit.

OBSERVATION

This is a case study of a 51-year-old primigravida nullipara patient with a well-monitored 34 weeks of gestation pregnancy conceived through

medically assisted procreation with no significant past medical history.

Her symptoms date back to two weeks before admission, with dizziness and epigastric pain relieved by vomiting, as well as a polyuric-polydipsic syndrome. On physical examination, she appeared conscious, with jaundiced skin and mucous membranes, hypertension at 140/80 mm Hg, normal heart rate at 85 beats per minute, polypnea at 22 cycles per minute, pulse oxygen saturation at 100% in ambient air, normal blood glucose at 0.86g/l, the temperature at 37.6°C, and no lower limb edema. Obstetric examination revealed a mono-fetal pregnancy. Abdominal, cardio-pulmonary, and neurological examinations were unremarkable.

Laboratory tests showed leukocytosis at 17,770/mm³, anemia at 6.4 g/dl, thrombocytopenia at 119,000/mm³, low prothrombin level at 25.9%, prolonged activated partial thromboplastin time (APTT) at twice the normal level, liver cytolytic activity at ten times the normal level, elevated lactate dehydrogenase (LDH) at seven times the normal value, hyperbilirubinemia at 78.3 mmol/l and acute kidney injury stratified KDIGO 3 classification.

Abdominal ultrasound showed a normal liver, spleen, and kidney, with a small amount of peritoneal effusion while Abdomino-pelvic computed tomography (CT) revealed a normal-sized liver with regular contours, and the presence of nodular formations, some of which were sub-capsular and rounded with fatty density, visible in segments III, IV, and VIII, measuring up to 11x8 mm in segment IV.

The diagnosis of AFLP was made based on seven Swansea criteria. An emergency cesarean section was performed, resulting in the birth of a healthy female infant. The patient experienced a postpartum hemorrhagic shock due to a hemoperitoneum, which required massive blood transfusion and surgical intervention, including triple ligation of the uterine artery, round ligament, and utero-ovarian ligament. Postoperative, the patient remained hemodynamically unstable, requiring high doses of vasoactive amines, including dobutamine, adrenaline, and noradrenaline, due to a vasoplegic sepsis-like profile. Her condition included bilateral unreactive mydriasis without oculomotor reflexes, and a transcranial doppler that was completely normal, with a pulsatility index of 0.8, diastolic velocity greater than 20 cm/s, anuria, and metabolic acidosis with a pH of 6.77 and $\text{HCO}_3^- = 3.2$ mmol/l. The patient underwent continuous hemofiltration with post-dilution flow of 35 ml/kg/h for 48 hours, and anticoagulation with heparin, resulting in hemodynamic improvement, rapid weaning from vasoactive drugs, improved myocardial contractility, and improved laboratory values. She was extubated after seven days of mechanical ventilation, and renal function normalized on the 14th day. The patient was discharged after 40 days of ICU hospitalization and a three-month follow-up showed the patient was in good mental and physical health.

DISCUSSION

Acute fatty liver of pregnancy (AFLP) is a rare but life-threatening complication of pregnancy with a high mortality rate especially in low-income regions due to late diagnosis and the lack of support treatment. Although the exact cause is not fully understood, It may be related to the increased estrogen in late pregnancy, fatty acid (long-chain 3-hydroxyacylcoenzyme A dehydrogenase metabolism disorders, and mitochondrial dysfunction [4]. These factors can cause direct liver damage by acid-induced lipotoxicity and microvesicular steatosis, a condition that can lead to liver failure, severe coagulopathy, and sepsis-like immune reactions associated with organ dysfunction often including renal failure. Diagnosis of this condition is based on clinical and laboratory criteria, with the Swansea criteria being an efficient diagnostic tool [2]. While prompt delivery remains the mainstay of management, many patients still present with severe complications and often require intensive medical support even after the pregnancy has concluded.

Therapeutic plasma exchange (TPE) is considered the first-line treatment for a majority of pregnancy-related pathologies, such as thrombotic microangiopathies, and has also been proposed for acute fatty liver of pregnancy (AFLP). TPE allows for the removal of 1 to 1.5 times the plasma volume per session, facilitating the elimination of molecules with high molecular weight up to 10^6 daltons [5]. This allows for the extraction of more than 70% of circulating immunoglobulins per session, with compensation by fresh frozen plasma and albumin. Given the immunological mechanism involved in the pathogenesis of AFLP, we believe that TPE may be a beneficial first-line treatment for this condition. However, the hemodynamic intolerance that can occur in unstable patients receiving high doses of vasopressors during TPE can be a significant obstacle to its implementation. Additionally, the removal of large molecules such as albumin and coagulation factors, which are necessary for patients with hepatic insufficiency, as well as the removal of immunoglobulins, which can increase the risk of infection, can be problematic. In light of these issues, we propose the use of continuous venovenous hemofiltration (CVVH) as an extrarenal clearance method, especially in patients with associated acute kidney injury. CVVH is a convection-based technique that allows for the filtration of large molecules of up to 50,000 daltons [6], including pro-inflammatory cytokines and ammonia, which are responsible for the neurological and hemodynamic symptoms observed in AFLP, while preserving albumin, coagulation factors, and necessary immunoglobulins. Moreover, in cases of acute kidney injury (AKI) often associated with AFLP, with extrarenal clearance criteria such as acidosis or anuria as in our patient, CVVH seems to be a good alternative with good hemodynamic tolerance.

Why hemofiltration instead of other RRT techniques?

Due to the molecular weight of the filtered molecules, CVVH has demonstrated its efficacy in certain case reports of septic patients or those in rescue therapy. It allows for the elimination of toxic molecules directly involved in the genesis of hemodynamic instability with a slow gradient of osmotic molecules, which allows for better cerebral tolerance and less risk of cerebral edema compared to diffusive techniques [7].

Wang *et al.* reported the combined use of TPE and continuous renal replacement therapy to improve clinical symptoms and laboratory characteristics, which significantly improved patient survival and management [2]. Another study by the team of Tang *et al.* on a cohort of 17 cases had a management strategy that involved CVVH + TPE [4]. Indeed, some patients who develop oliguric acute renal failure with metabolic acidosis are not good candidates for plasmapheresis, as it can induce a risk of acute lung edema due to its low filtration and the use of a large amount of fresh frozen plasma. The study by Tang *et al.*, demonstrated that

timely CVVH allowed patients to smoothly transition to the diuretic phase [4], and no patient died from any complication during the oliguric phase. This result proved that CVVH effectively stabilizes the metabolic compartment, leading to the recovery of renal function.

In our context, the patient received 48 hours of CCVH which allowed for the discontinuation of vasopressor drugs, as well as improvement in her laboratory test results, which ultimately contributed to the complete remission of the patient. AFLP remains difficult to study due to its low prevalence in the world. There is limited literature on its management with methods such as CCVH, which makes it interesting to investigate this therapy that can be used alone or in combination with other blood purification methods. Of course, the curative effects and economy of the method still require further study.

CONCLUSION

In summary, Acute Fatty Liver of Pregnancy (AFLP) is a rare yet severe complication that may result in multi-organ failure and maternal mortality. Optimal management requires appropriate prompt delivery and therapeutic support with plasma exchange or renal replacement therapies. In extremely unstable patients, continuous hemofiltration can be proposed as a rescue therapy with significant beneficial effects. Early recognition and timely treatment are vital in improving both maternal and fetal outcomes.

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