Left tilt position for easy extracorporeal membrane oxygenation cannula insertion in late pregnancy patients

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Abstract

The aim was to describe how to avoid technical difficulties during venous femoral cannula insertion for extracorporeal membrane oxygenation (ECMO) in a woman in late pregnancy.

A 28-year old pregnant woman presented at 32 weeks of gestation after developing an acute respiratory distress syndrome (ARDS) of an unknown origin that required venovenous ECMO insertion via the femoral vein. A cannula insertion by the Seldinger visual control technique was impossible in the supine position. A left lateral tilt between 15° and 30° was performed by placing a wedge-shaped cushion under the right hip permitting the cannula insertion. We proposed a systematic 15°–30° left lateral tilt position during the ECMO femoral cannula insertion in late pregnancy cases needing ECMO. This precaution should avoid an injury to the vessels due to multiple insertion attempts.

Keywords: Extracorporeal membrane oxygenation • Acute respiratory distress syndrome • Pregnancy • Aortocaval • compression • Left tilt

INTRODUCTION

Late pregnancy aortocaval compression in the supine position has previously been demonstrated by a cavo gram [1]. This feature has been recognized to be minor at least in 50% of the patients. In a small number of cases it leads to a supine hypotensive syndrome [2].

Extracorporeal membrane oxygenation (ECMO) support is instituted for the management of children and adults with life-threatening pulmonary and/or cardiac weakness when other treatment modalities fail [3,4]. Pregnant women may rarely develop acute respiratory distress syndrome (ARDS) and benefit from this kind of management [5]. We report a 28-year old pregnant woman at 32 weeks of gestation who developed ARDS in whom ECMO implantation was a challenge.

TECHNIQUE

A 28-year old pregnant woman (gravida 2, para 1, in the 32nd week of gestation) was admitted to the obstetric unit with a 2-day history of a uterine contraction. During her hospital stay, she developed fever and an acute inflammatory syndrome (Leucocytosis 26,800, CRP 33 mg/dl). Blood and urine cultures were done. Escherichia coli was found to be the germ in the urine cultures. Piperacillin-Tazobactam (4 g every 6 h intravenously) and oseltamivir (75 mg twice daily via an oral gastric tube) were started empirically. On the fourth day, the patient started to have dyspnoea, tachypnoea and respiratory distress. Her blood gases worsened (pH = 7.5, PaO2 = 62, PaCO2 = 27, oxygen saturation = 96% (with oxygen mask 50%); so she was transferred to the intensive care unit. She was in ARDS (severe hypoxaemia, PaO2/FiO2 120 mmHg, the four quadrants showing diffuse alveolar infiltrates on a chest X-ray film) and required immediate intubation. After 24 h of mechanical ventilation, her pulmonary functions continued to deteriorate (Murray Score = 3.5 : PaO2/FiO2 = 60 mmHg, the four quadrants showing diffuse alveolar infiltrates on a chest X-ray film, PEEP 14 mmHg, thoracic compliance 30); so a venovenous ECMO was indicated. As usual the device was placed bedside in a standard sterile fashion. The cannula insertion began with the patient in the supine position. A guide wire was introduced using visual control in the vena cava through the left femoral vein. Then, with the Seldinger technique, we tried to introduce 22F and 21F cannulas, but failed, as they seemed to bump into an obstacle even after dilatation. The same difficulty was found in the right femoral vein. Then we decided to tilt the patient by placing a wedge-shaped cushion under the right hip. In this position, the cannula advanced easily. A long 22F cannula was inserted in the right femoral vein and a 21F short cannula in the left femoral vein; the two were linked by a Y 3/8 joint and connected to the pump. Placing a 19F cannula in the left internal jugular vein under echography control completed the circuit. The system flow rate was 3l/min and after 2 days the patient’s condition improved, permitting weaning off the device (arterial blood gases before ECMO removal: Mechanical ventilation with FiO2 = 50%; pH = 7.43, PaO2 = 89 mmHg, PaCO2 = 37 mmHg). No bacterial or viral pathogens were detected in the blood culture.
endotracheal aspirates and lavages. A polymerase chain reaction was negative for current viruses including AH1N1 Influenza.

**DISCUSSION**

ECMO has become one of the treatments of choice for cardio-pulmonary failure [3,4]. Open or percutaneous cannula insertion is codified and can be easily performed through the femoral vessels [6,7]. Our case firstly underlines the possible challenges that are presented by ECMO cannula insertion in a pregnant woman. In fact, during late pregnancy, a situation that is well known to obstetricians and anaesthesiologists, the foetus may compress the vena cava leading to adverse effects such as the reduction of maternal cardiac output and foetal oxygenation. This condition may explain the difficulty faced in advancing a cannula through the guide wire in the vena cava (Fig. 1). Crawford proposed a 15° left lateral tilt to reduce the aortocaval compression during a caesarean section [8]. The left lateral tilt has also been recommended for the same reason in cardiopulmonary resuscitation in pregnant women [9]. Since a pregnant woman may present with a pulmonary or a cardiac failure (or both) and may derive benefit from ECMO implantation, physicians must be aware of the potential technical issues caused by the aortocaval compression. In some institutes, the double-lumen bi-caval cannula (Avalon Elite), which allows single-site cannulation through the internal jugular vein, if present, could be another solution for such a situation [10].

We conclude that it would be better for a pregnant woman to use the left lateral tilt position 15°–30° by the use of a rolled-up blanket, pillow, wedge-shaped cushion, inflatable device or a table tilt during femoral cannula insertion (Fig. 2). This precaution should avoid an injury to the vessels due to multiple insertion attempts. Further studies should be done to ascertain its reliability in mitigating the aforementioned technical difficulty.

**Conflict of interest:** None declared.
REFERENCES


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We read with great interest the paper by Ngatchou et al [1]. The 28-year old pregnant woman underwent a successful implantation of a veno-venous extracorporeal membrane oxygenation for acute respiratory distress syndrome of unknown origin. The insertion of the right and the left venous femoral cannula was facilitated by placing a wedge-shaped cushion under the right hip.

The authors stated that the left tilt position used in this case report is recommended for pregnant women in two situations: in a caesarean section and in cardiopulmonary resuscitation. However, the left lateral tilt position is also recommended in parturients undergoing cardiopulmonary bypass (CPB) for cardiac surgery. Reducing the compression of the inferior vena cava by the foetus is mandatory to allow for better venous return during CPB. This will prevent hypotension that occurs in case of poor venous return when the circulation goes from corporeal to extracorporeal. The collapse of peripheral resistance can bring about a brisk decrease of the mean arterial pressure and a secondary reduction of placental perfusion.

In the current era, CPB during pregnancy can be performed with relative safety when performed at tertiary centers with the expertise [2], however it is still associated with substantial morbidity and mortality [3]. We would like to share our experience relating to two parturients operated on an emergent basis with the use of CPB during the last three years at our institution and to highlight the important role of the left lateral tilt position during CPB. A 30-year-old woman at 26 weeks of gestation was admitted because of the acute onset of severe chest pain. Echocardiography revealed a tricuspid aortic valve with mild aortic regurgitation, and an acute aortic dissection involving the ascending aorta, which was also verified by a computed tomography scan. CPB was instituted between the right atriun and the right anterior artery. Hypothermia was avoided and the operation consisted of replacing the supracoronary ascending aorta. A 39-year-old woman underwent a successful pulmonary embolectomy at the 27th week of pregnancy. We performed surgical pulmonary embolectomy under CPB to restore adequate hemodynamic stability and to relieve strain on the right ventricle [4].

In both cases, the left lateral tilt position was applied and the venous return was very satisfactory. The pregnancies were carried to term and healthy newborns at 36 and 38 weeks of gestation were delivered, respectively.

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References