



CASE REPORT

ECMO in trauma patients—Should we consider alternative cannulation sites?

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Introduction

Pulmonary contusion is seen with blunt thoracic trauma and is often associated with polytrauma. Progressing respiratory failure can be challenging and despite maximal conventional respiratory management, mortality remains high.

Extra corporal membrane oxygenation (ECMO) has been safely used in trauma patients with acute respiratory failure and results in 50% survival. Early use of ECMO improves the outcome.⁵ Perchinsky et al.⁸ showed an improvement of survival when using ECMO in the resuscitation of massively injured trauma patients.

At the Department of Traumatology, University of Vienna Medical School, Austria, approximately 220 patients are treated annually with an injury severity score (ISS) >16. Baker's Injury Severity Score published in 1974 describes the overall severity of injuries and the probability of survival.²

We report about two polytraumatised patients with difficulties establishing the vascular access for ECMO in the groin due to elevated intraabdominal/pelvine compartment pressure.

Clinical summary

Case one

A 61-year-old woman attempted suicide by leaping from the third floor of a building. After standard shock management, a polytrauma CT scan was performed. CT scan showed bilateral intracerebral hematoma (AIS 5), bilateral contusion of the lung with haematopneumothorax and multiple rib fractures (AIS 5), unstable ring fracture of the pelvis with a retroperitoneal haematoma (AIS 4), an intrahepatic haematoma (AIS 2) and multiple open fractures of the long bones (AIS 3). Based on the AIS 90¹ the single scores were added up to an ISS of 66.

Despite maximal ventilatory support progressive respiratory failure made ECMO support necessary. Vascular access for ECMO was accomplished at the groin. After an easy insertion of the arterial cannula and placement of a distal perfusion cannula, the

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venous route could not be established. It was not possible to insert the cannula for more than 15 cm into the common femoral vein. The right jugular vein was used as an alternative. The patient died from haemodynamic shock despite regular function of ECLS 30 min later.

Case two

A 24-year-old woman was injured in a car accident. After primary shock management a polytrauma CT was performed. CT showed intracerebral contusion (AIS 3), a massive contusion of the right lung with a tension haematopneumothorax and multiple rib fractures (AIS 5), a pneumopericard with mediastinal emphysema (AIS 3), a major devascularization of the spleen (AIS 4), a liver laceration (AIS 2) and bilateral fractures of the scapula (AIS 2). Based on the injuries of head, thorax and abdomen an ISS of 50 was calculated.

Despite maximum ventilatory support progressive respiratory failure made ECMO support necessary. Standard vascular access was accomplished at the groin. Again, after an easy insertion of the arterial cannulas, the venous rout could not be established. Decompression laparotomy was performed and it was immediately possible to move the venous cannula forward into the correct position. The patient died due to severe intracranial haemorrhage 3 days later.

Comment

The use of ECMO has proven its usefulness in trauma patients with severe contusion of the lung and acute respiratory failure. Vascular access is usually accomplished by percutaneous Seldinger technique or by surgical approach. Manageable difficulties usually involve infections, dialysis, neurological events and limb complications.^{5,11}

The difficulties we faced in trying to insert the venous cannulas are most likely the result of the increased intraabdominal pressure and consecutive compression of the vena cava inferior and the iliac veins, due to massive bleeding in one case and the retroperitoneal haematoma associated with pelvic fractures in the other case. Effects of intraabdominal hypertension and abdominal compartment syndrome are well-documented.⁶ Pickhardt et al.⁹ reviewed preoperative CT scans of four patients with abdominal compartment syndrome and found extrinsic compression of the inferior vena cava caused in all cases by retroperitoneal haemorrhage

or exudates. Hessmann and Rommens³ reported three cases of ureteric obstruction and anuria due to massive retroperitoneal haematoma in association with a pelvic ring fracture. Decompression of the haematoma led to a prompt recovery of anuria and renal failure.

Traditionally in haemodynamic unstable polytraumatised patients we perform venoarterial ECMO with a femo-femoral circuit to provide cardiac support and assist systemic circulation. The right internal jugular vein can be used as a save additional drainage site¹⁰. Arterial access can also be gained through the right common carotid artery^{4,5} or the axillary artery.⁷

Based on our experience, alternative cannulation sites should be considered in patients with abdominal trauma or pelvic ring fractures requiring ECMO support due to severe thoracic trauma.

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