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The role of Venoarterial extracorporeal membrane oxygenation in the management of cardiogenic shock: A comprehensive review of clinical applications

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Abstract
Background: Extracorporeal membrane oxygenation (ECMO) has emerged as a pivotal intervention in managing cardiogenic shock (CS), a severe condition characterized by inadequate cardiac output leading to organ dysfunction. Despite advancements in medical therapy, the morbidity and mortality associated with CS remain high.
Methods: This review synthesizes current literature on venoarterial (VA) ECMO, focusing on its implementation in emergency settings for patients experiencing CS. We analyzed clinical studies and registry data to evaluate the efficacy, indications, and contraindications of VA ECMO, while also assessing hemodynamic outcomes and patient selection criteria.
Results: VA-ECMO provides immediate circulatory and respiratory support, facilitating organ recovery in patients unresponsive to conventional treatments. It is particularly beneficial in cases of acute myocardial infarction and fulminant myocarditis. However, the selection of suitable candidates is critical, as poor prognosis in certain patients limits the benefits of ECMO. Complications such as infection, bleeding, and device-related issues pose significant risks. Recent data from the Extracorporeal Life Support Organization (ELSO) registry indicate a marked increase in VA-ECMO utilization, with survival rates showing improvement, underscoring the need for standardized protocols.
Conclusion: VA-ECMO represents a vital therapeutic option for managing cardiogenic shock in emergency settings, offering a bridge to recovery or further interventions. However, careful patient selection and ongoing monitoring are essential to optimize outcomes and minimize complications. Future research should prioritize randomized controlled trials to establish evidence-based guidelines for ECMO use in cardiogenic shock.

Keywords: Extracorporeal membrane oxygenation, cardiogenic shock, venoarterial ECMO, patient selection, hemodynamic monitoring

Introduction
Cardiogenic Shock (CS) is a critical condition characterized by diminished cardiac output, leading to inadequate perfusion of vital organs and sometimes necessitating hemodynamic intervention [1, 2]. Hemodynamic parameters often used to characterize cardiogenic shock in clinical studies have included a systolic blood pressure of less than 90 mmHg for 30 minutes before the commencement of inotropic and vasopressor therapy, a cardiac index of 2.2 L/min/m² or lower, and an increased pulmonary capillary wedge pressure of 15 mmHg or more [1, 3]. End-organ hypoperfusion, characterized by tissue ischemia, altered mental state, oliguria, high arterial lactic acid levels, and multiorgan failure, constitutes essential aspects of circulatory shock and may assist in diagnosis. Cardiogenic shock may arise from an abrupt cardiac incident or the decompensation of preexisting chronic cardiomyopathy [4]. Acute myocardial infarction (AMI) is the predominant cause, responsible for around 80% of instances, with those exhibiting ST-segment elevation myocardial infarction facing the highest risk [5, 6].

Additional prevalent causes include chronic heart failure, fulminant myocarditis, valvular heart disease, high-risk pulmonary embolism, and hemodynamically unstable arrhythmias, with a rising prevalence of these etiologies [2, 7]. Cardiogenic shock (CS) is responsible for about 100,000 hospital admissions each year, and despite considerable progress in reperfusion treatment and mechanical circulatory support (MCS), CS continues to be linked with a substantial incidence of sequelae and markedly elevated patient morbidity and fatality rates [4, 8]. Extracorporeal membrane oxygenation has gained prominence during the last two decades and has shown efficacy in the therapy of cardiogenic shock [9, 10]. Venoarterial (VA) ECMO delivers swift and substantial biventricular circulatory and ventilatory assistance in cases of diminished cardiac output [3, 11]. It provides an opportunity for diagnostic and decisive treatments and possible organ recovery, often acting as a bridge to recovery, further decision-making, or destination therapy [1, 10, 12]. Despite the growing use and comprehension of VA-ECMO, and the general recommendations put forth by the Extracorporeal Life Support Organization (ELSO), the limited data from controlled trials regarding management, coupled with elevated complication and mortality rates, indicate persistent challenges and opportunities for enhancement [4, 10]. This paper presents a thorough and updated assessment of VA-ECMO and assesses the existing evidence about its use in cardiogenic shock (CS).

Venoarterial Extracorporeal Membrane Oxygenation

VA-ECMO, sometimes known as extracorporeal life support (ECLS), is a kind of cardiopulmonary bypass using a centrifugal flow pump, a membrane oxygenator, and venous input and arterial output cannulas. Extra ports may be included in the ECMO apparatus for ultrafiltration and hemodialysis purposes [13]. In ECMO, deoxygenated blood extracted from a central vein is routed via the membrane oxygenator, which facilitates the normalization of pCO2, pO2, and pH, before being reinfused into the systemic circulation via the centrifugal pump. Cardiac support may reach 6-7 liters of blood per minute [2, 14]. The pump may be configured to either partly or fully empty the heart by modifying flow and left ventricular unloading settings [15] (Figure 1).

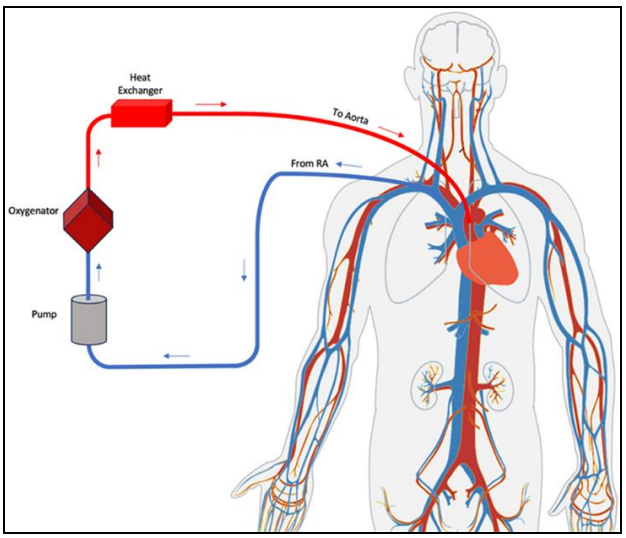

Fig 1: Central arrangement of VA ECMO

Cannulation may be performed centrally or peripherally [11, 16]. The judicious choice of cannula size is essential to mitigate the risk of vascular trauma and prevent adverse input and elevated outflow pressures: venous cannulas ranging from 18 to 28 Fr and arterial cannulas from 15 to 19 Fr are predominantly used [2]. In central cannulation, the venous inflow cannula is inserted directly into the right atrium, while the arterial outflow is positioned directly into the ascending aorta, facilitating natural anterograde circulation [16, 17]. Due to the invasive nature of the surgery, central cannulation is conducted in the operating room and is most often done on patients who cannot be weaned off cardiopulmonary bypass after cardiotomy [11, 16]. Peripheral cannulation is often executed using a percutaneous method or via surgical grafting of the peripheral vasculature [18]. In the femorofemoral arrangement, the input and outflow sites are the femoral vein and artery, respectively, leading to retrograde perfusion [16]. Peripheral cannulation may also include the arteries of the upper extremity, including the axillary, subclavian, or carotid arteries, facilitating anterograde perfusion, enhancing cerebral perfusion, and augmenting patient mobility [11, 16]. Moreover, in contrast to central cannulation, peripheral cannulation through the femoral approach can be executed safely outside the operating room, including in the catheterization laboratory, at the bedside in the emergency department or intensive care unit, or even remotely in the field during patient stabilization and transfer [10, 19, 20].

It is essential to recognize that VA-ECMO may also be performed using an innovative ambulatory method. In ambulatory ECMO, groin cannulation is circumvented, and enough oxygenation is ensured to enable patients to stand, move, and engage in vigorous physiotherapy, therefore mitigating deconditioning [21, 22]. No studies have yet been conducted to evaluate its safety and effectiveness in patients with CS; nevertheless, limited studies indicate safety and feasibility in meticulously chosen individuals, and many case reports demonstrate success when used as a bridge to cardiac transplantation [23, 24]. The majority of existing knowledge and experience on ambulatory ECMO pertains to patients with respiratory failure on venovenous (VV) ECMO who are awaiting lung transplantation [21, 25]. Ambulatory ECMO is linked to reduced deconditioning, enhanced rates of independent functioning, lower incidences of delirium, and shorter durations of ICU and hospital stays, suggesting it may become more prevalent in the management of patients with CS in the future [23, 26].

Upon the initiation of ECMO, it is imperative to conduct regular monitoring of hemodynamics and evaluate arterial and venous blood gases, in addition to gas samples from the VA-ECMO circuit, to ascertain that cardiac output and oxygenation facilitate myocardial recovery and aid in the restoration of renal, hepatic, and pulmonary function, acid-base equilibrium, coronary perfusion, and neurological condition [4, 10, 27]. The recommended flow target is typically 4-6 L/min, with a mean arterial pressure (MAP) target exceeding 60 mmHg, arterial oxygen saturation above 90%, and venous saturation above 60%. However, there is a paucity of literature and a lack of standardized guidelines concerning optimal titration and management [27-31]. Nevertheless, the use of VA-ECMO for cardiogenic shock has significantly escalated during the last twenty years in the ELSO registry. Utilizing data from approximately 15,000 adult patients-an expected increase of 1000%-the

examination of these instances may provide enough information to establish precise standardized criteria for effective patient therapy in the foreseeable future [11, 32, 33].

Indications and Contraindications for VA-ECMO

Patient selection is a critical but clinically demanding aspect of VA-ECMO implementation, intended to identify individuals with the greatest likelihood of recovery or suitability for destination treatment [10, 11, 34]. ELSO has proposed recommendations for indications and contraindications; nonetheless, the choice to start VA-ECMO must be tailored to the individual patient [4, 34]. It is essential to examine comorbidities, patient-specific risk factors, weaning tactics, and overall prognosis since patients with a poor probability of recovery are unlikely to benefit from invasive methods and may be more appropriately handled with a conservative approach [1, 4, 10].

Indications for VA-ECMO encompass cardiogenic shock unresponsive to standard medical and device interventions, predominantly in cases of acute coronary syndrome, acute on chronic decompensated heart failure, fulminant myocarditis, and failed weaning from cardiopulmonary bypass post-cardiotomy [10, 11, 31]. The usage of cesarean section owing to pulmonary hypertension leading to cor pulmonale and due to pulmonary embolism with hemodynamic compromise is less prevalent but is on the rise [4]. VA-ECMO may be used in cardiac arrest via extracorporeal cardiopulmonary resuscitation (ECPR) and in situations requiring temporary mechanical assistance as a bridge to left ventricular assist device (LVAD) implantation or cardiac transplantation [2, 4]. VA-ECMO has been identified as an efficient intervention for ventricular septal rupture and severe initial graft failure after cardiac transplantation [35-38]. Moreover, case reports have shown the use of VA-ECMO in treating COVID-19-related acute myocardial damage worsened by cardiogenic shock; nevertheless, further investigations are required to appropriately evaluate its safety in this patient population [39, 40]. The use of VA-ECMO in sepsis patients is contentious, however, it may be suitable for meticulously chosen individuals with refractory septic shock [41].

ECMO should not be utilized as a treatment for patients with cardiac conditions unlikely to improve, those with a life expectancy of less than one year, and individuals with preexisting conditions associated with high mortality rates that hinder ECMO weaning and recovery, particularly severe neurological injury, disseminated malignancy, and irreversible multiorgan failure. Further absolute contraindications include unwitnessed or extended cardiac arrest and conflicting patient care objectives, including "do not resuscitate" (DNR) directives [1, 2]. VA-ECMO should be contraindicated in individuals with significant aortic insufficiency since the elevated afterload jeopardizes hemodynamic stability. It may also be contraindicated in individuals who cannot undergo anticoagulation, since therapeutic anticoagulation is now the normal treatment with VA-ECMO [2, 10]. Additionally, the femorofemoral approach is contraindicated in the presence of a vena cava filter and significant aortoiliac illness. Advanced age, cognitive deficits, medical comorbidities, poor adherence, and insufficient social support are other relative contraindications that must be taken into account [31, 42]. While age by itself is not a contraindication to VA-ECMO, research has repeatedly shown that advanced age serves as an independent predictor of in-hospital mortality [42, 43]. To assist physicians in identifying suitable patients and those at risk of adverse outcomes, various clinical indices, such as the Survival after VA-ECMO (SAVE) score and the newly developed simplified cardiac ECMO score, have been introduced to evaluate the probability of in-hospital mortality and forecast recovery and hospital discharge [11, 44, 45]. While the ratings may be advantageous due to their validation in individuals undergoing VA-ECMO, they are inherently flawed by a selection bias. In every instance, the risk considerations, prospective benefits, patient prognosis, comorbidities, and weaning strategies must be evaluated for each patient before the commencement of VA-ECMO [4, 17].

Hemodynamic Observations

Cardiogenic shock is the most critical manifestation of left ventricular (LV) failure, characterized by either systolic or diastolic dysfunction that results in reduced cardiac output (CO), often stemming from decreased contractility and a significant decline in left ventricular ejection fraction (LVEF) [11, 46-48]. Decreased cardiac output, a low cardiac index usually under 2.2 L/min/m², and a significant drop in blood pressure result in diminished systemic and coronary perfusion, prompting reflex-induced elevations in heart rate and systemic vascular resistance (SVR) [11, 49]. In the traditional framework of cardiogenic shock, compensatory sympathetic stimulation exacerbates cardiac dysfunction, as the elevation in heart rate and contractility heightens myocardial oxygen demand, while systemic vasoconstriction and increased systemic vascular resistance augment functional circulating blood volume by up to 50% of total blood volume, thereby raising biventricular afterload and left ventricular end-diastolic pressure. Volume overload is intensified by increased preload, resulting from renal salt and fluid retention via activation of the renin-angiotensin-aldosterone system. Ultimately, the resultant hypotension, tachycardia, and diminished coronary perfusion amid heightened myocardial oxygen demand intensify myocardial ischemia and dysfunction, further impair myocardial contractility, and initiate a detrimental cycle of declining cardiac output, stroke volume, and blood pressure, alongside increasing left ventricular volume, culminating in progressive end-organ hypoperfusion, and if unaddressed, eventual mortality [46, 49, 50].

The hemodynamic implications of a mixed shock state must also be acknowledged since over 20% of patients hospitalized in the cardiac critical care unit exhibit this kind of shock [51]. The mixed condition often comprises cardiogenic and distributive shock, often arising from systemic inflammation or sepsis, leading to pathological vasodilation and diminished cardiac output. Acute cardiac damage may induce capillary permeability and the secretion of inflammatory mediators, resulting in systemic vasodilation, reduced systemic vascular resistance (SVR), and worsening hypotension [5]. Approximately 20% of individuals with acute myocardial infarction have a vasodilatory shock component resulting from inflammatory alterations generated by myonecrosis [5]. The resultant tissue underperfusion induces lactic acid accumulation, further exacerbating heart dysfunction [11, 47]. Nevertheless, despite specific hemodynamic variations, both cardiogenic and mixed shock result in reduced cardiac output and diminished coronary perfusion, culminating in progressive cardiac dysfunction that, if unaddressed, leads to mortality.

The precise hemodynamic effects of VA-ECMO on the heart and cardiovascular system in cardiogenic shock are currently under investigation. VA-ECMO is recognized for diminishing central venous pressure while elevating mean arterial pressure and the arteriovenous pressure gradient, thereby enhancing systemic perfusion [2]. One hypothesis posits that VA-ECMO decreases right ventricular (RV) preload, RV blood flow into the pulmonary artery, and peripheral venous congestion, leading to a reduction in left ventricular (LV) end-diastolic volume and pressure, hence facilitating hemodynamic stabilization [2, 6, 11, 52]. Conversely, another theory suggests that VA-ECMO elevates cardiac afterload, leading to an increase in LVEDP, left atrial pressure, and pulmonary capillary wedge pressure, hence exacerbating LV function and pulmonary edema [4, 6, 14, 53]. It is predicted that as many as 30% of patients undergoing VA-ECMO will have pulmonary edema [17, 53-55]. Moreover, particularly in patients lacking native cardiac ejection or those exhibiting severe left ventricular dysfunction subjected to elevated flow rates, the substantial rise in afterload may lead to inadequate aortic valve opening, left ventricular blood retention, and left ventricular distension, thereby exacerbating pulmonary edema. Moreover, the heightened afterload and left ventricular distention due to raised left ventricular filling pressures diminish the trans-coronary perfusion gradient, resulting in compromised myocardial perfusion and exacerbated dysfunction [11].

The primary drawback of peripheral VA-ECMO is its inability to achieve complete left ventricular (LV) unloading; it does not reduce the LV workload. Consequently, it may be necessary to optimize preload, afterload, and contractility to sustain forward flow through the LV and avert pulmonary edema and diminished LV function [6, 17, 18]. When pharmacological treatment with diuretics and inotropes proves inadequate, mechanical interventions, or left ventricular "venting" methods, are often used [3, 18].

As reported by ELSO, of the 12,734 adult patients who had VA-ECMO from 2010 to 2019, 3,399 needed mechanical unloading, with 82.9% using the intra-aortic balloon pump (IABP) and 17.1% employing transvalvular percutaneous ventricular assist devices (pVAD), such as the Impella [56]. The IABP, a percutaneous device inserted into the descending aorta, serves as an effective instrument for left ventricular unloading by enhancing the myocardial oxygen supply-to-demand ratio. It enhances coronary and myocardial perfusion while diminishing left ventricular afterload during systole, hence reducing myocardial workload [57, 58]. Zeng *et al*.'s most comprehensive meta-analysis, which included nine studies including over 2500 patients, identified a significant in-hospital survival advantage for cardiogenic shock patients receiving VA-ECMO in conjunction with IABP, as opposed to VA-ECMO alone, while demonstrating similar rates of adverse events and infection [59]. The pVAD is a catheter-based, miniature ventricular assist device positioned across the aortic valve and into the left ventricle, functioning to alleviate ventricular stress by sustaining systemic circulation by the active pumping of blood from the left ventricle into the ascending aorta. Fiorelli *et al*. performed a meta-analysis investigating outcomes in VA-ECMO combined with the Impella (ECPELLA) against VA-ECMO alone in 972 patients with cardiogenic shock across five investigations. LV unloading with ECPELLA was linked to reduced death rates-56.1% vs 63.7% in the control group [54, 57, 58].

Infrequently used methods for emptying the left ventricle encompass atrial septostomy, left atrial or pulmonary artery VA-ECMO, and direct surgical venting of the left ventricle [3, 18]. Surgical or percutaneous balloon atrial septostomy establishes a left-to-right shunt, resulting in an instantaneous decrease in preload and afterload, hence reducing ventricular workload [60]. A multicenter registry of 223 patients who had atrial septostomy for VA-ECMO unloading indicated that the procedure was linked to considerable complications, including arrhythmia and tamponade, with an overall hospital mortality rate of 46% [61]. Despite the absence of randomized or systematic trials assessing the effectiveness and mortality of left atrial (LA) and pulmonary artery veno-arterial extracorporeal membrane oxygenation (VA-ECMO), limited single-center case studies have shown that these approaches are efficient for left ventricular (LV) unloading and mayfacilitate successful weaning off VA-ECMO [62-64]. Partial ECMO flow serves as an auxiliary venting technique to avert left ventricular distention while facilitating ejection from the left ventricle [65-67]. Despite several studies indicating reduced mortality and increased weaning rates in adult patients with cardiogenic shock treated with VA-ECMO with LV mechanical unloading, there are now no randomized trials evaluating the different venting techniques. Timely identification of left ventricular distension and subsequent management is crucial. Diagnostic techniques for assessing left ventricular distention include X-ray, arterial line waveform analysis, pulmonary artery catheterization, and the monitoring of clinical signs, such as hemoptysis.

Another hemodynamic issue is the emergence of "north-south syndrome," or "harlequin syndrome," which has been seen in up to 8.8% of patients undergoing VA-ECMO [68, 69]. This uncommon phenomenon transpires in individuals with femoral artery cannulation, wherein well-oxygenated blood from the VA-ECMO circuit is retrogradely returned through the aorta, mixing with poorly oxygenated blood from the native circulation, frequently observed in patients with pulmonary compromise and significantly impaired gas exchange [70]. As cardiac function enhances or supplemental left-sided mechanical support devices for ventricular unloading are implemented, the outflow from the native left ventricle can surpass the retrograde flow from the circuit, resulting in selective hypoxia, with inadequately oxygenated blood, frequently below 90% saturation, perfusing the brain, coronary arteries, and upper extremities [10]. Under these circumstances, transitioning to central cannulation or peripheral cannulation from the upper extremities is a viable choice. Currently, there are no standardized criteria for diagnosing Harlequin syndrome, however, an arterial oxygen saturation gradient exceeding 15% between the right and left radial arteries indicates the syndrome. Transitioning from femoral cannulation to central or upper extremity cannulation may be advantageous.

The hemodynamic advantages of VA-ECMO are independent of intrinsic left ventricular performance and surpass those of IABP and Impella devices alone by operating independently of right ventricular function since it bypasses the pulmonary circuit for oxygenation [14]. Consequently, in contrast to IABP or Impella support alone, VA-ECMO may be used in refractory biventricular failure [2]. Ultimately, while the advantages of VA-ECMO in patients with cardiogenic shock are acknowledged, the

hemodynamic responses in this cohort are inconsistent and intricate, with significant gaps persisting in our comprehension.

Echocardiographic Observations

Echocardiography is crucial in the treatment of VA-ECMO. While specific guidelines are lacking, imaging assessment offers anatomical and diagnostic insights that assist in patient selection, promote safe cannulation and weaning, and function as a standardized instrument for patient monitoring and complication evaluation [52]. A thorough echocardiographic assessment, whether via transthoracic or trans esophageal echocardiography, is essential for all VA-ECMO candidates; however, this evaluation may be bypassed in patients exhibiting hemodynamic instability who urgently require MCS cannulation. Echocardiography may determine baseline anatomy, such as left ventricular size and wall thickness, as well as provide objective measures of systolic and diastolic function, including left ventricular ejection fraction, which can be used as a reference for evaluating myocardial recovery. Additionally, TTE/TEE offers a comprehensive evaluation of valvular morphology and function and may identify underlying structural abnormalities or the existence of mechanical valves [52, 53]. The insufficiency of the aortic and mitral valves must be recognized and assessed, since the commencement of VA-ECMO may exacerbate existent regurgitation owing to a substantial increase in afterload [52]. Finally, an echocardiogram may ascertain the exact etiology of cardiogenic shock or reveal any possible contraindications to the commencement of VA-ECMO.

Upon establishing the necessity for VA-ECMO, cannulation may be executed under fluoroscopy, transthoracic echocardiography (TTE), or trans esophageal echocardiography (TEE) guidance to facilitate direct visualization of the guide wire, confirm correct cannula placement, and swiftly detect complications during insertion and positioning, such as life-threatening pericardial effusion, aortic dissection, and stroke or other embolic events [52, 53]. These modalities may be inaccessible during ECPR owing to the continuation of CPR, complicating the cannulation process. Following the initiation of VA-ECMO, consecutive assessments using daily TEE are the most dependable approach to guarantee adequate ventricular emptying and to monitor left ventricular function, distension, and unloading degree [17, 52]. As VA-ECMO flow rates rise, aortic pressure rises, resulting in augmented left ventricular volume and distension. Trans esophageal echocardiography (TEE) reveals a dilated and dysfunctional left ventricle (LV), notable mitral regurgitation during both systole and diastole and in extreme instances, aortic valve (AV) opening failure [14, 52, 53]. A blocked atrioventricular valve elevates the chance of thrombus development owing to blood stasis, which is shown on trans esophageal echocardiography as an intracavitary spontaneous echo contrast [53].

Intracardiac thrombi constitute around 5% of all VA ECMO problems and may be located intracavitary, mostly in the left-sided heart chambers, or in the aortic root in instances when the left ventricle is not vented or exhibits severely reduced ejection fraction [10, 18, 79]. Despite their ability to embolize and elevate the risk of cerebral, renal, and mesenteric ischemia, which may markedly enhance death rates, echocardiography has been shown as an effective instrument for prevention and diagnosis [53]. TEE monitoring may assist in identifying ECMO malfunction and consequences, such as cannula displacement, cardiac tamponade, vascular blockage, or thrombi linked with the cannula, including pulmonary embolism [71]. Finally, echocardiography may enhance clinical decision-making for the weaning of circulatory support, as it monitors left ventricular function from baseline across different VA-ECMO flow rates, hence aiding in the evaluation of cardiac recovery [71]. Enhancement in LVEF, lack of LV dilation, augmented AV opening, and left ventricular outflow tract velocity time integral-an indication of cardiac systolic function and cardiac output-exceeding 10 cm on TEE are all markers of LVEF enhancement [52].

Conclusions

VA-ECMO delivers swift, comprehensive biventricular circulatory support alongside concurrent gas exchange, facilitating diagnostic and therapeutic interventions and potential organ recovery. It frequently acts as a bridge to recovery, further decision-making, or cardiac transplantation, providing a survival opportunity for patients in cardiogenic shock unresponsive to standard medical and device-based therapies with a generally poor prognosis. Although the advantages of VA-ECMO are acknowledged, its use must be judiciously considered in light of possible problems, and patient selection is a crucial factor in maximizing results and preventing medical futility. The outcomes of VA-ECMO are mostly influenced by the underlying indication, patient comorbidities, the degree of organ failure at the time of commencement, and any problems or adverse events that occur during mechanical circulatory support. Substantial progress has been made in our comprehension of VA-ECMO; nonetheless, thorough examination via prospective, randomized controlled trials is necessary to formulate standardized evidence-based recommendations for the best therapy of patients with cardiogenic shock necessitating VA-ECMO

Conflict of Interest

Not available

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دور الأكسجة الغشائية خارج الجسم الشريانية الوريدية في إدارة الصدمة القلبية: مراجعة شاملة للتطبيقات السريرية

الملخص

الخلفية :ظهرت تقنية الأكسجة الغشائية خارج الجسم (ECMO) كإجراء محوري في إدارة الصدمة القلبية(CS) ، وهي حالة خطيرة تتميز بعدم كفاية النتاج القلبي مما يؤدي إلى خلل في وظائف الأعضاء. على الرغم من التقدم في العلاجات الطبية، لا تزال معدلات الاعتلال والوفيات المرتبطة بالصدمة القلبية مرتفعة.

الطرق :تهدف هذه المراجعة إلى تحليل الأدبيات الحالية حول استخدام الأكسجة الغشائية خارج الجسم الشريانية الوريدية (VA-ECMO) مع التركيز على تطبيقها في حالات الطوارئ للمرضى الذين يعانون من الصدمة القلبية. قمنا بتحليل الدراسات السريرية وبيانات السجلات لتقييم الفعالية والمؤشرات والموانع، مع دراسة النتائج الديناميكية الدموية ومعايير اختيار المرضى.

النتائج :توفر تقنية VA-ECMO دعمًا فوريًا للدورة الدموية والتنفس، مما يتيح تعافي الأعضاء لدى المرضى غير المستجيبين للعلاجات التقليدية. تعد هذه التقنية مفيدة بشكل خاص في حالات احتشاء عضلة القلب الحاد والتهاب عضلة القلب الخاطف. ومع ذلك، فإن اختيار المرضى المناسبين أمر بالغ الأهمية، حيث يمكن أن تحد التوقعات الضعيفة في بعض الحالات من فوائد ECMO. تشمل المضاعفات المحتملة العدوى والنزيف والمشكلات المتعلقة بالجهاز. تشير البيانات الحديثة من سجل منظمة دعم الحياة خارج الجسم (ELSO) إلى زيادة ملحوظة في استخدامVA-ECMO ، مع تحسن معدلات البقاء على قيد الحياة، مما يبرز الحاجة إلى بروتوكولات موحدة.

الاستنتاج :تمثل تقنية VA-ECMO خيارًا علاجيًا حيويًا لإدارة الصدمة القلبية في حالات الطوارئ، حيث توفر جسرًا للتعافي أو للتدخلات المستقبلية. ومع ذلك، فإن الاختيار الدقيق للمرضى والمراقبة المستمرة ضروريان لتحسين النتائج وتقليل المضاعفات. يجب أن تركز الأبحاث المستقبلية على إجراء تجارب عشوائية مضبوطة لتأسيس إرشادات قائمة على الأدلة لاستخدام ECMO في الصدمة القلبية.

الكلمات المفتاحية :الأكسجة الغشائية خارج الجسم، الصدمة القلبية، الأكسجة الشريانية الوريديةECMO ، اختيار المرضى، المراقبة الديناميكية الدموية.

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