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Original article

ECMO in tropical diseases

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A R T I C L E  I N F O

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A B S T R A C T

Diseases prevalent in tropics present with varied manifestations compared to diseases that occur commonly in the temperate climate (the West). Tropical diseases contribute to significant mortality and morbidity. If diagnosed at the right time, tropical diseases have good prognosis too. Utilizing the useful function of supporting the cardio-pulmonary status in these critically ill disease states would be very useful to save thousands of lives each year. As these diseases are not frequent in the West, apart from reporting the experiences in the form of an anecdotal case report, much guidance is not available in their management.

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1. Introduction

Diseases prevalent in the tropics present with varied manifestations compared to diseases that occur commonly in temperate climates like in the West. Tropical diseases contribute to significant mortality and morbidity. If diagnosed at the right time, tropical diseases have good prognosis too. Utilizing the useful function of supporting the cardio-pulmonary status in these critically ill disease states would save thousands of lives each year. As these diseases are not frequent in the West, apart from reporting the experiences in the form of an anecdotal case, much guidance is not available in their management. We hold the great responsibility of providing the world with guidance on managing these tropical diseases on ECMO. Some of the examples are: Severe malaria with ARDS, Tuberculosis with secondary infections, Typhus fevers, Rickettsiosis, ARDS in H1N1, Middle East Respiratory Distress Syndrome (MERS) virus and similar viral infections, Chagas disease, Legionellosis, Envenomations such as Scorpion sting with severe vaso-dilatory shock, Snake bites, Myocarditis due to Dengue, Diphtheria, Scrub typhus, Poisonings etc. The list could be longer and these patients could be supported with the underlying understanding of managing the reversible phase of these critically ill diseases with ECMO support when they don’t respond to maximal conventional management (Table 1).

2. Infections presenting as ARDS

A variety of bacterial and viral infections present with an ARDS picture in tropical countries. Besides the usual gram positive infections, increasing number of gram negative organisms are being reported as causative organisms. Management of multi-drug resistant strains and variability in availability of pure drug formulations might contribute to additional challenges. In fact, infections are responsible for 20% increase in the mortality rate in ECMO outcomes compared to the western world [1]. When gas exchange can’t be achieved with maximal conventional management, ECMO would be a potential option in these reversible conditions. In diseases such as Pulmonary/Miliary Tuberculosis, onset of secondary infections are sometimes responsible for life threatening ARDS.

Table 1

Common indications for ECMO in the tropics.

| Disease       | Indications                                               |
|---------------|-----------------------------------------------------------|
| ARDS          | Bacterial, Viral, Parasites                               |
| Septicemia    | Fungal (rare)                                             |
| Myocarditis   | Tropical: Dengue, Entero and other viruses                |
| Miscellaneous | Venoms: Scorpion stings, Spider bites, Snake bites        |

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A plethora of viral infections are responsible for severe ARDS which are unresponsive to conventional measures. Some of the examples are H1N1 (mutated, more virulent versions are proven) [2], Avian Influenza H5N1 [3], H7N9 [4], SARS and MERS (Middle East Respiratory Distress Syndrome) as zoonotic coronavirus infections [5] are becoming increasingly noticeable as epideemics/endemics. Other known viral infections such as Respiratory Syncytial virus and Adenovirus are not only universally ubiquitous, but are also known to co-exist with other bacterial and viral infections.

Malaria has been predominant world-wide, however more so in tropical countries. Severe malaria presenting with ARDS (unresponsive to maximal conventional management) may present as a reversible condition on ECMO.

There are many infections noticeable particularly in the tropical world, of which the physician should be vigilant about and consider wider differential diagnosis under different geographical conditions. Any of the following conditions presenting with Severe ARDS unresponsive to maximal conventional treatment or severe sepsis will be an indication for ECMO support while awaiting the medications to act and the underlying process to resolve. In our experience, pertussis is one of the most difficult infections to be treated on ECMO [6] (Table 2).

3. Myocarditis

Tropical: Infections and bites from venomous animals such as Scorpions and Snakes can be transiently supported on ECMO while awaiting the effects of the causative agent to be neutralized. Myocarditis secondary to Dengue [7] and Enterovirus [8] have been successfully treated on ECMO unless the myocardium doesn’t recover within 10 days. In cases requiring prolonged ECMO, transition to a ventricular assist devise would be an option. Wide geographical areas such as deserts and forests infested with poisonous scorpions, spiders and snakes, the resulting myocarditis or vasodilatory shock could be supported on ECMO [9].

4. Poisonings

Unfortunately, poisonings are ubiquitous in South Asia and West Asia. One such scenario resulting from Celphos poisoning has been successfully treated on ECMO support given that patients are brought to centers having access to ECMO [10]. This principle applies to management of any similar condition which is transitory and expected to get better with support on ECMO.

There is a huge need for bringing this modality of healthcare to the majority of needy people in these resource limited countries. The future is promising.

Conflict of interest

None declared.

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Table 2

| Vectors | Diseases |
|---------|----------|
| Bites   | Tick     | Q fever, Rickettsia |
|         | Mosquitos| Severe Malaria, Dengue |
|         | Animal   | H1N1, Avian influenza, MERS, SARS, Ebola |
|         | Environmental | Coccidiomycosis, Histoplasmosis (rare) |
|         | Dust exposure (e.g., caves or deserts) | Legionella |
|         | Air conditioners/Hot Tubes | Schistosomiasis, |
|         | Fresh-water exposure | Leptospirosis, plague (pneumonic and septicemic) |
|         | Zoonosis | HIV |
|         | Sexual exposure | Immunocompromised: TB, Drug resistant TB |
|         | Miscellaneous | Bodioly Fluids: Ebola |
|         |           | Respiratory: Pertussis |

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