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Helical and retrograde aortic flow in the early phase of septic shock educed by multiphase non-Newtonian hemodynamic simulations

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Aim: We studied whether any aortic flow changes could be observed in the early stage of septic (warm) shock.

Patients & Methods: Computed tomography data and image reconstruction software packages to analyze patient-specific aortic flow patterns based on computational fluid dynamics models (non-Newtonian Navier-Stokes equations) were used. Boundary conditions were extracted from hemodynamic monitoring of trauma patients. 10 stable trauma patients [35±9.9 years of age, six males, injury severity score (ISS) 26±3.9] served as controls. 10 trauma septic patients [37±8.7 years of age, five males, ISS 27±4.2] were studied. Hemodynamic monitoring was performed using a pulmonary artery catheter.

Results: In warm shock, the model depicted: Increased asymmetry of the three-dimensional aortic vortex (dean number increased 77%); reduction of secondary flow in the peripheral blood vessels (Reynolds number increased 78%) and; increased aortic wall shear stress; while no pathology in aortic flow geometry was documented (Womersley number unchanged).

Conclusion: In warm shock, a severely distorted aortic vortex may be responsible for reduction of secondary flow to peripheral arteries and increased aortic wall shear stress.

Biography`

Ahad Alhassan Saud Abdulaziz Al Saud completed her Bachelor Degree of Medicine & Surgery (MBBS) at King Saud University, Riyadh (2008). She has been involved in training and teaching medical students and interns in the disciplines of Emergency Medicine since 2003. Her research interest includes "ECMO, trauma, disaster care, emergency medicine in a global health context, education and skills development". Currently, she is a senior board eligible Resident Educator at King Saud University Medical City in the Saudi Board of Emergency Medicine.

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