Computational fluid dynamics study in biomedical applications: a review

Abstract

Computational Fluid Dynamics (CFD) is a widely adopted methodology of computer-based simulation in order to solve complex problems in many modern engineering fields as well as biomedical field. CFD is becoming a key component in developing updated designs and optimization through computational simulations, resulting in lower operating costs with enhanced efficiency. Even though biomedical application is pertaining to the complexity of human anatomy and human body fluid behaviour, the recent CFD in biomedical application is more accessible and practicable due to the availability of high performance hardware and software with advances in computer sciences. Many simulations and clinical results have been used to study the analyses in biomedical applications, particularly in blood flow and nasal airflow. The study of blood flow analysis includes the circulation of blood of ventricle function, coronary artery and heart valves. Meanwhile, the nasal airflow analysis consists of the basic airflow in human nose, drug delivery improvement and virtual surgery. Therefore, this review discusses the essential methodology of CFD as a reliable tool for researchers and medical scientist in understanding the physiology and pathophysiology of cardiovascular system and respiratory system through simulation. CFD plays a major role as a decision support prior to undertaking a real commitment to execute any medical design alterations and provide the direction to develop medical interventions.