

Modeling the Blood Flow in the Arteries of the human arm by computational fluid dynamics (Medical – Engineering Studying)¹

Safa Sarakbi²

Nadim Chahin³

Reiner Schmitt⁴

Abstract

The objective of this study was to model the Blood Flow into human arm's arteries in order to define velocity profile. All steps were based on computational fluid dynamics .Simplified model for arm's most important arteries were made, while primary data such as length, diameter, and velocity were collected for a healthy 40 years old, male , weight 64 Kg with pulse rate 62 bpm ,and his arteries ranges from 1.6 to 2.6 mm by using Doppler measurement.

Reynolds's number showed flow linearity into specific arteries after obtaining mean velocity.

Moreover, this procedure led to obtain both velocity and pressure for the wave passing through arteries, and consequently, identifying blood flow diagram into these arteries (Branchial ,Ulnar and Radial) during heart beat cycle .

¹ For the paper in Arabic see pages (9-37).

² Faculty of Mech. & Elec. Eng.-Damascus University.

³ Faculty of Mech. & Elec. Eng.-Damascus University.

⁴ Fraunhofer institute – Saarland Uni. - GERMANY

Using matlab program, simulation was done to blood flow signal and the flow velocity variation versus time (velocity profile).

Both results actual & predicted were compared, showing that predicted results were very close to actual with an error of (0.5 %) for the Branchial artery ,(3.7 %) for Radial one , and (2.8 %) for Ulnar.

In comparison, the results obtained were reliable and identical with standard signals , therefore it was possible to prepare computed based model which could be applicable on any person after the collection of primary input data.

Key Words: Bio dynamic – Blood Circulation – Mathematical model – Matlab program -knowledge Base.