List of Figures

List of Tables

Abstract

Immune complexes are clusters of interlocking antigens and antibodies. Under normal conditions immune complexes are rapidly removed from the bloodstream by macrophages in the spleen and Kupffer cells in the liver. In some circumstances, however, immune complexes continue to circulate. Eventually they become trapped in the tissues of the kidneys, lung, skin, joints, or blood vessels. There they cause inflammation and tissue damage. Immune complexes work their damage in many diseases. Frequently, immune complexes develop in autoimmune disease, where the continuous production of autoantibodies overloads the immune complex removal system. Using the presently available techniques autoimmune disease is detected at a very advanced stage where treatment becomes impossible.

The flow characters of immune complexes were studied using CFD software which showed the particles flow was in laminar flow. Numerical methods have emerged as an important tool to research on bioengineering topics, which involve Computational Fluids Dynamics (CFD) analysis by FLUENT software. The initial model for importing into the FLUENT was done using the GAMBIT software. Thus all the relevant data like velocity, density, friction loss, particle motion etc. were graphically obtained from the software and the results was analyzed.

Further there is no prognosis method available at the onset of the autoimmune disease. With the help of CFD and using its applications in blood flow simulation the change in blood pressure during the onset of the autoimmune disease was determined. Hence by using a drop of blood to assess the immune complex load and change in pressure values with the available concentration of immune complexes can be detected. Further risk of the onset of coronary complications of autoimmune diseases can be predicted in a completely non invasive method.

Aim and Objectives

1. To construct the 2D arterial geometry in GAMBIT including one branching of artery into arteriole.
2. To Standardize Parameters of flow dynamics using FLUENT simulating normal arterial flow in Brachial Artery.
3. To study change in pressure due to circulating immune complexes and the resulting systolic/diastolic pressure characteristics useful for diagnostics.
4. Diagnosis and Prognosis of circulating immune complex in Autoimmune Diseases.