A COMPUTATIONAL FLUID DYNAMICS OF BLOOD FLOW IN CEREBRAL SACCULAR ANEURYSM

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"I declared that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree"

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CHAPTER 1

INTRODUCTION

1.0 Introduction.

This work entitled "Computational Fluid Dynamics (CFD) analysis of blood flow in cerebral saccular aneurysm" helps in the determinantion of properties such as wall shear stress, velocity and vorticity for different configurations. This work consists of background planned work (topic, and research scope), schedule, and conclusion.

1.1 Project Background.

When aneurysm is being detected, it forces doctors and patients to make decision whether or not to treat them with surgery. The use of CFD analysis will hopefully someday allow medical professionals to determine if an aneurysm is at risk of rupture. Characteristics of the flow field are then collated with the knowledge of whether or not the aneurysm ruptured. Importance of wall shear stress, velocity and vorticity of blood flow for cerebral saccular aneurysm can also be analyzed.

Some of the saccular aneurysm shapes will be analyzed using CFD for the effect of geometric variations in aneurysm model on the flow dynamics. Since medical images are subjected to geometric uncertainties, CFD results must be carefully compared before providing clinical feedback.

1.2 Objective.

The objectives are summarized as:

1. To obtain effects of small geometric variations in aneurysm models on the flow dynamics.
2. To analyze importance of wall shear stress, velocity and vorticity of blood flow in saccular aneurysm.
3. To provide CFD graphics to examine the flow inside the vessel in the form of flow streamlines.
4. The use of CFD and analysis techniques will hopefully allow medical professionals to determine if an aneurysm is at risk of rupture.

1.3 Scope of project.

The major purpose of this project is specially focused on the studies of numerical simulation in the bulging saccular aneurysm. The Catia V5 software models the aneurysm geometry. The Catia files are transferred into data that which can be read by the Star Design and Star CCM software and then proceed with the grid generation. After determining the appropriate grid generation and meshing volume, the simulation will be performed using Cd Adapco software .

1.4 Significance of Project.

The significance of this project is to expose me into CATIA V5R17 software and CFD software (Cd Adapco) environment. Therefore the combination of these two computational engineering tools will help to develop skills of designing the products from sketch to finishing. On the other hand, computational fluid dynamics will contribute the experience in numerical solutions involving analyzing problems of fluid flow and heat transfer through computational simulations By Using CFD analysis hopefully it can provide the guidance for surgical intervention decision making in some of the more questionable cases in cerebral aneurysm, the aneurysm characteristics can be analyzed and allow medical professionals to determine if an aneurysm is at risk of rupture. The simulated images will show the contours of pressure and wall shear stress on the aneurysms walls. The medical professional also can know whether surgery is wanted or not to reduce the risk of cerebral aneurysm amongst specific patients.