Device

Numerical investigation on diagnosis and treatment system for diseases in blood vessel with CFD

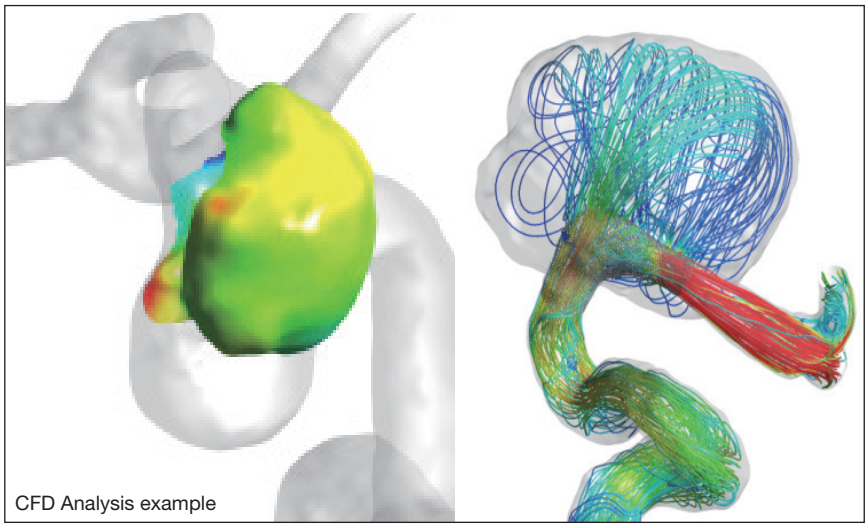
Makoto YAMAMOTO (Vice President and Professor, Department of Mechanical Engineering Faculty of Engineering, Tokyo University of Science)

Purpose of Research

The human blood vascular system can be suffered by various diseases under the influence of blood circulation state. In the past, how to diagnose or treat these diseases have been determined almost depending on experiences of the physician. The diagnosis/treatment techniques based on scientific knowledge are demanded to be proposed and developed. This study is intended to confirm the diagnosis criterion for vascular diseases with computational fluid dynamics (CFD) algorithm, and to develop a diagnosis/treatment system for predicting efficacy of therapy using a coil or a stent.

Summary of Research

This study deals with growth or rupture of cerebral aneurysm, efficiency of stent therapy for cerebral aneurysm, atherosclerotic lesion in a carotid artery, etc. The blood vessel shape model is created from the images obtained by MRI or CT. The blood circulation state is analyzed in detail based on the model with the CFD algorithm. Using this analysis data, the quantitative diagnosis criterion is confirmed for each disease, and the diagnosis/treatment system is structured and developed based on the scientific knowledge.



CFD Analysis example

Points

- **Scientific diagnosis and treatment are realized!**
- **Diagnosis/treatment criteria are made based on enormous patient data!**
- **Diagnosis is made at the same time as the patient is subject to MRI or CT scan!**
- **The therapeutic efficiency can be confirmed scientifically!**
- **This system can be introduced in every hospital in the world!**

Comparison with Conventional or Competitive Technology

Out university is able to create/propose the diagnosis criterion based on enormous patient data through the collaborative project with the Jikei University School of Medicine. Though the blood flow analysis is not technically difficult, it is impossible to establish the reliable diagnosis criterion without patient data.

Expected Applications

- Scientific diagnosis for various vascular diseases
- Planning of treatment policy
- Core or software for diagnosis/treatment system

Challenges in Implementation

The fundamental blood flow analysis technique is established, but the blood vessel shape model cannot be automatically created from MRI or CT image. If the automatic model creation becomes possible, the diagnosis/treatment system construction will be achieved as a supplement system of MRI and CT.

What We Expect from Companies

We are looking for a company as a collaborative project partner who is willing to deal with development of diagnosis/treatment system for vascular diseases together with us.

Future Developments

- Reflect verification examples and establish diagnosis/treatment criteria
- Develop diagnosis/treatment system
- Develop a prototype system
- Introduce such system in every hospital in the world

■ Research Structure:
Tokyo University of Science and Jikei University School of Medicine
■ Awards:
Annual Meeting of the Japanese Society for Neuroendovascular Therapy (Golden Award)
Japan Society of Mechanical Engineers Award in the Category of Computational Dynamics (Prize Awarded for Achievement)
110th Anniversary Meeting of the Japan Society of Mechanical Engineers (Achievement Award) JACM (Fellow Award)
■ Blood Flow Analysis Skill: Offerable

TOKYO UNIVERSITY OF SCIENCE University Research Administration Center

1-3, Kagurazaka, Shinjuku-ku, Tokyo, 162-8601, Japan E-MAIL: ura@admin.tus.ac.jp

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