

MATCH in Japan (AVEC 2016)

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Introduction: The pathophysiology of cerebral aneurysm is highly influenced by the flow dynamics and many researchers have been contributing to reveal it.

Although CFD researchers have conflicting opinions as to the rupture prediction of cerebral aneurysms, there seems to be substantial agreements as to the determination of the rupture status.

We held a competition in which participants made CFD simulations to determine the rupture status of multiple cerebral aneurysms in the 39th annual meeting of Japanese Society of Biorheology (June 2016). The purposes of this competition were to investigate the accuracy of the diagnosis based on CFD and the robustness of CFD results among researchers.

Materials & methods: Two cases were prepared for the competition. In the case 1, there were two aneurysms: one was 4mm located at anterior cerebral artery(ACA), and the other was 4mm located at basilar artery(BA). In the case 2, there were three aneurysms: one was 7mm at middle cerebral artery(MCA), another was 4mm at posterior communicating artery(PcomA) and the other was 3mm located at ACA.

The participants were recruited on the homepage of the annual meeting. The participants made CFD simulations without knowing the answers, and they sent the reports that which aneurysm ruptured in each case and which hemodynamic parameters were used to make decisions. The participants also reported the calculated WSS values of each aneurysms to the organizer.

Results: There were 8 participants. The percentage of question answered correctly was 62.5% for case 1 and 50% for case 2.

The hemodynamic parameters used by the participants were "low WSS", "high OSI", "high GON", "high energy loss", "high inflow coefficient", and so on.

The values of calculated WSS of each aneurysm differed considerably among the participants. As to the case 1, the WSS of the ACA aneurysm was lower in the simulations of six participants but that of the BA aneurysm was lower in the simulations of two participants.

Conclusion: The CFD could correctly tell the rupture aneurysm in multiple aneurysm cases with an accuracy of 60%, and this result encourages the clinical application of CFD in the near future. On the other hand, there were considerable inter-participants differences of the calculated WSS values, which should be minimized to establish credibility of CFD from physicians.

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