Missed Significant Pathology on CTA		
Lesion	Number	Percentage
Arterial aneurysm (1-4 mm)	13	50%
Arterial occlusion or severe stenosis	5	19%
Dural venous sinus thrombosis	1	4%
Arterial dissection	1	4%
Mass	3	11.5%
Other	3	11.5%

Conclusion
CT angiography neck and head datasets are large and there is a potential for missed findings. Significant discrepancies can occur with a low but not insignificant rate. Arterial pathology accounted for the majority of discrepancies. This study emphasizes the need for careful and systematic scrutiny for both vascular and nonvascular pathology in all patients regardless of indication. Strategies to reduce errors include double reading.

Key Words: CT angiography, interpretation error, misdiagnosis

Wednesday Afternoon

3:15 PM - 4:45 PM
Ballroom 6A

(39b) Interventional: Aneurysms II (Scientific Papers 418 - 428)

See also Parallel Session
(39a) Cerebrovascular Occlusive Disease II
(39c) Head & Neck: Paranasal Sinuses, Temporal Bones and Cervical Carotid Disease
(39d) Pediatrics: Congenital Malformations and Disorders

Moderators: Michael Marks, MD
Ajay K. Wakhloo, MD, PhD

Paper 418 Starting at 3:15 PM, Ending at 3:23 PM

Hemodynamic Force Dyssynchrony Found in Cerebral Aneurysms: A Quantitative Patient-Specific Aneurysm Flow Analysis at Single Location

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Purpose
Brain aneurysm rupture is one of the causes of subarachnoid hemorrhage, and the morbidity rate due to aneurysm rupture remains high in the United States. Studies have suggested that aneurysm growth and rupture may be related to the hemodynamic force and unstable blood flow inside an aneurysm. This study investigates the hemodynamic force changes in a group of aneurysms over a cardiac cycle. Our hypothesis is that the unstable blood flow inside an aneurysm may alter both the magnitude and the timing of the peak hemodynamic force over the cardiac cycle.

Materials & Methods
To minimize hemodynamic variation due to aneurysm location, aneurysms from the same anatomical location were selected. Twenty-seven internal carotid artery-ophthalmic artery aneurysms (5 ruptured and 22 unruptured which were consecutively treated in the Division of Interventional Neuroradiology at UCLA Medical Center) were included in this study. Images acquired by three-dimensional rotational angiography prior to embolization were used for the quantitative patient-specific hemodynamic analysis. To measure the hemodynamic force changes in an aneurysm over a complete cardiac cycle, pulsatile flow profiles obtained from a normal subject were applied to simulate the blood flow. Results of aneurysmal flow properties at different cardiac phases were carefully examined, and the magnitude of the hemodynamic forces at the aneurysm neck, body and dome were recorded and compared with the hemodynamic force at the parent artery.

Results
We observed general agreement between the changes in hemodynamic force within an aneurysm and the changes of the blood pressure profile. Detailed comparison using quantitative flow parameters (wall shear stress and flow velocity) revealed that some aneurysms had the peak hemodynamic force shifted to the later cardiac phases. Among the 27 aneurysms, 21 cases had the peak hemodynamic force occurring at the end of systole, and six cases had the peak force occurring at the early diastolic phase. The magnitude of the hemodynamic force ranged from 15.1 Pa to 0.19 Pa within aneurysms and from 33.6 Pa to 0.32 Pa at the parent arteries.

Conclusion
The shift of the peak of hemodynamic force was observed in 20% of the cases. This suggests that to understand the influence of hemodynamics on brain aneurysms, studies may need to consider the results of blood flow analysis at both the end of the systolic and the early diastolic phases. Continued studies focusing on these peak shifts may shed more light on hemodynamic force effects on aneurysm growth and rupture.