

Detailed results of the user study according to our questionnaire

The experts filled out a questionnaire about the visualization techniques and their medical relevance. The questions could be ranked using a five-point Likert scale ($--, -, \circ, +, ++$). For the interpretation of our predefined Likert scores, we provide the number S of experts who chose the individual categories.

Medical Relevance. All experts, especially the radiologists emphasized the importance of analyzing different scalar fields on the aneurysm wall to assess the aneurysm's state ($S(++)=5$; $S(+)=3$). Moreover, they stated that changes of specific attributes such as the WSS before and after stenting would influence the stent position ($S(++)=4$; $S(+)=4$). In addition, they described the analysis of attributes between ruptured and non-ruptured datasets as important to better understand the patient-specific rupture risk ($S(++)=7$; $S(+)=1$).

Circle Aneurysm Plot. The initial division of the aneurysm surface into regions is appropriate in order to get an overview of the aneurysm data ($S(++)=3$; $S(+)=5$). The interactive updating of the plot based on user-selected thresholds supports a fast identification of interesting attribute correlations ($S(++)=5$; $S(+)=3$). In addition, the experts emphasized the benefit of brushing own regions, which are then presented within the plot ($S(++)=6$; $S(+)=2$). This allows a focused investigation of morphologically conspicuous wall regions according to their rupture risk or how attributes have changed after treatment.

2D Map Visualization. All participants found that the 2D map provides a fast overview about the data ($S(++)=5$; $S(+)=3$). In addition, the color-coding of the ostium enables the visual correspondence between the 3D and 2D aneurysm depiction ($S(++)=6$; $S(+)=2$). Furthermore, all experts commented that the selection of individual points on the map followed by changing the camera in 3D helps to explore the 3D geometry ($S(++)=4$; $S(+)=4$).

Checkerboard Visualization. The suitability of the checkerboard to analyze two attributes simultaneously was rated more controversially with $S(++)=1$, $S(+)=4$ and $S(\circ)=3$. Similar to that, the understandability of the slider and the subsequent change of the chessboard size was rated with $S(++)=4$, $S(+)=2$, $S(\circ)=2$. P2 and P4 argued that the hatching scheme more directly indicates possible attribute correlations, whereas the experts needed more time to get used to the checkerboard. However, they mentioned that the checkerboard allows a more quantitative comparison of two attributes, which is less possible with the hatching. The medical experts could also imagine to use two juxtaposed maps, where each shows one attribute, as doctors are used to mentally combine two views. However, the other experts described the identification of scalar correlations as difficult using two maps.

Glyph-Based Visualization. The cylindrical glyphs were perceived as very appropriate to depict the temporal behavior of two scalar fields ($S(++)=5$; $S(+)=3$). Adding glyphs manually on the map supports the analysis of specific regions ($S(++)=5$; $S(+)=3$). P8 suggested to provide possibilities to filter glyphs according to specific attribute ranges, which would help to focus on high-risk regions.

Brushing Facilities. All participants confirmed that brushing on the map helps to establish a spatial correlation between the 2D and 3D aneurysm visualization ($S(++)=6$; $S(+)=2$) and it helps to detect suspicious regions in 3D ($S(++)=4$; $S(+)=4$). Similar to that, the brushing on the scatterplots allows an identification of rupture-prone regions on the 3D surface ($S(++)=7$; $S(+)=1$).

Statistical Visualizations. Regarding the statistical depictions, the experts stated that the scatterplots support the exploration of attribute correlations ($S(++)=7$; $S(+)=1$). Furthermore, all experts commented that the depiction of the scatterplots before and after treatment or between ruptured and non-ruptured datasets helps to assess treatment success and rupture risk ($S(++)=5$; $S(+)=3$). Moreover, the histograms provide an overview about the distribution of the scalar fields ($S(++)=5$; $S(+)=2$; $S(\circ)=1$).

Attributes Clustering. The clustering was described as helpful to explore different attributes ($S(++)=2$; $S(+)=4$; $S(\circ)=2$). P5 and P8 mentioned that a stronger user integration by providing interesting attribute ranges would strengthen the clustering. The color-coding of the cluster results allows a visual perception of high-risk regions ($S(++)=4$; $S(+)=4$) and a visual differentiation between regions with a low and increased risk ($S(++)=5$; $S(+)=3$). Finally, the experts confirmed that the clustering allows to detect homogeneous and inhomogeneous regions ($S(++)=1$; $S(+)=7$).

Summarizing table of the selected answers.



	Clinicians				CFD Experts		Visualization	
	P1	P2	P3	P4	P5	P6	P7	P8
Medical Relevance								
Analyzing different scalar fields on the aneurysm wall is important to assess the aneurysm's state.	+	+	++	++	++	++	++	+
Changes of specific parameters such as the WSS before and after stenting influence the stent position.	+	+	++	+	++	++	++	+
The analysis of parameters between ruptured and non-ruptured datasets is important to better understand the patient-specific rupture risk.	++	++	++	++	++	++	++	+
Circle Aneurysm Plot								
The initial division of the aneurysm into regions is appropriate in order to get an overview of the data.	++	++	+	+	+	+	++	+
The interactive updating of the plot based on user-selected thresholds supports a fast identification of interesting parameter correlations.	++	++	++	+	+	++	++	+
Brushing own regions allows a focused investigation of morphologically conspicuous wall regions.	++	++	++	++	+	++	+	++
2D Map Visualization								
The 2D map provides a fast overview about the data.	+	+	++	++	+	++	++	++
The color-coding of the ostium enables the visual correspondence between the 3D and 2D aneurysm depiction.	++	++	++	+	+	++	++	++
The selection of individual points on the map, followed by changing the camera in 3D helps to explore the 3D geometry.	+	+	++	++	+	++	+	++

	Clinicians				CFD Experts		Visualization	
	P1	P2	P3	P4	P5	P6	P7	P8
Checkerboard Visualization								
The checkerboard is suitable to analyze two parameters simultaneously.	+	+	0	0	0	+	+	++
The slider and the subsequent change of the chessboard size is understandable.	+	0	+	0	++	++	++	++
Glyph-Based Visualization								
The cylindrical glyphs are appropriate to depict the temporal behavior of two selected scalar fields.	++	+	++	++	+	++	+	++
The possibility to manually add glyphs on the map supports the analysis at specific regions.	+	+	+	++	++	++	++	++
Brushing Facilities								
The brushing on the map helps to establish a spatial correlation between the 2D and 3D aneurysm visualization.	+	+	++	++	++	++	++	++
The brushing on the map helps to detect suspicious regions in 3D.	+	+	++	++	++	++	+	+
The brushing on the scatterplots allows an identification of rupture-prone regions on the 3D surface.	++	+	++	++	++	++	++	++
Statistical Visualizations								
The scatterplots support the exploration of parameter correlations.	++	+	++	++	++	++	++	++
The depiction of the scatterplots between different datasets helps to assess treatment success and rupture risk.	+	+	+	++	++	++	++	++
The histograms provide an overview about the distribution of the scalar fields.	+	0	++	++	++	+	++	++

