

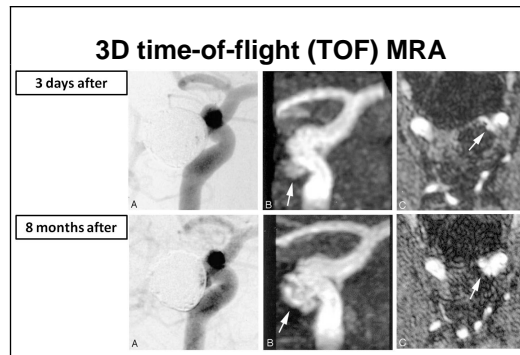


Introduction

Stent-assisted coiling (SAC) for intracranial aneurysms requires adequate follow-up (FU) imaging because of recurrence and thromboembolic events after the treatment. Residual flow in coiled aneurysms or patency of the stents are difficult to visualize by usual MR angiography (MRA) due to metal artifact.

Objective

we assessed the feasibility and usefulness of time-of-flight (TOF) MRA for FU of intracranial aneurysms treated with SAC.



We applied 3D time-of-flight (TOF) MRA characterized by a **short TE (1.69 ms)** and a high spatial resolution to diminish metal artifact; 1.5T-MRI, non-contrast, TE: 1.69 ms, voxel size: 0.6×0.6×0.4 mm, flip-angle: 25 deg (*N. Yamada, AJNR 25:1154-1157, 2004*).

Results

Results 1

	Visualization by 3D-TOF MRA	
Parent artery lumen	12 / 35 cases	34.2%
Residual sac	17 / 35 cases	48.6%

Results 2

	Residual flow in coiled ANs		P value
	Visualization+	Visualization-	
Total No.	17	18	
Male	4 (23.5%)	1 (5.6%)	0.30
ruptured	3 (17.6%)	7 (38.9%)	0.29
Anterior circulation	10(58.8%)	9 (50.0%)	0.85
Terminal type	2 (11.7%)	3 (16.7%)	0.94
Neck size (mm)	6.2 (3.7-10.2)	6.2 (1.9-11.2)	0.71
Max size (mm)	9.6 (6.4-12.5)	9.8 (3.8-16.5)	0.32
VER (%)	27.7% (16.8-31.5)	29.8% (16.9-55.7)	0.10
Neuroform EZ	12 (70.6%)	1 (12.5%)	< 0.001

Results 3

Stent type	Total case	mean Diameter of stent	mean Length of stent	3D TOF MRA "GDC protocol"	
				In-stent flow	Residual sac
Neuroform EZ	13	4.05 mm (2.5-4.5)	23.6mm (20-30)	11 / 13 (84.6%)	12 / 13 (92.3%)
Enterprise VRD	22	4.5mm	26.3mm (22-28)	3 / 22 (13.6%)	5 / 22 (22.7%)
				P < 0.01	P < 0.001

A static phantom model

Two intracranial nitinol stents, Enterprise VRD (4.5×22mm) and Neuroform EZ (4.0×20mm) were placed in a vessel-like silicon tubes (inner diameter of 3.5 mm) filled with saline. The remaining tube represented the control tube without a stent.

We measured a signal intensity in the stent by 3D-TOF MRI.

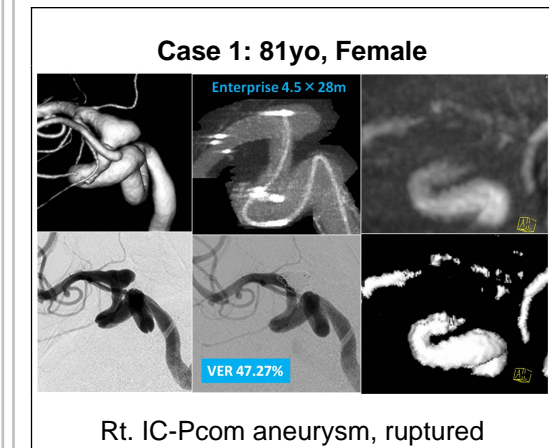
Phantom model

	Stent (-)	Enterprise VRD	Neuroform EZ
Proximal	100	23.18	75.62
Mid	100	20.55	74.01
Distal	100	24.60	80.99

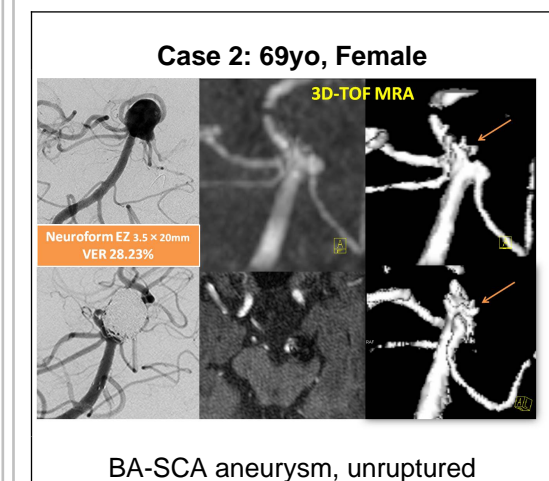
Conclusions

For follow-up study after SAC, DSA still remains gold standard. But 3D TOF MRA could provide acceptable visualization of both parent artery lumen and residual sac, especially in the cases with Neuroform EZ®.

Illustrative cases



Case1. A 81-year-old women with Rt. IC-Pcom ruptured aneurysm was treated by stent-assisted coil embolization. The ICA C2-MCA M1 proximal is covered by a Enterprise VRD. Anatomic outcome of the aneurysm in the DSA was complete occlusion. 3D-TOF MRA showd slightly visible flow in the stent.



Case2. A 69-year-old women with unruptured BA-Lt. SCA aneurysm was treated by SAC. The Lt. PCA - basilar artery is covered by Neuroform EZ. Anatomic outcome of the aneurysm in the DSA was neck remnant. 3D-TOF MRA showd the shape of depiction equql to that of DSA.

Subject

	Total cases	Neuroform EZ	Enterprise VRD
Time period	January 2011 – June 2015		
Case (N)	35	13	22
Female (N)	29	10	19
mean Age (yo)	66.2 (36-87)	66.9	65.7
No. of stents	37	13	24
Ruptured ANs	10	1	9
Unruptured ANs	25	12	13

Methods

We compared postprocedural 3D TOF MRA images with concurrent digital subtraction angiography (DSA) images after SAC.

