

# Experience with Detachable Tip Microcatheter

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# Disclosures

- Consultant - Microvention

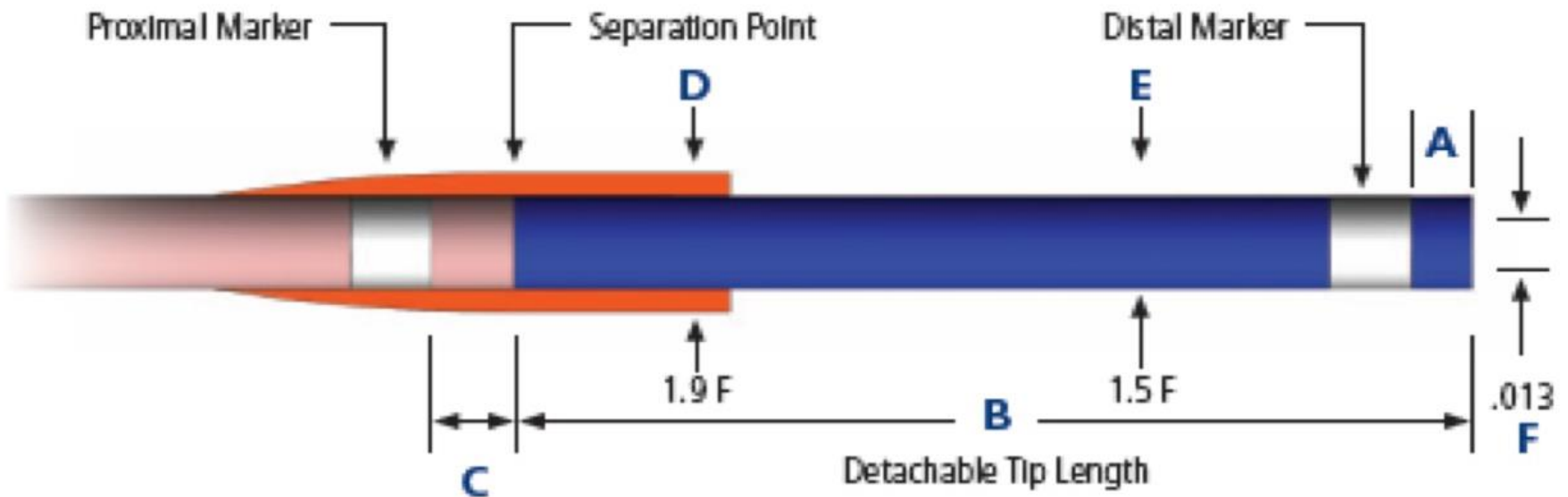


# Team

- Alex Berenstein, MD
- David Altschul, MD
- Srinivasan Paramasivam, MD
- Santiago Ortega-Gutierrez, MD

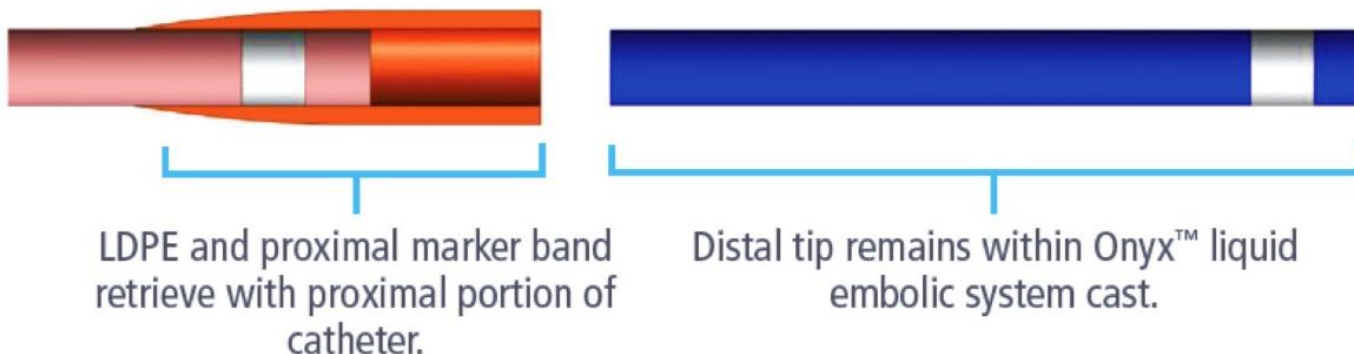
# Detachable tip microcatheter

- Apollo™ onyx delivery detachable tip microcatheter
  - Single lumen end hole microcatheter
  - 0.013 inches
  - Detachment lengths - 1.5 cm and 3 cm

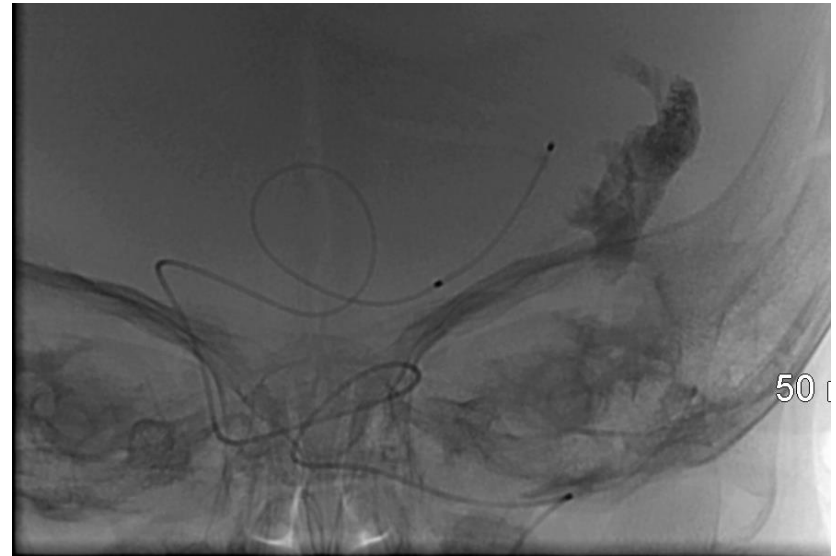


# Detachment of the microcatheter

- The required detachment force is about 33 grams. It is less than 1/3<sup>rd</sup> the force required to break the next weakest bond in the catheter.
- Gentle and continuous traction – Mechanical detachment
  - Reduce the slack in the system
  - Initial traction related stretching of the microcatheter.
  - Detachment of the microcatheter / release of the microcatheter from the embolic cast.

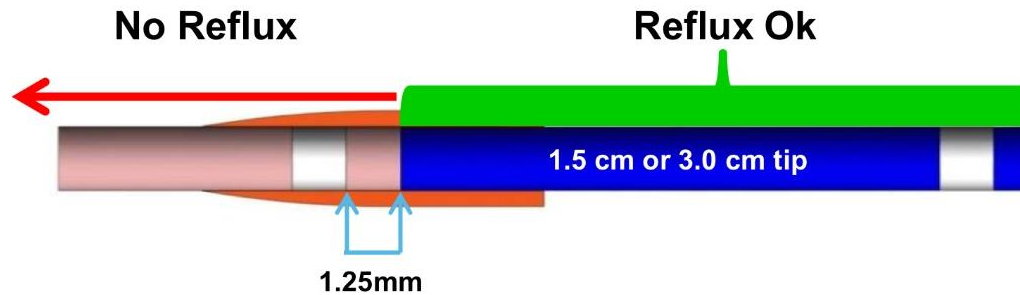


# Reflux



## Reflux Tolerance

- ✓ Reflux is acceptable on distal tip.
- ✓ Leave a gap of at least **1.25mm** between the Onyx™ LES reflux and the proximal marker band. Excessive reflux may result in difficult catheter removal.
- ✗ **Do not reflux past the proximal marker band!**



Why do we need a detachable tip  
micro catheter?

# Onyx Embolization

- Proximal plug around the catheter is usual during onyx injection.
- The catheter needs to be removed from the embolic cast at the end of embolization.
- Excessive reflux can lead to:
  - Retained microcatheter
  - Aggressive attempts at removal can lead to complications like vessel rupture and hemorrhage.
- Incidence Unknown.



# nBCA embolization

- Goals:
  - Good penetration.
  - Prevention of proximal reflux - prevent catheter retention and non-target embolization.
- Flow and operator dependent – Fear of catheter entrapment.
- Prolonged contact with polymerized nBCA lead to retained catheter or vessel injury.
- Incidence unknown

# Our experience

- Between March 2013 and March 2014, detachable tip microcatheters were used in 16 patients under FDA approval for compassionate use.
- 39 catheterizations in 19 procedures.
- The patients were aged between 3 months and 18 years.

# Our experience

- Since April 2014, we have been using it under physician sponsored IDE.
- In 7 patients, 13 catheterizations were performed.
- In total 52 catheterizations and embolizations performed.
- In most instances the 1.5 cm detachable tip microcatheter was used.
- Since June 2014, the Apollo has been FDA approved.

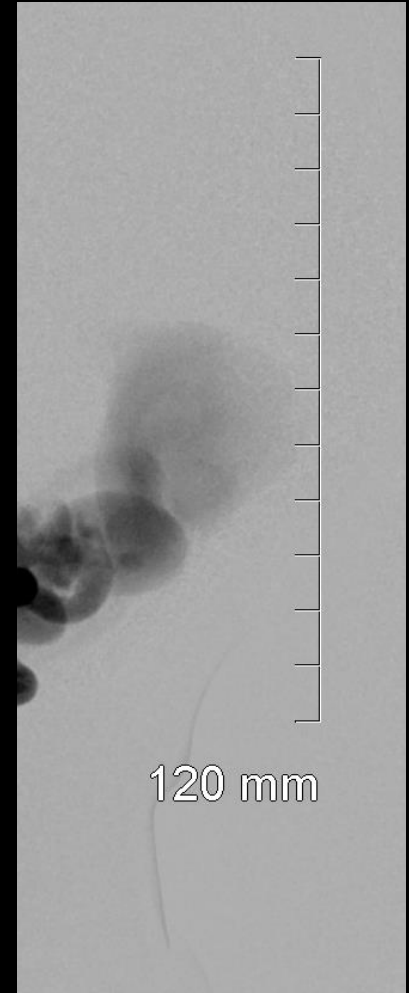
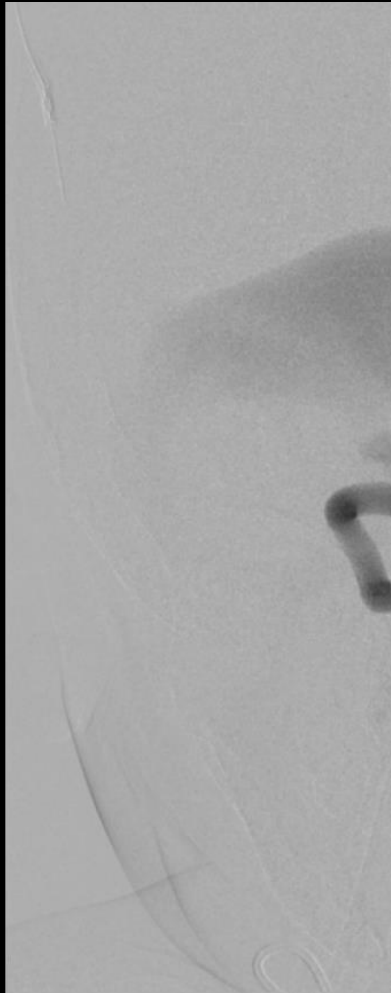
# Our initial experience

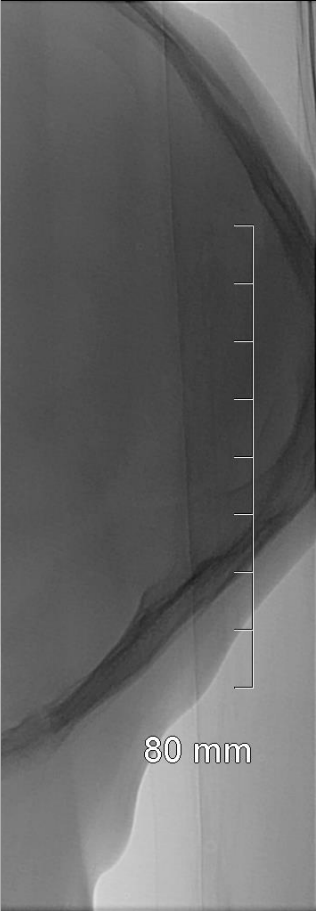
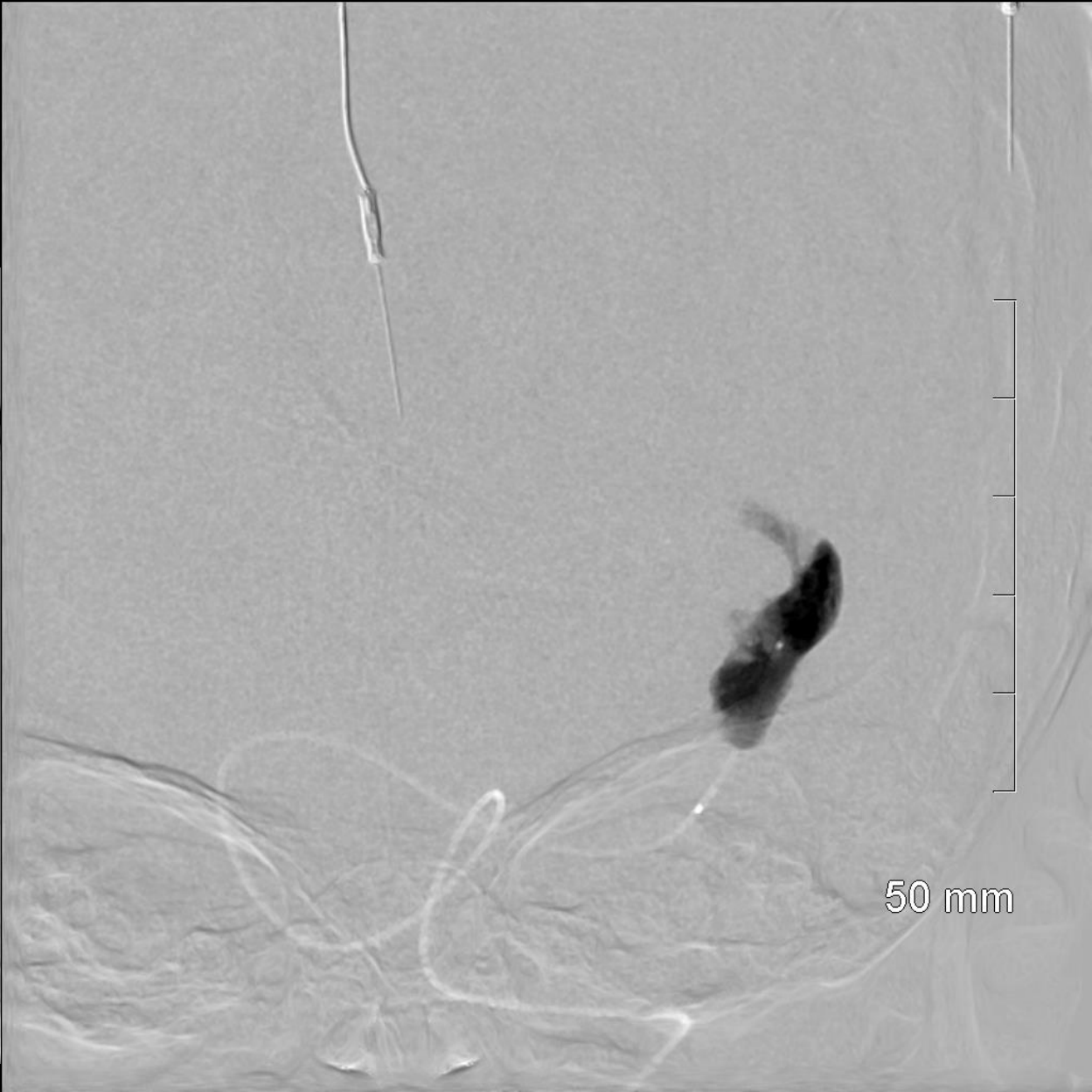
- Embolic agent:
  - Onyx was used 18 times and
  - nBCA was used 33 times.
- Catheter detachment rate:
  - Three times with onyx (17%) and
  - 18 times with nBCA use (55%).
- Inadvertent and premature detachment:
  - One

# Initial Experience

Age	Sex	Diagnosis	Injections	Tip Length	Vessel Embolized	Material	Amt	Tip Detached	
4 yr	F	Left Cerebellar AVM	Catheter 1	1.5cm	SCA	Onyx-18	1.2mL	No	
			Catheter 2	1.5cm	AICA	Onyx-18	1.0mL	No	
3 mo	F	Vein of Galen Malformation	Catheter 1	1.5cm	PCA	n-BCA	0.3mL	No	
5 mo	F	Vein of Galen Malformation	Catheter 1	1.5cm	Pericallosal	n-BCA	0.4mL	Yes	
11 yr	M	Midbrain AVM	Catheter 1	1.5cm	MCA	Onyx-18	0.9mL	No	
			Catheter 2	1.5cm	MCA	Onyx-18	0.6mL	Yes	
			Catheter 3	1.5cm	ACA	Onyx-18	0.5mL	No	
			Catheter 4	1.5cm	ACA	Onyx-18	0.8mL	No	
			Procedure #2	Catheter 5	1.5cm	SCA	n-BCA	0.3mL	No
			Catheter 6	1.5cm	SCA	n-BCA	0.1mL	No	
			Catheter 7	1.5cm	PCA	Onyx-18	1.7mL	No	
1.5 yr	F	Right parietal pial AVF	Catheter 1	3.0cm	ACA	n-BCA	1.2mL	No	
			Catheter 2	3.0cm	MCA	Onyx-34	1.6mL	No	
6 mo	M	Left basal ganglia AVM	Catheter 1	1.5cm	PCA	Onyx-18	0.4mL	No	
4 mo	M	Posterior Fossa pial AVF	Catheter 1	1.5cm	PICA	n-BCA	0.4mL	No	
			Catheter 2	1.5cm	PICA	n-BCA	0.4mL	Yes	
			Catheter 3	1.5cm	PICA	n-BCA	0.7mL	No	
			Procedure #2	Catheter 4	1.5cm	PICA	n-BCA	1.6mL	Yes
			Procedure #3	Catheter 5	1.5cm	PICA	Onyx-18	2.0mL	No
18 yr	M	Thalamic AVM	Catheter 1	1.5cm	PCA	Onyx-18	1.2mL	No	
3 mo	M	Vein of Galen Malformation	Catheter 1	1.5cm	PCA	n-BCA	1.3mL	No	
			Catheter 2	1.5cm	PCA	n-BCA	1.2mL	No	
6mo	M	Vein of Galen Malformation	Catheter 1	1.5cm	PCA	n-BCA	0.4mL	No	
			Catheter 2	1.5cm	PCA	n-BCA	0.4mL	No	
7mo	M	Vein of Galen Malformation	Catheter 1	1.5cm	PCA	n-BCA	0.6mL	Yes	
			Catheter 2	1.5cm	PCA	n-BCA	0.6mL	Yes	
			Catheter 3	1.5cm	PCA	n-BCA	0.5mL	Yes	

# Vertebral Pial Fistula

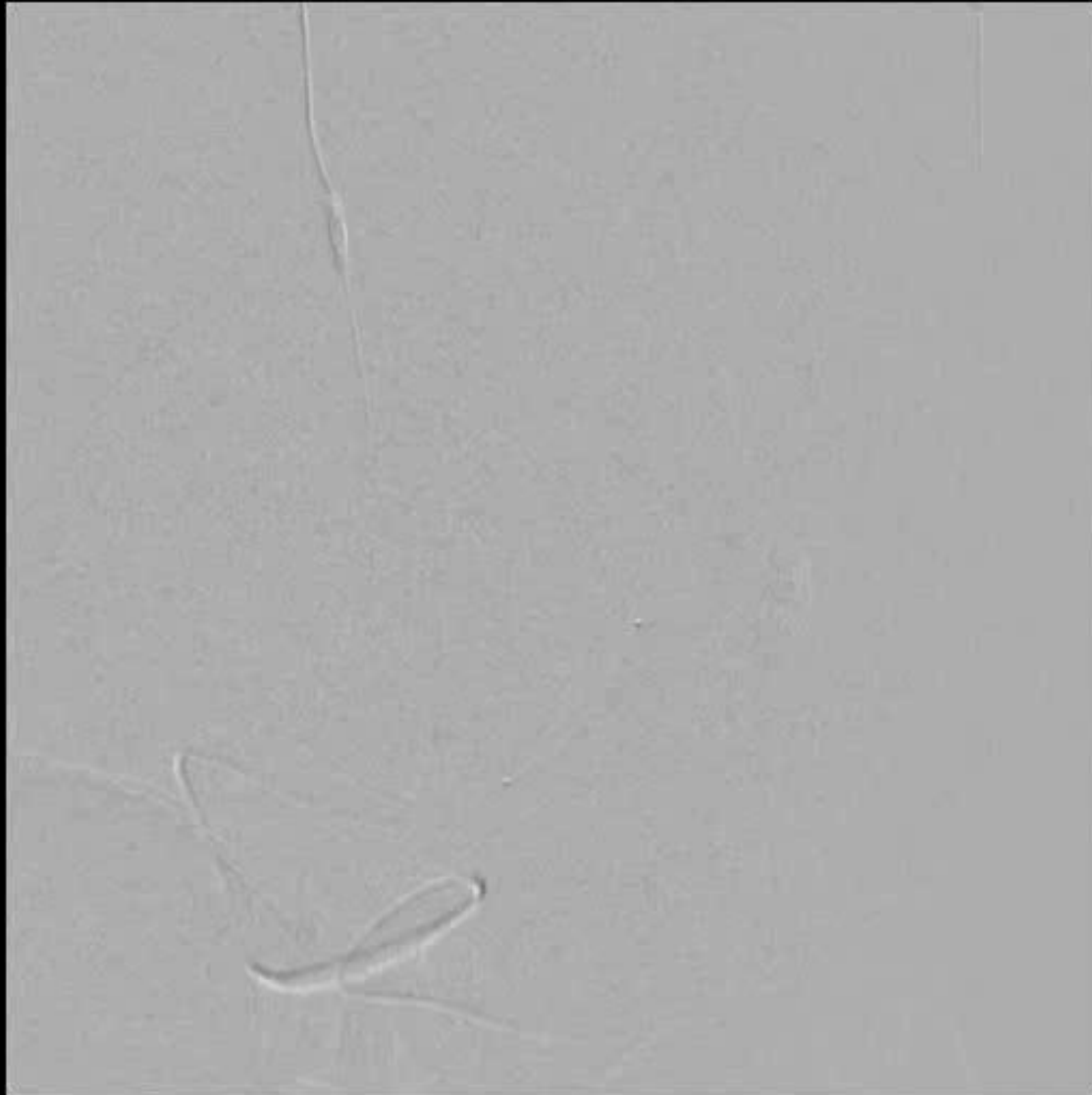




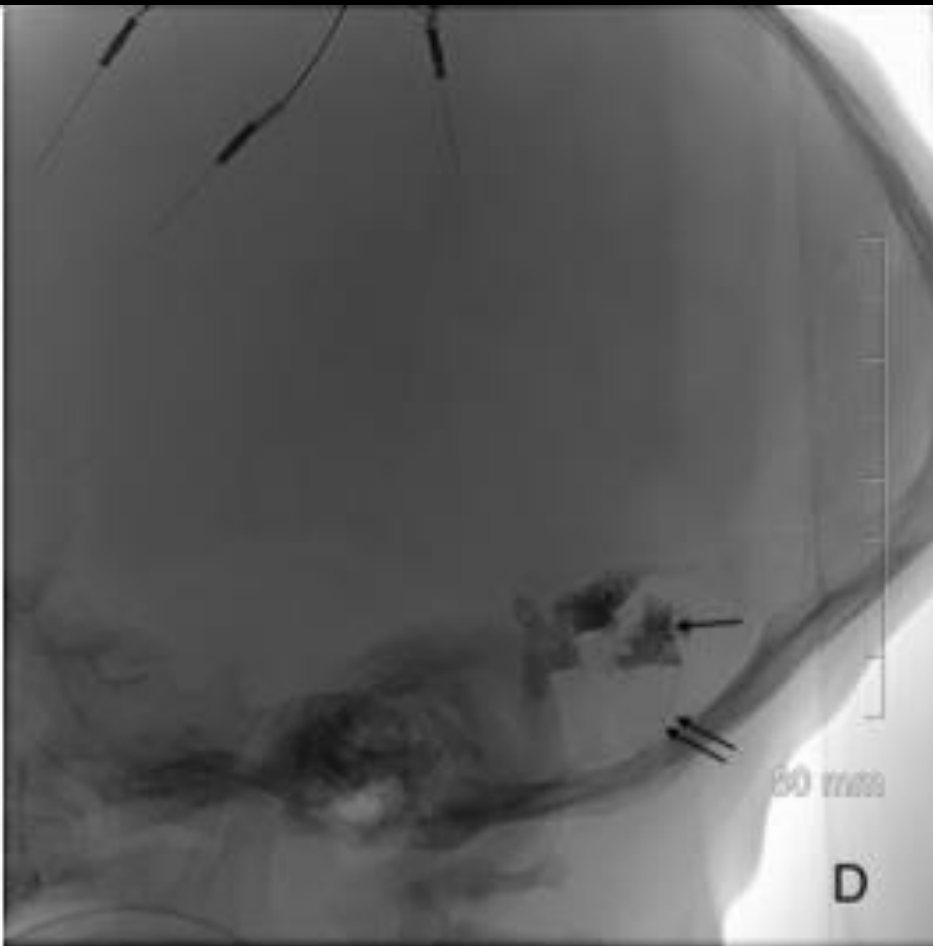
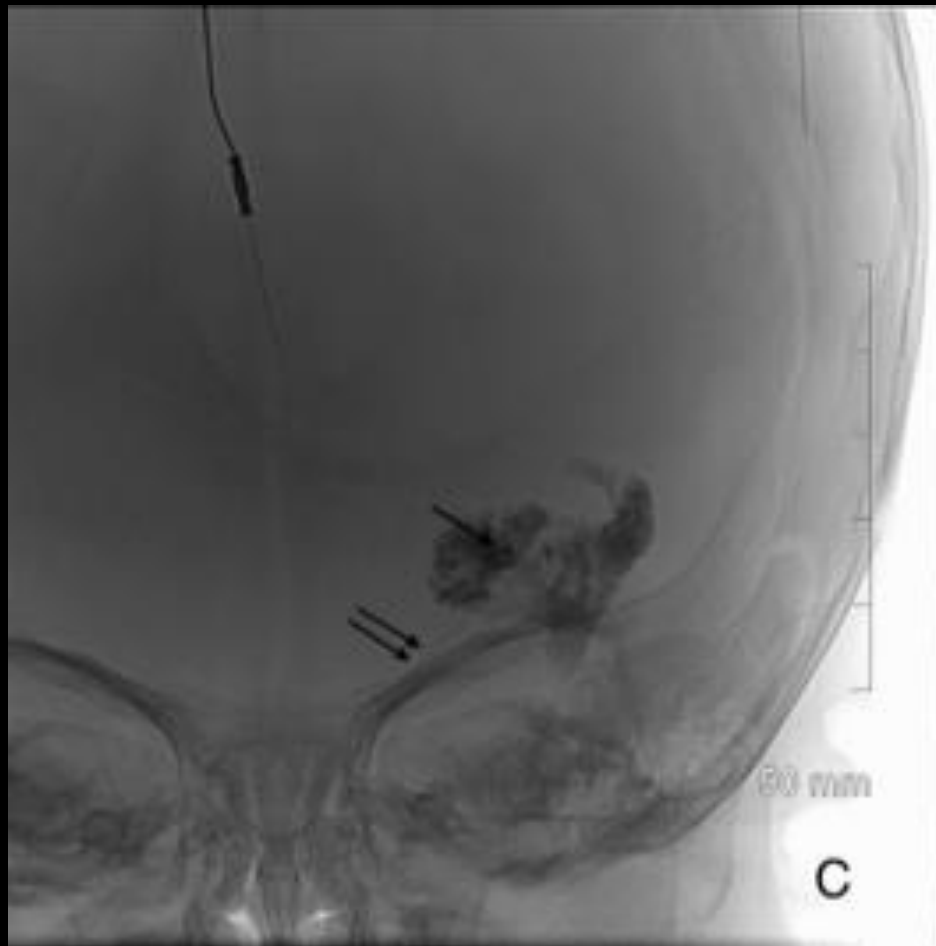




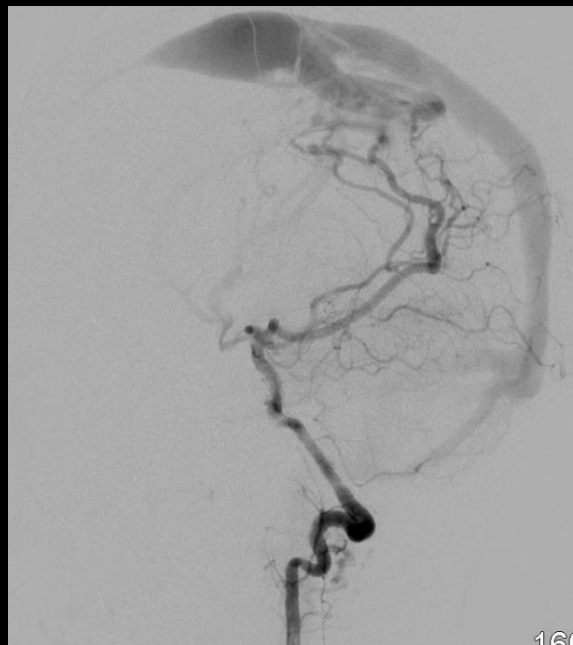
# High concentration nBCA

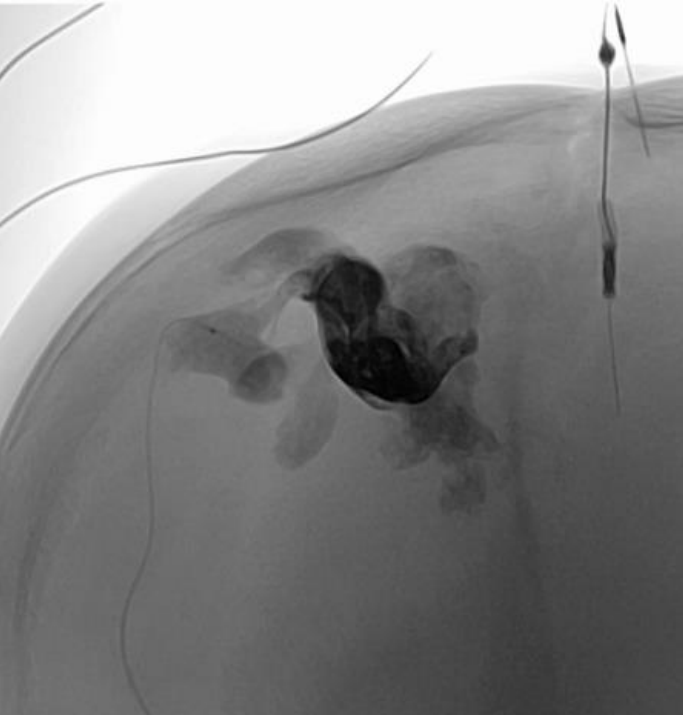


# Detached Tip



Right Parietal complex Pial AVF – previously treated by multiple NBCA embolizations.





**End of Second embolization  
with Onyx**  
– Right Middle Cerebral Artery

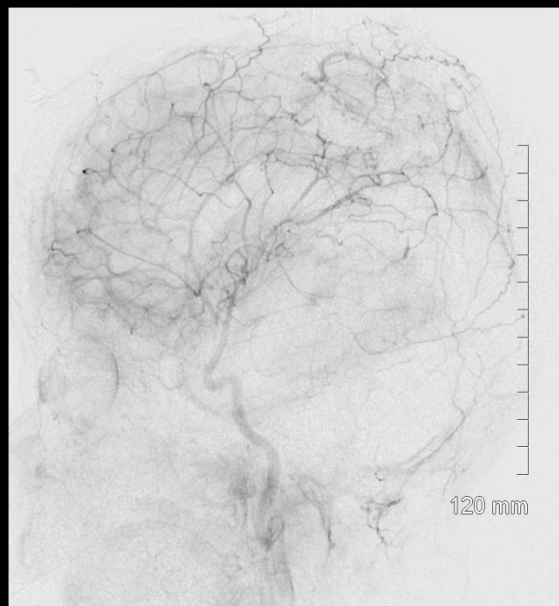
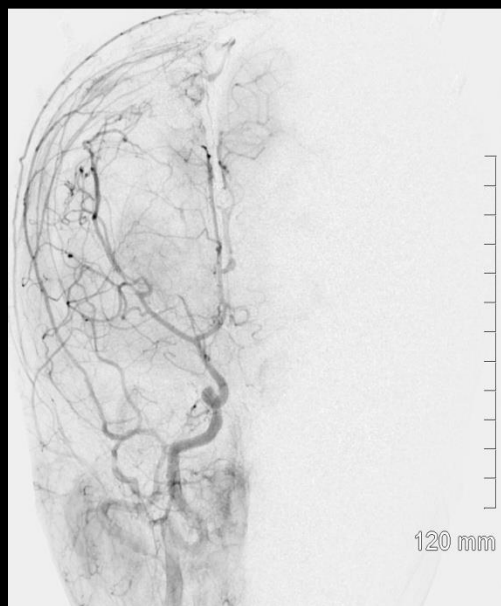
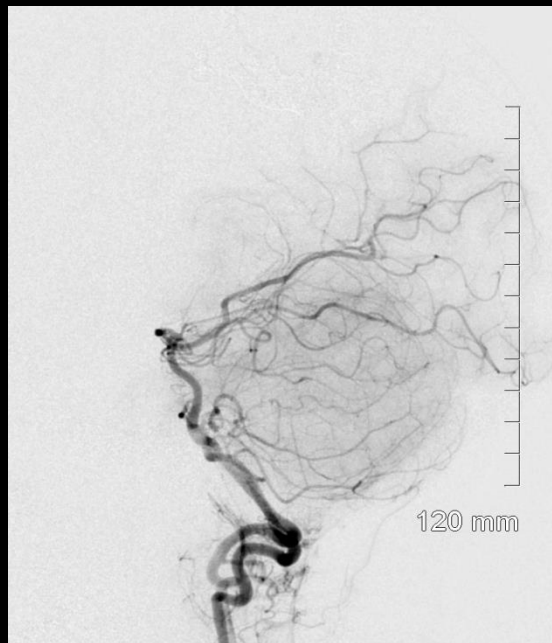


**End of second  
embolization by Onyx  
injection with Apollo  
microcatheter**

– Right Middle Cerebral  
Artery.



Right Parietal complex Pial AVF – completely treated following the use of Apollo detachable tip Microcatheter.  
The Glue and Onyx cast from previous embolizations is visible.



# Advantages

- Trackability and Navigability – As good as or better than any wire guided microcatheter.
- Used through a 4 Fr guiding catheter for nBCA and 5 Fr guiding catheter for Onyx injections.

# Advantages

- Onxy injection - reflux limit is known.
- nBCA injection –
  - Controlled injection of high concentration nBCA (80 – 90% for high flow fistulas).
  - Permissible reflux
  - Intermittent injections to allow better control of the glue cast.
- Aggressive injection, better penetrability.

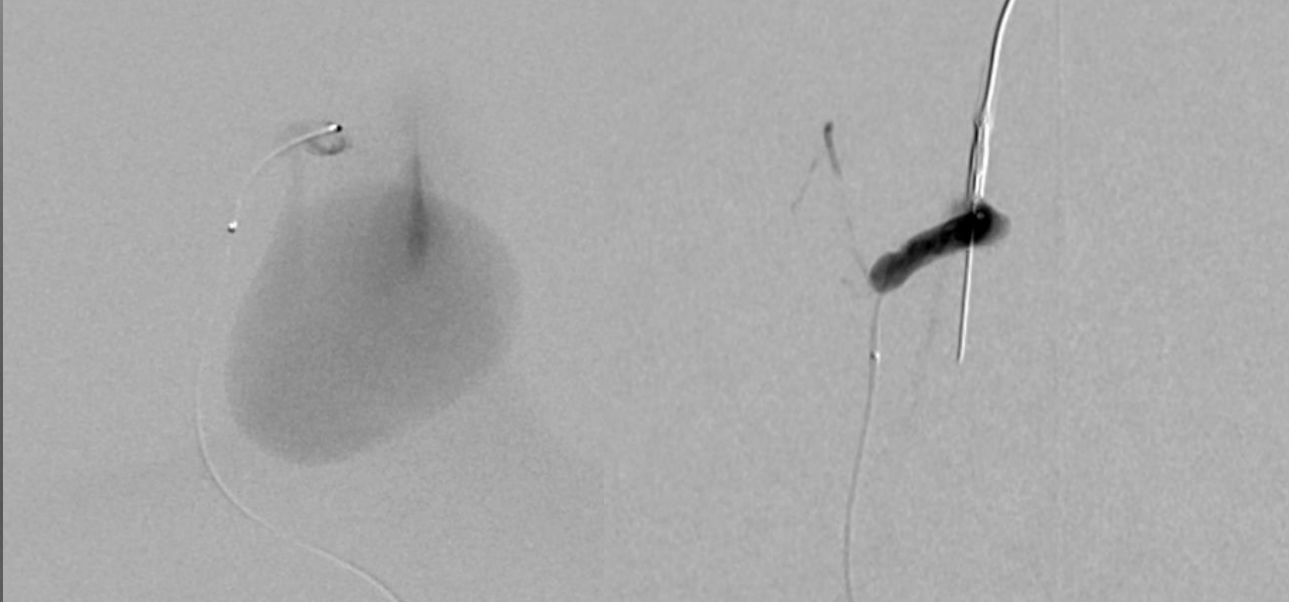
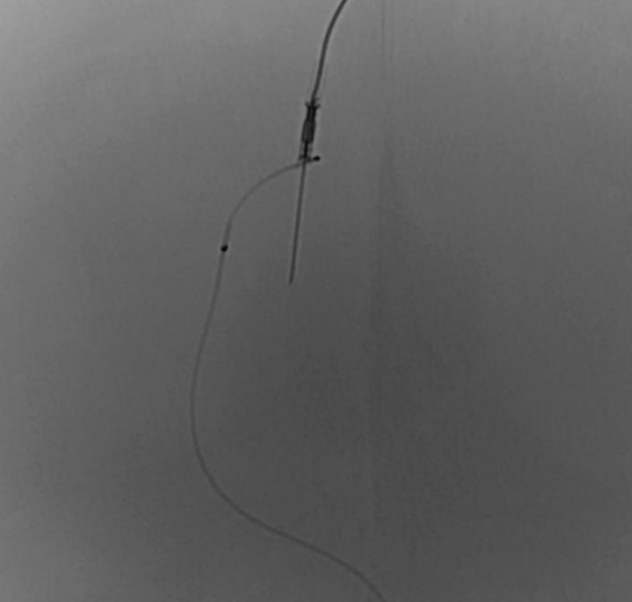
# Advantages

- Controlled catheter retrieval under fluoroscopy guidance.
- Less pressure used for catheter removal.
- No incidence of vessel rupture or hemorrhage.

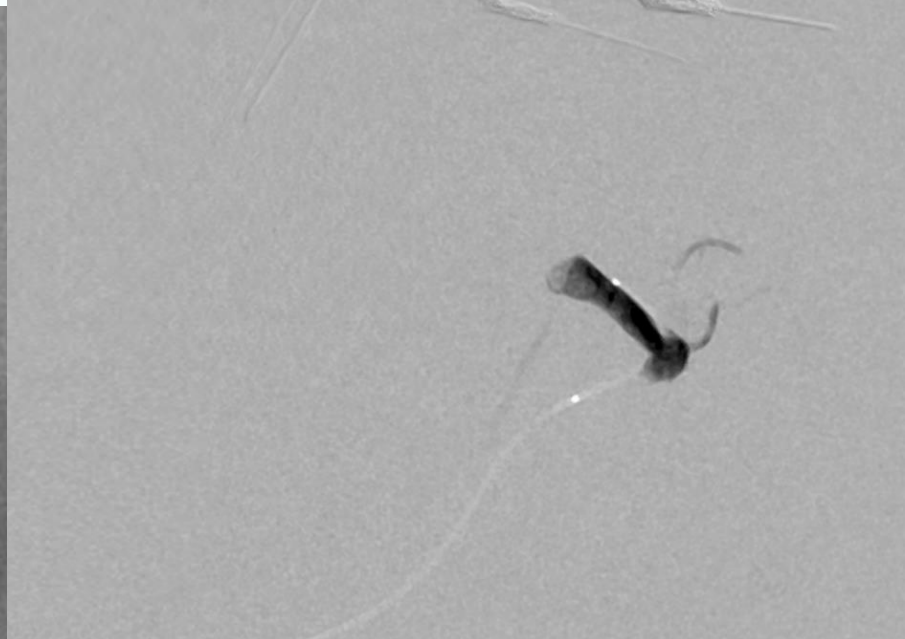
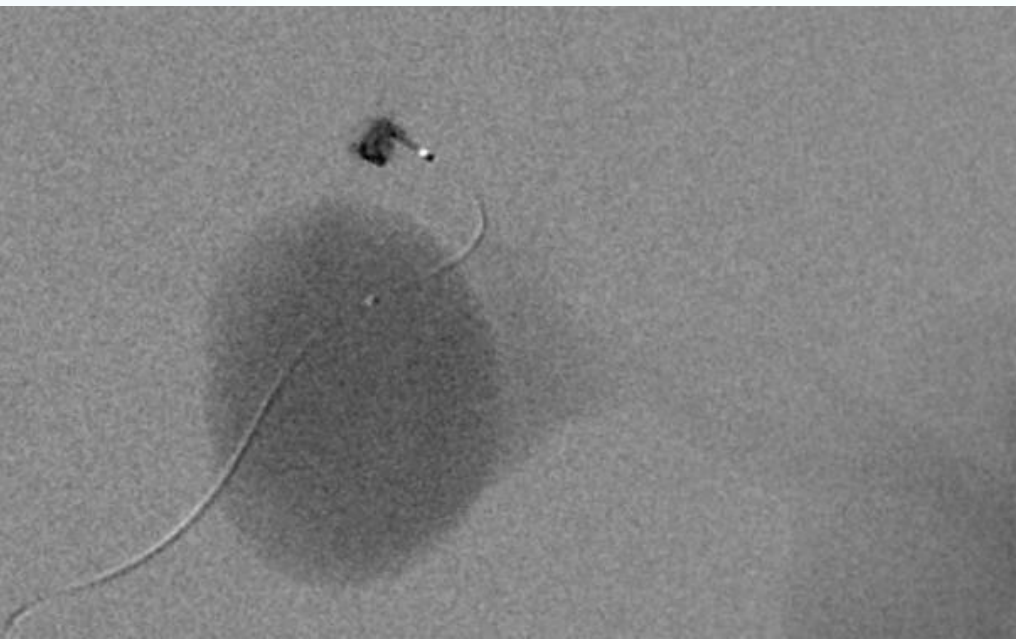


# Disadvantages

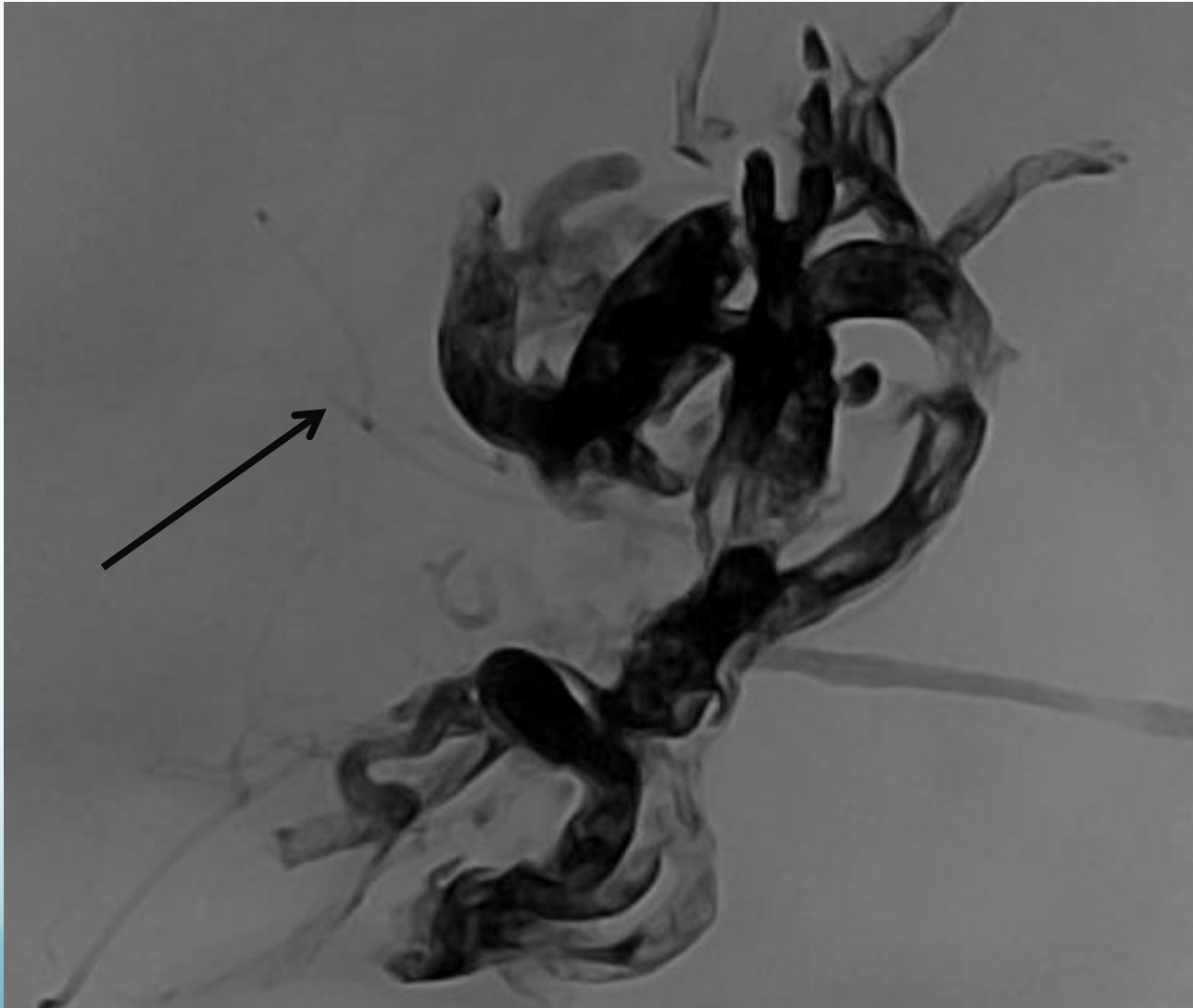
- The detachment zone is relatively stiff compared with the rest of the microcatheter.



- Beware of normal branches arising from detachable segment.



- Inadvertent detachment of the tip.



# Conclusion

- Results in more penetration especially in high flow fistulas using nBCA.
- Catheter retrieval is more controlled and less traumatic.
- Our initial experience is encouraging and it is an useful tool to have.
- Multicenter experience is essential before ascertaining its safety and efficacy.

Thank you