

Introduction

Neuro interventional cerebral angiography commonly performed for evaluation and treatment of various disorders including: Aneurysm, AVM, Dural fistula, Angioplasty and stenting, Epistaxis, Trauma, Tumor embolization, and most commonly Stroke recanalization. The procedure utilizes guide wires, sheaths, catheters, and other devices. It is important for a resident to know the basic steps and equipment involved.

Technique

Access:

Femoral or Radial Artery Access (Table 1).

- A micropuncture kit can be used (Figure 1) which includes an 18G needle, .018 wire, and 4/5 Fr cannula.
- The puncture site is localized below the inguinal ligament over the femoral head for improved post procedural hemostasis (Figure 2).
- Sheaths: (Figure 3a and 3b).
 - Short: 4/5 French (11 - 23 cm)
 - Femoral Long: 6 - 9 French (> 23 cm)

Once access is gained a .018 wire is paced and a sheath is advanced over the wire, then exchanged for a .035 J wire, a continuous heparinized saline flush line is connected with use of a manifold or Tuohy-Borst adapter (figure 4a & b). An 80-90 cm long sheath is placed in the carotid artery to support further stroke intervention tools.

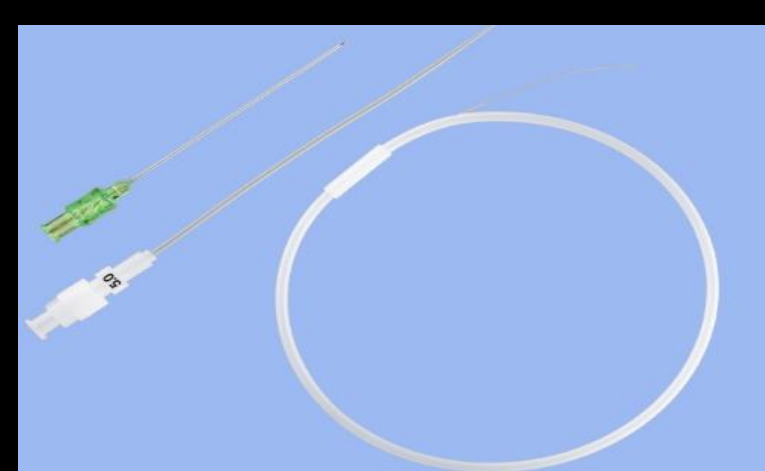


Fig 1: Micropuncture kit

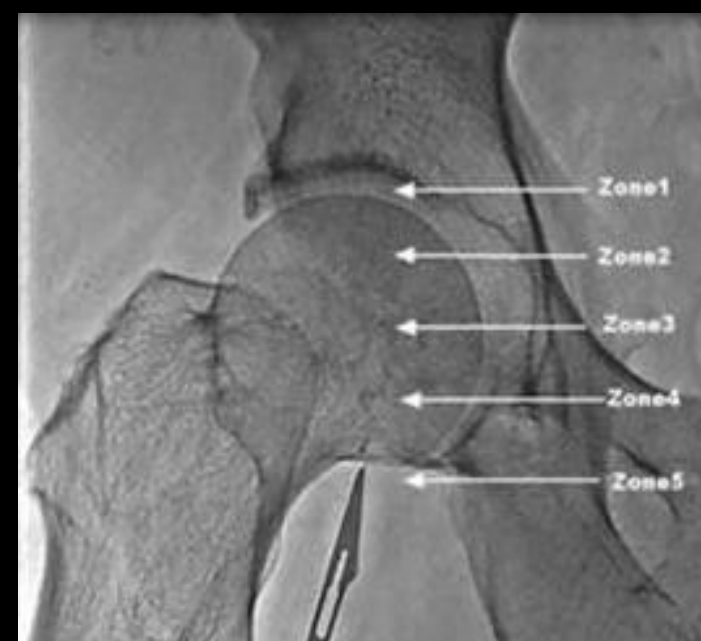


Fig 2: femoral artery access (Puncture the skin at zone 5 and enter artery at Zone 3.

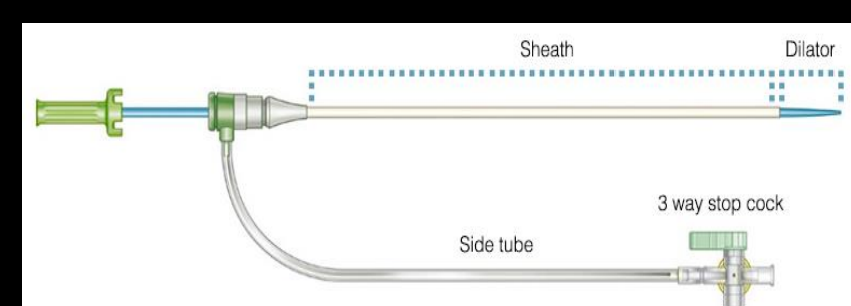


Fig 3a: Trans-radial access sheath



Figure 3b: Trans-femoral access sheath



Fig 4a: Manifold



Fig 4b: Tuohy-Borst Adapter



3-D rotational angiography showing a 3 mm recurrent aneurysm – treated with clipping previously

Table 1: comparison between femoral vs radial access technique

Feature	Femoral Access Technique	Radial Access Technique
Access site bleeding	3 – 4%	0 – 0.6%
Artery complications	Pseudoaneurysm, retroperitoneal bleed	Rare local A-V fistula, painful hematoma
Ambulation	2-4 hours	immediate
Extra costs	Closure device vs. manual compression	TR-band

Cerebral Angiography: Equipment, Technique, and Fluoroscopic Views

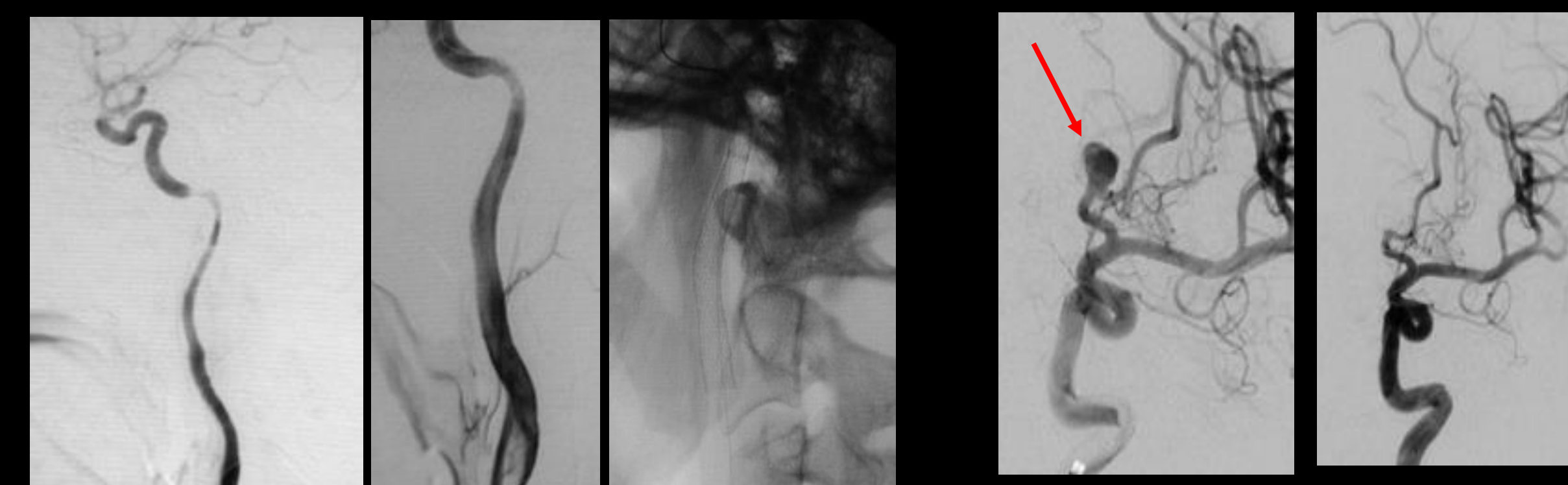
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Location	Additional Views	Percentage of Rotation	Angulation (Cephalad/Caudal)
ACOM	Transorbital oblique Caldwell's oblique	15 – 30 15 - 30	7 cephalad 7 caudal
MCA	Transorbital oblique Submentovertex	15-30 0	7 cephalad 90 degree to baseline
PCOM	Transorbital oblique Paraorbital oblique	15-30 15 – 30	7 cephalad 7 cephalad
ICA bifurcation	Transorbital oblique Submentovertex	15-30 0	7 cephalad 90 degrees to baseline
Basilar tip and Vertebro basilar junction	Towne's oblique Transfacial	10-30 0	25-30 caudal 90 degrees to baseline
ICA/ophthalmic	Transorbital oblique Caldwell's oblique	15-30 15-30	7 cephalad 7 caudal
Cavernous ICA	Paraorbital oblique Haughton lateral	55 90	7 cephalad 45 cephalad
SCA, AICA, PICA	Towne's oblique	10-30	25-30 caudal

Table 4: Bi-plane positioning for Cerebral Vessel Visualization



ICA Dissection causing hypoperfusion stroke, treated with stenting

Ruptured ACOM Aneurysm treated with coiling



Digital Subtraction angiography showing MCA Clot, with Trevo XP 4x20 device and Penumbra Aspiration



Stroke Intervention Tools:

- Long Sheath Catheters vs. Balloon-guide Catheter (Figure 9): Typically 0.088 Internal diameter. Examples: Infinity LS, Neuron max, Shuttle.
- Aspiration Catheters: Catalyst 6, Penumbra ACE catheters, etc.
 - Connected to aspiration tubing and pump (Figure 10)
- Microcatheters (.021-.028): Headway, Marksman, Prowler Select, etc.
- Stent-Retrieval Devices (3-6mm) (Figure 12): ex. Trevo, Solitaire FR, Penumbra 3D.

Procedure: The sheath is placed in the carotid artery, microwire and catheter are advanced to cross occluded vessel, stent device is deployed, +/- balloon inflated, and suction thrombectomy performed. In contrary stent device may not be utilized by all operators.

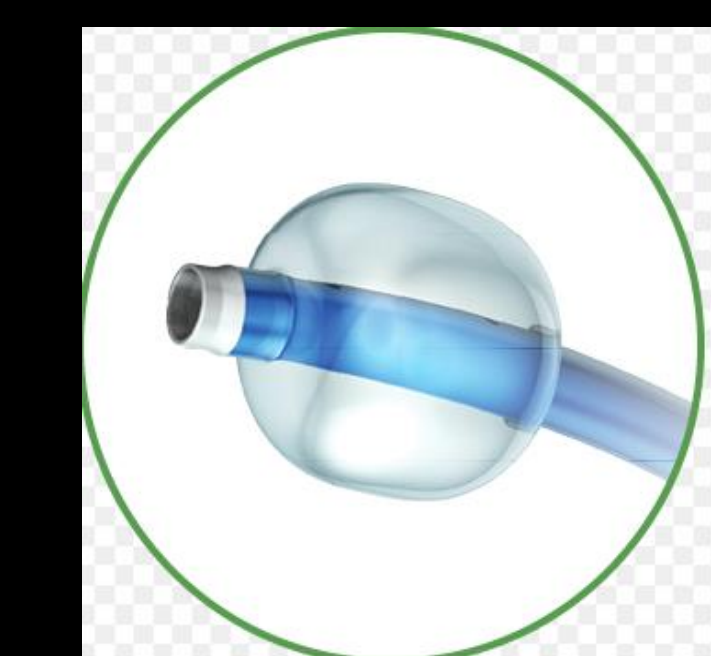


Fig. 9: Balloon Guide Catheter



Fig. 10: Aspiration tubing and Pump



Fig 11: Clot from Thrombectomy

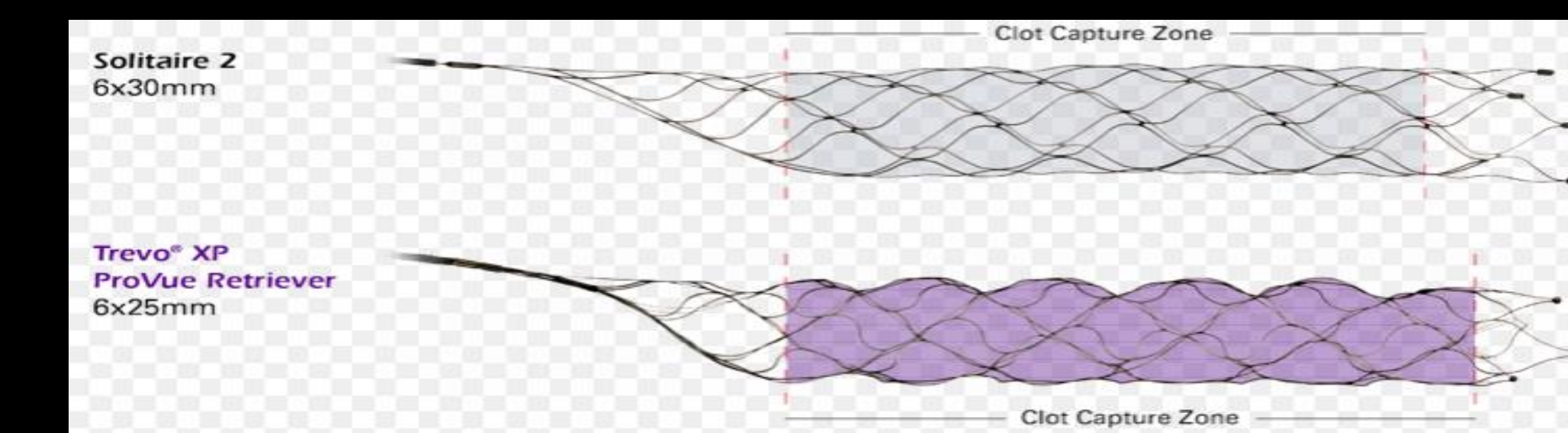


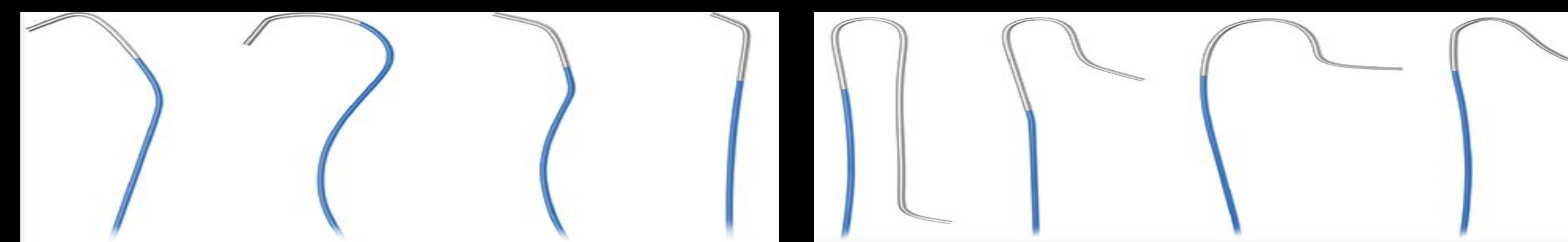
Fig 12: Stent- Retrieval Devices

Complications

- Neurological complications:**
 - Stroke (1%), TIA (2.5%), Thromboembolism, and Perforation.
- Non-neurological complications:**
 - Renal failure (0-0.15%), arterial occlusions requiring intervention (0 - 0.4%), AV fistula (0.01 – 0.22%), hematoma (groin, retroperitoneal) (0.25-1.5%).
- Increase in length of procedure, number of catheter exchanges and amount of contrast used is associated with higher rates of complications⁵.

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Simple Curve Catheters	Complex Catheters
e.g: Vert 45, Berenstein 90	e.g: Vitek, Simmons I-II

Figure 5: simple vs complex curve catheters

Product Name
Omnipaque 240
Omnipaque 300
Isovue 200/300
Visipaque 320

Table 3: Types of Contrast

Vessel	Contrast injection Rate (mL/s)/total mL	Framing rate (frames/second)
Aortic arch	20/40	3
Extracranial ICA (catheter in CCA)	4-5 / 7-8	2
Cerebral Angiogram (catheter in CCA)	7- 8 / 11 – 12	2 - 3
ECA (catheter in ECA)	4 – 5 / 6 – 7	2
Posterior Cerebral Angiogram with catheter in vertebral artery	6 – 7/ 9 - 10	2

Table 2: Contrast Injection Rates and Imaging Frame Rates for Common Selective Catherization