Endovascular Intervention to Correct Dialysis Vascular Access Malfunction

Nguyen Duy Tan, MD, PhD

Tran Thi Tuyet Mai, MD

Pham Huu Duc, MD

Introduction

❑ Today, thanks to medical advances, hemodialysis patient 's survival time is improving.

❑ Therefore, treating patient's with vascular problems are currently a priority, which are improving the patient's survival prognosis.

❑ There is little research literature about there problems and how to handle problems of hemodialysis.

Introduction

Endovascular intervention has more advantageous than traditional surgery:

- Less invasive

- Treating vascular problems is flexibility that surgery cannot do

Arteriovenous Fistula (AVF)

❑Most popular

❑Less problems

❑Long usage time

❑Low risk of infection

❑High economic efficiency

Dòng máu từ máy lọc máu

Dòng máu tới máy lọc máu

Cầu nối ĐM-TM

Tĩnh mạch

Động mạch
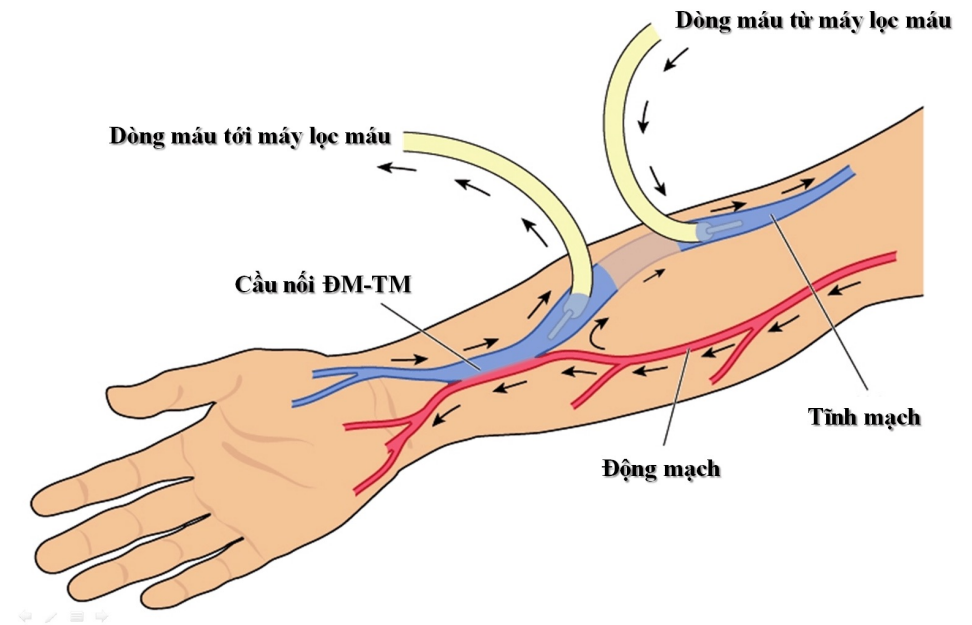
Arteriovenous Fistula (AVF)

➤It takes 6-12 weeks to mature

➤20-50% do not mature,
requiring endovascular
intervention to treat
(after 4 weeks to avoid rupture)
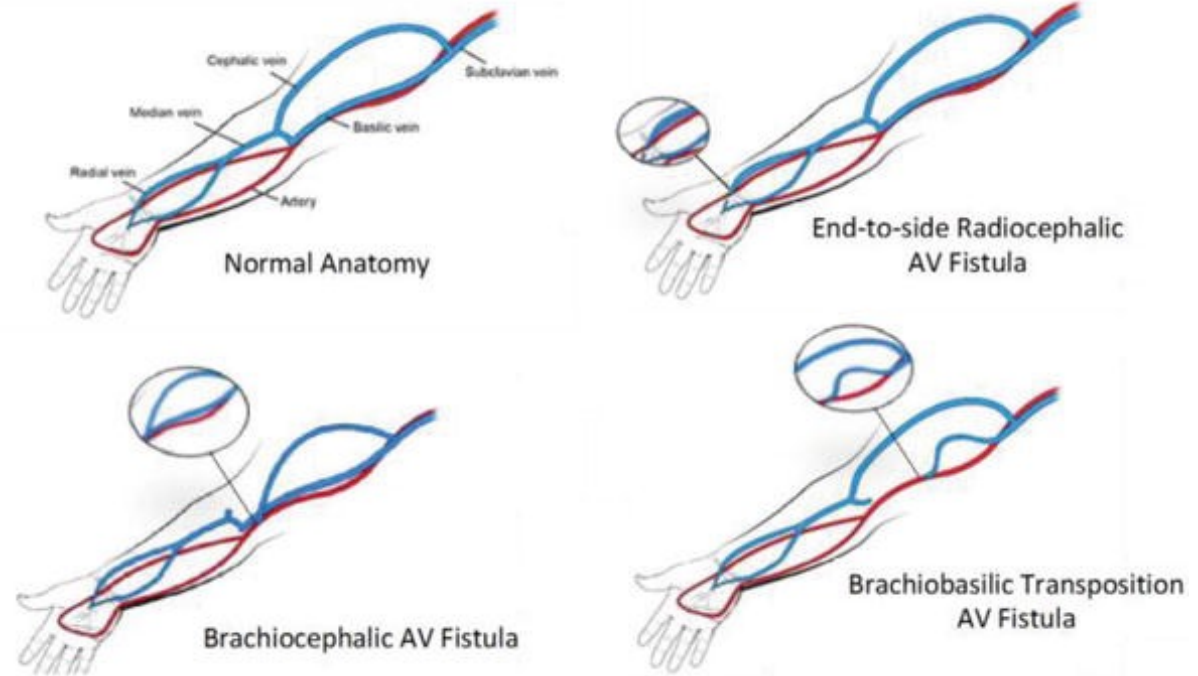
Arteriovenous Graft (AVG)

❑Usually using PTFE

❑The loop type lasts longer than the
 straight type

❑Less durable than AVF, higher cost

❑Easier endovascular intervention

Loop Forearm Graft Fistula

Loop Brachiobasilic Graft AV Fistula
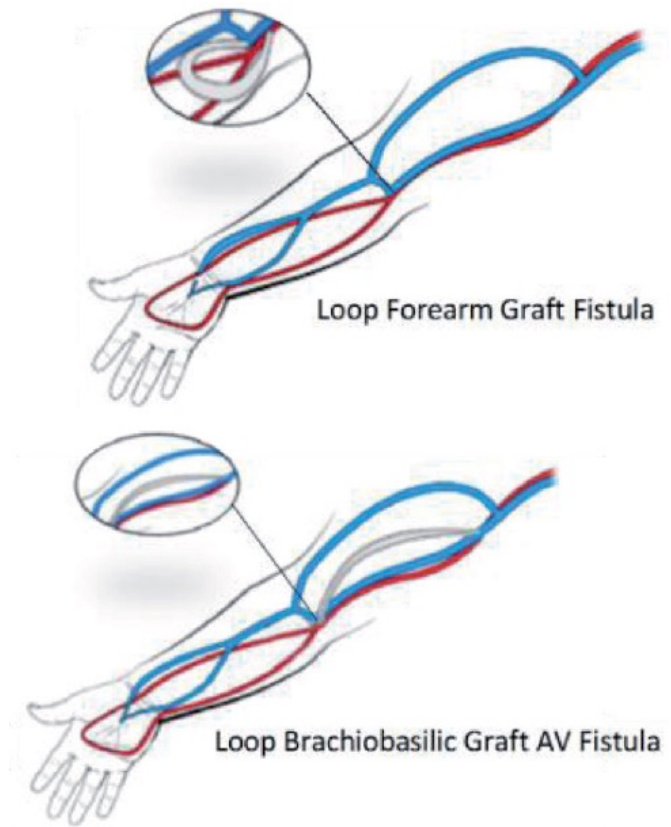
Dialysis Vascular Access Malfunction

➢ Flow less than 600ml/min with AVG

➢ Flow less than 400ml/min with AVF

➢ Flow reduced by more than 25% using

2 different measurement methods
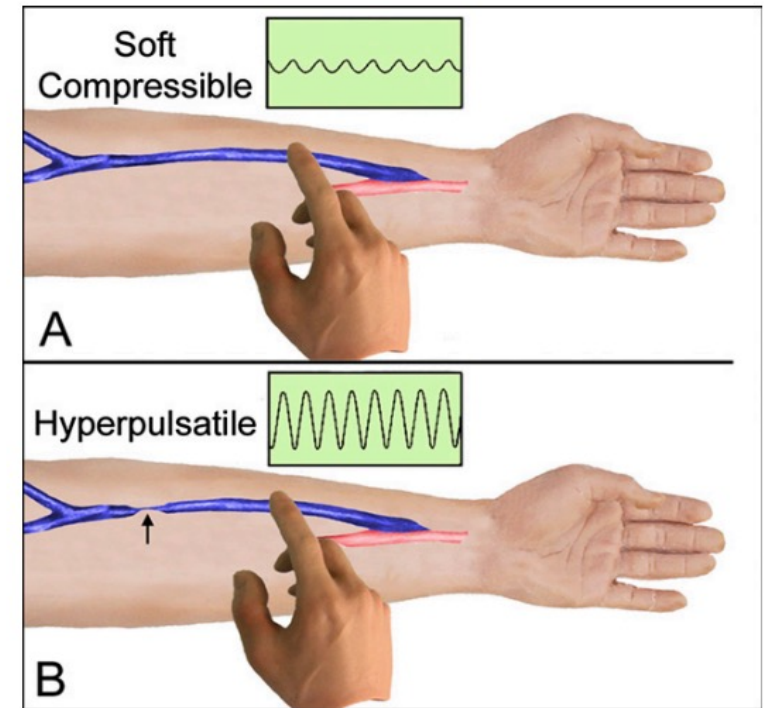
| |
|---|
| Stenosis |
| -iuxta-anastomotic |
| -of the arterial inflow |
| -of the venous outflow |
| Thrombosis (sometimes occur immediately after surgery or resulting from the presence of a stenosis). |
| Central venous stenosis or thrombosis |
| Hematoma and pseudoaneurysm |
| Infection, seroma and lymphatic collection |
| Steal syndrome and ischemic monomelic neuropathy |
| Pseudo-delayed maturation |

Abbreviation: AVF, arteriovenous fistula.
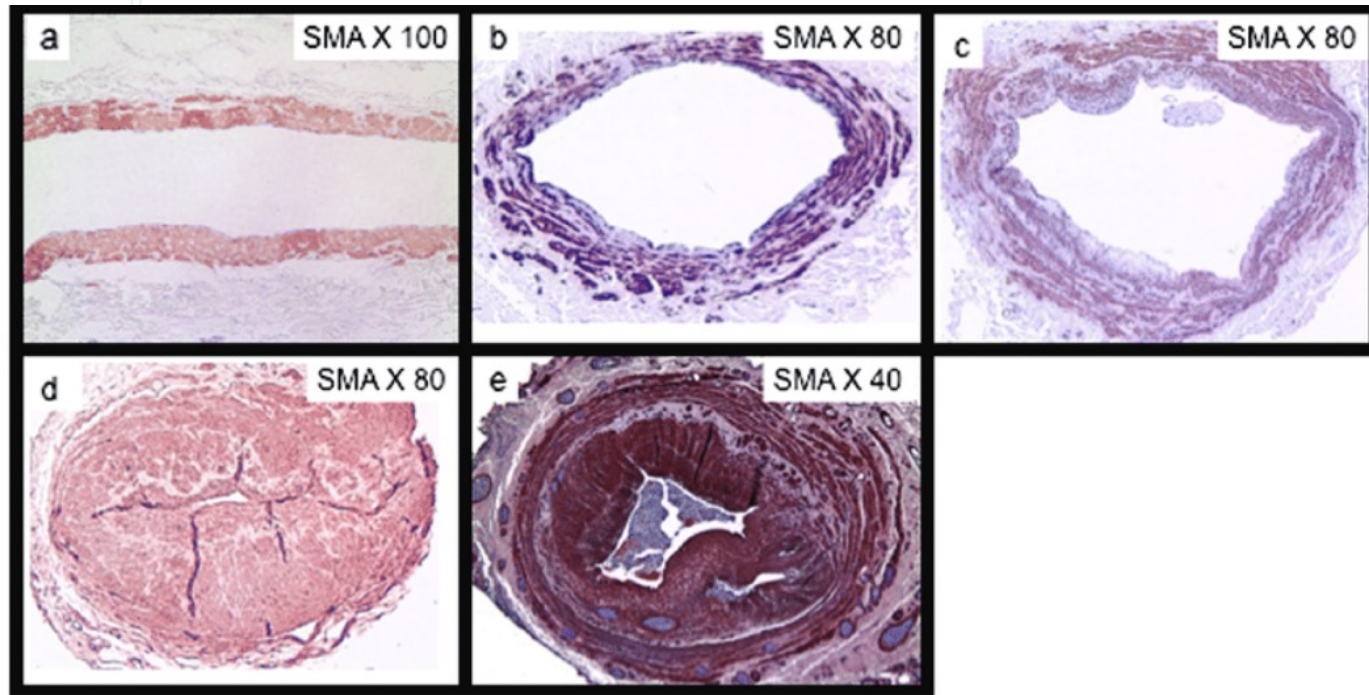
Histopathology of vein specimens from normal patients to stenosed AVF. (a) Shows normal human vein in a patient with no CKD. Note the absence of medial thickness and neointimal hyperplasia (b-d) shows SMA sections of patients with advanced CKD at the time of AV access placement. Note that neointimal hyperplasia in patients is variable from minimal neointimal hyperplasia to very severe lesions (e) shows a human vein in a patient with ESRD with a stenotic AV fistula. Note the aggressive thickening of the neointima and media and significant luminal stenosis that is similar to the lesion prior to access placement in some patients (d).

KDOQI 2019

Statement: General Treatment of Clinically Significant Stenosis or Thrombosed AV Access

15.4 **KDOQI considers it reasonable to use a careful individualized approach to the treatment of failing or thrombosed AVF and AVG (surgical or endovascular), based on the operators best clinical judgment and expertise considering the patient's ESKD Life-Plan. (Expert Opinion)**

Statements: Treatment of Clinically Significant AV Access Stenosis

Angioplasty

15.5 **KDOQI considers it reasonable to use balloon angioplasty (with high pressure as needed) as primary treatment of AVF and AVG stenotic lesions that are both clinically and angiographically significant. (Expert Opinion)**

Note: *Angiographically present stenosis without accompanying clinical signs and symptoms is inadequate to treat/intervene upon.*

15.6 **There is inadequate evidence for KDOQI to make a recommendation regarding the use of specialized balloons (drug-coated or cutting) versus standard high-pressure balloons in the primary treatment of AVF and AVG stenosis.**
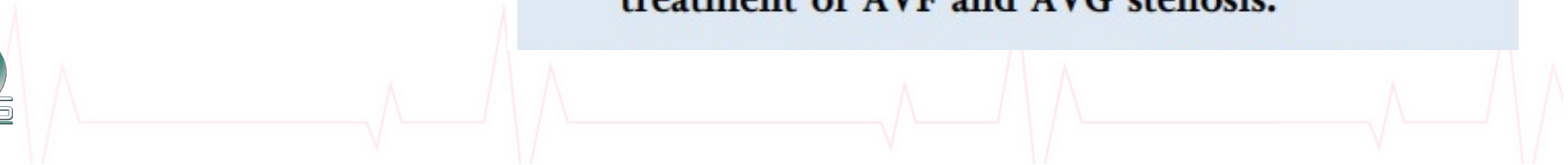
Choosing Flexible Tools

❑High-Pressure Balloons

❑Cutting Balloons

❑Drug-Coated Balloons

❑Nitinol Stent or Covered Stent

Research

❑ From June 2020 to October 2023

❑ Standards:

✓ Flow lower than 400 ml/min (AVF) and 600 ml/min (AVG)

✓ There is evidence of stenosis on the AVF/AVG (anastomotic, venous), no or little old thrombus

TOTAL PATIENTS	38
ANASTOMOTIC	
Radiocephalic	27
Brachial-cephalic	10
Graft	1
REASON	
Stenosis	32
AVF immaturation	6

Vị Trí Hẹp

Anatomy	Definition	N
Anastomotic	At the arteriovenous anastomosis	16
Post-anastomotic	Within a vascular segment 3 cm downstream from the anastomosis	14
Mid-vessel	Functional needling segment of the AVF, that is 3 cm downstream to the AV anastomosis and proximal to the 'swing point'; these include the mid-forearm, mid-humeral or upper humeral areas.	8
Swing point	Vascular segment crossing from a superficial to a deep venous system, such as the cephalic vein in the delto-pectoral groove or basilica vein confluence with brachial veins	3
Central	Intra-thoracic vascular segment, which includes the SVC, IVC, brachiocephalic and subclavian veins	5

Results

❖Cannot access: 10 patients

❖Lost to follow-up: 08 patients

❖Follow-up for 6 months: 22 patients

❖AVF/AVG preservation rate 6 months after angioplasty: 96%

❖Problems during intervention:

    ✓Hematoma at sheath puncture site: 2 patients

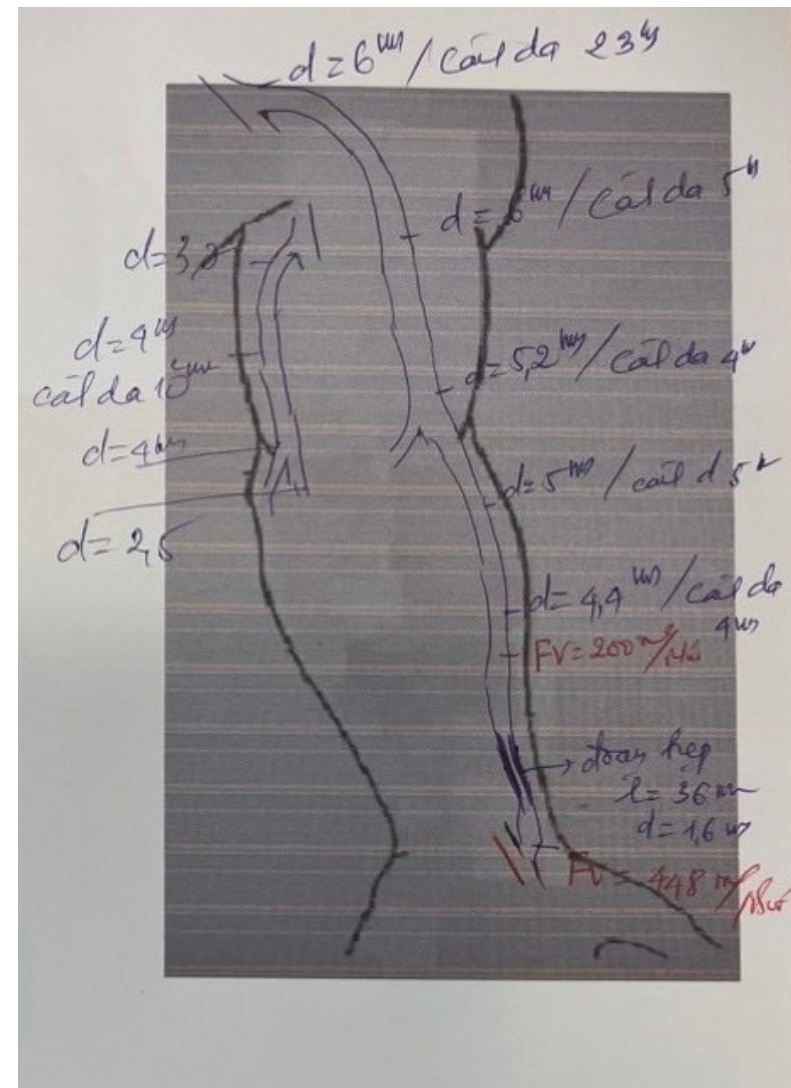   ✓Vein rupture after angioplasty: 3 patients

CASE 1

Female patient, 64y

✓ Hemodialysis 3 times per
   week, stage 5 CKD # 5 year

✓ Lower flow of Radiocephalic
   FV = 200 mL/ph

After intervention, this patient continues hemodialysis at radiocephalic until now
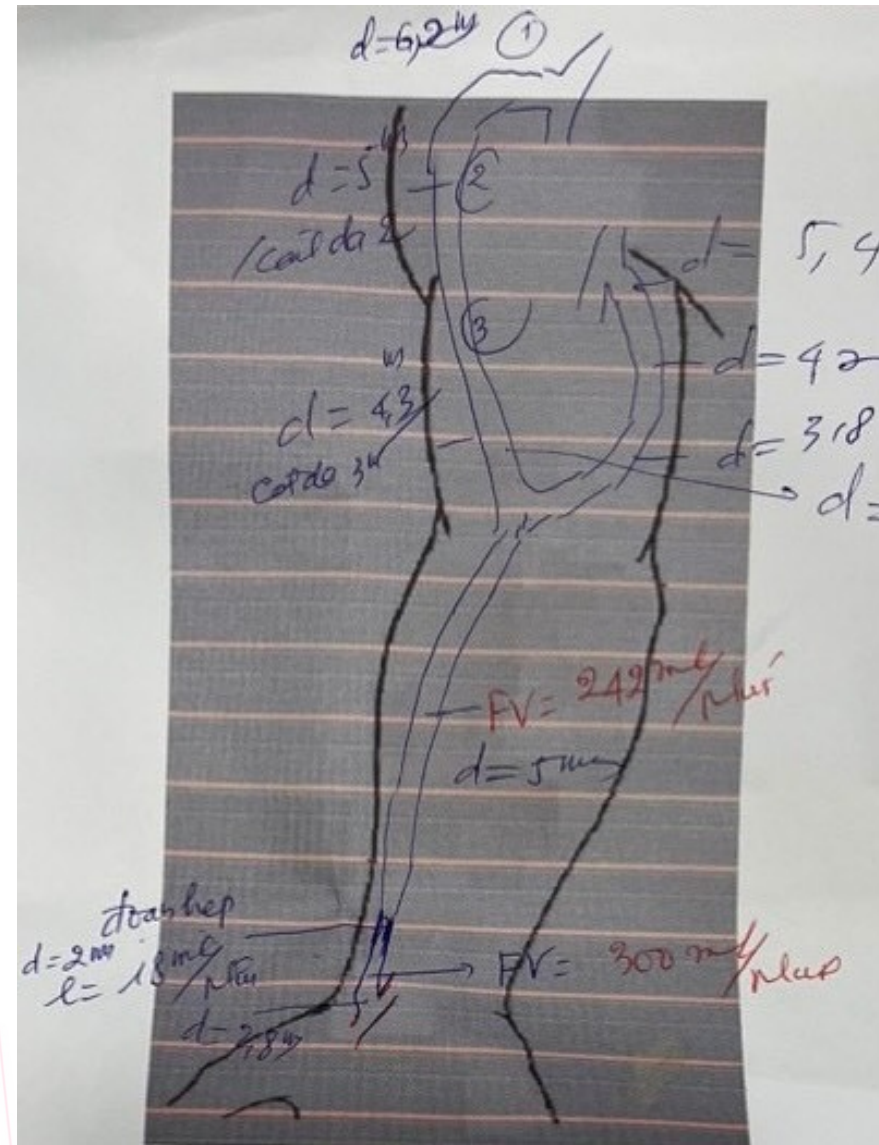
CASE 2

Female patient, 68y

✓ Hemodialysis 3 times per
   week, stage 5 CKD # 3 year

✓ Lower flow of Radiocephalic
   FV = 242 mL/ph

Conclusion

❑   Angioplasty is an effective treatment in dialysis vascular access malfunction, cause by stenosis anastomotic or returned vein

❑   Research data is limited, medium and long-term results have not been evaluated. Cannot separate stenosis anastomotic and AVF immaturation

❑   The important role of nephrologists and hemodialysis nurses in early detection of dialysis vascular access malfunction