Access for paediatric dialysis

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ERKNet
The European Rare Kidney Disease Reference Network

Outline

- Access for PD
  - catheters types
  - complications
  - guidelines
- Access for HD
  - central venous catheters (CVCs) vs arteriovenous fistulae (AVFs)
  - ‘One-stop’ vascular access clinic
- ESPN clinical practice guidelines on vascular access

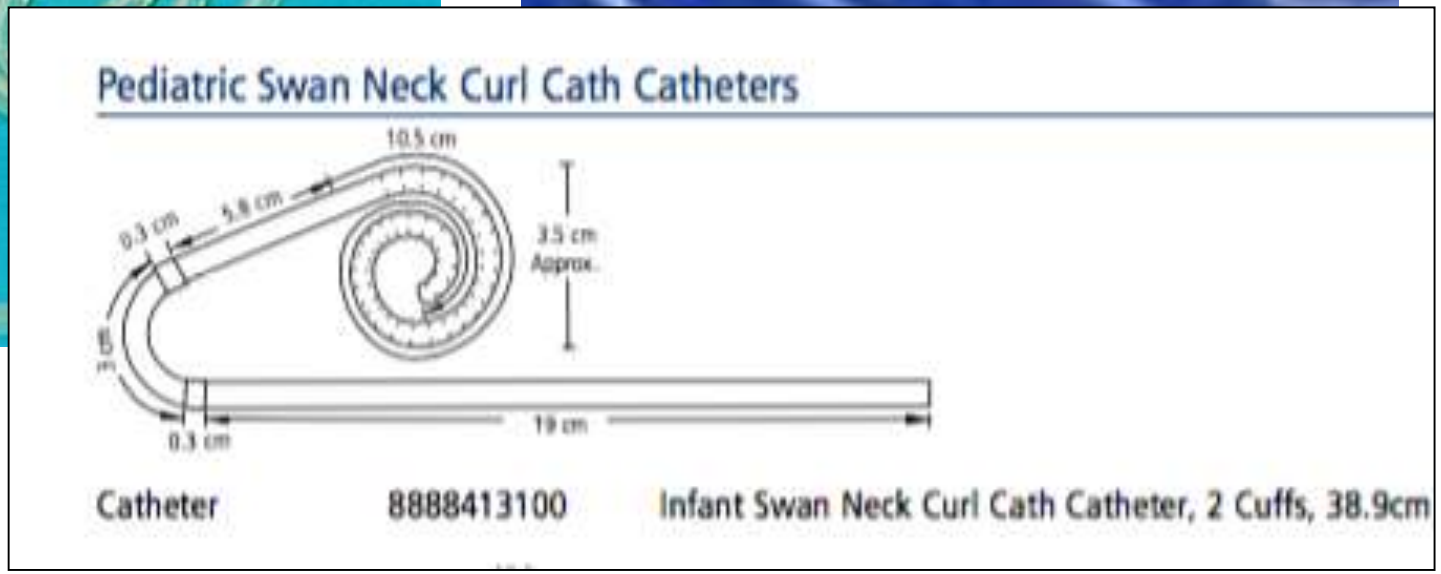
PD access

All figures removed for patient confidentiality reasons

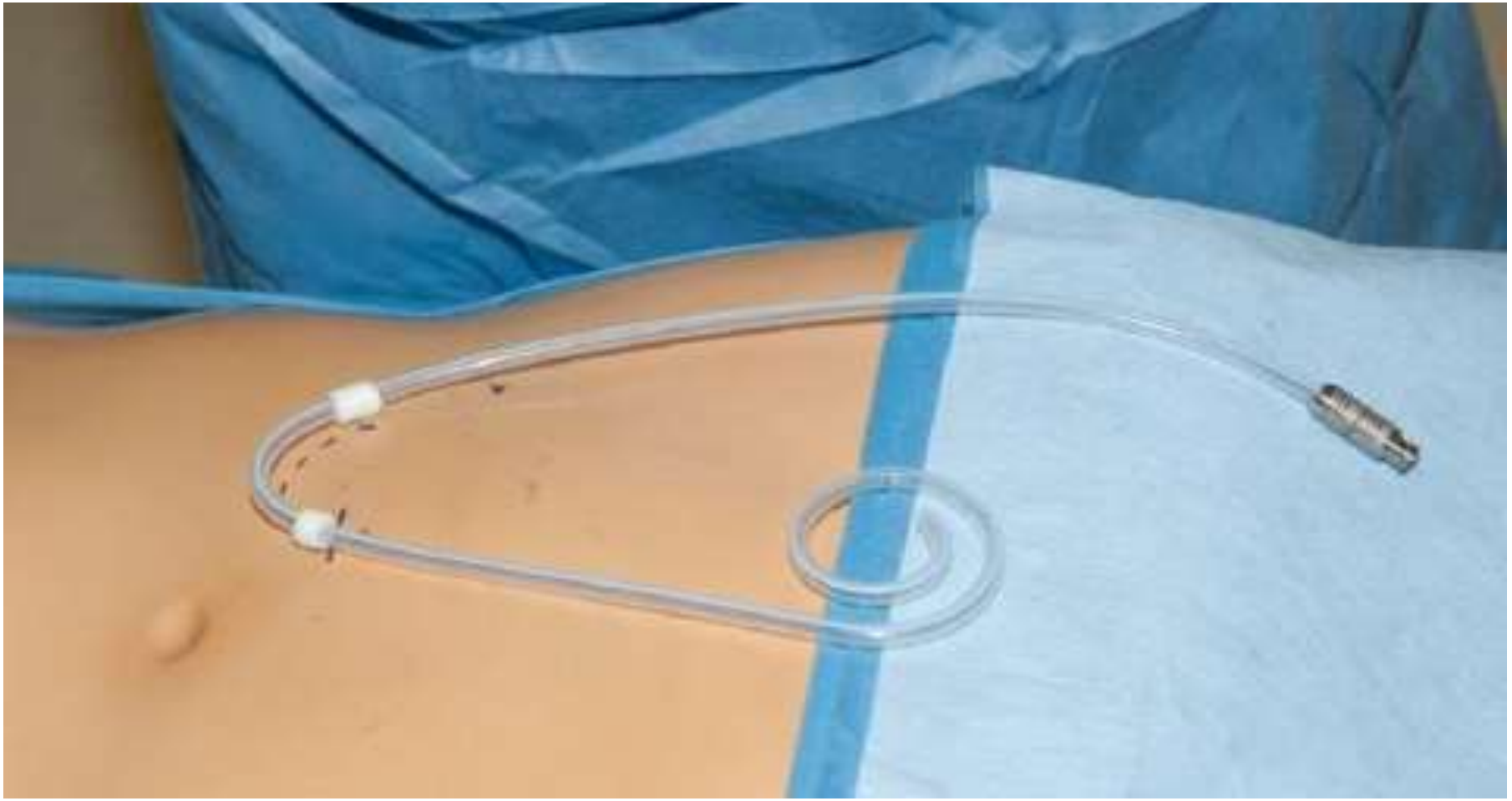
- Catheter types
- Placement
- Complications
- Guidelines

Tenckhoff catheters

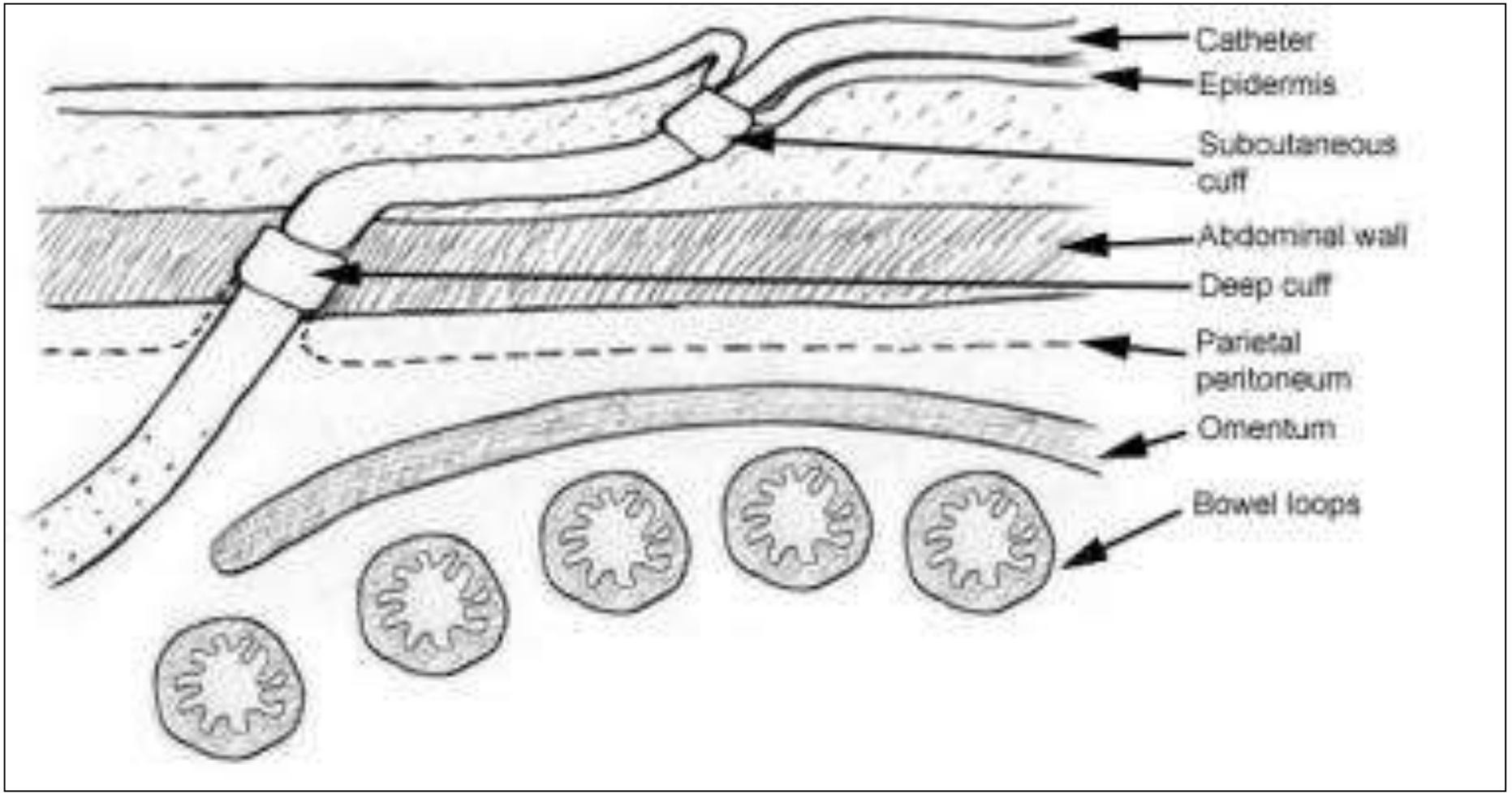
- Straight or coiled
- Permanent bend between 2 cuffs – allows downwards pointing exit site



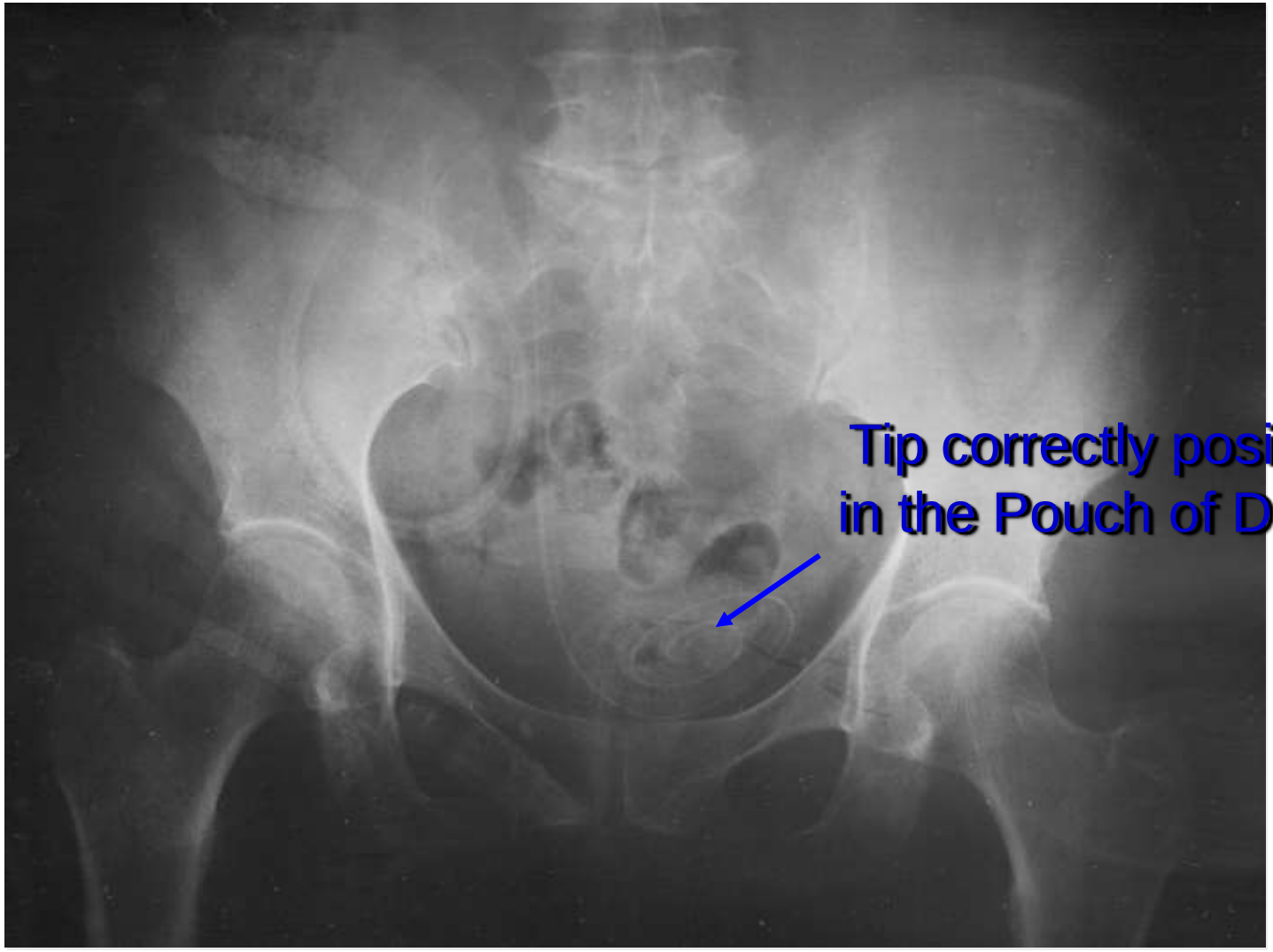
Measuring up the catheter



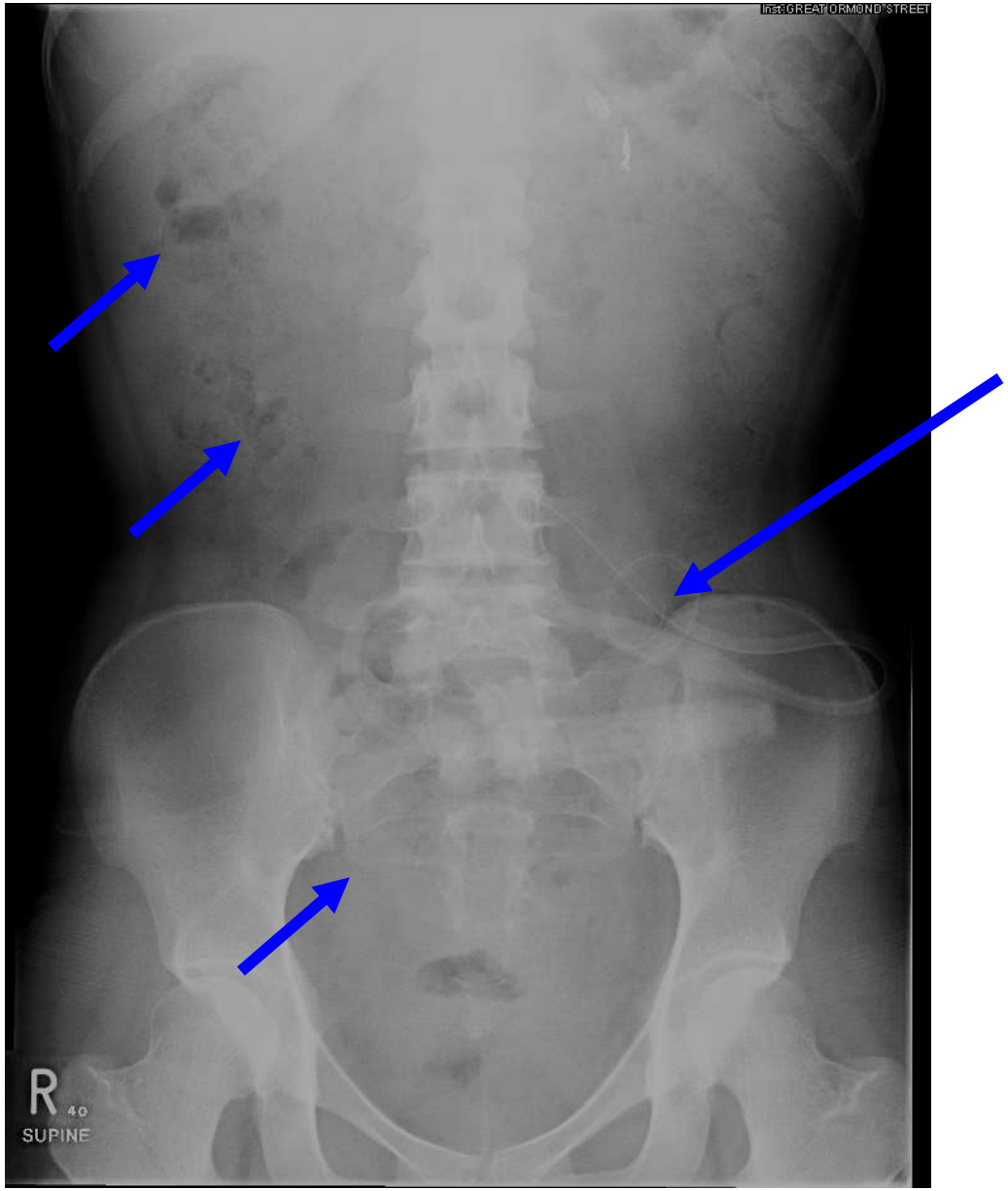
Anchoring the catheter



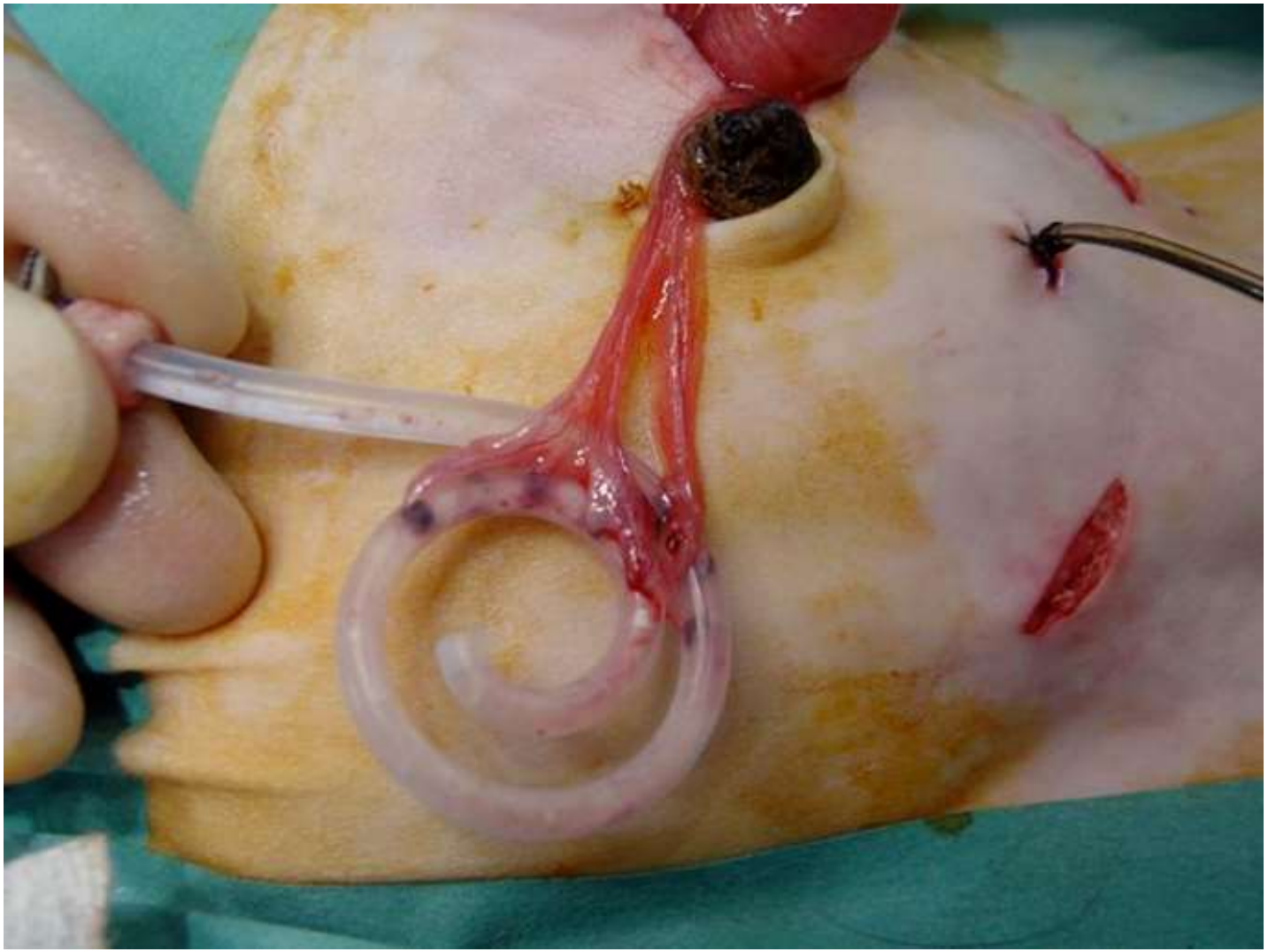
Ideal position



Where is the tip?!



A common complication….



How is this complication prevented?

1. Doing partial omentectomy
2. Doing total omentectomy
3. Inserting the catheter by seldinger technique
4. ‘Hitching’ (stitching) the omentum to the parietal peritoneum
5. This complication cannot be prevented

How is this complication prevented?

1. Doing partial omentectomy √
2. Doing total omentectomy √
3. Inserting the catheter by seldinger technique
4. ‘Hitching’ (stitching) the omentum to the parietal peritoneum √
5. This complication cannot be prevented

Catheter-related problems

One way obstruction

(good inflow - poor outflow)

- constipation
- catheter migration into upper quadrants
- Omental wrap

Management

- Careful attention to bowel preparation
- Omentectomy at time of PD catheter insertion
- Stitch catheter into pelvis (?)

Two way obstruction

(inflow and outflow)

- kink or bend in the catheter
- intraluminal obstruction
  - fibrin
  - blood clots

Management

- radiological insertion of trochar to straighten catheter
- flush with heparinized saline or tPA

PD in the patient with a colostomy

- PD in the presence of a colostomy or ileostomy is NOT contraindicated. *K/DOQI & European best practise guidelines*

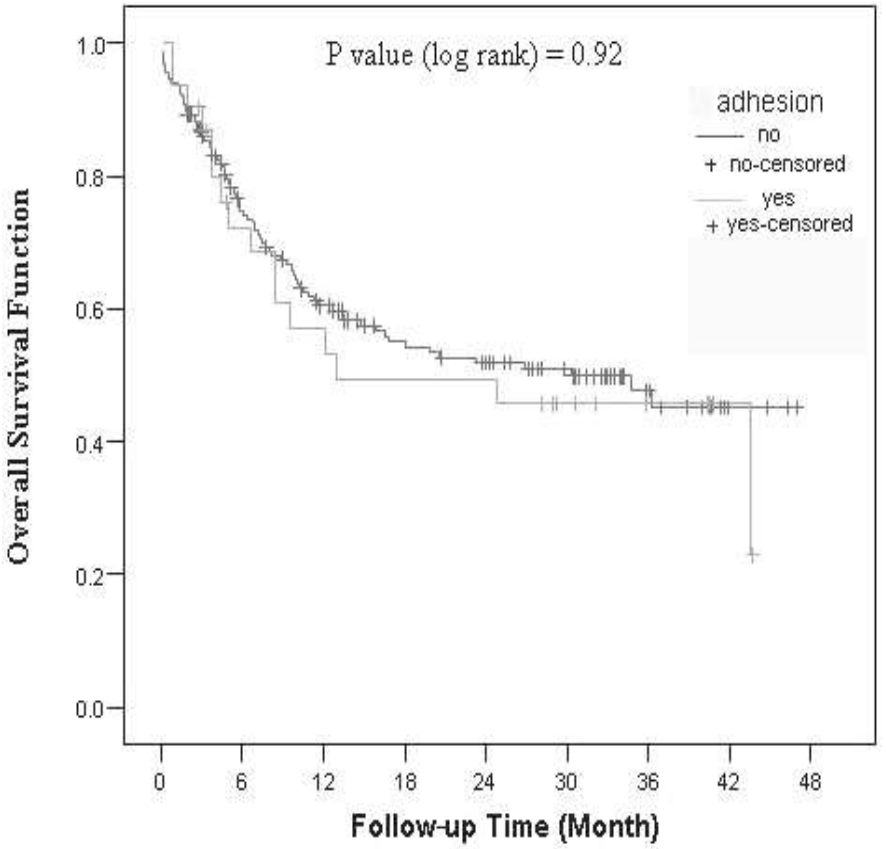
- Only 2 cases reported in paediatric literature

Chadha et al, Adv Perit Dialy, 2000

Effects of Previous Abdominal Operations on the Outcome of PD Catheters

217 successful catheter implantations
- previous abdominal surgery in 43%
- 27% had intraperitoneal adhesions
- 2.8% of patients without previous abdominal surgery had intraperitoneal adhesions.

There were no significant differences between the 2 groups for 1- and 2-year revision-free and overall catheter survival, mechanical dysfunction, infectious complications, or surgical revision



Keshvari A et al; PDI 2010

Cochrane review states that the following catheter-related interventions are important for the prevention of peritonitis

1. straight versus coiled catheters
2. single versus double cuffed catheters
3. laparoscopy compared with laparotomy for catheter insertion
4. Midline compared to lateral insertion
5. Standard insertion with resting but no subcutaneous burying of the catheter versus implantation and subcutaneous burying
6. Immobilisation versus no immobilisation of the PD catheter

Cochrane Review - CStrippoli G, Craig JC et al; 2004

Cochrane review states that the following catheter-related interventions are important for the prevention of peritonitis

1. straight versus coiled catheters √ **(may be relevant)**
2. single versus double cuffed catheters
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NOTE – a downward pointing exit site may prevent exit site infections

Cochrane Review - CStrippoli G, Craig JC et al; 2004

… results from RCTs

3 RCTs have shown **better outcomes with a straight rather than coiled catheter** (in adults)

Straight catheters have:

- Improved primary catheter function
- Improved PD technique survival
- Lower risk of catheter migration

Stegmayr BG, et al; Perit Dial Int 2005
Johnson DW, et al; Am J Kidney Dis 2006
Lo WK, et al; Perit Dial Int. 2003

The internal memory of the catheter is the most important factor against catheter migration.

PD access - conclusions

- Comparable outcomes with different types of PD catheters and insertion techniques
- Local expertise should govern the choice of PD catheter insertion technique
- Most catheter related complications are preventable….. Constipation is the commonest!

Access for HD

All figures removed for patient confidentiality reasons

Which of the following should NOT be used for chronic dialysis in a 10 year old child?

1. Single lumen cuffed catheter
2. Double lumen uncuffed catheter
3. Double lumen cuffed catheter in the subclavian vein
4. Hickmann line
5. Femoral arteriovenous graft

Which of the following should NOT be used for chronic dialysis in a 10 year old child?

1. Single lumen cuffed catheter √
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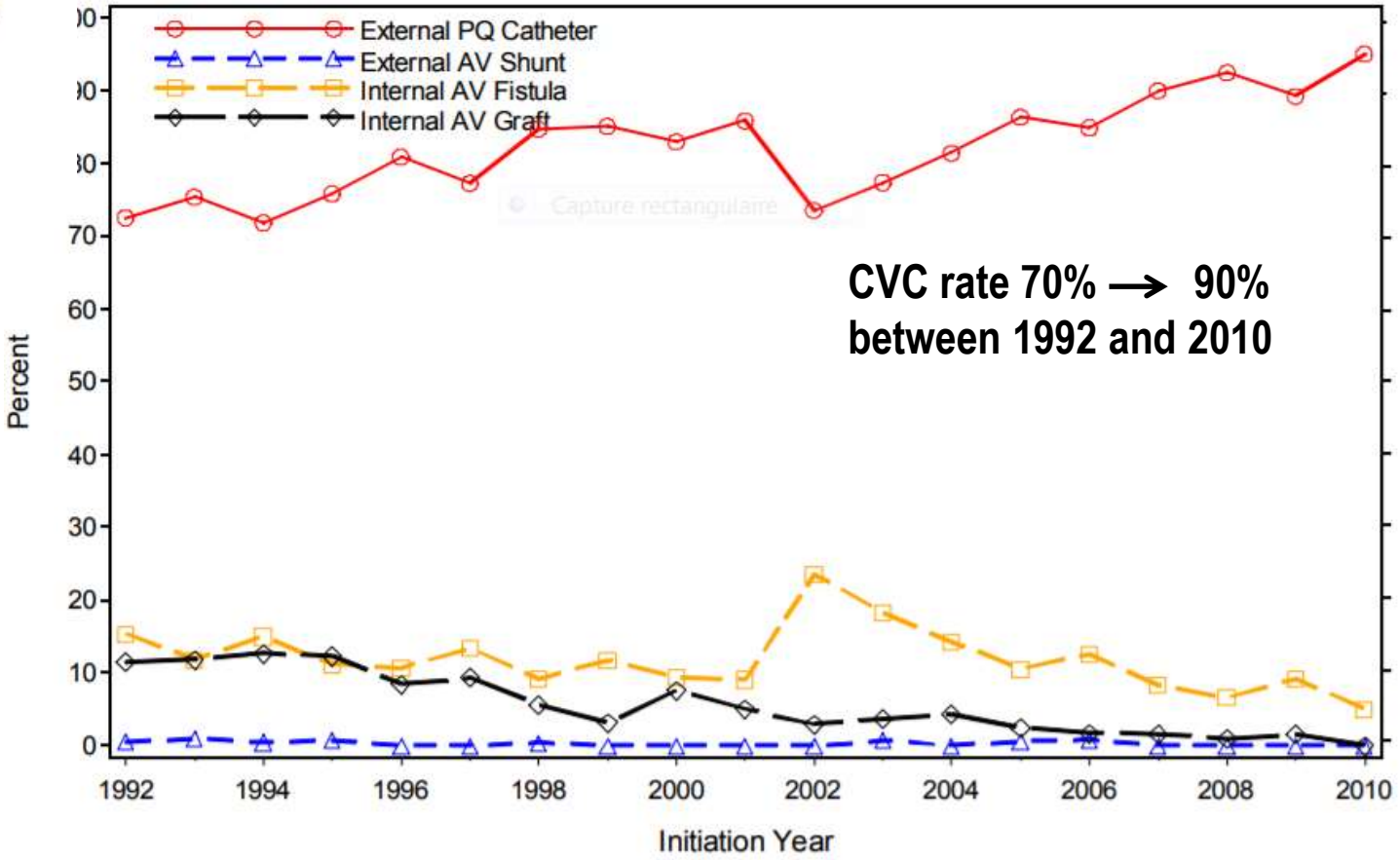
3. Double lumen cuffed catheter in the subclavian vein √
4. Hickmann line √
5. Femoral arteriovenous graft √

International Pediatric Fistula First initiative – a call to action



AJKD 2008

NAPRTCS annual report 2011

Pediatr Nephrol (2012) 27:999–1004
DOI 10.1007/s00467-011-2079-3

ORIGINAL ARTICLE

Vascular access: choice and complications in European paediatric haemodialysis units

Wesley N. Hayes · Alan R. Watson · Nichola Callaghan · Elizabeth Wright · Constantinos J. Stefanidis · On behalf of the European Pediatric Dialysis Working Group

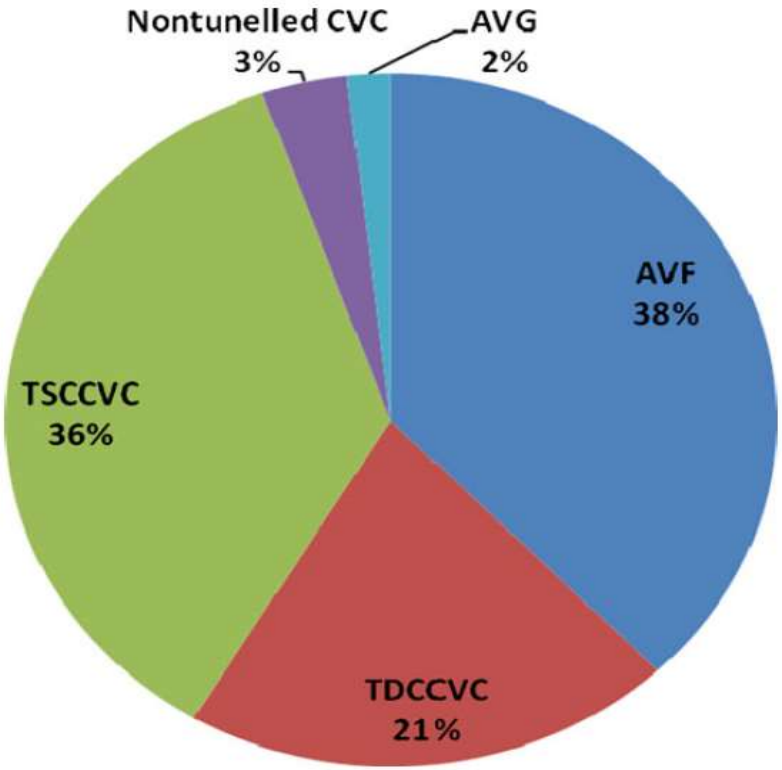


Fig. 3 Choice of vascular access. *AVF* arteriovenous fistula, *AVG* arteriovenous graft, *CVC* central venous catheter, *TSC CVC* tunneled single-cuff CVC, *TDC CVC* tunnelled double-cuff CVC

All figures removed for patient confidentiality reasons

Central Venous Catheter

Increased risk with CVC of:

- Death
- Infection
- Poor Dialysis adequacy
- Thrombosis

All figures removed for patient confidentiality reasons

- Paed Nephrol 2005;20:1054
- Am J Kid Dis 2005;45:303
- Am J Kid Dis 2005 ;45:705

What does this photo and scan show?

All figures removed for patient confidentiality reasons

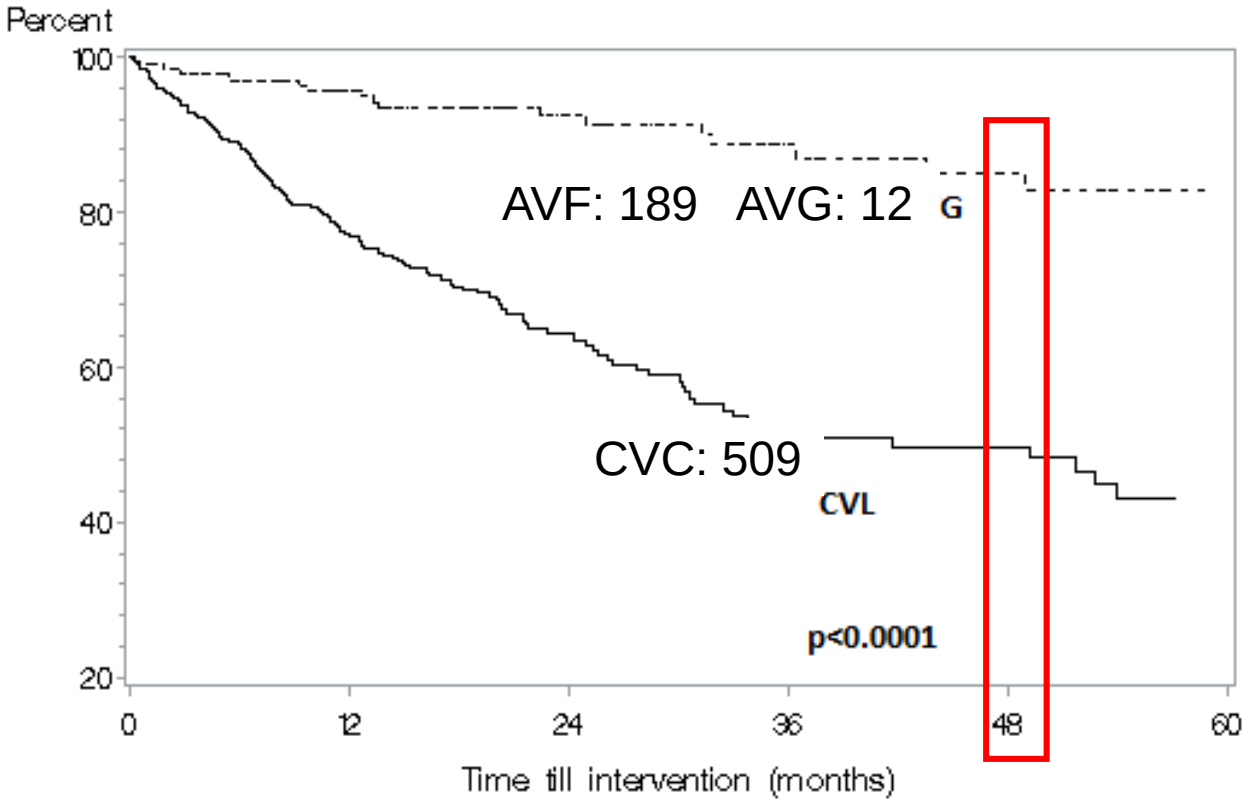
What does this photo and scan show?

1. Inferior vena cava syndrome
2. Superior vena cava syndrome
3. Dilated chest veins due to cirrhosis
4. Subclavian vein occlusion
5. Bilateral and complete occlusion of all central vessels

What does this photo and scan show?

1. Inferior vena cava syndrome
2. Superior vena cava syndrome √
3. Dilated chest veins due to cirrhosis
4. Subclavian vein occlusion
5. Bilateral and complete occlusion of all central vessels √

IPHN Registry - Vascular access survival



Vascular access choice and complications in pediatric hemodialysis: Findings from the **International Pediatric Hemodialysis Network (IPHN)**. Borzych-Duzalka D et al. 2016

Clinical Course Associated with Vascular Access Type in a National Cohort of Adolescents Who Receive Hemodialysis: Findings from the Clinical Performance Measures and US Renal Data System Projects

Clin J Am Soc Nephrol 1: 987–992, 2006.

Jeffrey J. Fadrowski,* Wenke Hwang,† Diane L. Frankenfield,‡ Barbara A. Fivush,* Alicia M. Neu,* and Susan L. Furth*§

Characteristic	Total Population (n = 418)	Stratified Population	
		Catheter (n = 175)	Permanent Access (n = 243)
Mean age (yr [SD])	15.6 (1.6)	15.4 (1.6)	15.7 (1.5)

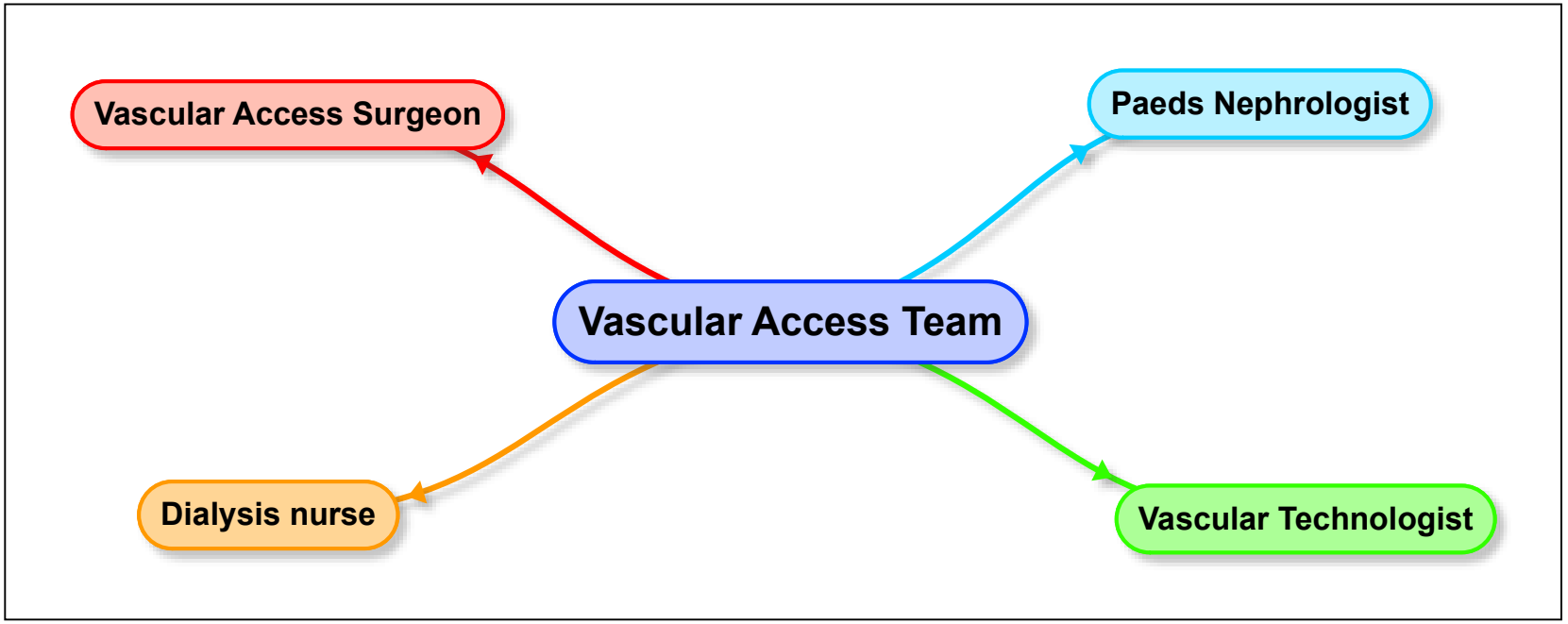
Table 3. RR (catheter *versus* permanent access) of dialysis outcomes in adolescent patients who received hemodialysis[a]

Parameter	Hospitalization, All-Cause		Hospitalization, Infection-Related		Access Complication	
	RR[b]	95% CI	RR	95% CI	RR	95% CI
Vascular catheter *versus* permanent access	1.84[d]	1.38 to 2.44	4.74[d]	2.02 to 11.14	2.72[d]	2.00 to 3.69



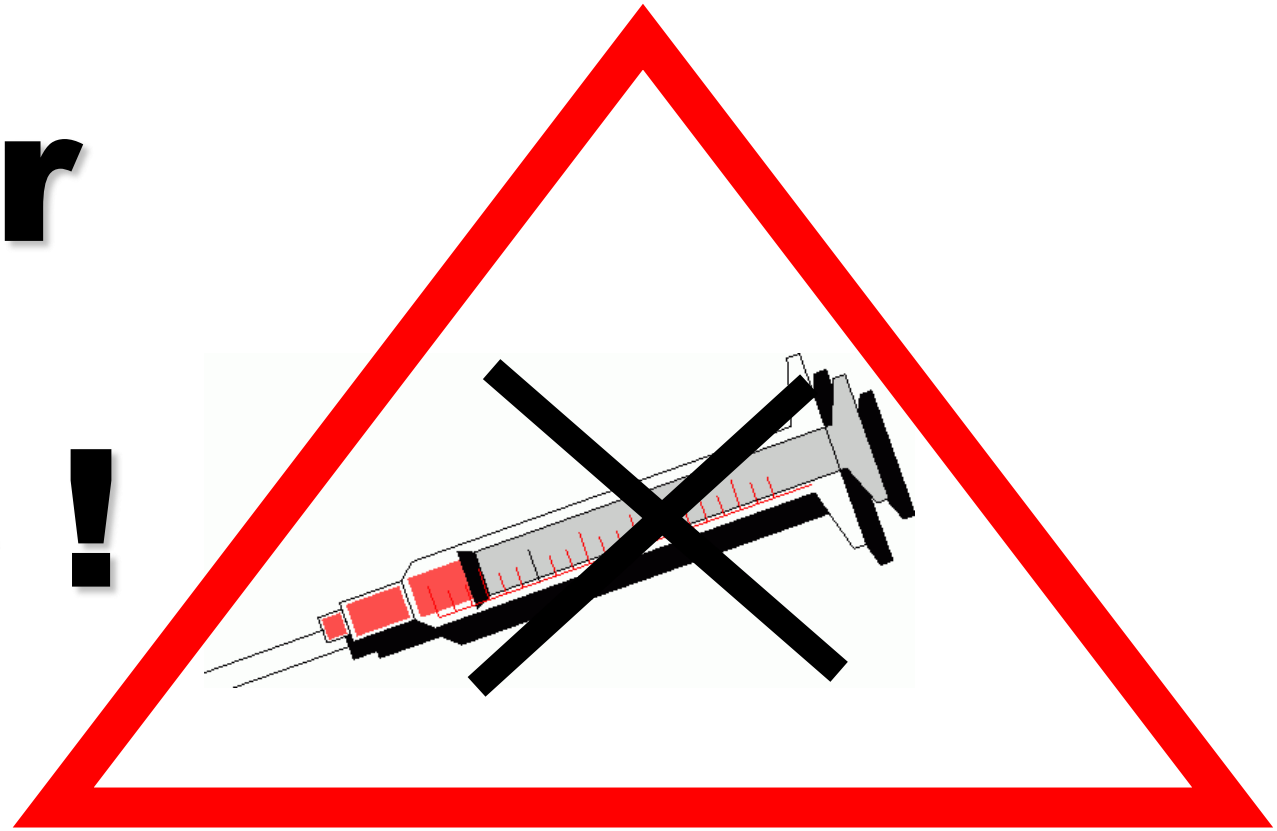
'permanent access'= AVF or AVG…. They are not permanent!

‘One – Stop’ Vascular Access Clinic



Save Your Veins

Your Life !



No to Needling

Vascular Access Strategy

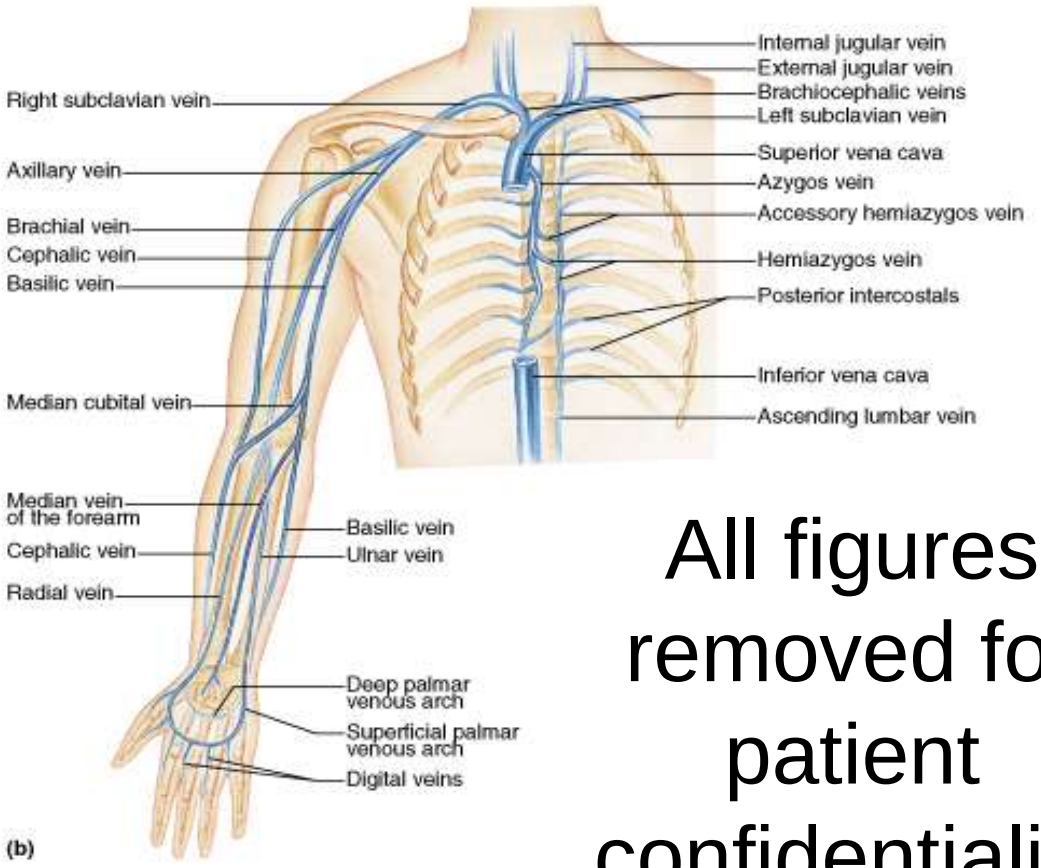
- See the patient early
- Vein preservation
- Non-dominant before dominant
- Distal before proximal
- Native before Graft
- Avoid CVC

All figures removed for patient confidentiality reasons

Non-dominant limb

Venous Assessment - clinical

- Peripheral
  - Size
  - Dilation
  - Continuity
  - Length
  - Straight
  - Depth
- Central veins



All figures removed for patient confidentiality reasons

Assess in a warm room with tourniquet application and elicit the ‘Lewis response’ if needed

Venous Assessment - ultrasound

Ultrasonic Angiology Department GSTT

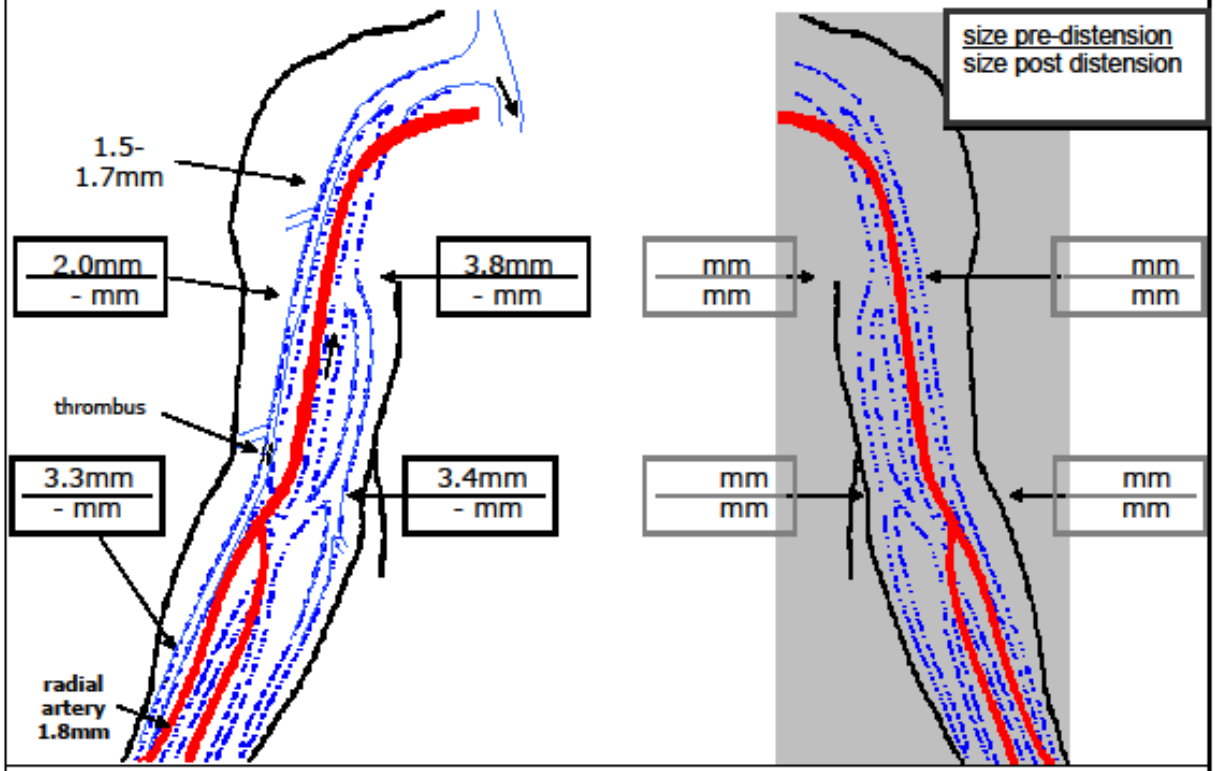
Patient Name:
Hospital Number: DOB:
Address:

Hospital: **GOSH**
Consultant:

Ultrasonic Angiology Department
2nd Floor, Borough Wing,
Guy's Hospital, London SE1 9RT
Tel/Fax: 0207 188 6778/6771
Head of Dept: Dr. TS Padayachee

V5

RENAL ONE STOP CLINIC Scan Date: 02.06.2015



Conclusion:

RIGHT ARM

First cannulation

Pediatr Nephrol
DOI 10.1007/s00467-016-3382-9

ORIGINAL ARTICLE

Timing of first arteriovenous fistula cannulation in children on hemodialysis

Veronika Almási-Sperling[1] · Matthias Galiano[2] · Werner Lang[1] · Ulrich Rother[1] ·
Published online: 25 April 2016 · nne Regus[1]

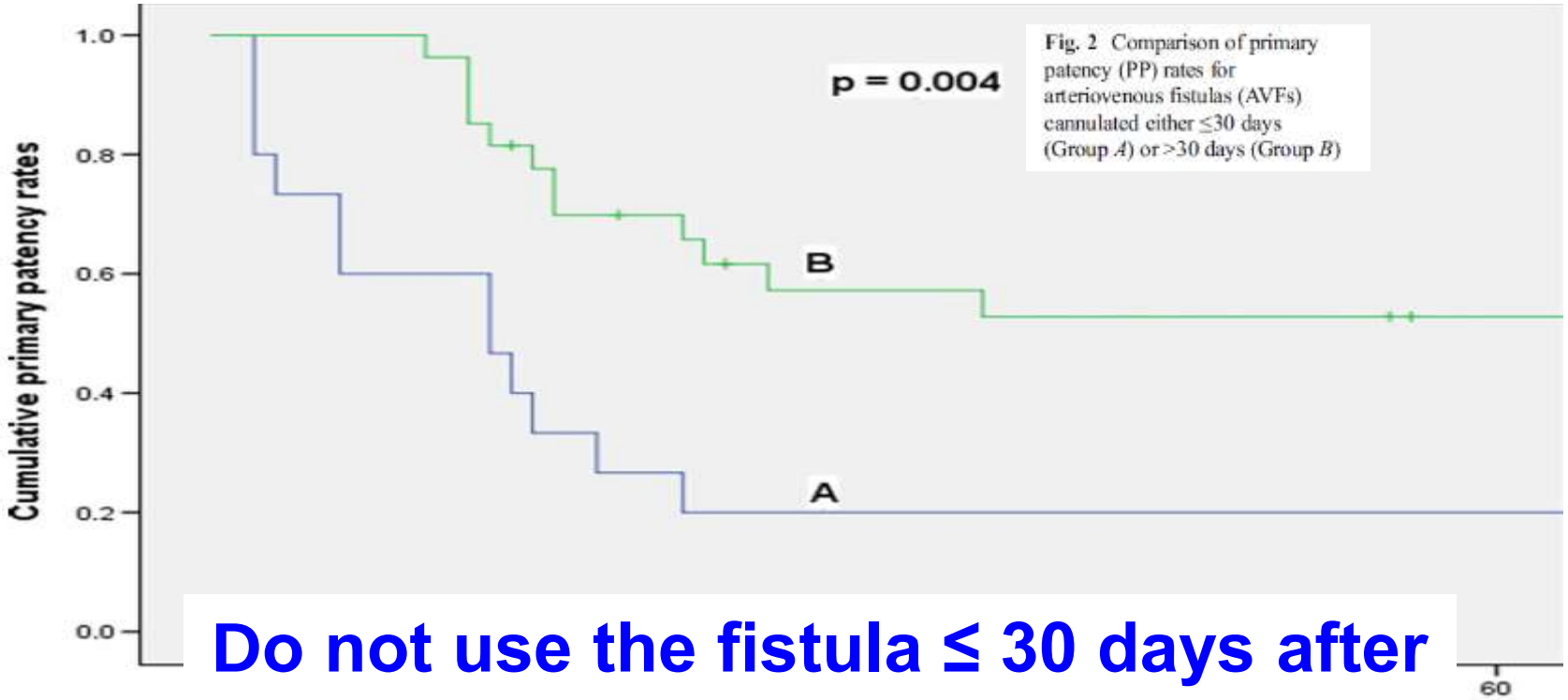


Fig. 2 Comparison of primary patency (PP) rates for arteriovenous fistulas (AVFs) cannulated either ≤30 days (Group *A*) or >30 days (Group *B*)

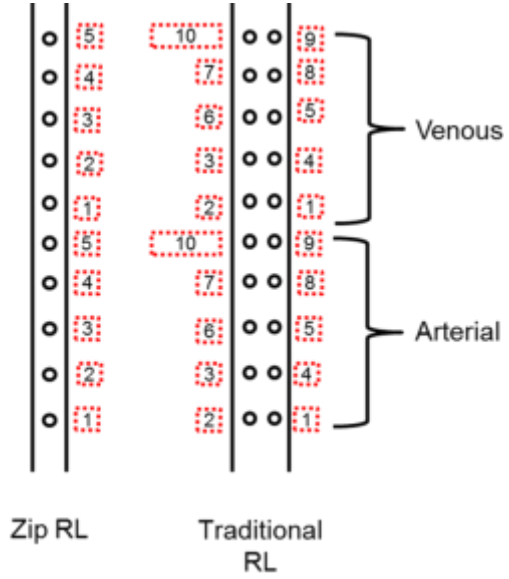
Do not use the fistula ≤ 30 days after it's creation; wait until 45 days

Cannulation techniques

Area puncture
cannulation of AVF in the same area

Buttonhole – needles are placed at the same site (same angle and depth) at each dialysis session through a previously created track.

Start with sharp needles, then blunt needles are routinely used.



Rope ladder – needle puncture sites are chosen
at a defined distance from each other along the access and rotated

Surveillance

- **Adequacy of dialysis**
- **Blood flow rate**
- **Clinical problems**
- **Diagnostic imaging / Dialysis parameters**
- **Examination**

All figures removed for patient confidentiality reasons

Monitoring & Surveillance

Monitoring and surveillance with subsequently pre-emptive radiological or surgical intervention reduces the rate of thrombotic events in AV fistulae, thus substantially decreasing patient morbidity, hospital admissions and costs of healthcare delivery [12–14].

3-monthly flow measurements for AVFs recommended.

EBPG Nephrol Dial Transplant (2007) 22 [Suppl 2]: ii88–ii117

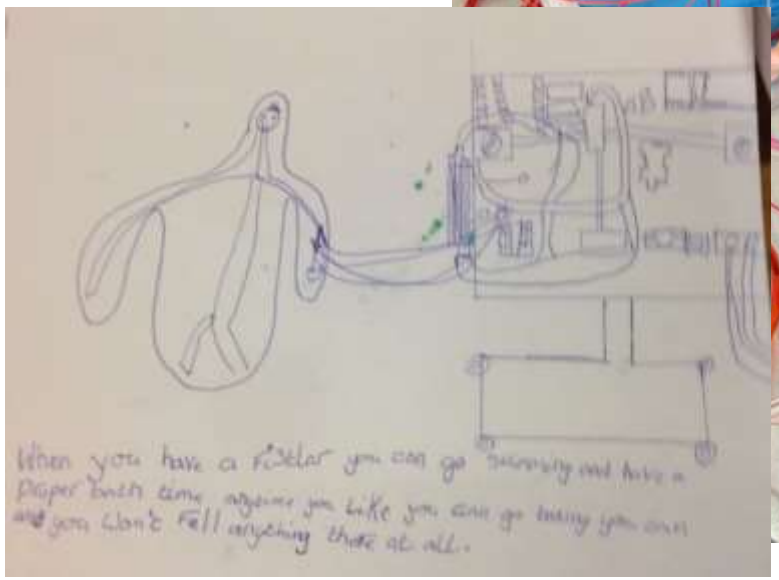
Psychological Preparation

All figures removed for patient confidentiality reasons

All figures removed for patient confidentiality reasons

Preparation and Desensitisation

- Reward Charts
- Role playing
- Messy play
- Written step by step plan
- Coping techniques
- Kidney Book



Changes in RRT modality before reaching 18 years age

Number of treatment changes from the start of RRT to age 18[a]	N (%)
0	614 (34.6)
1	753 (42.4)
2	188 (10.6)
≥3	222 (12.5)

Preserve vascular access *t al; NDT 2009*

ESPN consensus document on vascular access for chronic HD

Table 4 – Summary of recommendations

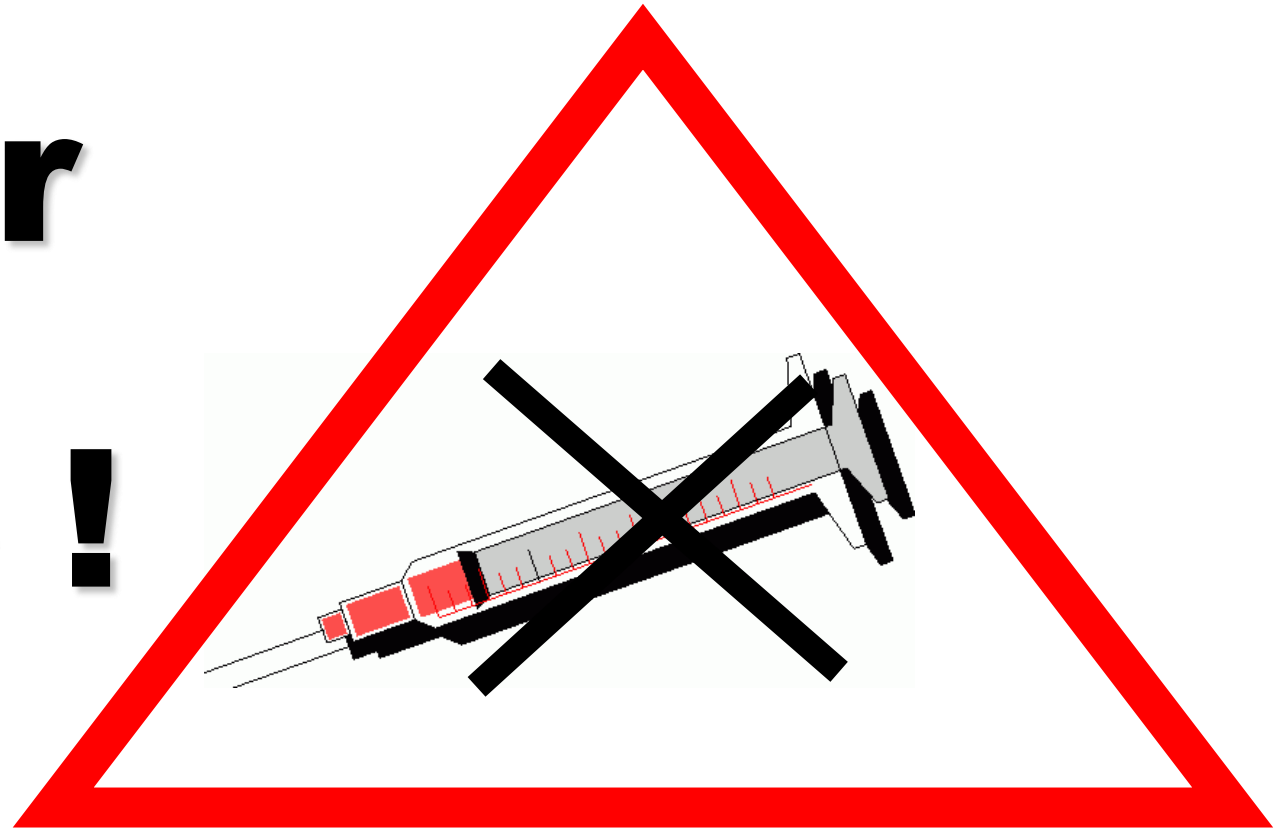
	CATEGORY	RECOMMENDATION	GRADE
1.	Planning vascular access	1. 1 Educate children with CKD and their carers about venous preservation, irrespective of the choice of future renal replacement therapy, and starting from their early contact with the nephrology services. 1.2 Educate children with CKD stage 4 (estimated GFR < 30 mL/min/1.73 m² by Schwartz formula), those with rapidly declining kidney function, or those who need to start maintenance dialysis imminently, about kidney failure and options for its treatment, including kidney transplantation, peritoneal dialysis, haemodialysis in the home or in-center, and conservative treatment, where appropriate. 1.3 We suggest referring children with CKD 4 who are being prepared for future haemodialysis to a dedicated vascular access team.	Ungraded Ungraded 2D
2.	Optimal vascular access in children	2.1 We suggest that children requiring chronic haemodialysis start with a functioning AVF where appropriate. 2.2 Reserve cuffed CVLs for very small children depending on vessel size and surgical expertise, those requiring urgent or unplanned haemodialysis, patient preference and where a short period on haemodialysis is anticipated before transplantation. 2.3 There is insufficient evidence to provide recommendations on AVGs in children.	2C Ungraded Ungraded
3.	Pre-operative evaluation for AVF formation	3.1 We suggest performing a structured history, physical examination and duplex ultrasound of upper limb arteries and veins to plan AVF creation. 3.2 We suggest performing appropriate imaging of central veins by venography, CT angiography or non-contrast MRI in children in whom central venous stenosis is suspected, such as those with previous CVLs. 3.3 Avoid AVF creation in the ipsilateral arm of a central venous stenosis.	2C 2D Ungraded
4.	Site of AVF placement	4.1 Place an AVF in the non-dominant arm where possible 4.2 We suggest placing an AVF distally in the arm.	Ungraded 2D
5.	Timing of creation of vascular access	We suggest creating an AVF at least 3 months before its anticipated use.	2D
6.	Assessment of AVF maturation	We suggest assessing maturation four to six weeks after AVF formation by clinical examination and duplex ultrasound in order to plan the timing of AVF cannulation.	2D
7.	AVF cannulation	7.1 We suggest cannulating an AVF when it has matured adequately. 7.2 Use an aseptic technique for AVF cannulation. 7.3 We suggest using either rope-ladder or button-hole technique for AVF cannulation.	2D Ungraded 2C
8.	AVF surveillance	8.1 We suggest that a structured physical examination of AVFs is routinely performed by dialysis nurses and medical staff.	2D

NDT 2019

Thank you!

Save Your Veins

Your Life !



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