cannulation and ultrasound in the dialysis unit

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What the dialysis nurse thinks is a good AVF for cannulation

- > 6mm in diameter
- < 6mm deep
- Easy to palpate
- 10cm of **straight** vein for rope ladder cannulation
- Not too soft (Low inflow)
- Stops bleeding quickly at the end
Ultrasound in the dialysis unit

- Used as an adjunct to standard clinical assessment
- Helps to avoid infiltration by allowing staff to choose optimal cannulation sites and visualise insertion
- Staff training – Visualise what you are palpating
- Aid to create AVF “map” for future cannulators
- Helps to identify problems – deep vessels, areas of previous infiltration, stenosis, thrombus
- Images can be saved and uploaded to eMR
- Staff should be provided with training
Portable ultrasound
Pre Cannulation assessment

- Lets you see what you will be needling
- Able to assess entire vein for suitable cannulation sites and areas to avoid
Depth

Perfect

Too deep
Visualising our cannulation
Visualising our cannulation

- Real time guide for cannulation
Patient referred from HD unit with “no access” (multiple failed arm and leg)

1 year old functioning AVF “un useable”

Septic from tunnelled femoral catheter (removed)

Vein 1cm deep and hard to palpate

No ultrasound in referring unit
When there is bruising the ultrasound can be used to assess the fistula

Do the cannulation puncture sites line up with the vessel?

? Bruising may not have occurred if US used
What we see with the Ultrasound in the dialysis unit
The AVF has no stenosis and good flow but “we keep having cannulation issues” since infiltration 2 weeks ago

The “vein” is easily palpable and shallow but we keep missing

“We are getting clots in the needle”
What the staff were palpating and cannulating
False aneurysm

- Referred by dialysis nurses as ongoing cannulation issues
- Good flow 780ml/min
- Nice straight shallow vein
- Multiple cannulation marks noted at widest palpable vein segment
Stenosis

- Clinical assessment – suspected stenosis
- Easily seen on ultrasound
- Access flow performed and 200ml/min
- Recirculation 30% as both needles distal to stenosis
- Referred for urgent angioplasty
How could you miss?

- Should be easy to cannulate
- Patient area needling at home
- Multiple issues with cannulation
When we looked…. 

- When questioned pt had fevers for weeks at home and didn’t tell anyone
- BC’s attended and +ve for Staph
- Echo=bacterial endocarditis
Intra op
Referred as “infected AVF’s?”

Afebrile, erythema, pain, stent

Afebrile, erythema, pain
Infection

BC’s positive for staph
Non occlusive thrombus

Thrombophlebitis
Infected buttonhole

Outside

Inside

FISTULA
What we see with our US

Valve, false aneurysm, aneurysm, fresh thrombus

Stent with false aneurysm, Buttonhole
Large haematoma surrounding
PTFE AVG
Once staff are trained and confident

- Helps with staff training and promotes improved cannulation with less infiltrations
- Helps to confirm clinical findings
- Promotes rope ladder cannulation
- Quick – especially for problematic AVF’s
- Never enough in the unit to go around
- No more multiple cannulation attempts
Other countries
Challenging our beliefs
Indonesia
3 years on HD – No “vascular access”
- Femoral vein, cephalic vein puncture
- No “vascular access” but still having dialysis
- Not just short term
Cannulating Fem vein with dialysis needle
Japan
Japan

- Mostly in centre HD (300,000 patients)
- 95% cannula needles for dialysis
- AVF’s routinely needled at 3–4 weeks
Japan

- Tourniquets applied to cannulation sites (Sometimes > 1 hour)
- Nephrologists, doctors, dialysis nurses and renal techs all trained to cannulate.
- Self cannulation inconceivable to dialysis staff and patients
Brachial artery superficialisation
Conclusion

- Use of a portable ultrasound by trained dialysis nurses promotes improved cannulation with pre cannulation assessment and real time visualisation to guide cannulation.
- Can be used as an adjunct to clinical assessment to promote early detection of problems
Buttonholes
What is a buttonhole

- Epithelialised track
- Studies show increased risk of infection
- Studies show strict adherence to preparation reduces incidence of infection
- Track can be $> 1\text{ cm long}$
- We are only prepping the surface
- What is going on inside the track??
Established buttonhole
Buttonhole creation
False aneurysm originating from AVF vein

- More common than we realise post infiltration
- Easily palpable
- Easy to needle
- Hard to thread needle
- Possible outflow stenosis