

Vascular Access Cannulation and Care



NephroCare

Maria Teresa Parisotto

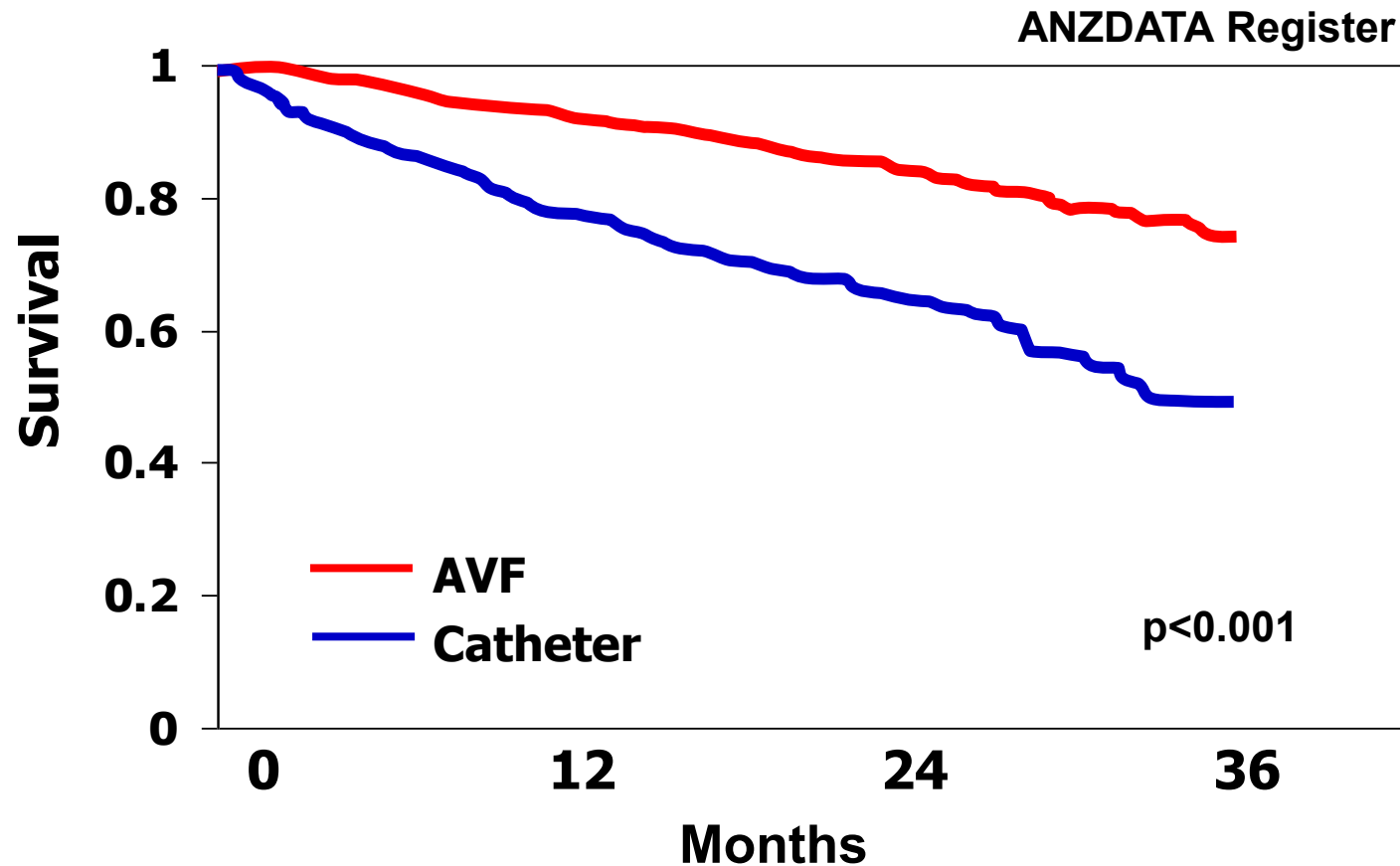
Director, Nursing Care Management

Fresenius Medical Care – NephroCare Coordination - Bad Homburg - Germany

Belek/ANTALYA, October 23rd, 2014

Preserving the AVF as the patient lifeline: reduced mortality with the AVF compare to catheter

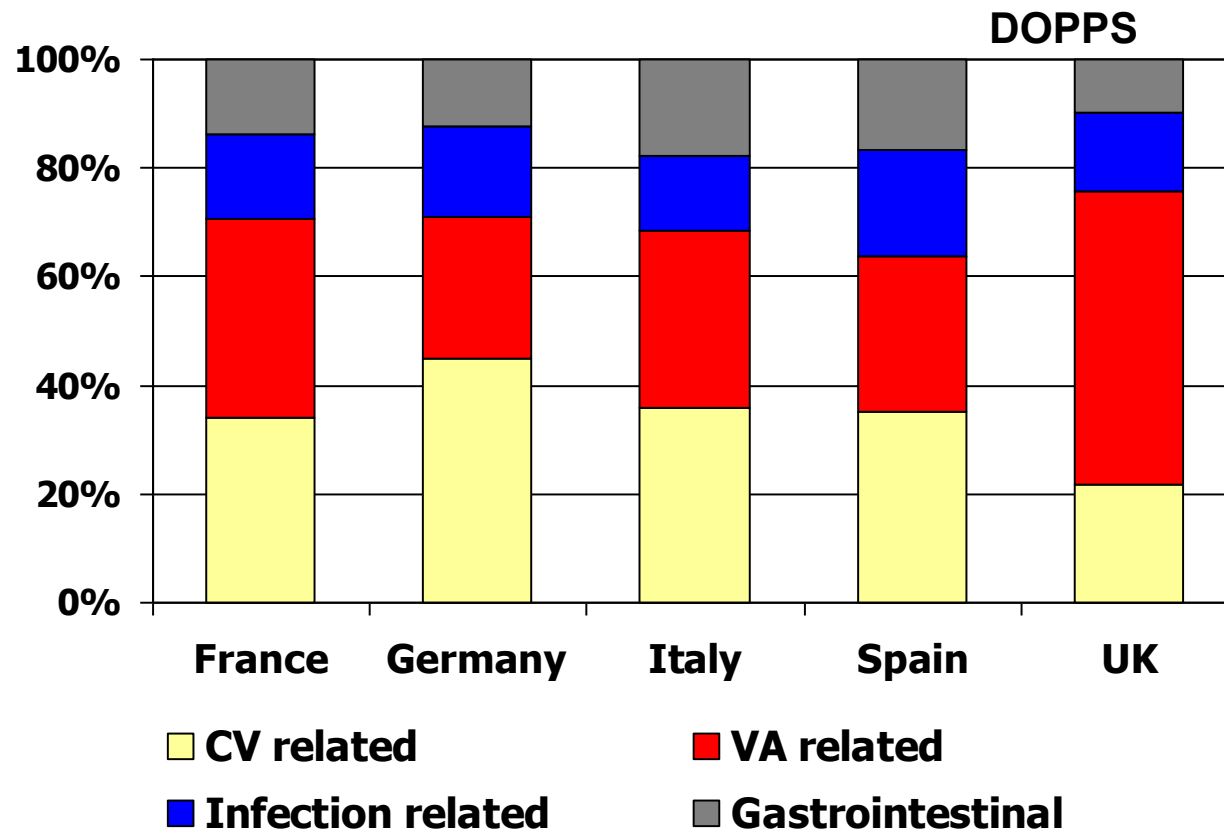
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Polkinghorne et al. *J Am Soc Nephrol* 15: 477-486, 2004

Vascular Access Major Cause of Hospitalisation

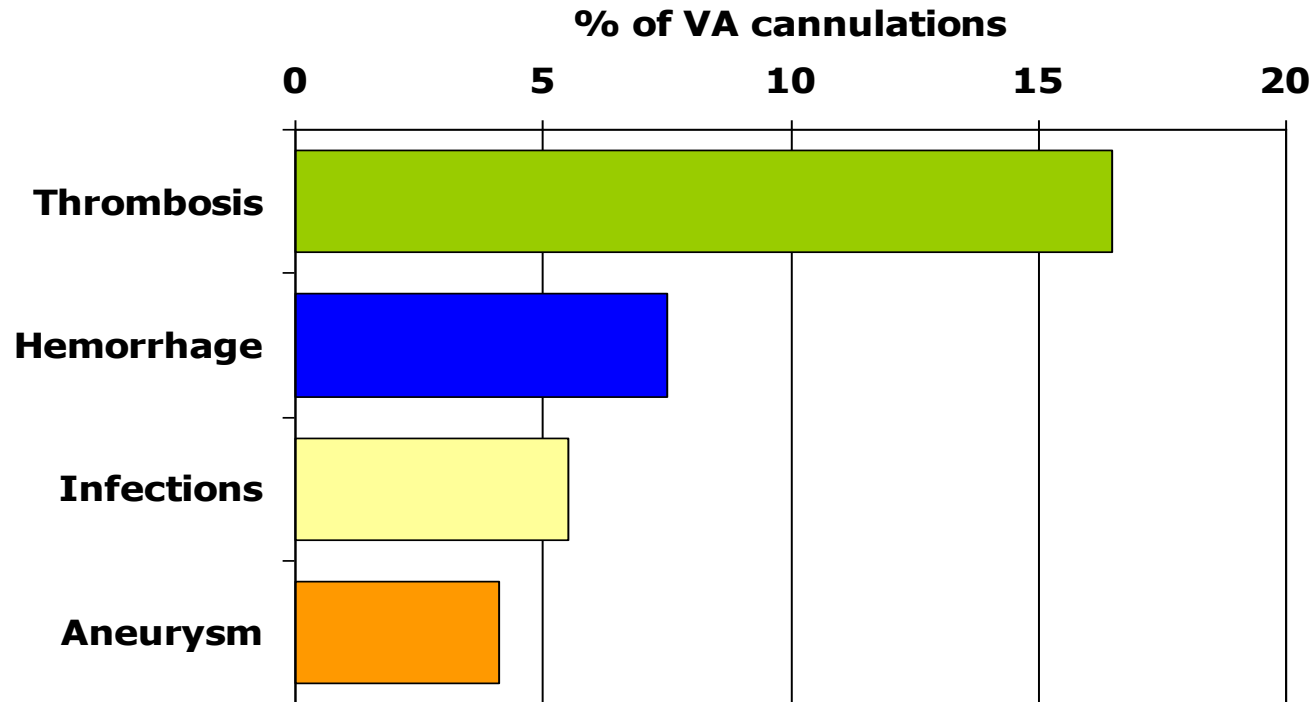
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Rayner et al. Nephrol Dial Transplant 19: 108-120, 2004

Complications Associated to VA Cannulation

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Yürügen and Erdogan, J Vasc Access 2001; 2: 119-124 (Data from Master Thesis at Istanbul University)

**Do we know
how cannulation
is performed
in our centre or country?**

Vascular Access Cannulation: Study Design

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- **Objective:**
Snapshot on the current practice of vascular access cannulation
- **Design:**
International, multi-centre, observational, cross-sectional survey
- **Centres:**
Dialysis centres of the Fresenius Medical Care network in Europe, Middle East, Africa, participation on *voluntary basis*
- **Procedures:**
Anonymous documentation of vascular access and its cannulation once per patient (Patient Questionnaire) at appointed date (April '09)

Vascular Access Cannulation: Inclusion criteria

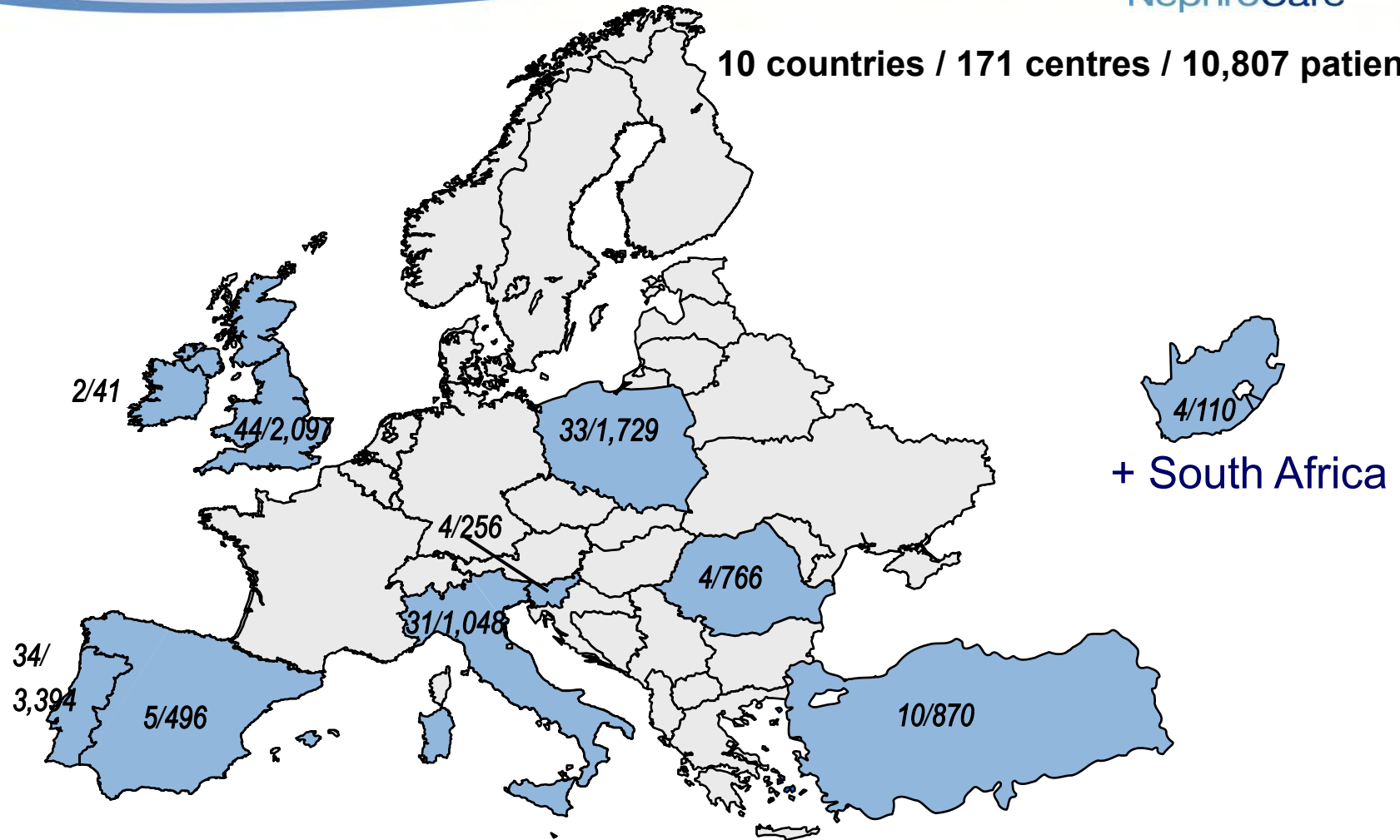
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- Patients treated with haemodialysis or haemodiafiltration during the week the survey was performed
- Vascular access via native fistula or graft
- Double needle haemodialysis
- No catheter, no single needle haemodialysis

Vascular Access Cannulation: Participating Countries and Centres

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10 countries / 171 centres / 10,807 patients

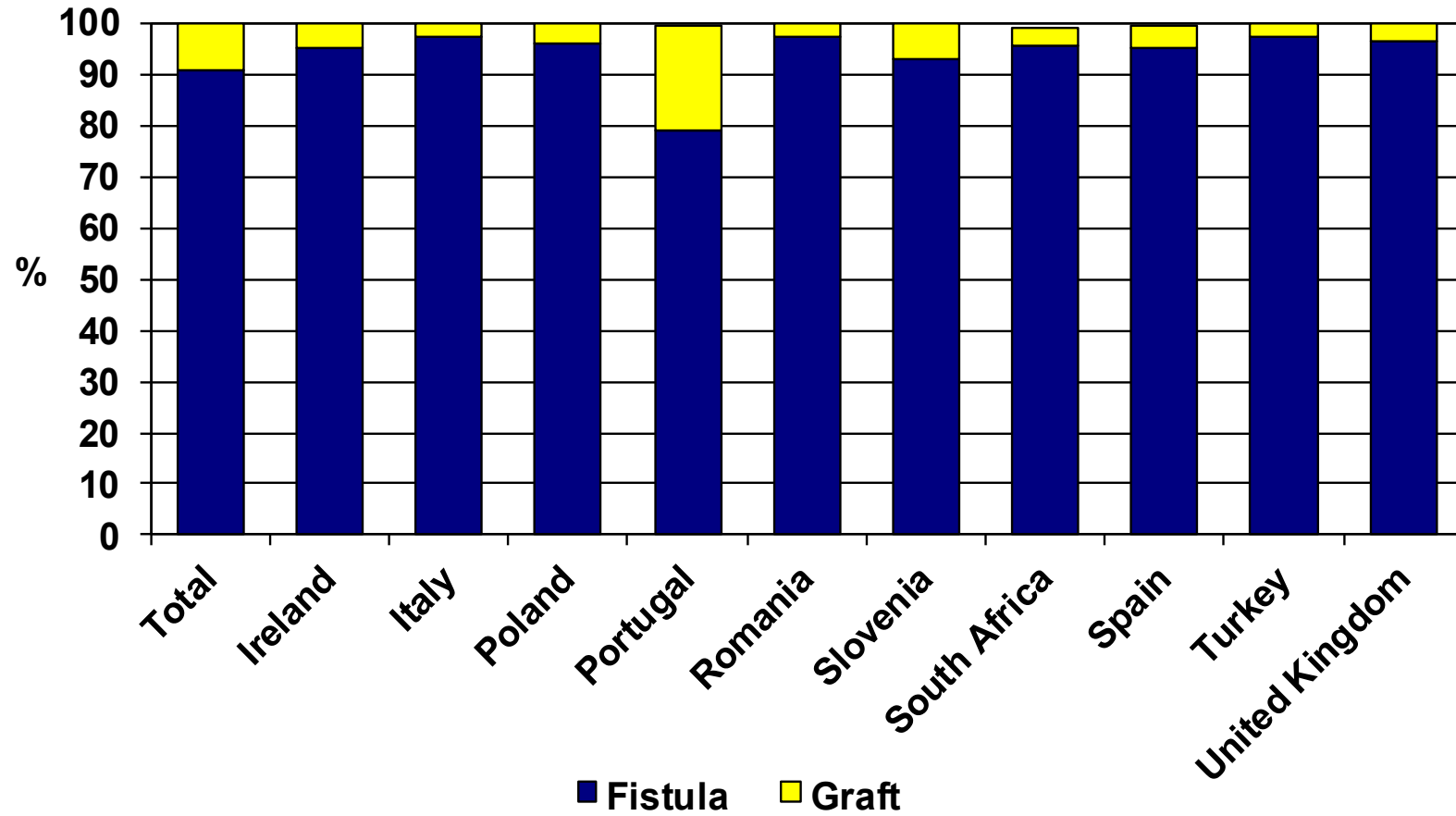


(Numbers: Centres/Patients by country)

Results

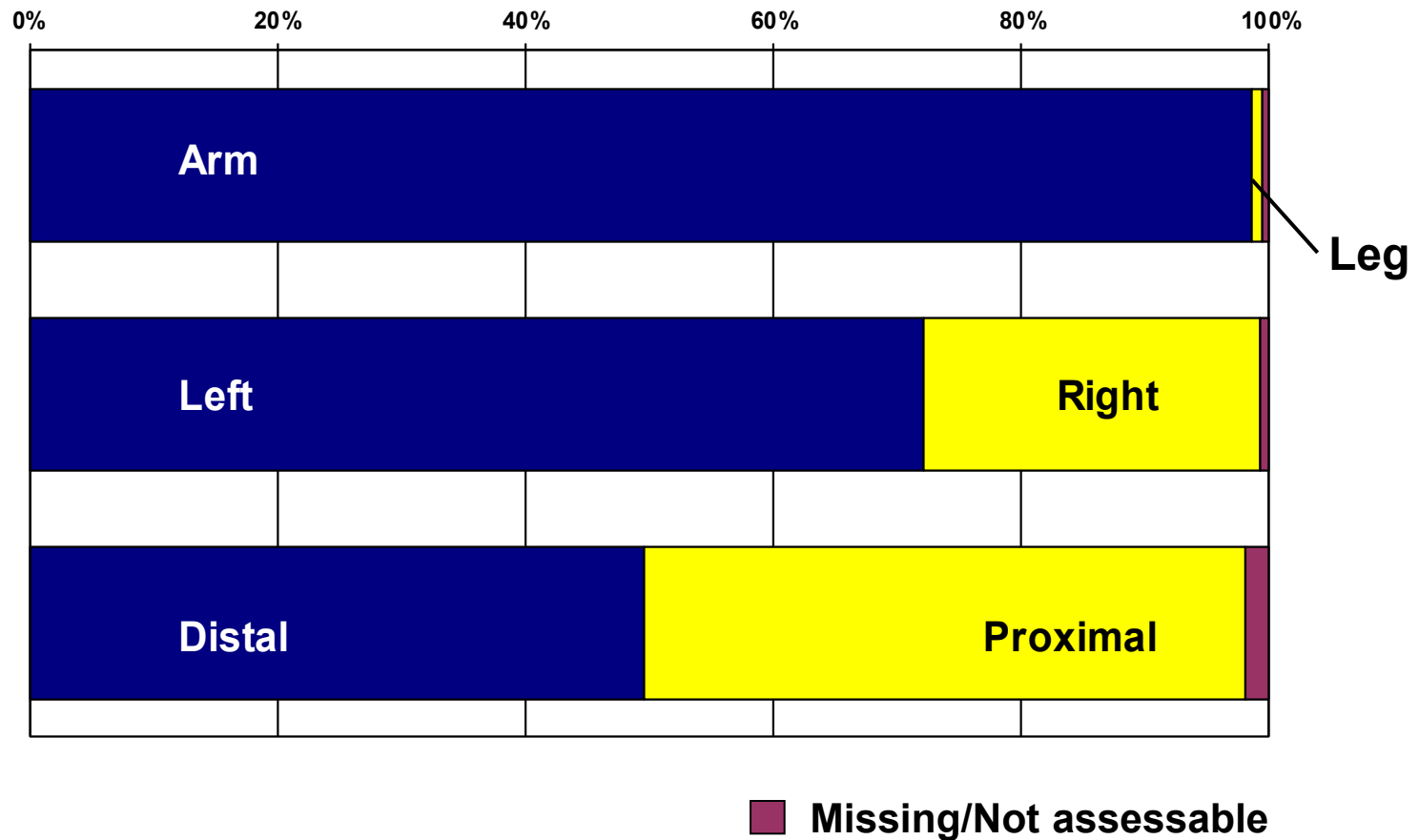
Type of Vascular Access

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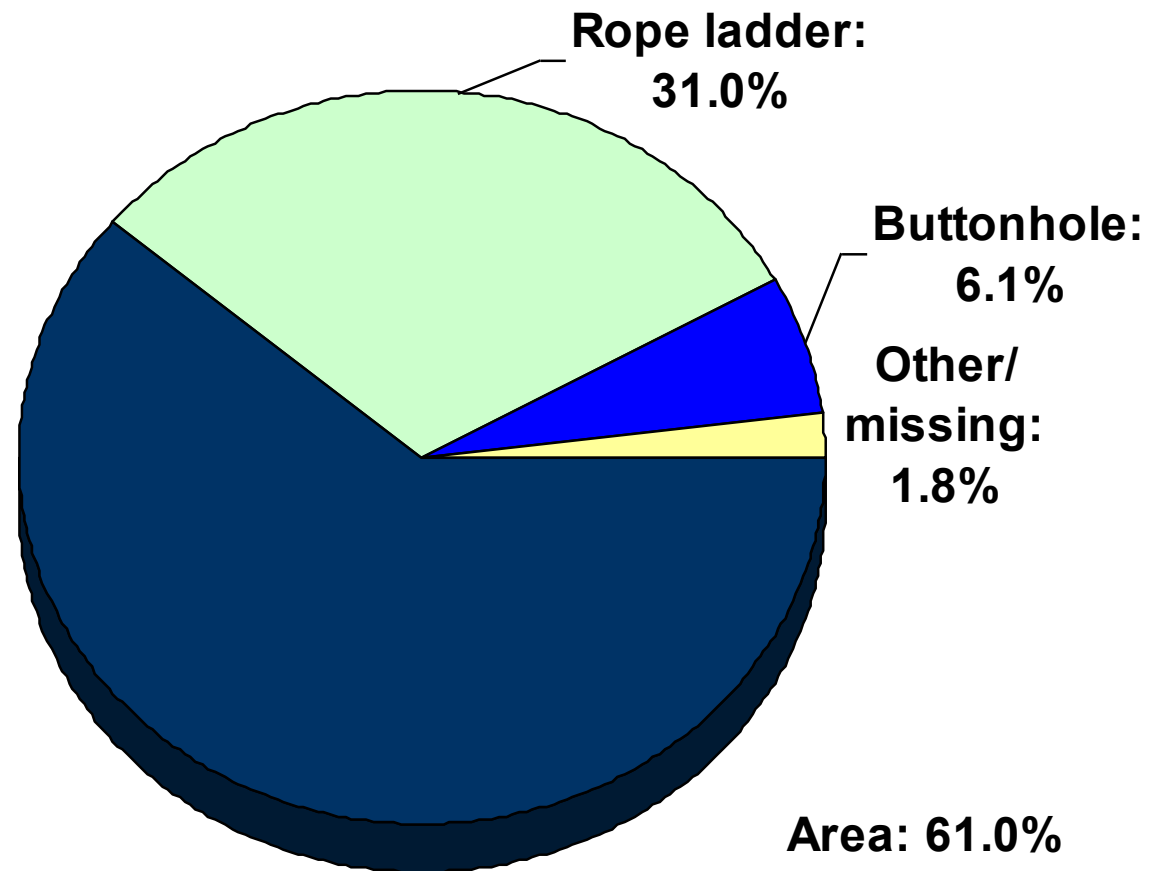
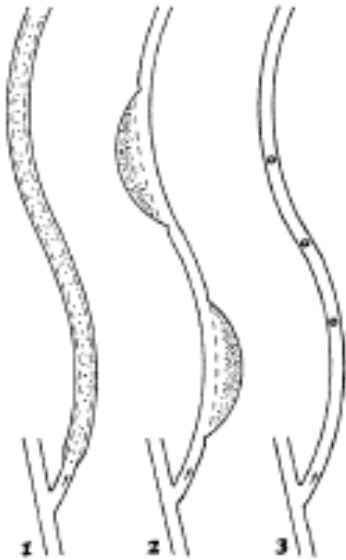
Location of Fistula

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Cannulation Techniques

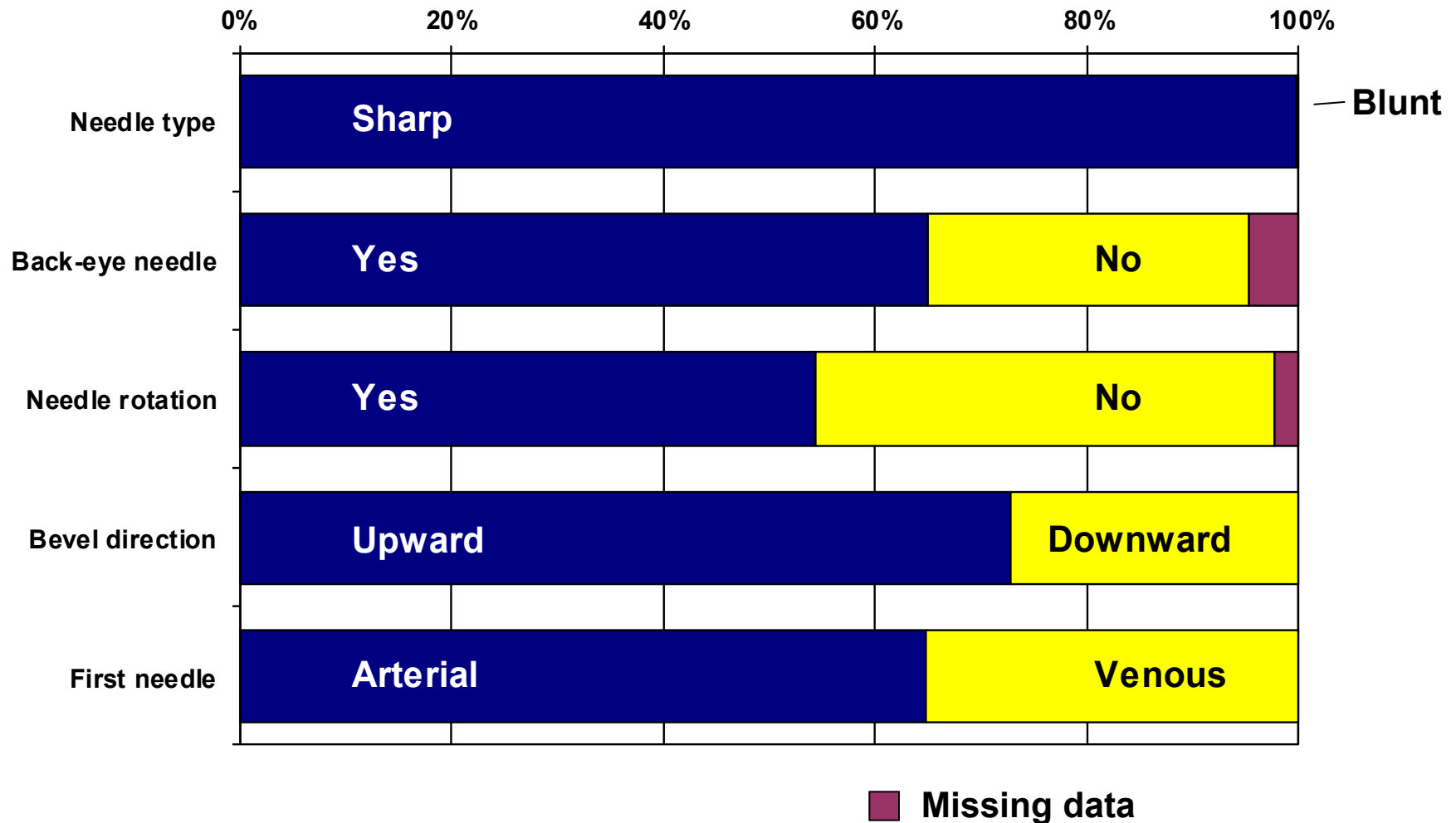
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1. Rope ladder technique
2. Area technique
3. Buttonhole technique

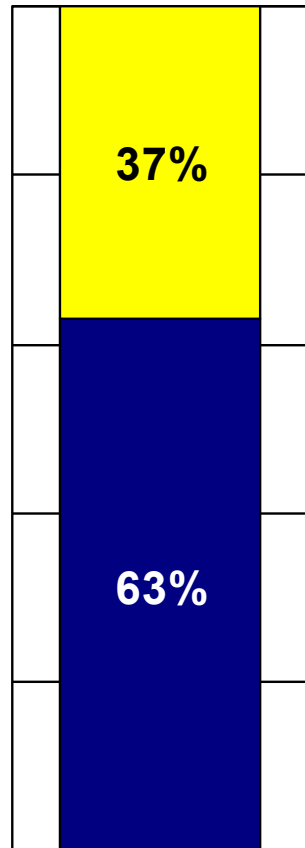
Needles & Cannulation Procedure

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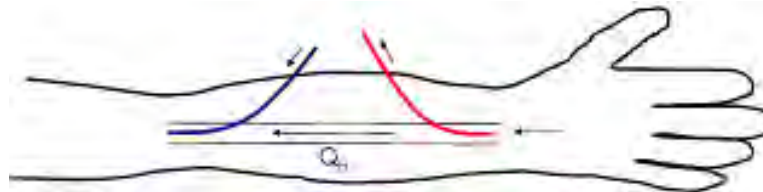


Direction of Arterial Needle

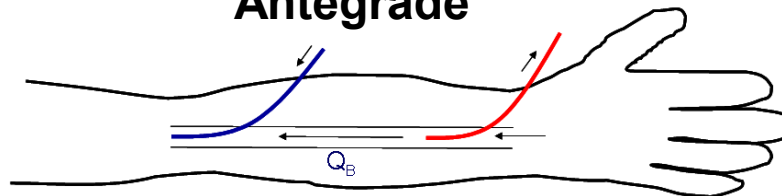
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Retrograde

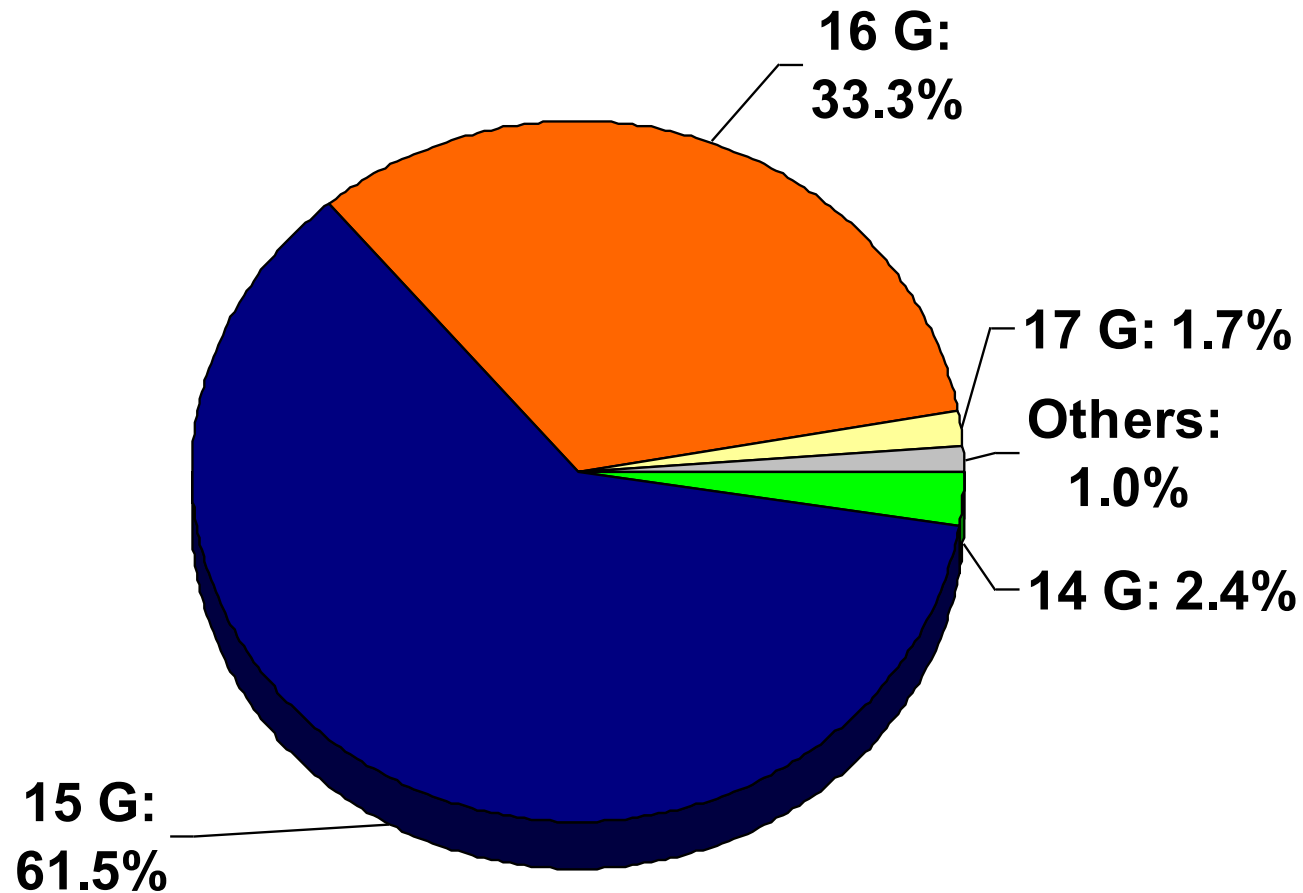


Antegrade



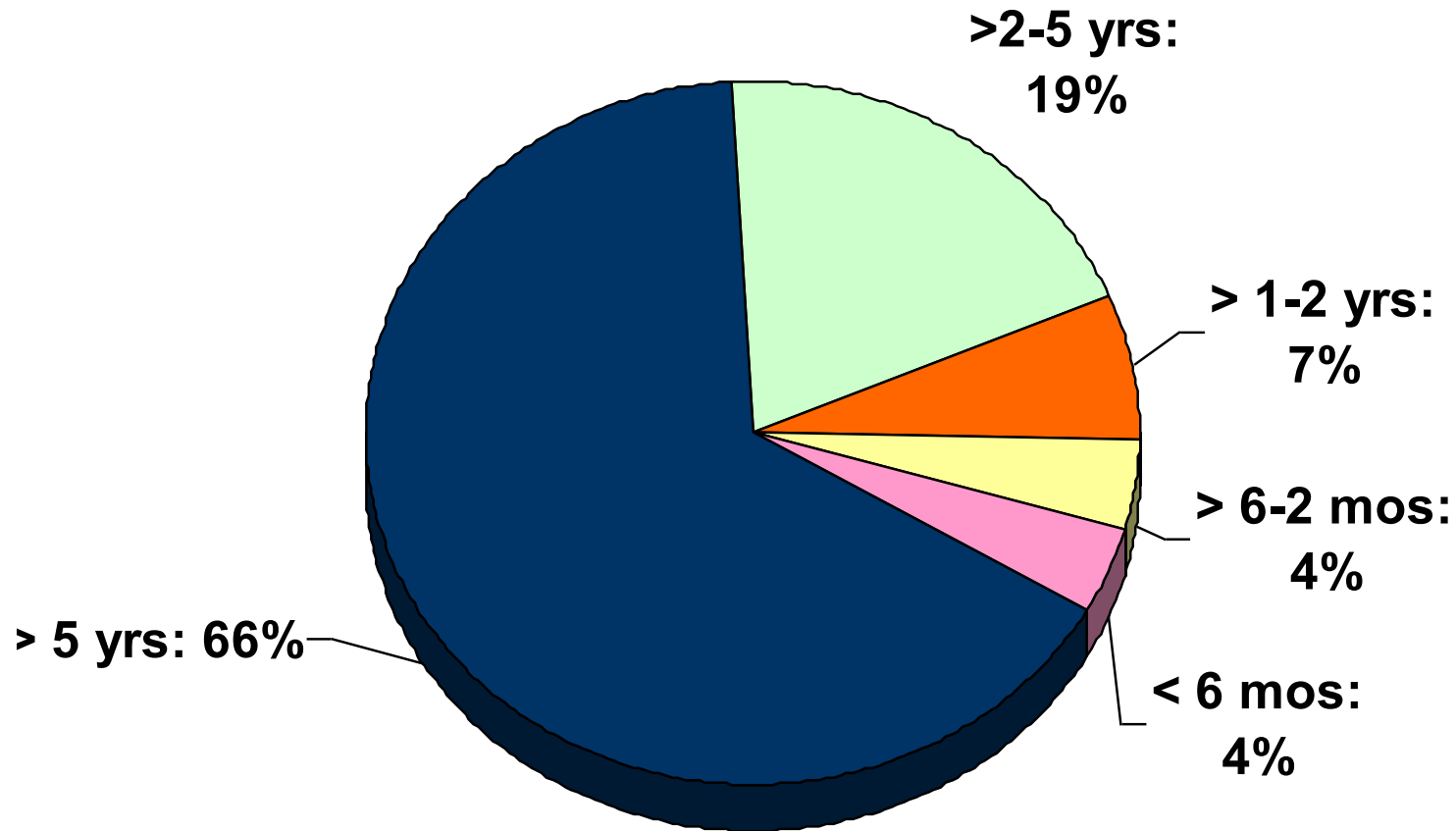
Needle Size

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Nurses' Experience in Dialysis

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- Vascular access management and cannulation are important issues in haemodialysis care.
- Some variability in cannulation practises exists between countries and centres.
- Observations of this survey provide a broad basis to further study the relation between vascular access practices and patient outcomes.

Prevention of access complications has high priority in dialysis therapy and various recommendations exist aiming at maintaining access patency for long term use.

However, in practice, techniques for AVF cannulation are known to vary from clinic to clinic, mainly because of historical training approaches in the individual settings.

Examples:

- Needle Gauge?
- Puncture technique: which one is the best?
- Bevel up or down?
- Retrograde or antegrade arterial needle puncture?

Cannulation technique vs VA survival:

Aim of the Study

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- To investigate the impact of needle gauge, cannulation technique, bevel direction, retrograde or antegrade needling, blood flow and venous pressure on the survival of the vascular access.

Cannulation technique vs VA survival: Patients and Methods

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Based on the April 2009 survey conducted in 171 dialysis units located in Europe, Middle East and Africa (the results have already been published¹), a cohort of patients was selected for follow-up to investigate vascular access survival.

¹Gauly A, Parisotto MT et al. Vascular access cannulation in hemodialysis patients—a survey of current practice and its relation to dialysis dose. J Vasc Access 2011; 12: 358–364.

Cannulation technique vs VA survival:

Statistical Analysis

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- Primary outcome in our analysis was the **time of the first surgical access intervention** resulting in the creation of a new access, where survey date serves as baseline.
- The observation period was 3 years (from April 2009 till March 2012).
- To adjust for individual patient differences, the following information was extracted from the clinical database: **Patient age and gender, BMI, prevalence of diabetes and the use of ACE inhibitors, platelet anti-aggregants, salicylic acid and anticoagulants.** Additionally the median blood flow prescriptions was documented at centre level at the time of the survey.

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival. Kidney Int doi: 10.1038/ki.2014.96

Cannulation technique vs VA survival:

Results #1

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- Out of the 10,807 patients enrolled for the original survey, access survival data was available for 7,058 (**65%**) from Portugal, UK, Italy, Turkey, Romania, Slovenia, Poland and Spain.
- **Mean age was 63.5±15.0 years; 38.5% were female; 27.1% were diabetics; 90.6% had a native fistula and 9.4% had a graft. Access location was distal for 51.2% of patients.** During the follow-up, 51.1% were treated with antiaggregants and 2.8% with anti-coagulant.

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival. Kidney Int doi: 10.1038/ki.2014.96

Cannulation technique vs VA survival:

Results #2

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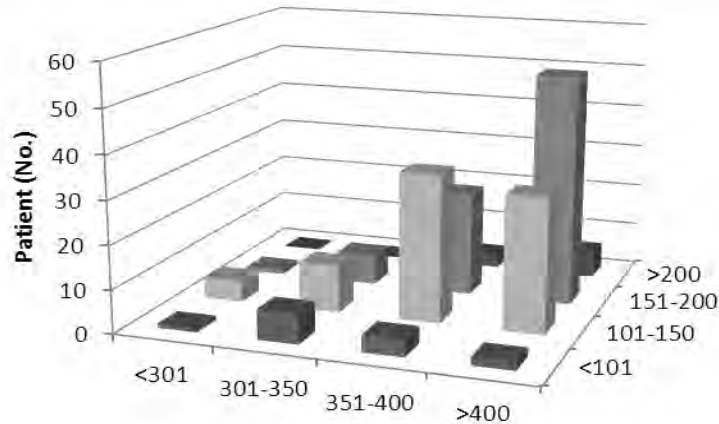
- Prevalent needle sizes were **15 G and 16 G for 63.7% and 32.2% of the patients**, respectively (14 G: 2.7%, 17 G: 1.4%).
- Cannulation technique was area for **65.8%**, **rope-ladder for 28.2%** and **buttonhole for 6%** of patients, and the **direction of arterial puncture was antegrade for 57.3%**. The **bevel direction was downward for 29.8% of the patients**. The prevalent combination between arterial needle puncturing and bevel direction was antegrade with bevel upward (43.1%) followed by retrograde with bevel downward (27.1%). The proportion of the two other combination, antegrade and retrograde with bevel downward were 14.2% and 15.6% respectively.
- **Median blood flow was 350-400 mL/min.**

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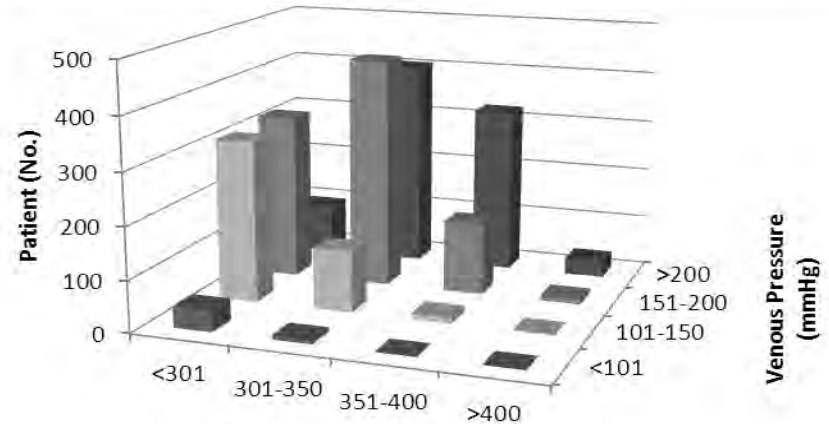
Needle size, blood flows and venous pressure levels

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival.
Kidney Int doi: 10.1038/ki.2014.96

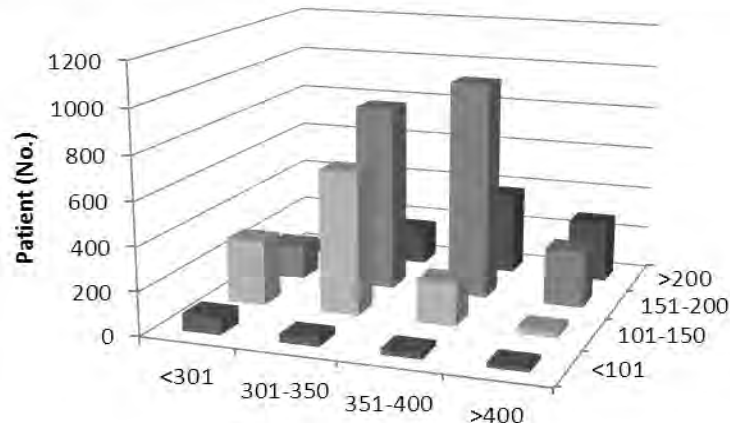
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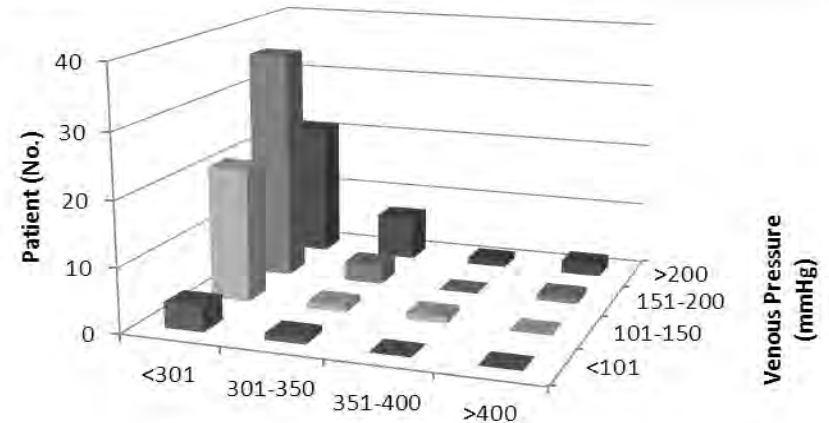
14G Needle



16G Needle



15G Needle

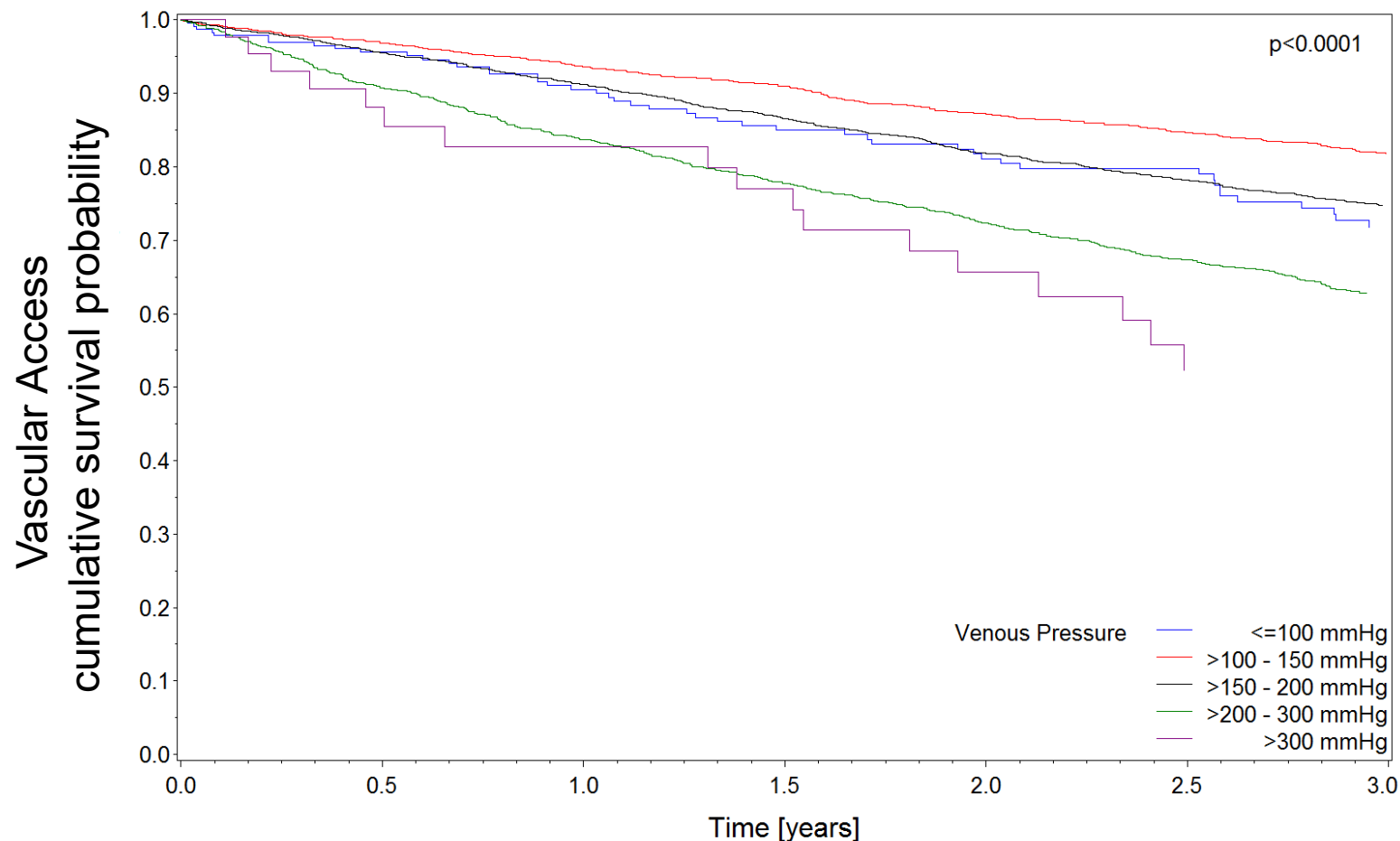


17G Needle

KM vascular access survival according to VP

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival. Kidney Int doi: 10.1038/ki.2014.96

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Cox model with primary outcome vascular survival

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival.
Kidney Int doi: 10.1038/ki.2014.96

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Parameter	Category	Reference	HR	95% CI		p-value
Age	18-50 yrs 65-76 yrs >75 yrs	50-60 yrs	1.00 1.03 1.47	0.85 0.90 1.28	1.17 1.19 1.69	<0.0001
Gender	Male	Female	0.94	0.84	1.04	0.23
Diabetes	Yes	No	1.14	1.02	1.28	0.03
Platelet Anti-Agggregation	Yes	No	1.11	1.00	1.23	0.06
Fistula Type	Graft	Fistula	1.74	1.49	2.03	<0.0001
AV-Fistula Location	Right	Left	1.12	1.01	1.26	0.045
AV-Fistula Location	Proximal	Distal	1.50	1.34	1.68	<0.0001
Needle Size	14 G 16 G 17 G	15 G	1.23 1.22 1.48	0.83 1.08 1.01	1.81 1.38 2.16	0.006
Blood Flow	<300 ml/min 350-400 ml/min >400 ml/min	300-350 ml/min	1.18 0.90 0.92	1.02 0.79 0.75	1.37 1.03 1.13	0.02
Cannulation Technique	Buttonhole Rope-Ladder	Area	0.78 0.88	0.61 0.78	0.99 1.00	0.03
Bevel and Needle Direction	Antegrade + Bevel Down Retrograde + Bevel Up Retrograde + Bevel Down	Antergrade + Bevel up	0.98 0.94 1.19	0.84 0.82 1.03	1.16 1.08 1.39	0.02
Venous Pressure	<100 mmHg 150-200 mmHg 200-300 mmHg >300 mmHg	100-150 mmHg	1.49 1.42 1.89 2.07	1.09 1.22 1.57 1.24	2.03 1.66 2.27 3.47	<0.0001
Arm Compression at Time of Cannulation	Patient Assistance Tourniquet	None	0.80 1.05	0.67 0.92	0.96 1.20	0.02

Cannulation technique vs VA survival:

Summary

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In summary, the study revealed that **area cannulation technique, despite being the most commonly used, was inferior to both rope-ladder and buttonhole** for the maintenance of Vascular Access functionality.

With regard to the effect of needle and bevel direction, the combination of **antegrade position of arterial needle with bevel up or down was significantly associated with better access survival than retrograde positioning with bevel down.**

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Cannulation technique vs VA survival:

Summary

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Results referring to the type and location of access and the technical parameters (i.e. venous pressure) were as follows:

There was an **increased risk of access failure for graft versus fistula, proximal vs distal location, right arm vs left arm, and the presence of a venous pressure greater than 150 mmHg.**

The results on venous pressure are worth considering. **A venous pressure of 200-250 mmHg is considered acceptable by the scientific community; the results of this study put these values under discussion.** However, further investigations are required to clarify the topic fully.

Parisotto MT et al. (2014). Cannulation technique influences arteriovenous fistula and graft survival. Kidney Int doi: 10.1038/ki.2014.96

Recommendations for the best cannulation practice

Vascular Access Assessment and Preparation

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Physical examination of AVF/AVG:

LOOK



LISTEN



FEEL



Using our eyes, ears and fingertips, we assess AVF/AVG for complications

Vascular Access Assessment and Preparation

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INSPECT (observe and look for):

Oedema, redness, swelling, bruising, haematoma, rash or break in skin, bleeding, other exudate, aneurysm or pseudo-aneurysm



Vascular Access Assessment and Preparation

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PALPATE (touch and feel):

Character of pulse, change in temperature, atypical warmth, tenderness

Direction of the flow, flow characteristics along the fistula (thrill versus pulse)

N.B. The thrill should feel like a continuous vibration, not a strong pulsation



Vascular Access Assessment and Preparation

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AUSCULTATE (Listen to the fistula):

Auscultation for bruit along the vein for the quality of the sound and its amplitude

N.B. The bruit – a whooshing sound – should be strong and continuous; each sound linked to the one before



**In case of absence of bruit and/or thrill,
DO NOT cannulate the AVF/AVG!**

Vascular Access Assessment and Preparation

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Preparation

Proper needle-site preparation by both the patient and staff reduces infection rates.

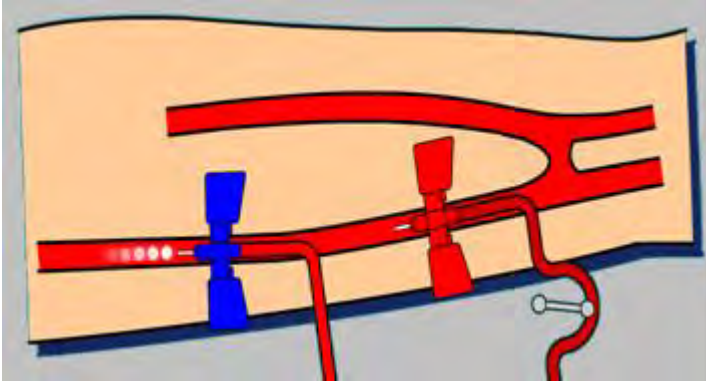
- Disinfect AVF site before needle insertion. Allow to air dry for 30–60 seconds.
- Start at the chosen cannulation site and move outwards in a circular rubbing motion that will carry bacteria away from the selected needle insertion site
- Repeat skin preparation if the site is touched by the patient.
- If using the buttonhole cannulation technique, disinfect before and after scab removal



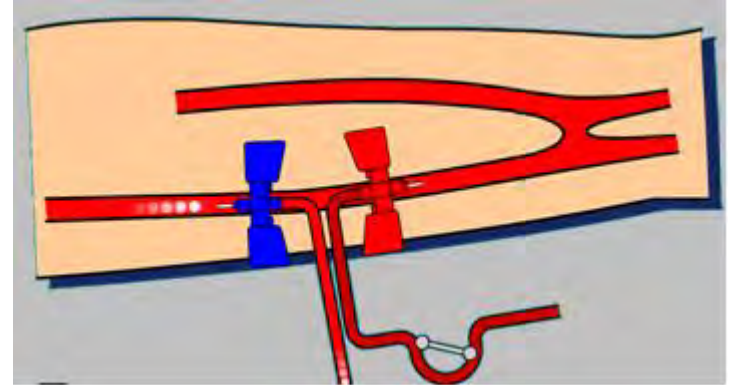
- The rope-ladder technique should be the first choice. It provides almost the same results in terms of access survival as the buttonhole, and requires fewer pre-requisite to be successful.
- There are few exceptions which indicates the buttonhole cannulation as the absolute best option:
 - ✓ when there is a limited area for cannulation sites,
 - ✓ for the potential home dialysis patients candidate for self-cannulation.

Arterial needle direction

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Antegrade: with the flow



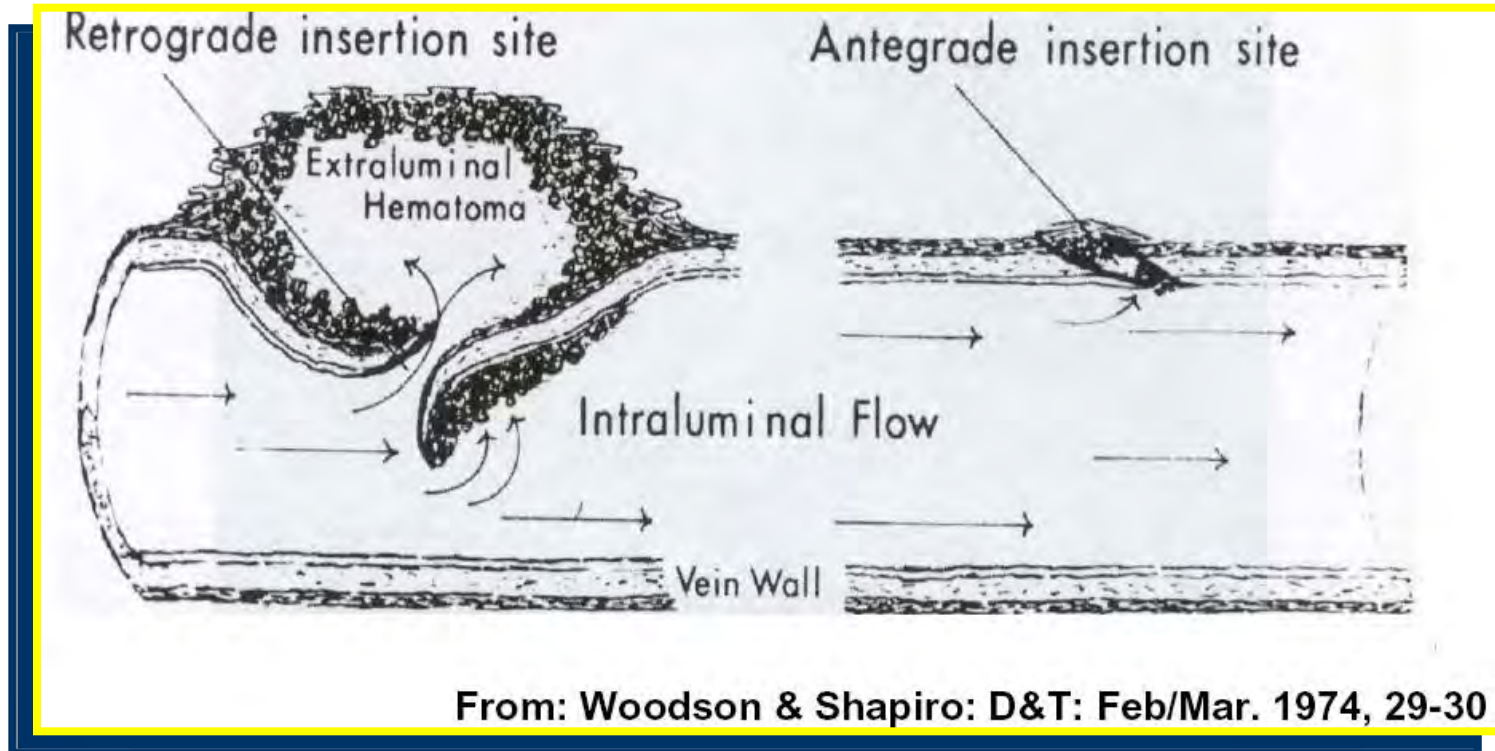
Retrograde: against the flow

Both needles antegrade:

1. Easier for nurse to puncture
2. Easier for self-puncturing
3. May be fistula protective

Discussion: Antegrade puncturing may be fistula protective

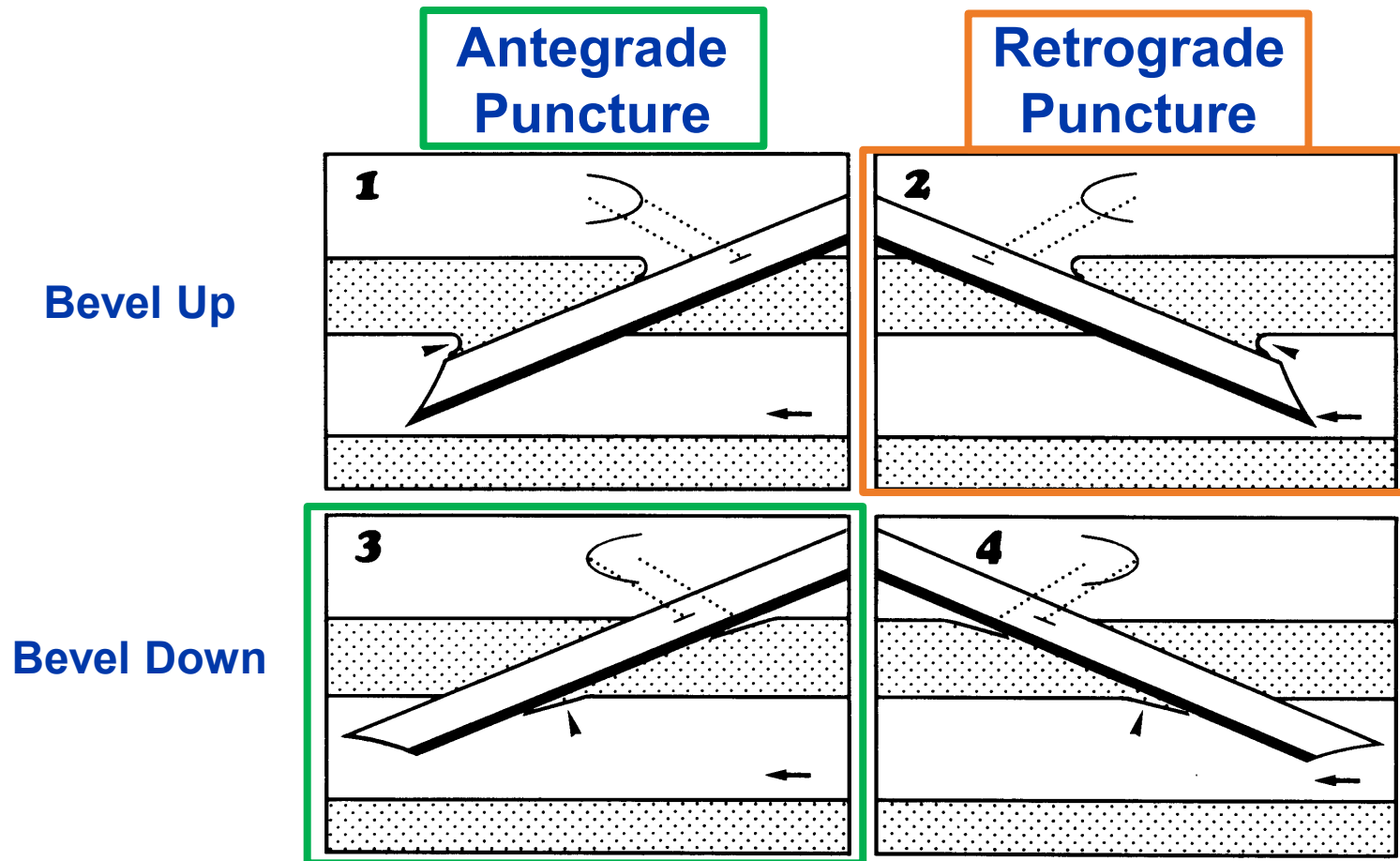
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- Increased risk of haematoma formation from retrograde filling
- Tract closure through flow force by antegrade puncture

Effect of bevel direction in the arterial needle position (antegrade/retrograde)

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Bionic Medizintechnik GmbH

To avoid bruising, compression is essential for good haemostasis. One finger should be positioned over the external insertion site (skin) and the second over the internal insertion site (vessel entry). Pressure should be sufficient to stop bleeding but not so great as to stop the flow of blood through the vascular access.



- Educate patients to:
 - Look at VA arm to detect any abnormalities
 - Use a stethoscope if possible to check if there is a good blood flow through the VA; and teach them to recognise the 'bruit' sounds
 - Use palpation, to feel a rhythmic vibration/buzzing sensation (thrill) by putting their hand on the VA.
 - Importance of hygiene



- Patients must be educated:
 - To recognise, prevent and report any signs and symptoms of infection, such as:
 - * Redness
 - * Fever
 - * Swelling, warmth to touch
 - * Pain
 - * Exudate
- Teach patients the importance of maintaining a constant temperature in the area of the VA:
 - Avoid excessive heat
 - Avoid excessive cold



Summary and Conclusions

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1. Rope-ladder cannulation technique as preferred option and only when there is a limited area for cannulation sites, or for the potential self-care dialysis patients choose buttonhole
2. Insert arterial needle in the antegrade direction (blood flow direction) and with bevel direction downward for both needles
3. In the case of arterial needle retrograde position, the direction of the bevel should be upward
4. 15 G needles are recommended
5. Blood flow ≥ 350 ml/m
6. Venous pressure around 150 mmHg
7. Perform a correct haemostasis
8. Educate the patients to care for the VA

ÇOK TEŞEKKÜR EDERİM