Routine Ultrasound Puncture Guidance in Distal Radial Access for Cardiac Catheterizations

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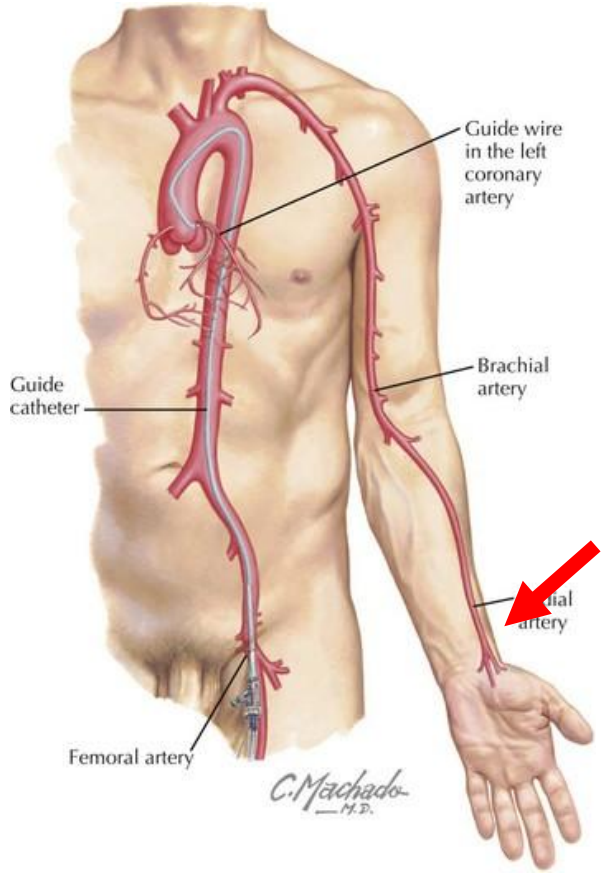
Vascular access in (cardiac) catheterizations

- Arterial access is an integral part of cardiac catherizations and interventions.

Recommendations on choice of stent and access site

Recommendations	Class[a]	Level[b]
DES are recommended over BMS for any PCI irrespective of: • clinical presentation • lesion type • planned non-cardiac surgery • anticipated duration of DAPT • concomitant anticoagulant therapy.[100,578,579,640]	I	A
Radial access is recommended as the standard approach, unless there are overriding procedural considerations.[172,638,641]	I	A
BRS are currently not recommended for clinical use outside of clinical studies.[642–650]	III	C

BMS = bare-metal stents; BRS = bioresorbable scaffolds; DAPT = dual antiplatelet therapy; DES = drug-eluting stents; PCI = percutaneous coronary intervention.
[a]Class of recommendation.
[b]Level of evidence.



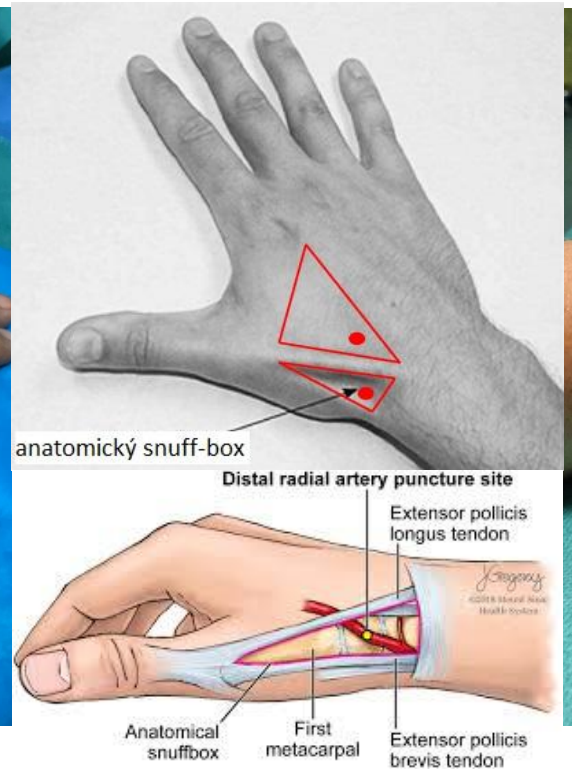
Proximal (conventional) RA

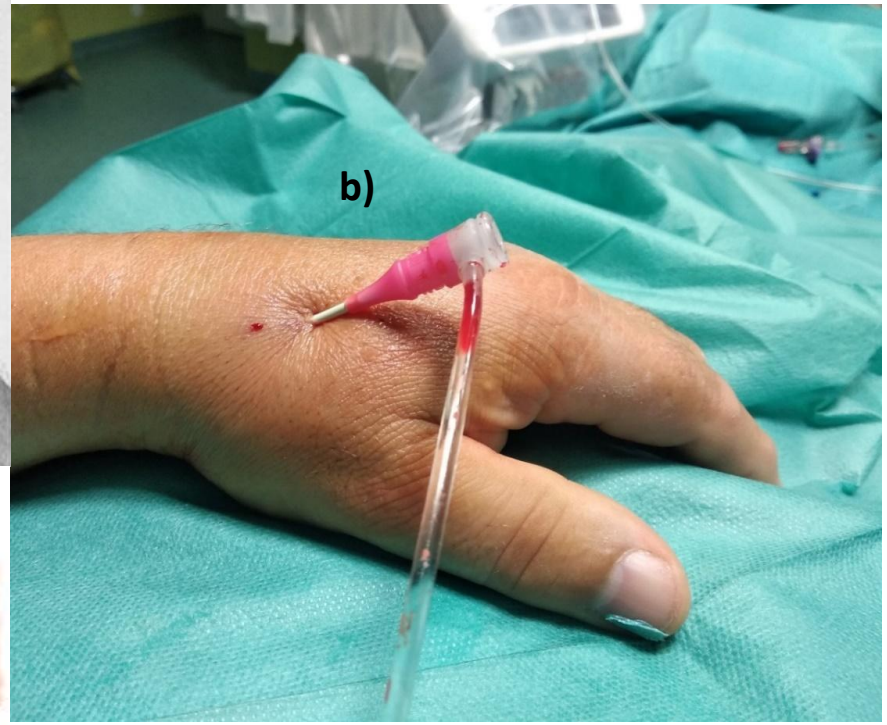
Radial artery access complications

Complication	Rate of occurence
RAO	3,9-8,1%
Spasm	4,3-16%
Hematoma	1,2-2,6%
Pseudoaneurysm	0,03-0,2%
Perforation radial/brachial a.	0,07-0,9%
AV fistula	<0,1%
Dissection	0,05-0,4%
Hand ischaemia	<0,1%
Compartment syndrom	<0,05%

Riangwiwat T., Blankenship JC: Vascular Complications of Transradial Access for Cardiac Catheterization, US Cardiology Review 2021;15:e04

Distal Radial Access - DRA





JACC Cardiovascular Interventions

DIStal Versus COnventional RADIAL Access for Coronary Angiography and Intervention: a Randomized Multicenter Trial

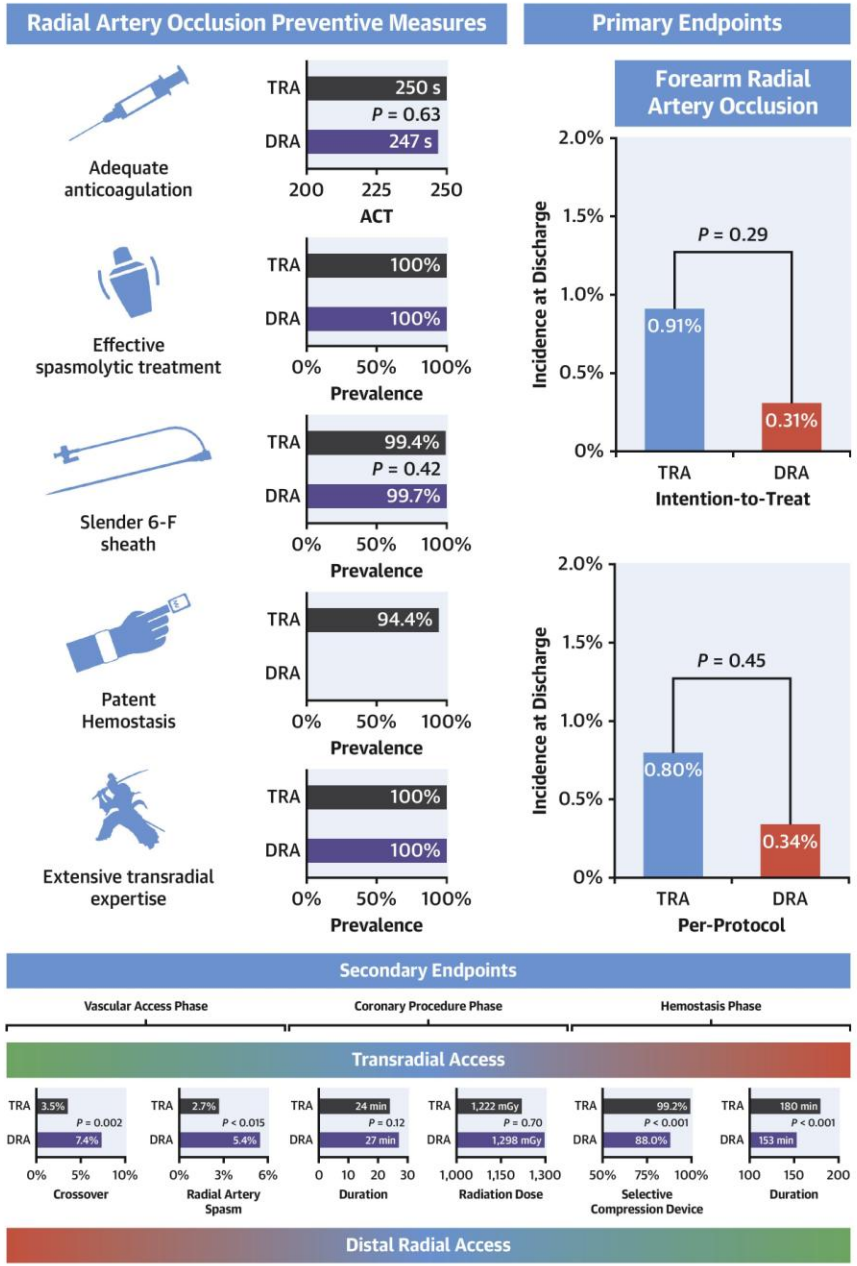
~1300 patients requiring transradial coronary angiography and/or intervention

R

Distal
Transradial access

Conventional
Transradial access

CENTRAL ILLUSTRATION: Key Findings of the DISCO RADIAL Trial



Aminian A, et al. J Am Coll Cardiol Intv. 2022;15(12):1191-1201.

G.Ferrante, F.Condello, SV.Rao, M.Maurina, S.Jolly, GG. Stefanini, B.Reimers, G.Condorelli, T. Lefèvre, S. Pancholy, O. Bertrand, M.Valgimigli

Background

Emerging evidence from randomized clinical trials (RCTs) comparing distal radial access (DRA) with conventional radial access (RA) is available.

Objectives

The aim of this study was to provide a quantitative appraisal of the effects of DRA vs conventional RA for coronary angiography with or without intervention.

The primary endpoint was radial artery occlusion (RAO) at the longest available follow-up.

Results

Fourteen studies enrolling **6,208** participants were included. Compared with conventional RA, DRA was associated with a significant **lower risk of RAO**, either detected at latest follow-up (number needed to treat **NNT = 30**) or in-hospital (**NNT = 28**), as well as EASY **≥II hematoma** (**NNT = 107**).

By contrast, DRA was associated with a higher risk of access site **crossover** (**NNT = 12**), a longer time for radial puncture ($P < 0.001$), a longer time for sheath insertion ($P < 0.001$), and a higher number of puncture attempts ($P < 0.001$).

Distal vs Conventional Radial Access for Coronary Angiography and/or Intervention: A Meta-Analysis of Randomized Trials

Relative Treatment Effect Measures in the Overall Population: DRA vs Conventional RA

	Pooled Event Rate	RR	95% CI	P Value
RAO at the longest follow-up	1.6% vs 5.2%	0.36	0.23-0.56	<0.001
In-hospital RAO	1.4% vs 5.3%	0.32	0.19-0.53	<0.001
EASY ≥II hematoma	0.9% vs 1.9%	0.51	0.27-0.96	0.04
Any local hematoma	6.5% vs 6.4%	1.03	0.79-1.34	0.84
Radial artery spasm	2.6% vs 4.9%	0.61	0.21-1.77	0.36
Access site crossover	12.5% vs 3.8%	3.08	1.88-5.06	<0.001

Conclusions

Compared with conventional RA, DRA is associated with lower risks of RAO and EASY ≥II hematoma
but requires longer time for radial artery cannulation and sheath insertion, more puncture attempts and a higher access site crossover.

J Am Coll Cardiol Interv 2022;15:2297-23

Distal Radial Access

- DRA is now established alternative arterial vascular access for cardiac (and also non cardiac) catheterization
- DRA has many advantages, most obvious is significant reduction of RAO
- DRA has more access failures and crossover rates when compared with cTRA
- There is also almost always preselection of patients according to palpation

Distal radial access – contemporary state

1. We know advantages of DRA
2. There is proof of applicability in clinical setting
3. **Remaining questions: is the method suitable just for limited population?**
    1. So far exist preselection of suitable patients mainly based on palpation/-bility of DRA (at least weak palpability is usually required)
    2. How many patients are excluded??
    3. Is absence of palpable DRA a limitation?
4. Palpation guided puncture is most used approach – which might be a potential limitation that could be circumvented?
    - **Routine US use might be a solution.**

What's New in Transradial Access

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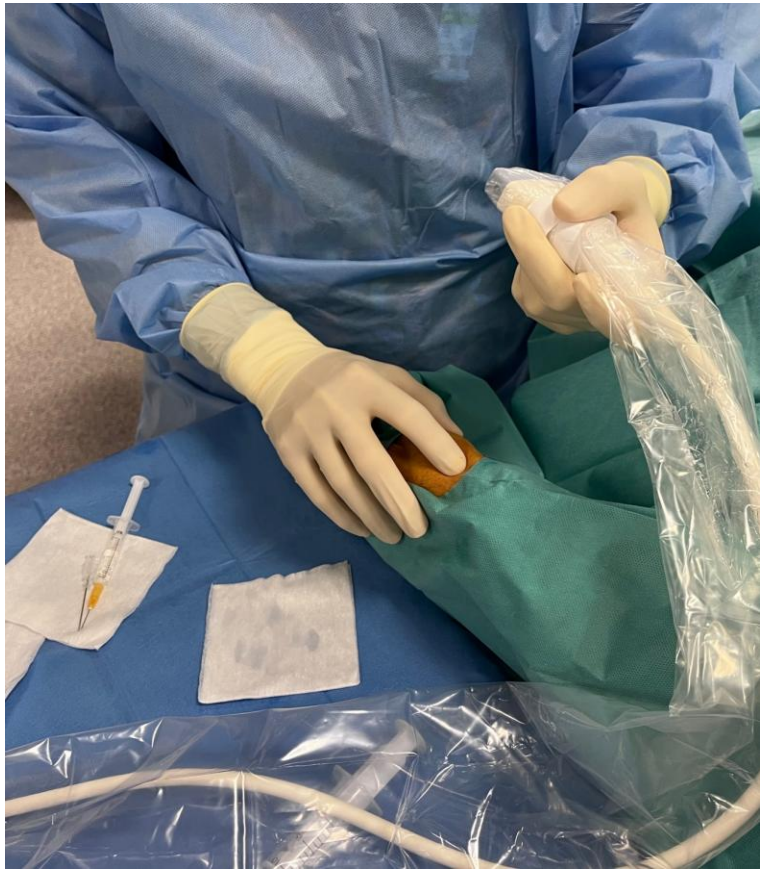
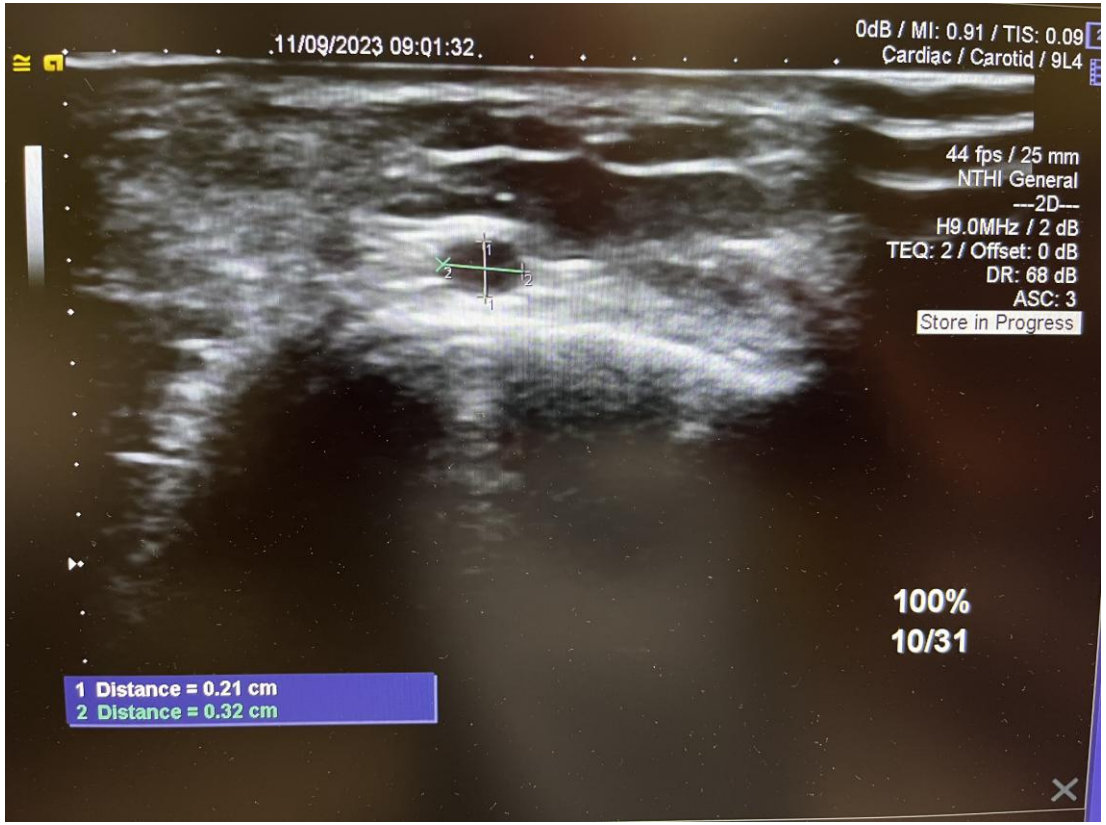
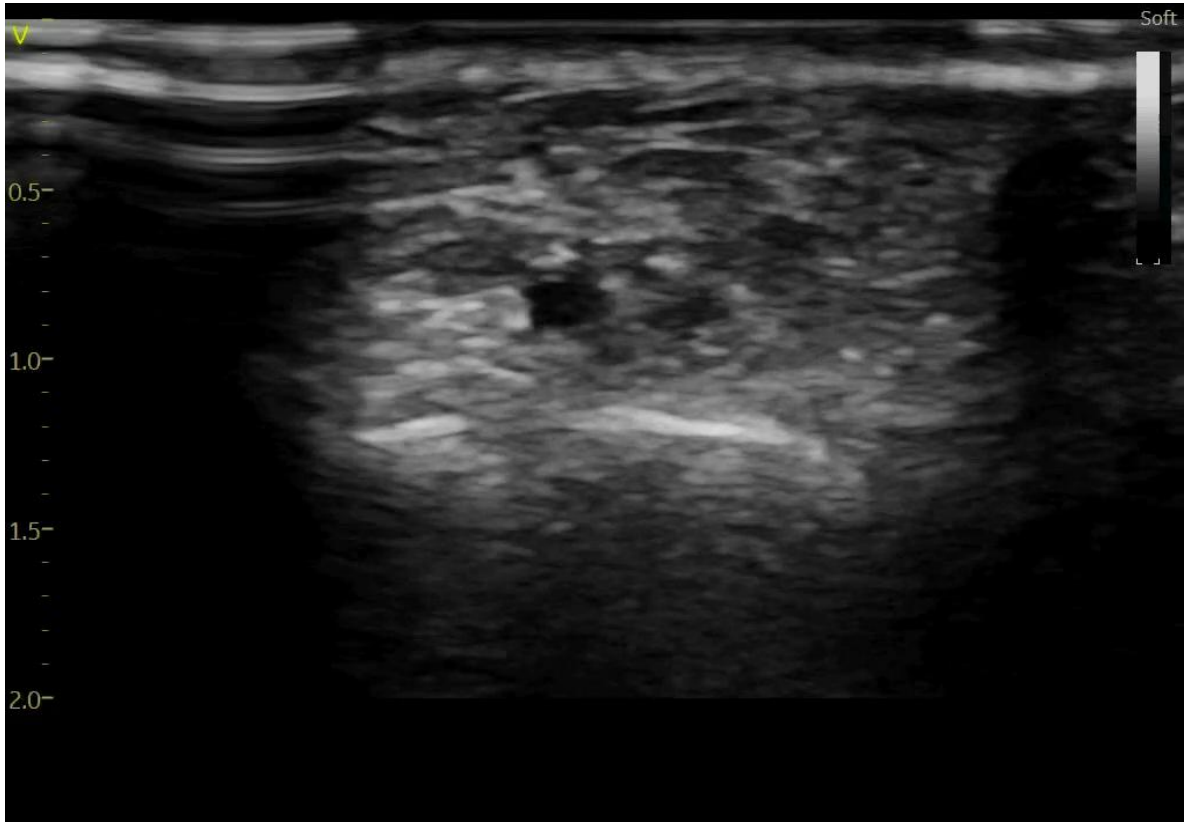
Uptake of Ultrasound-Guided Access Among Healthcare Professionals

Despite all these advantages, and no obvious potential disadvantages, uptake of ultrasound-guided access outside radiology remains sporadic, perhaps because of the initial cost, learning curve, and training requirements. This technique also initially adds time to the procedure, but routine use has been shown to reduce the time to femoral[14] and radial[15] access.


Routine Ultrasound in DRA





Routine Ultrasound in DRA

Routine Ultrasound in DRA: pilot project

- Hypothesis:
  - Routine ultrasound use can enlarge fraction of patients suitable for cath via DRA
  - Non palpable DRA can be punctured with US guidance
  - US use is applicable in routine clinical setting in everyday workflow
  - Patients need not to be preselected by palpation to assess eligibility for DRA access.

Routine Ultrasound in DRA: pilot project

- Protocol outline
  - Non selected consecutive patients
  - Excluded are subject with **STEMI**, **shock** and generally all subjects where protentional **delay** (that might be caused with US sterile setting) might affect outcome, **primarily other than radial access**
  - Patients are involved irrespective of palpation quality of DRA (snuffbox or distal dorsal)
  - Quality of palpation is assed by nurses before sterile drape and the by cardiologist before puncture in sterile setting. Both are recorded and can be compared.
  - All Patients give institutional informed consent

Routine Ultrasound in DRA: pilot project

- Quality of puncture is assesd on a scale from 0 to 5 and then evaluated in terciles
  - **Tercile 1** – traditionally assessed as “not suitable for DRA by palpation – no palpation = no puncure)
    - 0 – no pulsation
    - 1 – unsure weak pulsation
  - **Tercile 2** weak to very weak pulsation – puncture not sure.
    - 2 – very weak, but present pulsation, puncture unsure
    - 3 – weak, but certain pulsation, puncture probably possible
  - **Tercile 3** – generally good pulsation
    - 4 – good pulsation suitable for puncture
    - 5 – very good pulsation, failure not probable

Routine Ultrasound in DRA: pilot project Protocol outline

- Basic demography, info about previous use o ipsilateral RA or DRA
- Quality of palpation according to previous slide (nurse and performing physician)
- US evaluation – cross-sectional dimension in two perpendicular axes
- Number of puncture attempts
- Success of sheath insertion, sheath size (always GSS), type of procedure
- Site of puncture (sin, dx, SB, DDRA)

Routine Ultrasound in DRA:
Evaluation of subject recruitment after first 50 subjects

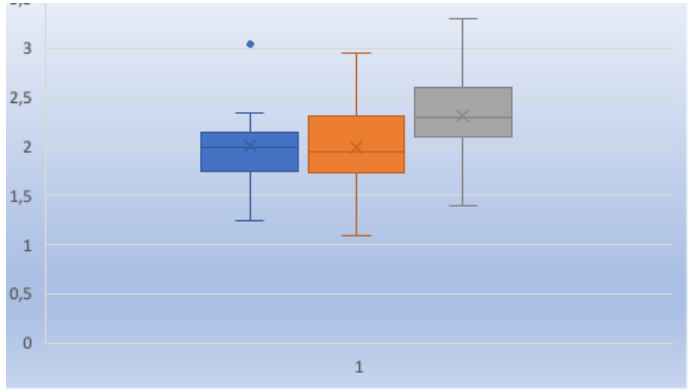
- Evaluation of non selected subjects after including of first 50 subjects
- From total of the first **74** screened patients was into the project included 50 patients
  - Of Note: In 24 subjects, that were not included in the project, 6 of them were anyway catheterized from z DRA
  - **24 excluded**:
    1. 3x nonfunctional ultrasound (US machine in repair)
    2. 15x STEMI
    3. 2x height of patient + length of arm too long for standard catheter
    4. 4x primarily femoral artery from different reasons

Routine Ultrasound in DRA: Result overview

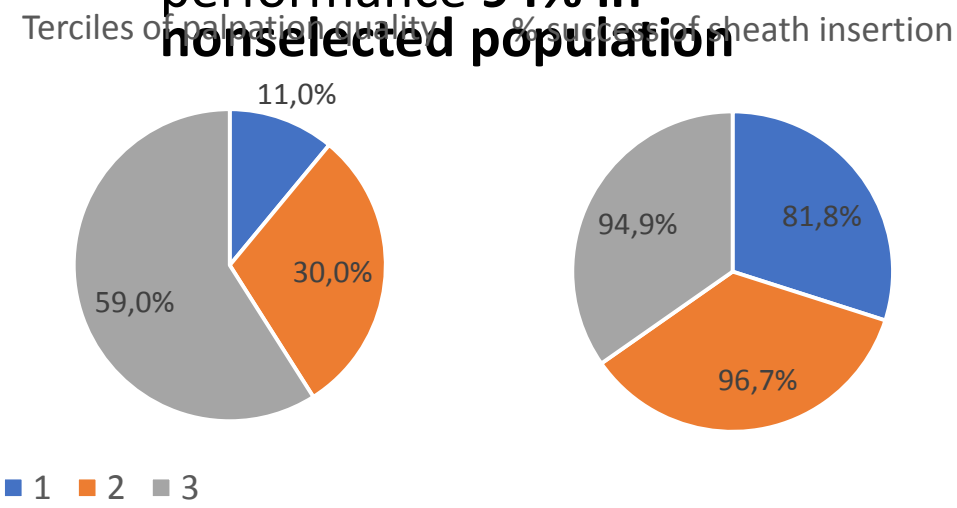
Demography	N=100=%
TOTAL (F)	100(24)
HTN	25
Age	67
BMI	30
HTN	77
HLP	82
DM	28
Smoker	20
ICHS	34
PCI prev.	21
cTRA ipsilat prev.	27

Procedural data	
Total succesfull sheath insertions	n=94
SB sin	91(97%)
SB dx	3(3%)
F5/F6	76/18(19%)
SKG	71(76%)
SKG+PCI	23(24%)

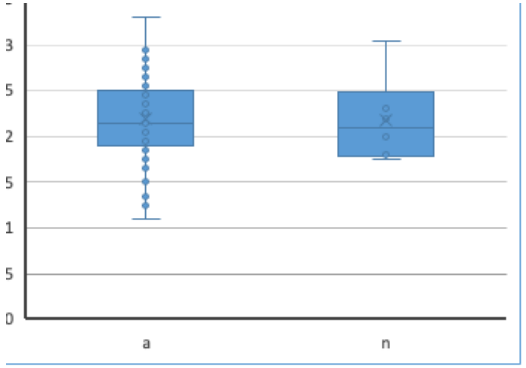
Routine Ultrasound in DRA: central illustration

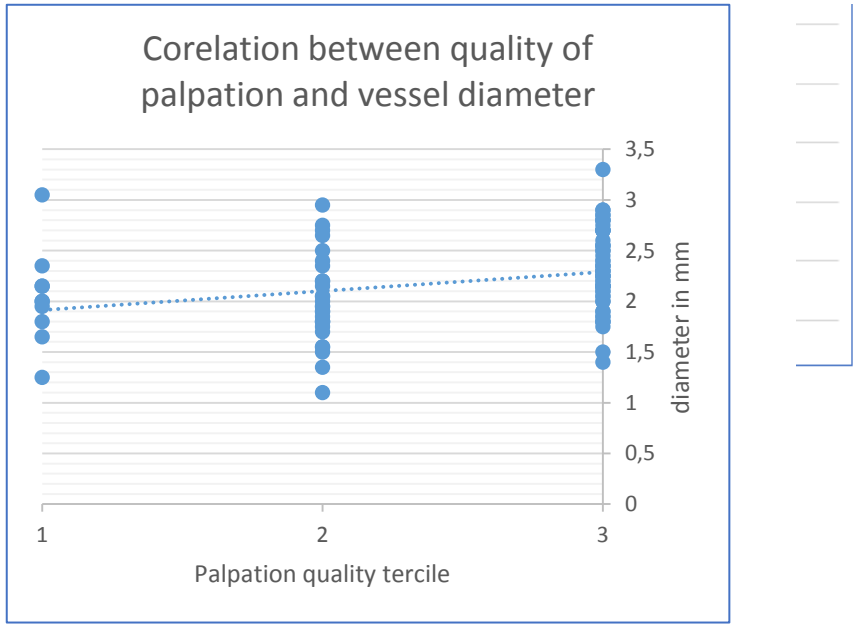


- ~ **11%** w/o palpable DRA
- With use of US in ~ **80%** puncture and sheath insertion (and cath) possible
- Total crossover
  - 5% (palp +), 6% (palp +/-)
- Avg # of punctures 2,6 vs 1,8 (palp+/- palp +)
- Total success of sheath insertions and cath performance **94% in nonselected population**



Important findings:

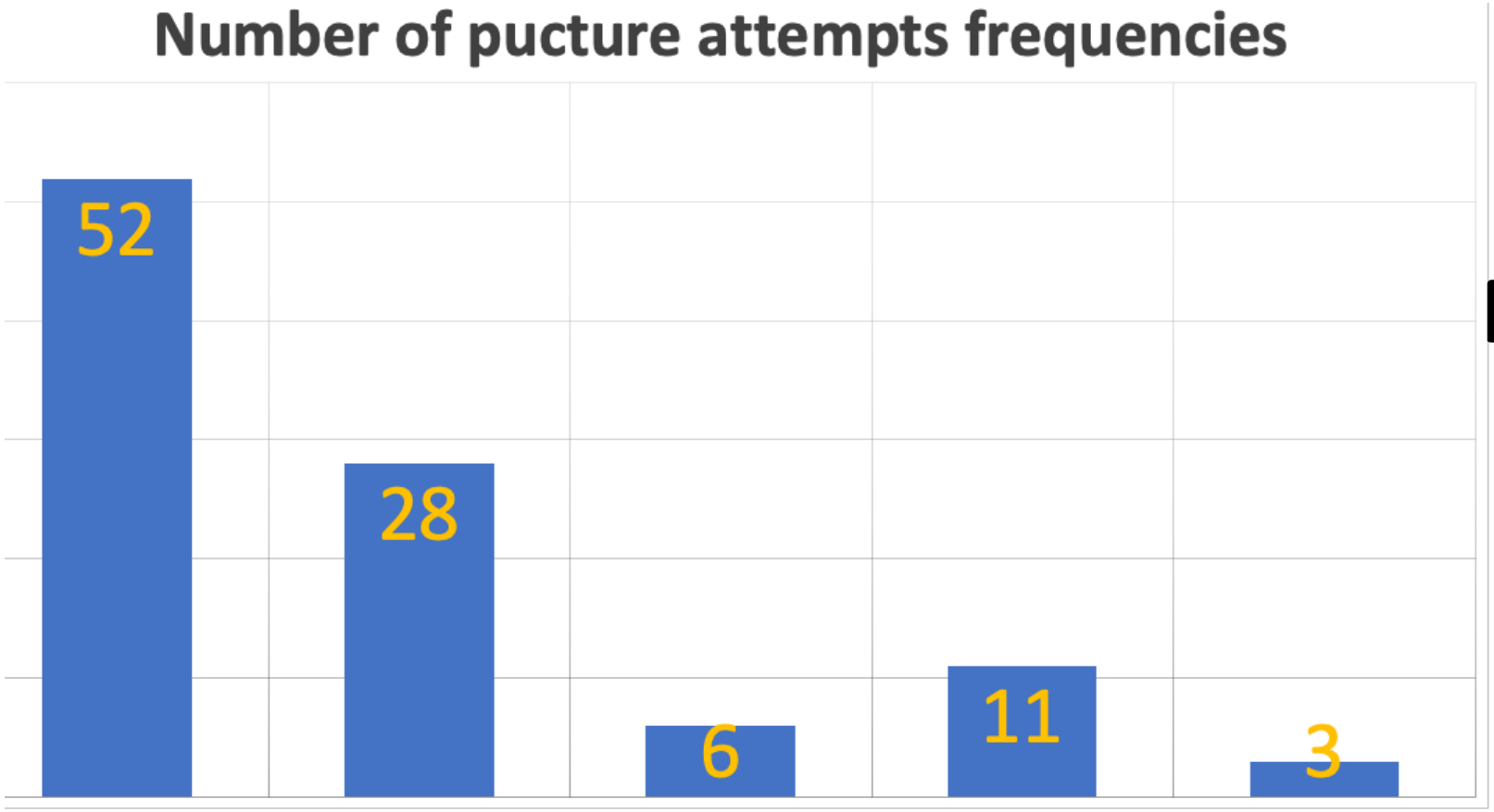




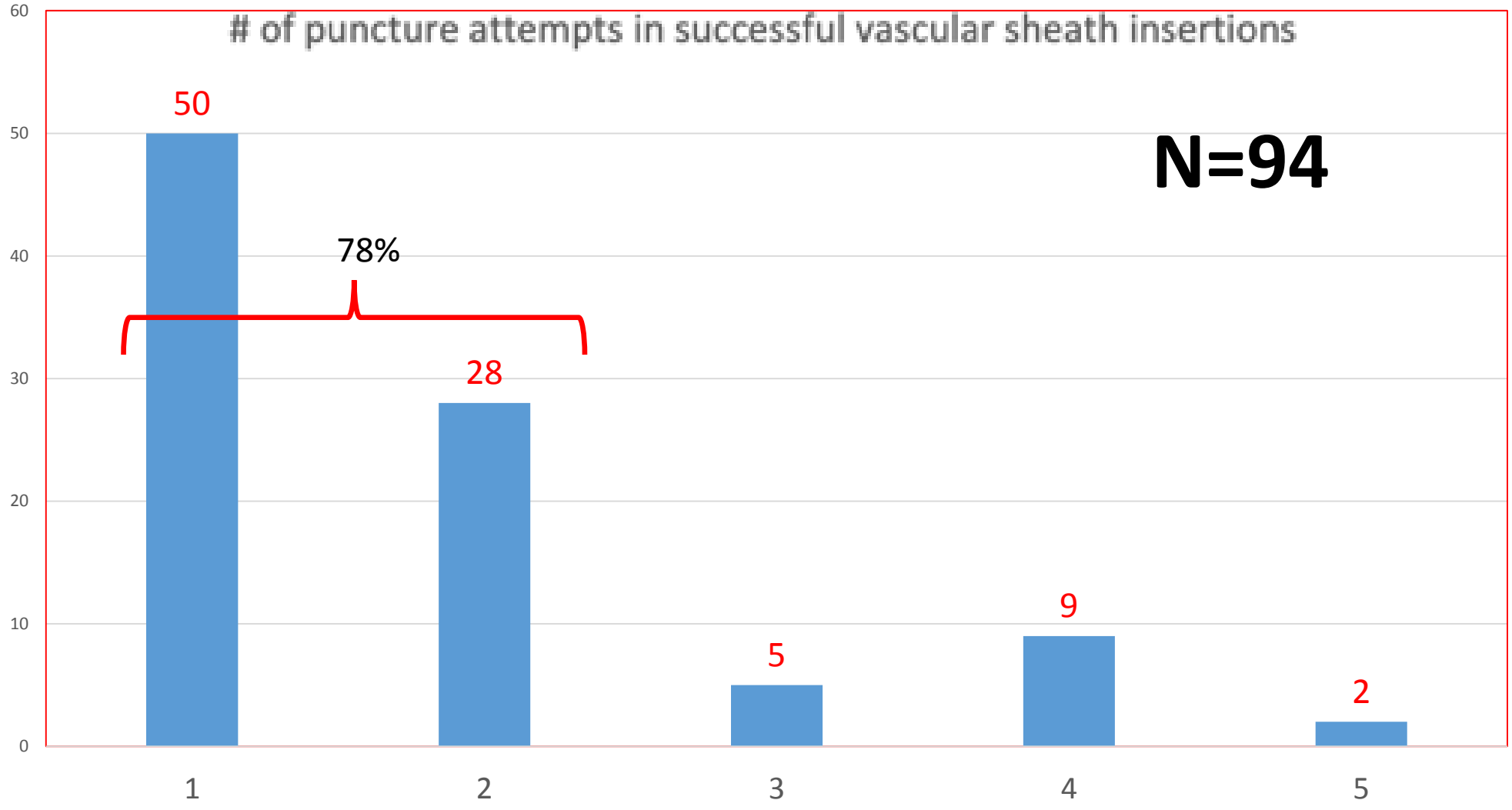
Routine Ultrasound in DRA
Relationship between success of puncture and quality of palpation and DRA diameter

Routine Ultrasound in DRA

Palpation Tercile	1	2	3	total
n	11	30	59	100
Success n(%)	9 (82)	29 (97)	56 (95)	94 (94)
AVG diameter (mm)	2,01	2	2,32	2,19
min/max (mm)	1,25/3,05	1,10/2,95	1,40/3,30	1,10/3,30



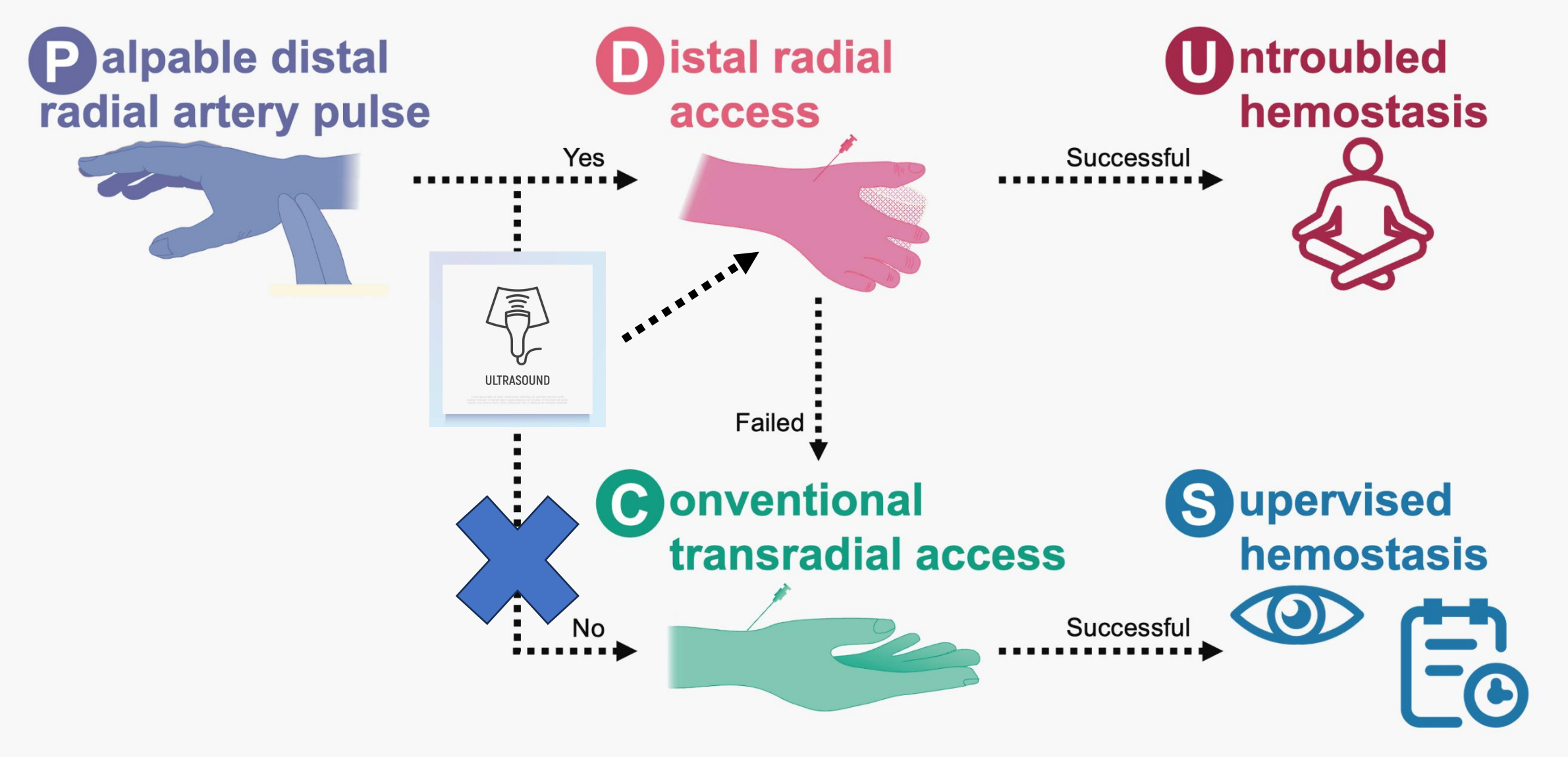
N=100


# of puncture attempts in successful vascular sheath insertions
N=94
78%
50
28
5
9
2
60
50
40
30
20
10
0
1
2
3
4
5

What are new contributions of our project to current knowledge?

- Results from project:
  - At present, not using of US excludes patient w/o palpable artery in snuffbox from DRA.
  - Using ultrasound-guided puncture provides an opportunity to perform puncture and sheath insertion among these patients (previously deemed usually ineligible for DRA) with a high rate of success. The total success rate in nonselected patients could exceed 90% and may approach cTRA.
  - Therefore, the DRA has the great potential to become the first choice in the selection of arterial access for routine cardiac catheterizations.

Závěr - náš cíl do blízké budoucnosti = rozšířit do PCI center:



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