

Indications for percutaneous and surgical creation of AVFs at the elbow: the radiologist's point of view

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Disclosure

Richard Shoenfeld, MD, FSIR, FAHA

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I do not have any potential conflict of interest



- 1. Is endoAVF the functional equivalent of sAVF?
- 2. Does endoAVF have early advantages compared to sAVF?
- 3. Does endoAVF have the same or fewer potential complications than sAVF?
 - Primary failure, high resistance, stenosis, aneurysmal dilatation, high output, distal ischemia
- 4. In case of failure, does endoAVF prevent other options?
- 5. Is endoAVF non-inferior to sAVF?
- 6. Does endoAVF have the same or better durability than sAVF?
- 7. What are some potential indications for endoAVF?
- 8. Should endoAVF be the *first fistula*?

Is an endoAVF the functional equivalent of a sAVF?

Proximal RA surgical AVF

- Incision, dissection, mobilization
- Calibrated suture anastomosis
- Ligate competing venous outflow
- Wound closure, post-op pain, scar
- Procedure time: \geq 1 hour



Arnaoutakis, D. et al. J Vasc Surg 2017

Brachial Basilic veir enhalic vei Mediar cephalic ve Median cubital vein Recurrent radial artery vein Median antebrachia Ulnar arten

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Band-aid to puncture site, no pain or scar Procedure time: \geq 15 minutes

endoAVF (proximal RA)

• US-guided vein then radial A. puncture

• Endo-anastomosis, 5-mm angioplasty

• ± occlude competing venous outflow

Mallios A. et al. J Vasc Surg 2018

communicating

Does endoAVF have early advantages compared to sAVF?

elbow sAVF

- Same day surgery, inpatient
- OR Scheduling issues
- Surgical skills, technically demanding
- Post-operative recovery; morbidity
- Progressive hypertrophy, maturation
- Early, immediate use not recommended

endoAVF

- Outpatient (drive-by) procedure
- No wait
- Basic catheterization skills; not demanding
- No post-op recovery; no or minimal morbidity
- Immediate high arterial flow
- Early or immediate use, if necessary

Does endoAVF have the same or fewer potential complications than sAVF?

RC AVF: *the gold standard*

- Moderate flow, low-moderate pressure
- Cephalic arch obstruction: rare
- Distal ischemia: 1-4%
- High output: almost never
- Lower risk of arm swelling with CV obstruction

BC AVF

- High-flow, high pressure, aneurysmal dilatation
- Cephalic arch obstruction: frequent
- Distal ischemia: 15-22%
- High output: not uncommon
- Higher risk of arm swelling with CV obstruction

endoAVF behaves like a proximal RC AVF

- Moderate flow, low-moderate pressure
- Cephalic arch obstruction: rare
- Distal ischemia: 1-4%
- High output: almost never
- Lower risk of arm swelling with CV obstruction

Is endoAVF non-inferior, as durable as sAVF?

Group (overall)	Study/ Author	Technical Success	Primary Patency	Cumulative Patency	Assisted 1º Patency	(suitable for dialysis) (Qa > 500 ml/min)
Brachial-Cephalic AVF ¹	Almasri		0.526 @130 wks	0.573 @ 104.5 wks	0.966 @260 wks	0.863 @ 6 wks
Brachial- Basilic AVF ¹	Almasri		0.582 @ 104 wks	0.722 @ 91 weeks	0.857 @65 wks	0.780 @ 34.15 wks
Radio-Cephalic AVF ¹	Almasri		0.554 @ 104 wks	0.536 @ 104 weeks	0.858 @52 wks	0.781 @ 45.5 wks
Proximal RC AVF ²	Jennings		0.6 @ 12 mos 0.47 @ 24 mos	0.93 at 12 months 0.91 at 24 months	0.9 @ 12 mos 0.86 @24 mos	
Distal RC AVF	Inston	0.926	0.534 @ 6 mos 0.44 @ 12 mos	0.667 @ 6 mos. 0.576 @ 12 mos.		
endoAVF WavelinQ	Inston	0.967	0.655 @ 6 mos 0.565 @ 12 mos	0.758 @ 6 mos 0.695 @ 12 mos		
endoAVF Ellipsys ⁶	PIVOTAL	0.95		0.867 @ 12 mos.		100 days
endoAVF Ellipsys (early results) ³	Mallios	0.96	0.94 @ 3 mos.	0.92 @ 3 mos.		0.96 @ 6 wks
endoAVF Ellipsys (early can.) ⁴	Mallios	1.00	0.69	1.00	0.92	1-12 days
endoAVF EverlinQ ⁵	NEAT	0.98	0.69 @ 12 mos.	0.84 @ 12 mos.	0.46 interv./pt-yr	52/60; 0.87 @ 3 mos

¹Almasri, J. et al. J Vasc Surg 2016. ²Jennings, W.C. et al. J Vasc Surg 2018 ³Mallios, A. et al. J Vasc Surg 2018 ⁴Mallios A. et al. J Vasc Access 2019 ⁵Lok, C. et al. Am J Kidney Dis 2017 ⁶Hull, J. et al. J Vasc Interv Radiol 2018

Potential indications for endoAVF

- RC AVF poor anatomy, failure
- High BMI patients (up to 44 kg/m²)
- Candidates for BC/BB AVF
- Stage I: transposition, elevation BC/BB AVF
- Dialysis pts; early cannulation avoid initial or problematic PC,¹ early use AVG
- Non-dialysis pts; need for early dialysis
- H/O elbow AVF, distal ischemia + need for new AV access
- The elderly (> 70 years)
- Diabetics with heavily calcified distal RA?
- ESRD + cardiomyopathy (RC AVF not possible)
- Dual vein cannulation; avoid recirculation
- Surgical fatigue

Access_Type	ES (95% CI) Followup_weeks
DM	
BBaF	→ 0.95 (0.86, 1.04) 52
FAG	• 0.79 (0.56, 1.09) 52
AVF	• 0.52 (0.42, 0.65) 44.5
RCF	0.37 (0.28, 0.50) 156
FAF	0.32 (0.25, 0.42) 208
No DM	
LEF	• 0.87 (0.67, 1.11) 52
RCF	• 0.53 (0.41, 0.69) 182
UAG	• 0.45 (0.25, 0.79) 130
AVF	——— 0.37 (0.28, 0.48) 65
LEG	• 0.35 (0.17, 0.74) 52
FAF	• 0.29 (0.12, 0.71) 260
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Access 1º patency in diabetics and non-diabetics²

Should endoAVF be the *first fistula*?

endoAVF (WavelinQ) vs sRC AVF

- Clinical outcomes
 - endoAVF ≥ surgical BC AVF
 - BC AVF > RC AVF
- Procedural success
 - endoAVF ≥ surgical RC AVF (96.7 vs 92.6%)
- Failure in the first year
 - endoAVF < RC AVF (30.5% vs 42.4%)
- Preservation of surgical sites
 - endoAVF preserves upper arm options
 - sRC AVF after endoAVF
 - endoAVF after sRC AVF





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endoAVF Challenges

Suboptimal anatomy Choice of endoAVF systems How much embolization, if any? Dialysis nurses' comfort with endoAVFs Challenges of early cannulation POCUS available in dialysis centers Paucity of results compared to surgery Need to protect veins from phlebotomists, iv's, etc. Internet, word of mouth: patient demand for endoAVF rather than surgical AVF CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE

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endoAVF – The Radiologists's Perspective

Goal = sustained clinical use of AV access

Easy, safe creation of functional AVF; high success rate

Early Physiologic maturation; low reintervention rate

Early clinically useful AVF

Early CVC removal

Preservation of venous capital and future access options

Consider: endoAVF as *first fistula* in *fistula first*.