Novel two-stage proximal brachial artery to proximal basilic/brachial vein arteriovenous graft extension for dialysis access.

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No disclosures

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Contents

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AVG compared to mature AVF

- All types of AV grafts, synthetic and biologic have inferior primary patency.
  - *Mode of failure is scarring preventing outward remodeling and neointimal hyperplasia resulting in inward remodeling and stenosis at the venous anastomosis.

- This results in AV grafts requiring more interventions to stay functional.
  - *Need to continuously dilate and stent the venous anastomosis.

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Protocol for AV access creation

In every patient a primary fistula should be attempted. **Maturation** can result but can be as **low as 40%** when applying the **rule of 6's.**
If after transposition and revision, the cannulation segment is too short for cannulation (less than 8 cm) then the most peripheral portion of the outflow vein that dilated to 7-8 mm can be used for graft extension

The outflow vein used for the anastomosis should have the following characteristics

1. Large caliber 7 to 8mm to match or exceed the size of the graft
2. Thickened tissue to match the compliance of the graft
3. End to end configuration to mimic the fistula hemodynamics

An AVG should be created as a salvage procedure for a failed fistula and is nearly always a secondary procedure.

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Operative technique

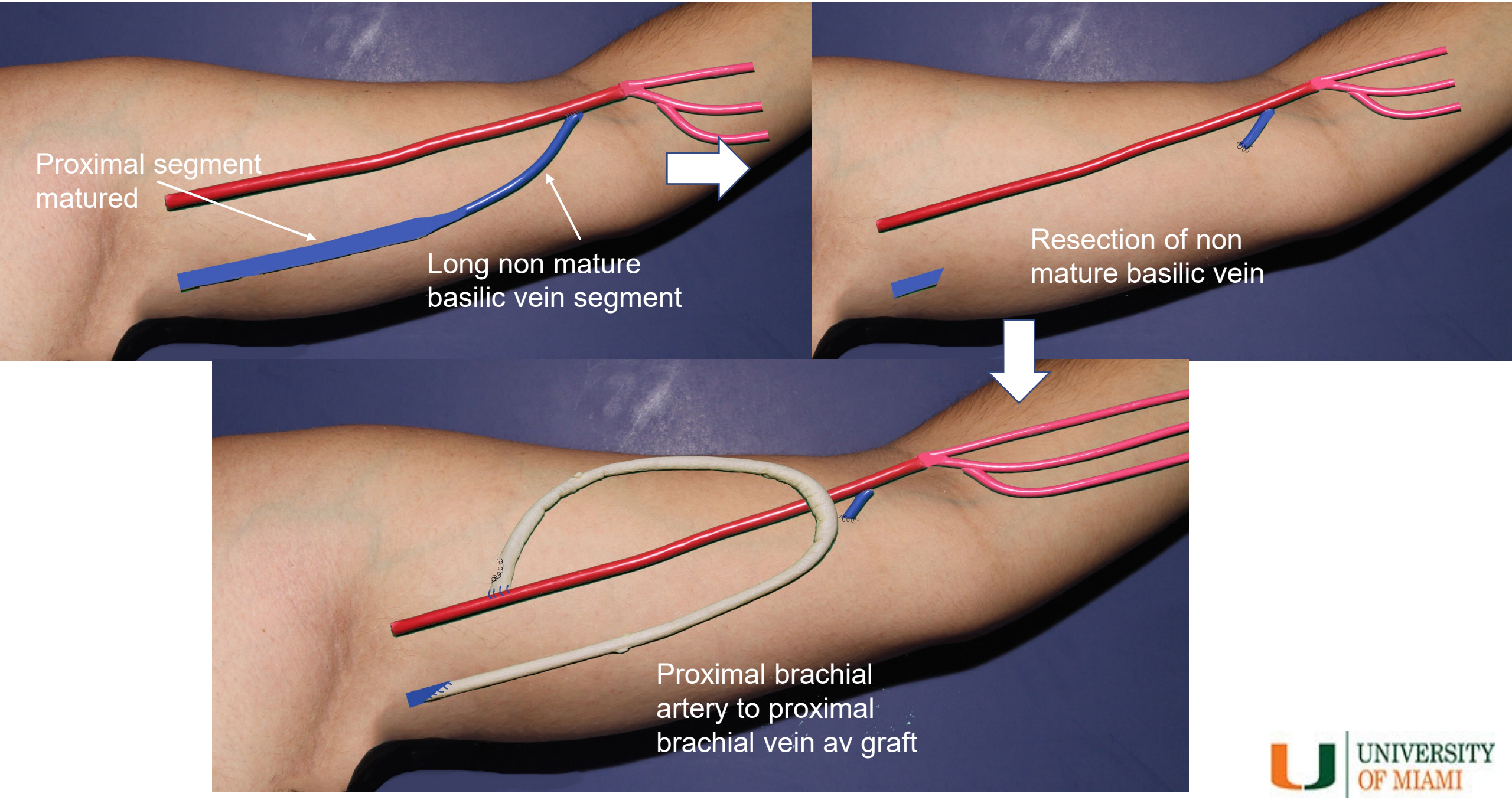
BBAVG

Proximal brachial artery to proximal basilic/brachial vein arteriovenous graft.

Scenario 1

2-stage procedure

Basilic vein transposition **failed to mature**, but outflow vein in the upper arm achieved the primary characteristic of enlargement to 7-8 mm



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Scenario 2

3-stage procedure

Basilic vein transposition **failed to mature** and outflow vein in the upper arm **did not** achieve the primary characteristic of enlargement to 7-8 mm.

Avoid going to the axillary vein.

*Perform 2nd stage procedure

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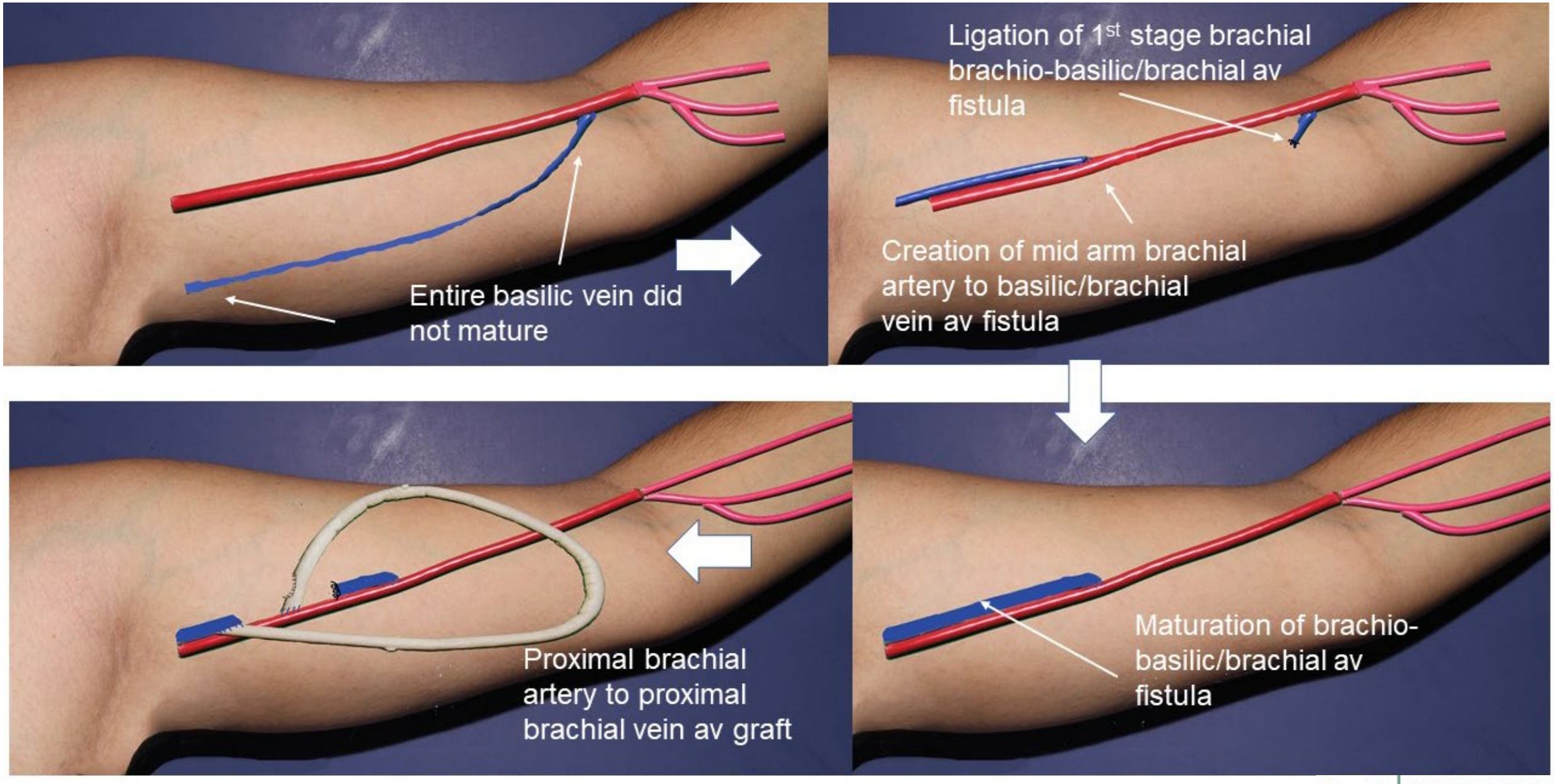
By: Marwan Tabbara, MD.



Scenario 3

2-stage procedure

NO distal arm veins (cephalic, basilic, or brachial) available.

Typically, the axillary vein is used for outflow.

Mid-arm basilic/brachial vein AVF is created for the sole purpose of achieving the requirements for an optimized AVG.

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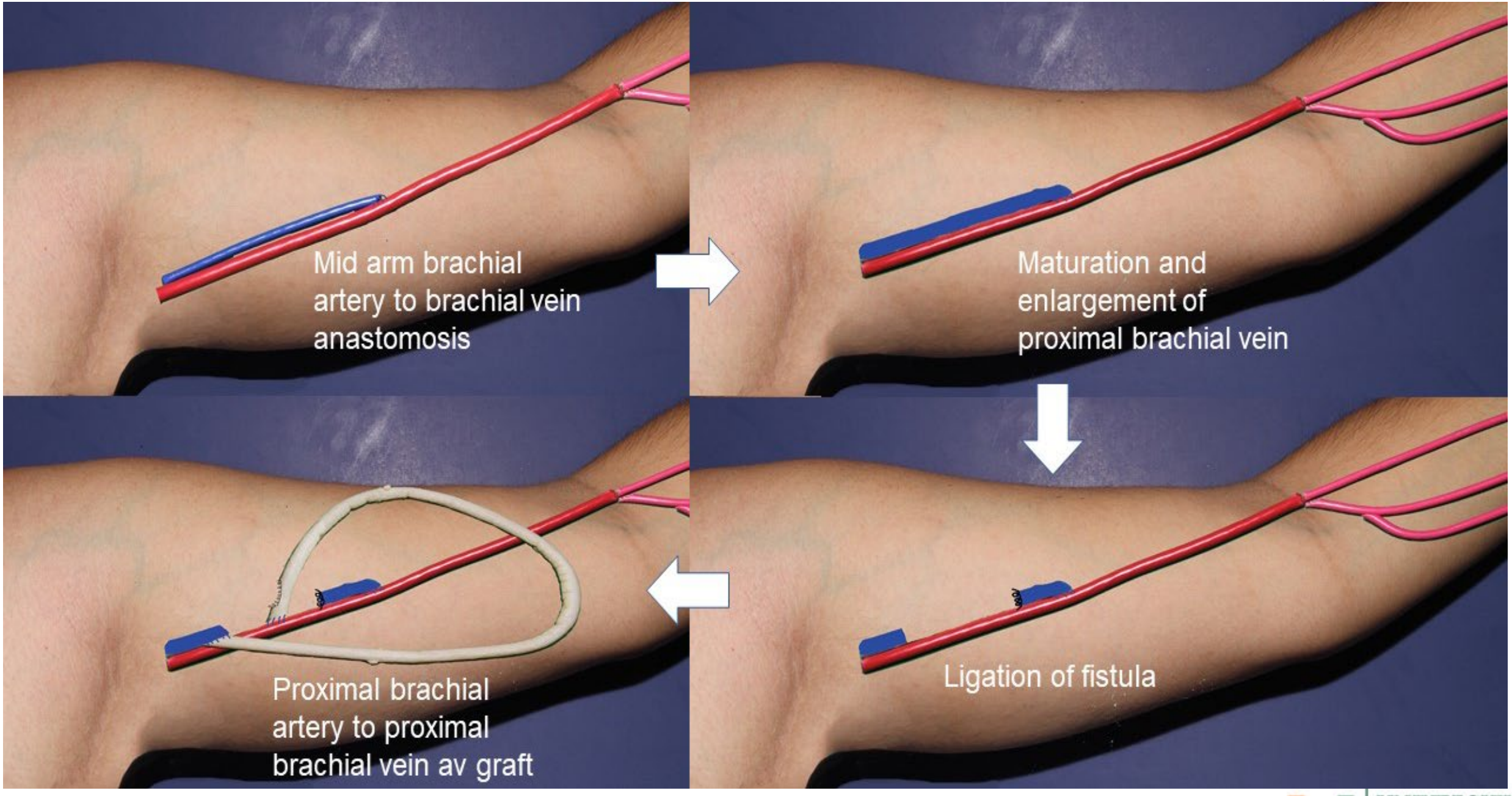
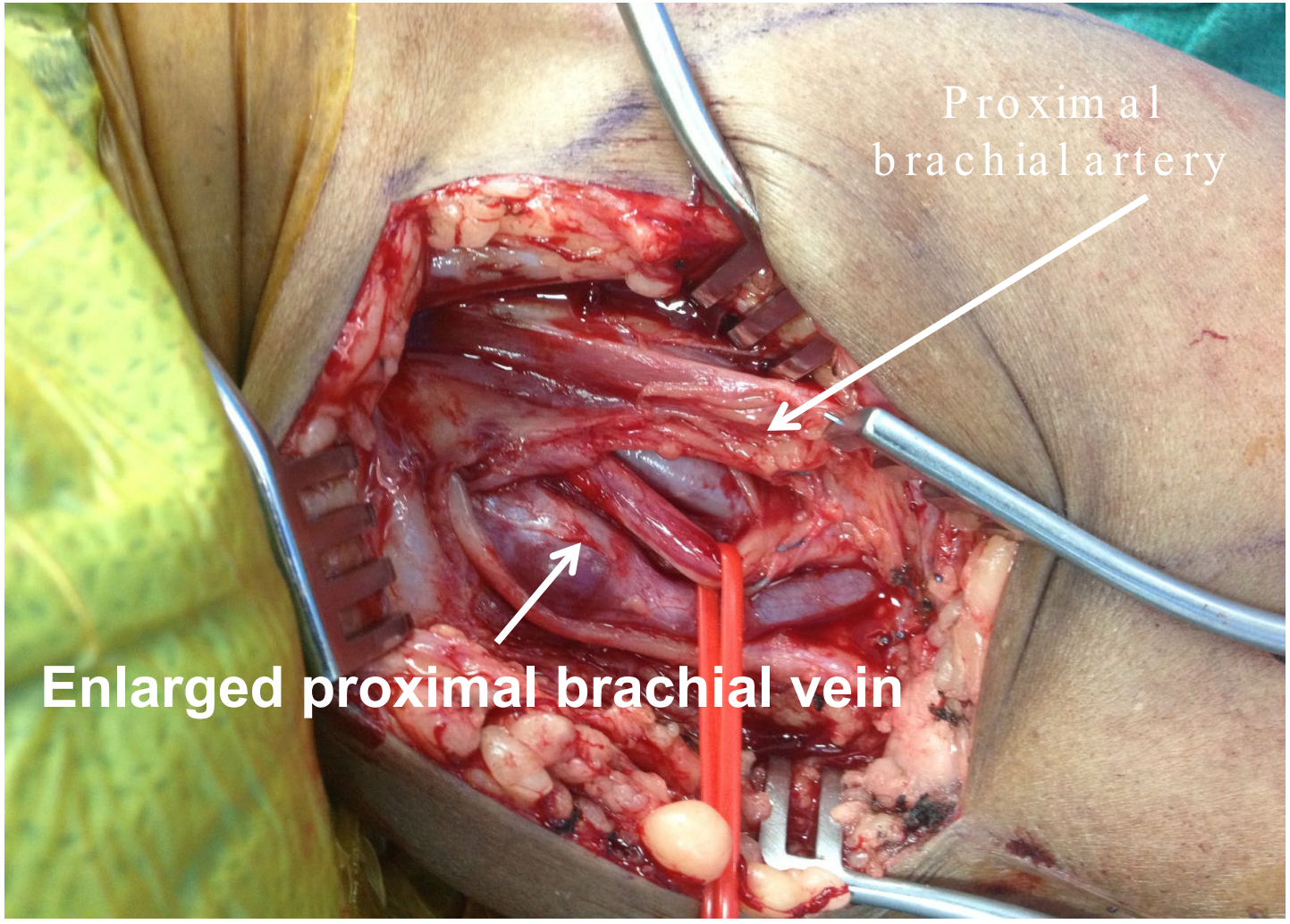
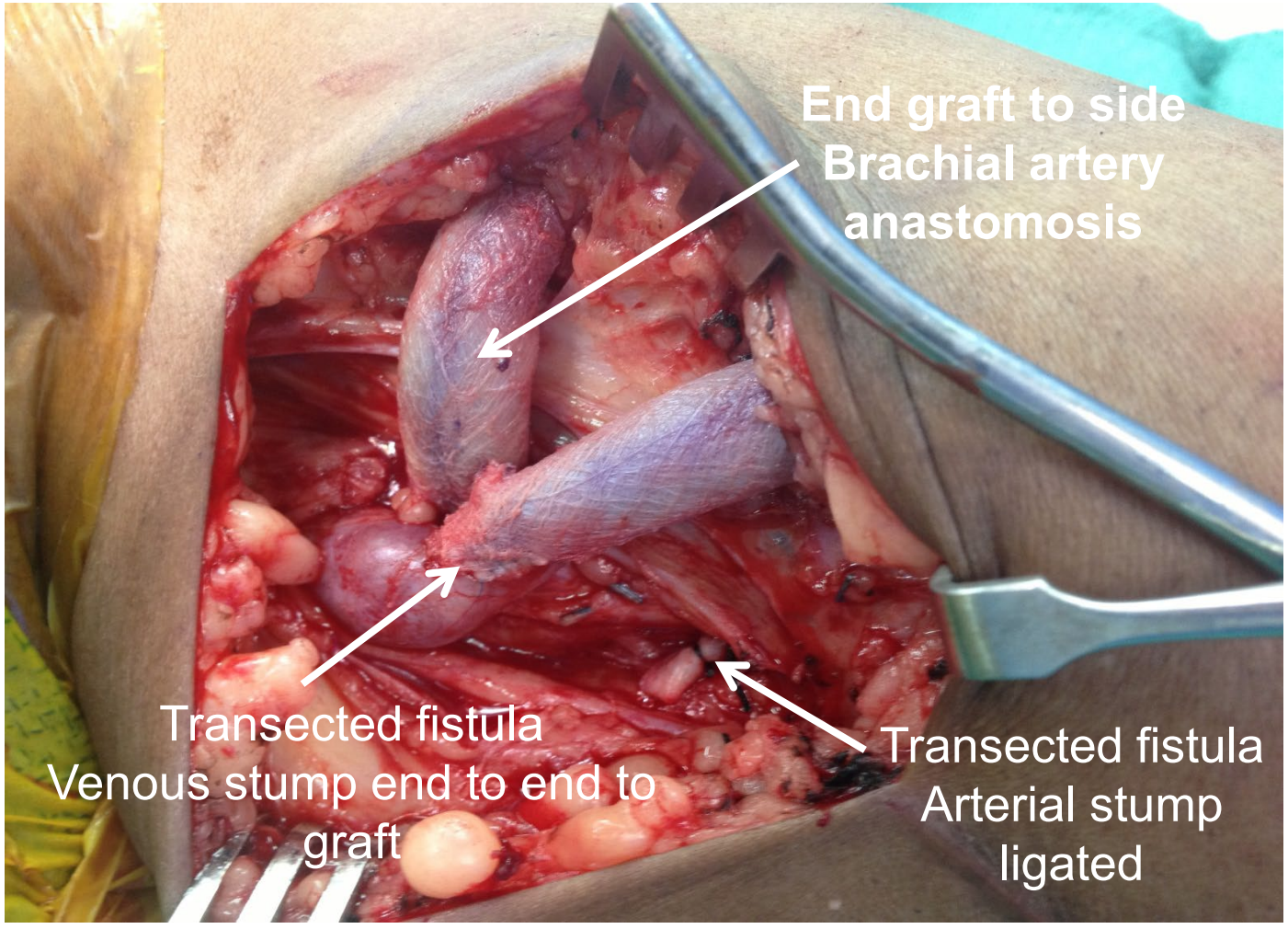
By: Marwan Tabbara, MD.



Close up of the enlarged proximal brachial vein draining the mid brachial artery to brachial vein AV fistula



Close up of the end-to-end anastomosis between Artegraft and basilic vein. End to side anastomosis to brachial artery



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Methods

Study participants

Retrospective review of 104 patients (>18 y.o.) with ESRD on hemodialysis, who underwent a BBAVG at UMH and JMH between January 2015 and May 2021. Falling under any of the following groups:

Inclusion/Exclusion criteria

2 stage procedure

1. Adequate enlargement of the proximal vein after a failed basilic transposition, resulting in a subsequent graft extension (BBAVG).

3 stage procedure

2. Non-enlargement of the proximal vein requiring a mid-upper arm brachial artery to basilic/brachial vein AVF to enlarge a proximal vein and allow a BBAVG creation.

2 stage procedure

3. Creation of a primary mid-arm brachial to basilic/brachial AVF due to lack of suitable distal arm veins and subsequent BBAVG. 3 stage procedure

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Methods

Primary Outcomes:

Loss of primary and secondary patency rates estimated using Kaplan-Meier survival analysis.

- ✓ Loss of primary patency: time from BBAVG creation to permanent failure that required any intervention (endovascular or surgical) in order to maintain or restore blood flow (SVS).
- ✓ Loss of secondary patency: time from BBAVG creation until it is no longer used as an access due to failure, despite the interventions (SVS).
- ✓ 12-month patency: vascular accesses patent and used throughout the first year of follow-up, regardless of the interventions performed.

(*) Censored data: accesses that did not have a defining event for loss of follow-up or death due to other causes unrelated to the surgical procedure.

Secondary Outcomes:

Associations of access failure through a Cox regression models with covariates adjustment.

- ✓ Demographic characteristics
- ✓ Comorbidities
- ✓ AVF characteristics

Cull JD, Cull DL, Taylor SM, Carsten CG, 3rd, Snyder BA, Youkey JR, et al. Prosthetic thigh arteriovenous access: outcome with SVS/AAVS reporting standards. J Vasc Surg. 2004;39(2):381-6.

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Baseline demographic characteristics and comorbidities

Age – mean in years (SD)	63 (± 14)
Ethnicity – N (%)	
African American/Haitian	71 (68%)
Hispanic	16 (15%)
Caucasian	17 (16%)
Gender – N (%)	
Male	36 (35%)
Female	68 (65%)
Comorbidities – N (%)	
Hypertension	104 (100%)
Diabetes Mellitus	65 (62%)
Coronary Artery Disease	28 (27%)
Peripheral Vascular Disease	18 (17%)
Medications – N (%)	
Antiplatelets	54 (51.9%)
Statins	54 (51.9%)
ARB/ACEI	20 (19.2%)
Location – N (%)	
Left	85 (82%)
Right	19 (18%)
Previous AVF – N (%)	78 (75%)
Deceased – N (%)	13 (12%)
N: Number, SD: Standard deviation, ARB: Angiotensin Receptor Blocker, ACEI: Angiotensin-Converting Enzyme Inhibitor, AVF: arteriovenous fistula	

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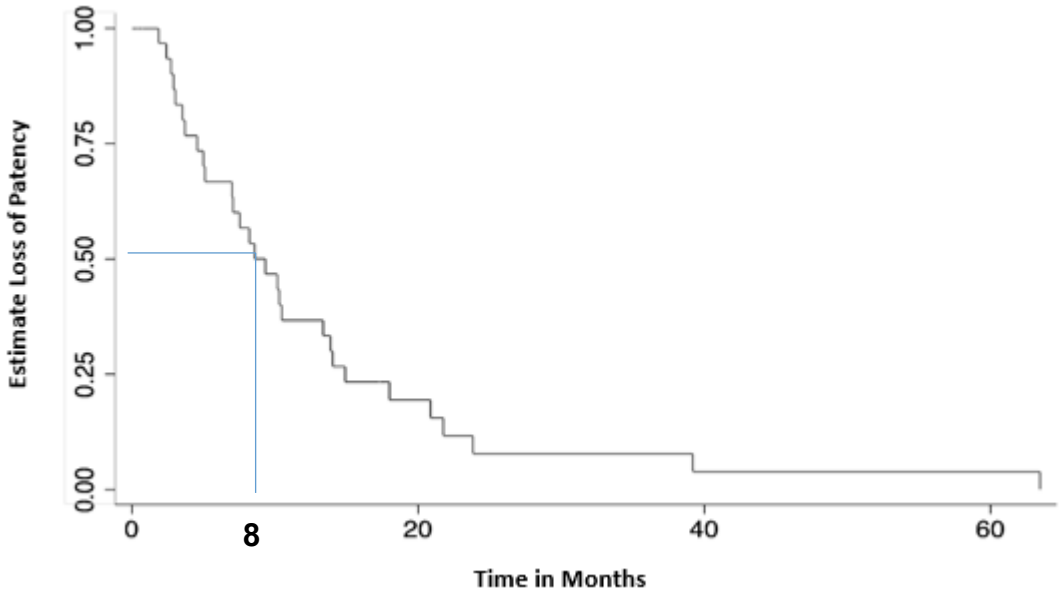
Primary Patency outcomes



Loss of primary patency at the end of follow up time – N (%)	29 (28)
Time to loss of primary patency – median in months (IQR)	8 (4-14)

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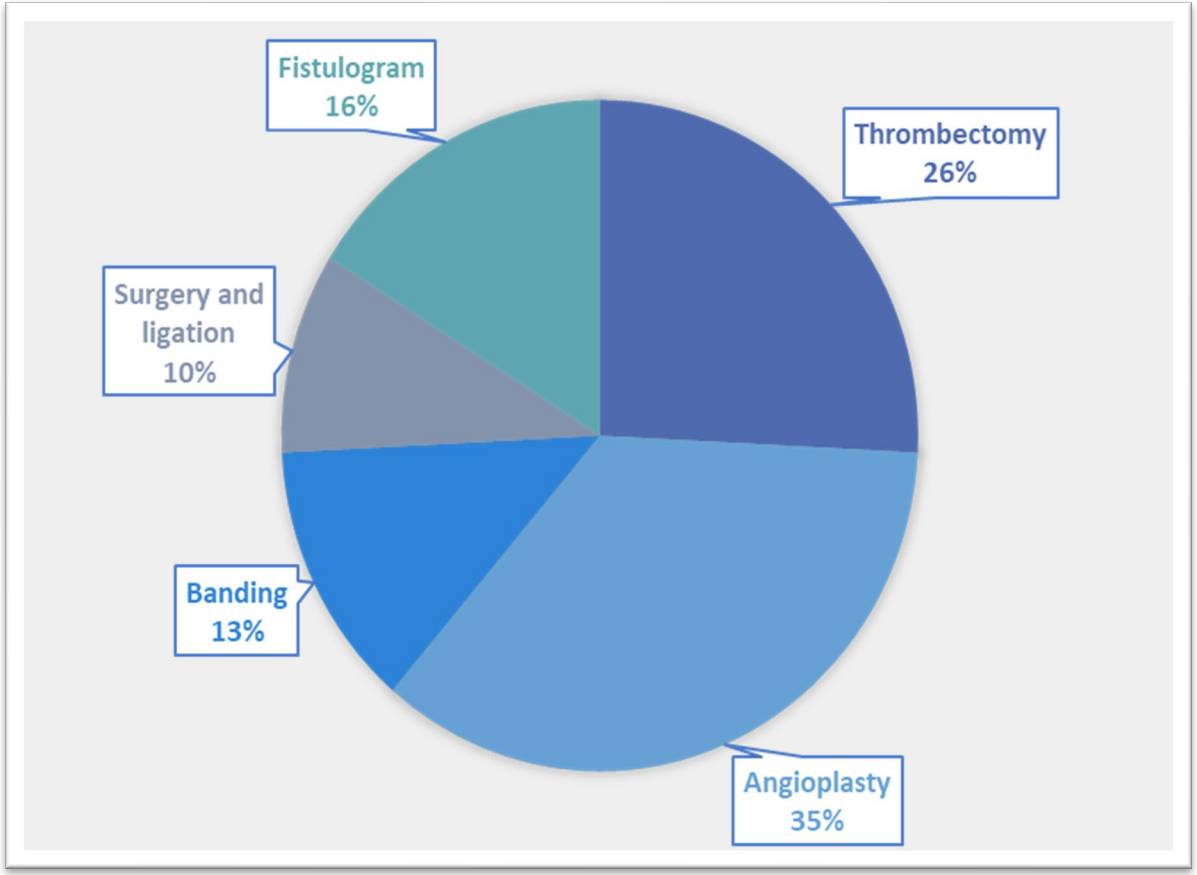
Secondary Patency outcomes



Loss of secondary patency at the end of follow up time – N (%)	14 (14)
Time to loss of secondary patency – median in months (IQR)	61(42-66)
12-month follow-up patency – N (%)	**89 (85.6)**
Time of follow-up – median in months (IQR)	11(11-30)

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Highlights

What we know

- AVFs are the best option for hemodialysis access (1, 2)
- Benefits from AVF as hemodialysis access depend on patient's anatomy for a successful fistula (2)
- Vessel size is a determining factor for successful maturation and overall access longevity (3)
- Institutions using a similar approach, but different surgical technique, have shown a primary failure rate for BBAVG that ranges from 7.4% to 37.5% (4)
- Secondary patency at 12-months of 76.3% (4)

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Highlights

Our results

- The initial creation of the brachial-basilic/brachial fistula allows for enlargement and thickening of the proximal segment brachial vein, which optimizes the overall success of the second-stage graft anastomosis.
- **85.6%** of our patients maintained a secondary patency at one year.
- BBAVG is a reasonable and durable alternative for vascular access creation in patients requiring hemodialysis without adequate superficial veins.
- Limitations: generalizability.

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Conclusions

- A larger diameter and thicker vein for AVG creation, by means of a first stage brachial-brachial AVF, followed by a second stage graft placement using an end-to-end venous anastomosis improves patency.
- Our BBAVG technique offers patients with limited access options a possibility to preserve the axillary vein for future access use.
- Primary patency was similar to literature reports and secondary patency rate shows promising results, for which we recommend further studies for validation.

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