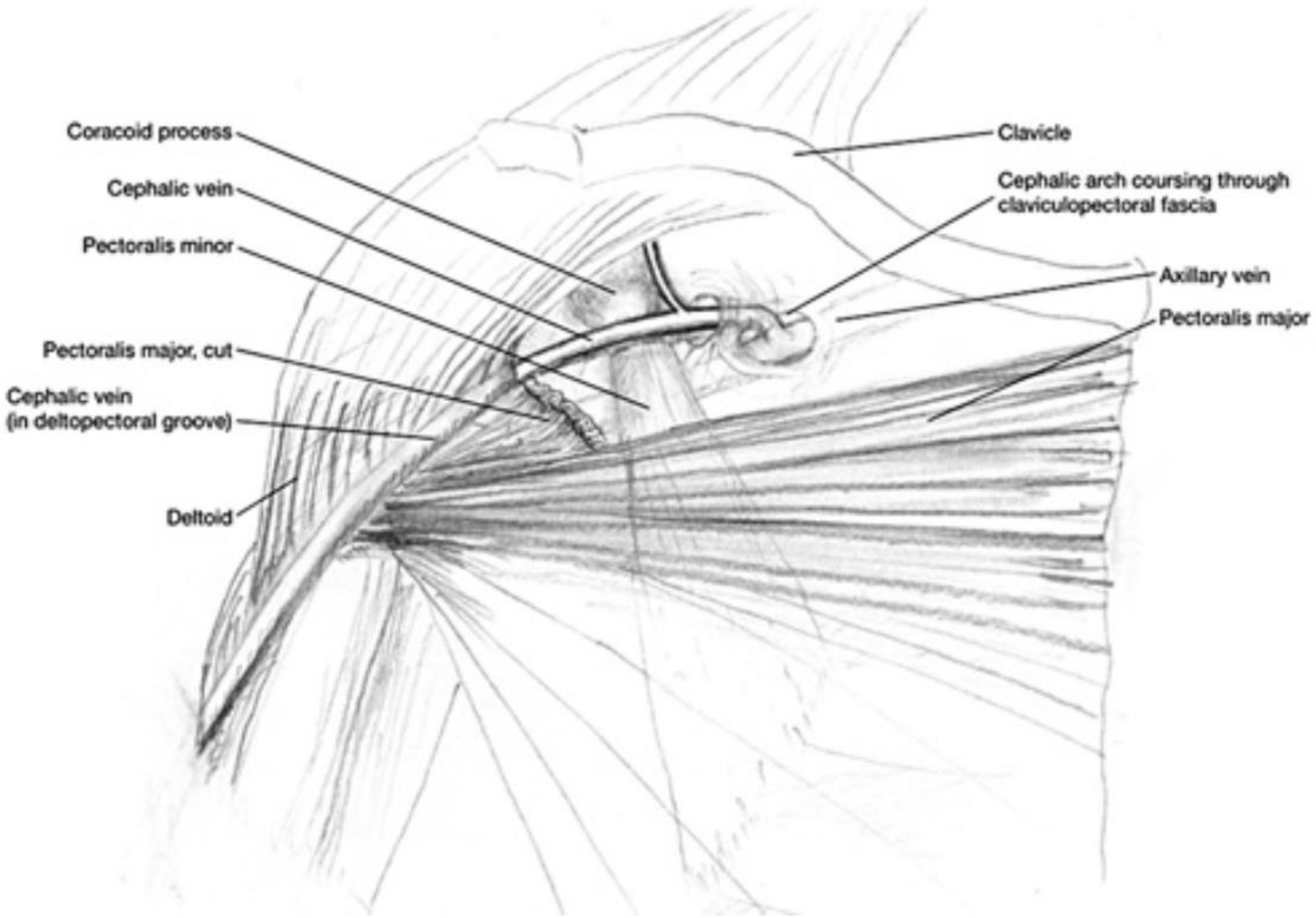
Management cephalic arch stenosis

Rungrujee Kaweewan

Cephalic arch stenosis (CAS)

- Out flow stenosis is a common cause of AVF failure.
- Cephalic arch is one of outflow tract prone to stenosis.
- CAS is more prevalence in brachiocephalic fistulas than radiocephalic fistulas.
- Prevalence in brachiocephalic fistulas 30-77% , radiocephalic fistulas 20%

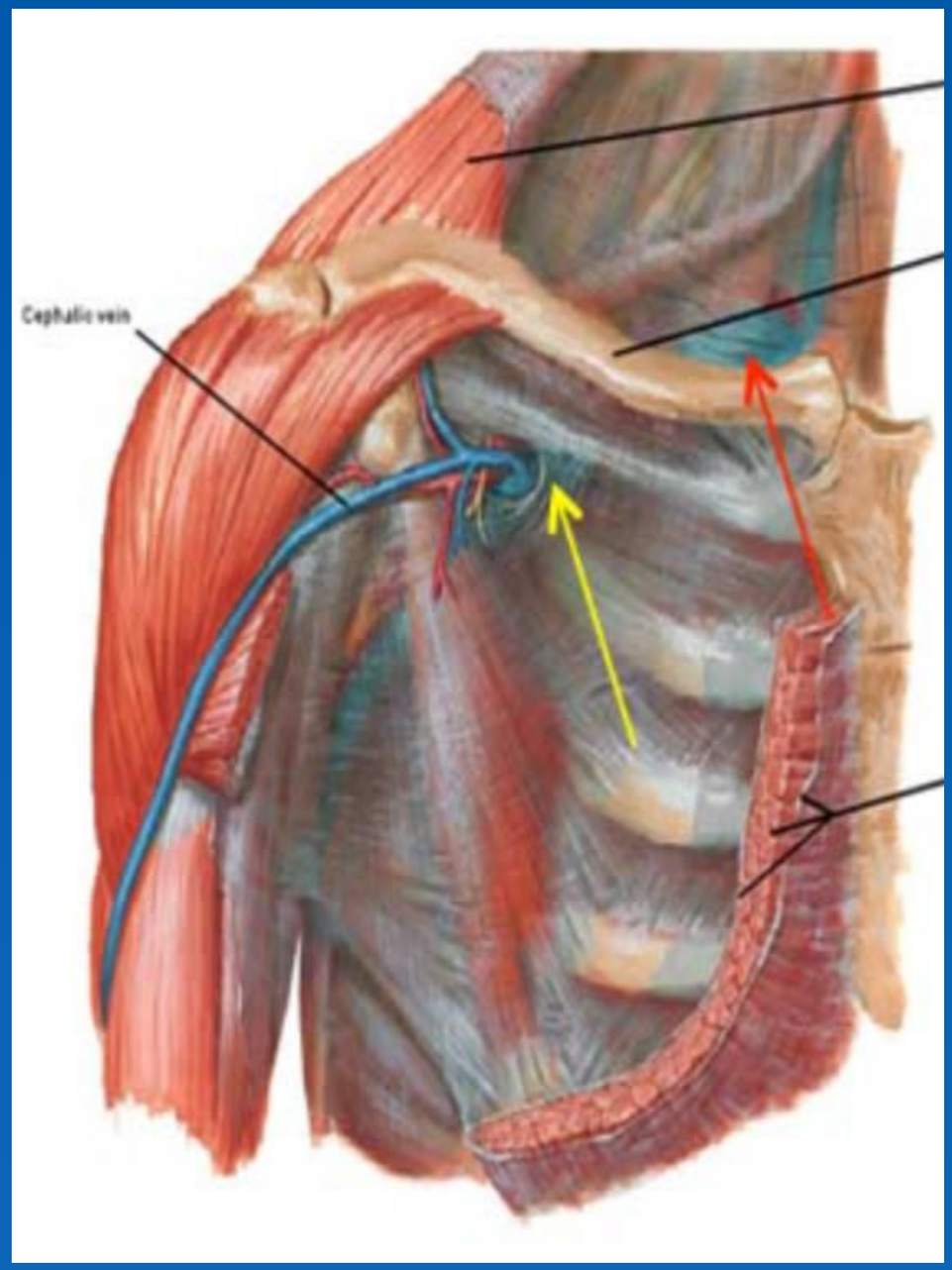
Anatomy of cephalic arch



JVascAccess 2014;15(3): 157-162

Etiologies of CAS

- Altered flow in a fistulized cephalic vein.
- External compression by fascia.
- Morphology of the cephalic arch and angle of cephalic vein entry into axillary vein.
- Large number of valves in the cephalic outflow.



JVascAccess 2014;15(3): 157-162

Management CAS

- Percutaneous transluminal angioplasty (PTA)
  - ballon angioplasty / high pressure balloon
  - cutting balloon angioplasty
  - stenting (stent graft / bare stent)
- Surgery : cephalic vein transposition, venovenostomy bypass

Angioplasty

- Balloon size can be determine by estimation or software measuring.
- Cephalic arch has significant rate of rupture during PTA, do not oversize balloon.
- 6% rate of cephalic arch rupture during PTA

JVascAccess 2014;15(3): 157-162

Cutting balloon angioplasty

- Theoretical benefit of CBA
  - microincisions in vessel wall ,effective dilatation with less amount of radial force applied
  - reduces barotrauma to vessel wall, induced less neointimal proliferation

The Journal of Vascular Access 2010; 11: 41-45

ORIGINAL ARTICLE

Cephalic arch stenosis in autogenous brachiocephalic hemodialysis fistulas: Results of cutting balloon angioplasty

Søren T. Heerwagen[1], Lars Lönn[2], Torben V. Schroeder[3], Marc A. Hansen[1]

[1]Department of Interventional Radiology, Rigshospitalet, Copenhagen - Denmark
[2]Department of Interventional Radiology, Rigshospitalet and University of Copenhagen, Copenhagen - Denmark
[3]Department of Vascular Surgery, Rigshospitalet and University of Copenhagen, Copenhagen - Denmark

- Primary patency rates at 3, 6, 12 and 15 months were 94%, 81%, 38% and 22%
- CBA did not improve patency compare to published result of conventional PTA
- CBA may lower the frequency of re-interventions. (0.9/patient/year VS 1.6 in PTA)
- Recommendation for CBA have beeb restricted to selective indication : failed conventional PTA

Stent graft placement

- Indications
  - significant residual stenosis after PTA
  - rupture not controlled by prolonged low pressure balloon dilatation
  - recurrent symptomatic stenosis within 3 months after successful PTA

Stent graft placement

- Stent graft deployment in the cephalic arch is challenging for two reasons
  - the segment is curved,requiring flexible device and should be long enough to extend to straight portion of vein
  - accurate deployment at the confluence with the axillary vein (angle of entry and anteroposterior orientation of confluence)

Stent graft placement

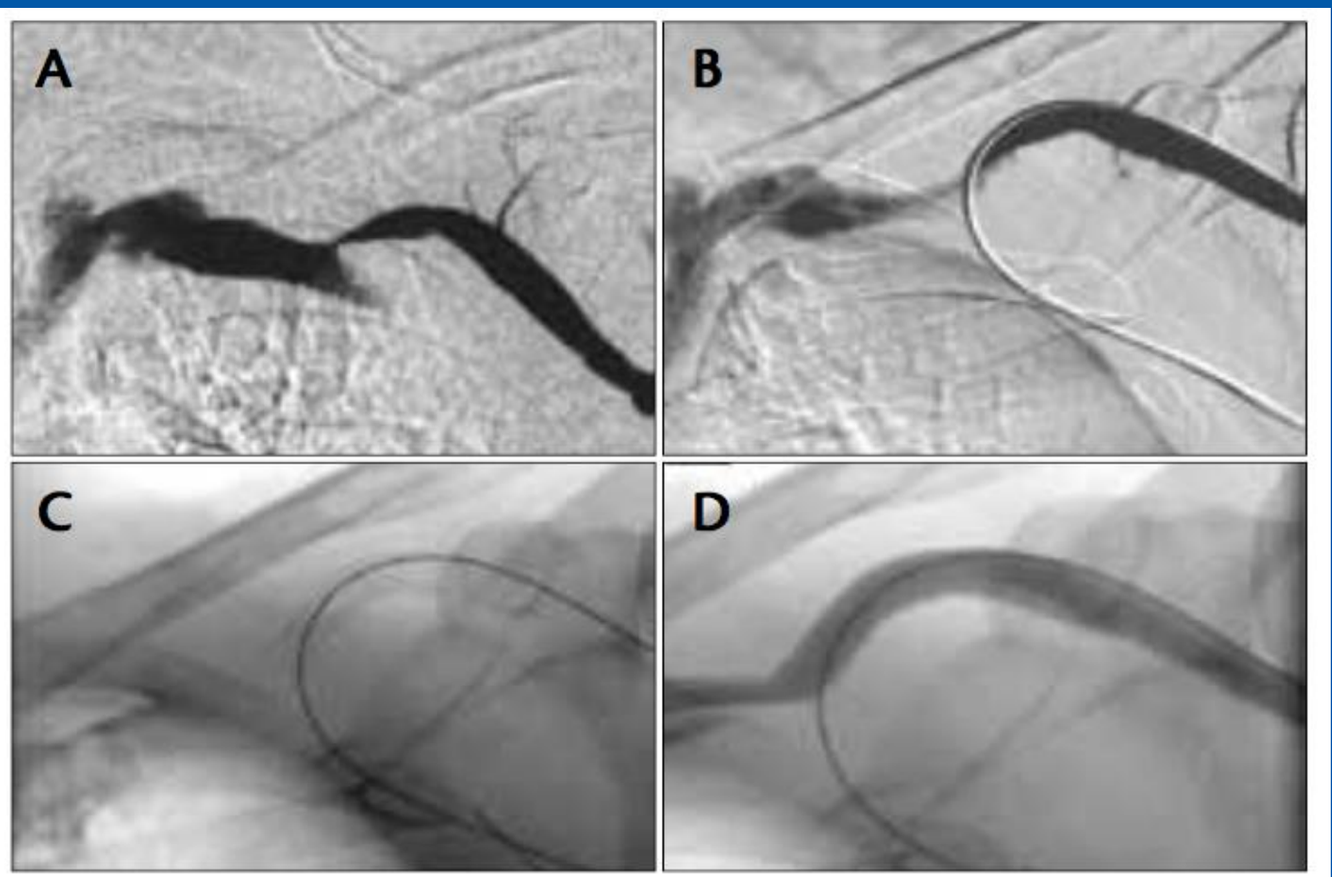


Figure 1. Severe recurrent cephalic arch stenosis at the confluence with the axillary vein (A). A stiff wire has been passed retrograde into the axillary vein, increasing the perpendicularity of the confluence (B). Stent graft deployment before final PTA (C). Completion angiogram showing satisfactory position of the stent graft (D).

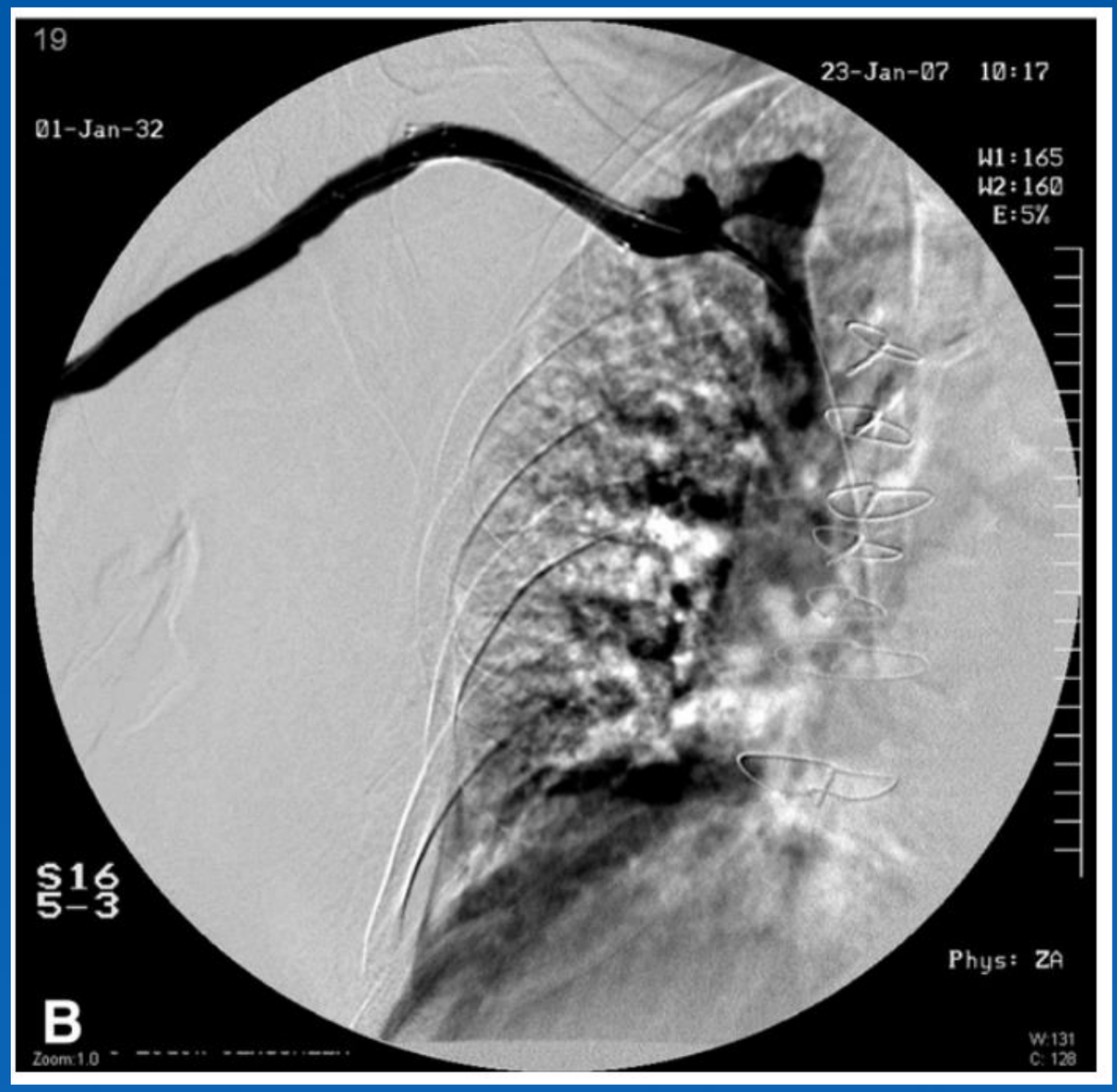
Managing cephalic arch stenosis.
Endovasculartoday, June 2012.

Angioplasty with stent graft versus bare stent for recurrent cephalic arch stenosis in autogenous arteriovenous access for hemodialysis: A prospective randomized clinical trial

David Shemesh, MD,[a] Ilya Goldin, MD,[a] Ibrahim Zaghal, MD,[b] Daniel Berlowitz MB, BChir,[b] David Raveh, MD,[c] and Oded Olsha, MB, BS,[a] *Jerusalem, Israel*

- *Inclusion criteria* : recurrent CAS >50% with in 3 months of successful PTA
- *Results* :
  - restenosis rate 7/10 (70%) in bare stent, 2/11 (18%) in stent graft group at 3 months
  - one year primary patency : 32% in stent graft , 0% in bare stent (p=.0023)

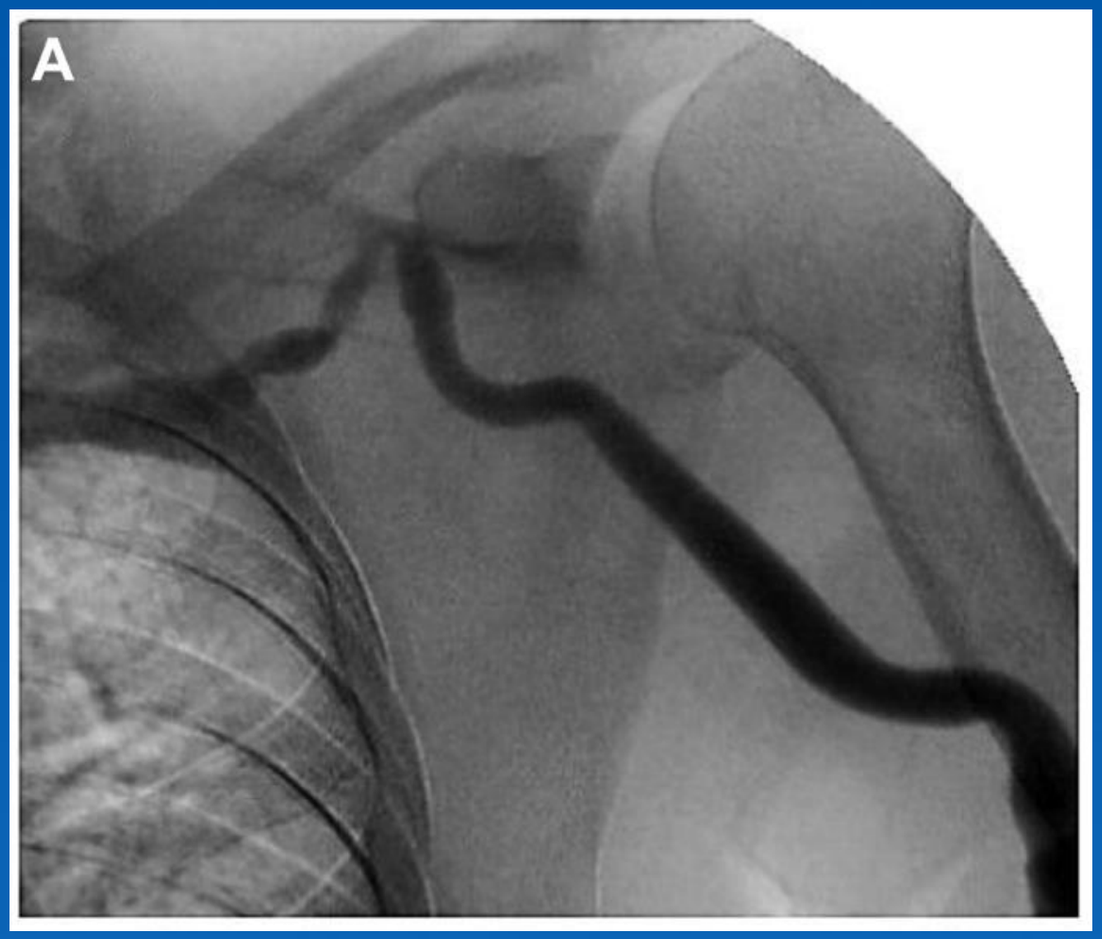
J Vasc Surg 2008; 48:1524-31

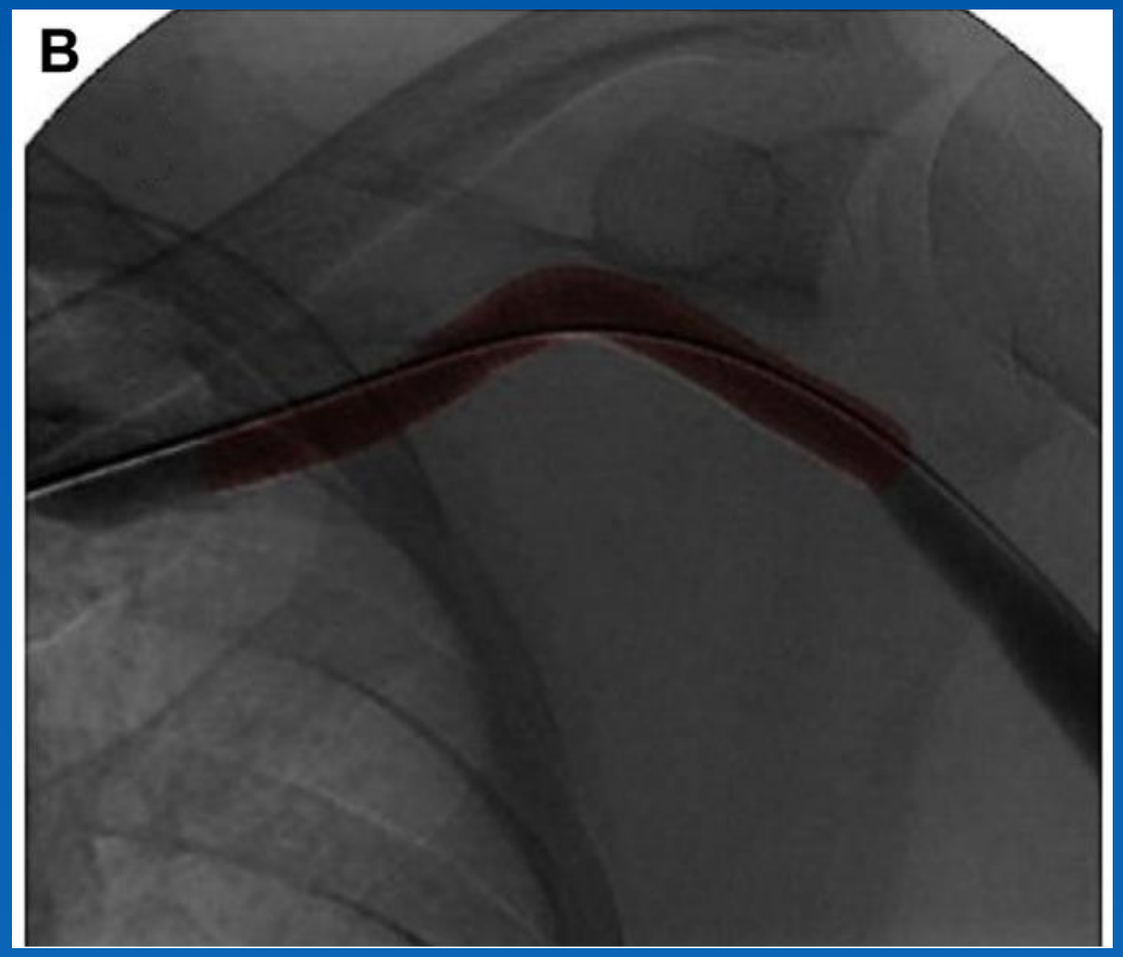


J Vasc Surg 2008; 48:1524-31

Use of the Viabahn stent graft for the treatment of recurrent cephalic arch stenosis in hemodialysis accesses

Gregg A. Miller, MD,[a] Dean C. Preddie, MD,[a] Yevgeny Savransky, MD,[a] *and* Lawrence M. Spergel, MD,[b]
Brooklyn, NY; and San Francisco, Calif





- Result : Primary patency at 3,6,12 months was 90%, 74%, 60%

J Vasc Surg 2018;67:522-8.)

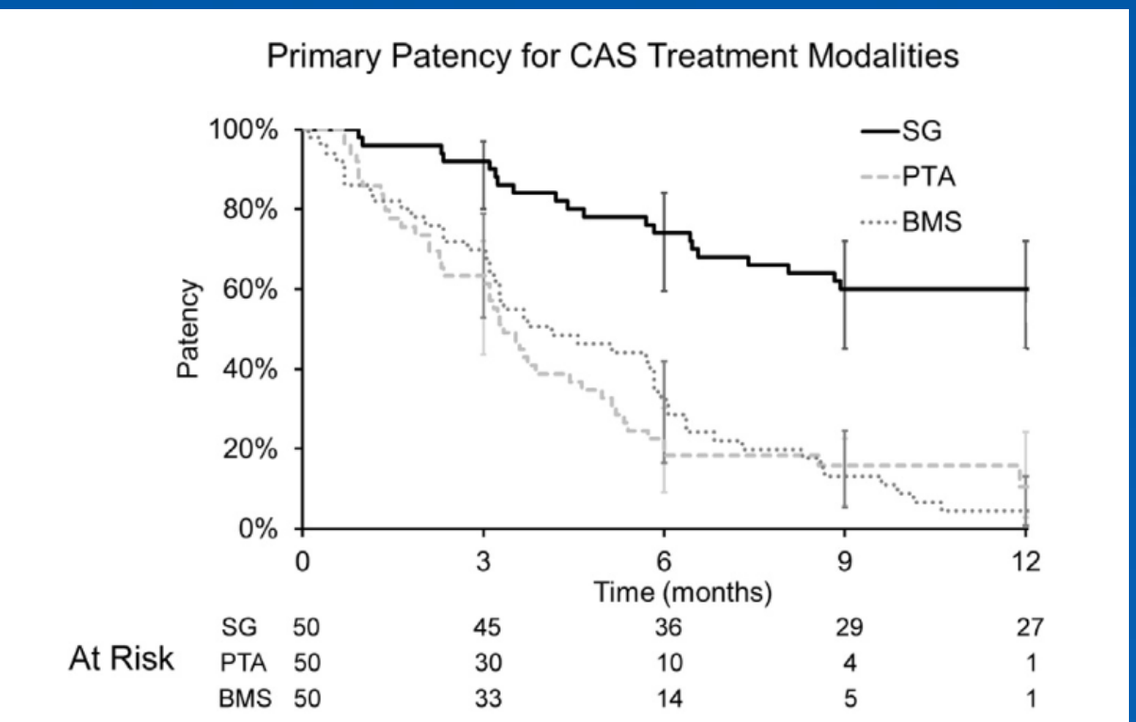


Fig 2. Kaplan-Meier survival estimate of primary patency rates with 95% confidence intervals. The stent graft (*SG*) cohort demonstrated statistically greater survival probability during the 1-year study period based on log-rank statistical analysis compared with the other cohorts ($P < .001$). *BMS,* Bare-metal stent; *CAS,* cephalic arch stenosis; *PTA,* percutaneous transluminal angioplasty.

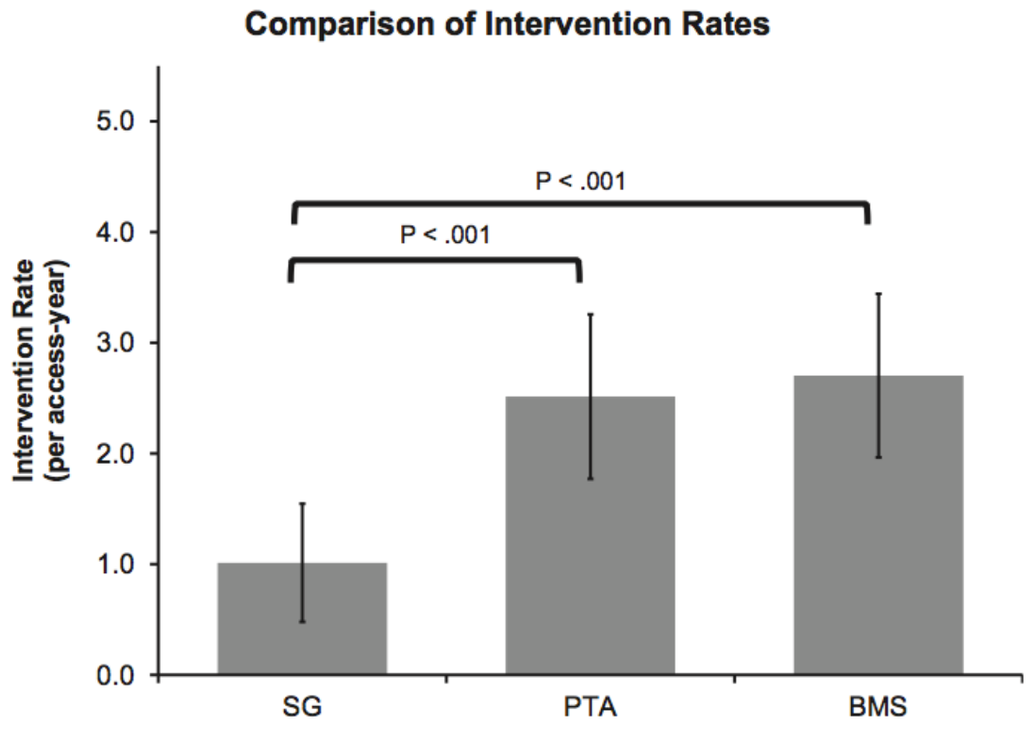


Fig 3. Intervention rates reported for the three treatment modalities for the first year of follow-up. The stent graft (*SG*) cohort showed a statistically significant lower intervention rate than the other two cohorts. *BMS,* Bare-metal stent; *PTA,* percutaneous transluminal angioplasty.

J Vasc Surg 2018;67:522-8.)

Fig 5. Representative image of juxtasubclavian stenosis (JSS) associated with the placement of a bare-metal stent (BMS) in the cephalic arch and a "tented" axillary vein.

- Juxtasubclavian vein stenosis at 12 months was 6% (BMS 55% ,p<0.001)

J Vasc Surg 2018;67:522-8.)

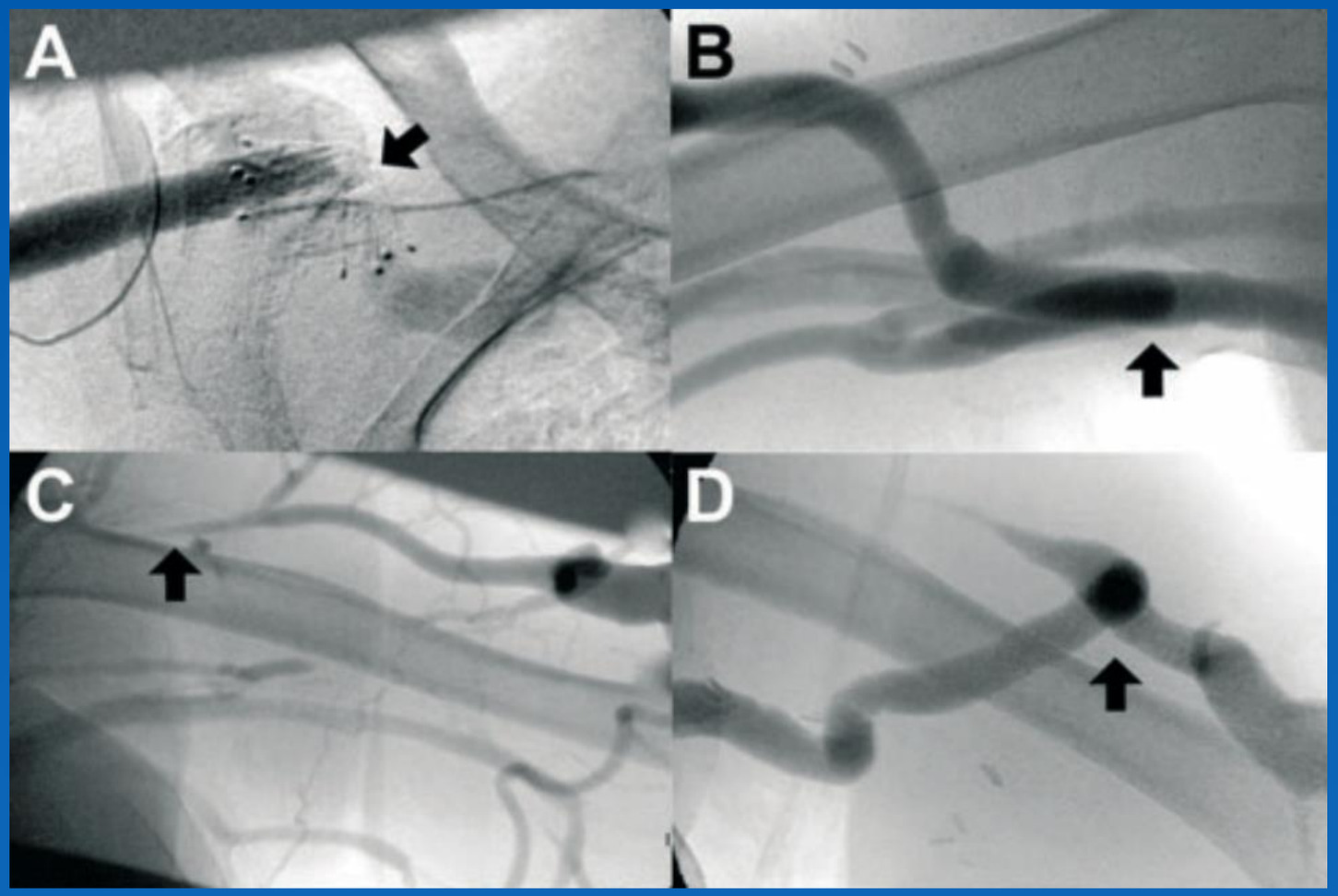
Surgery

- Cephalic vein transposition
- Basilic vein transposition
- Patch venoplasty
- Stenotic segment resection
- Venovenous bypass graft surgery (Cephalo-jugular bypass)

Surgical Management of Cephalic Arch Occlusive Lesions: Are There Predictors for Outcomes?

Shouwen Wang,* Ammar Almehmi,† and Arif Asif‡

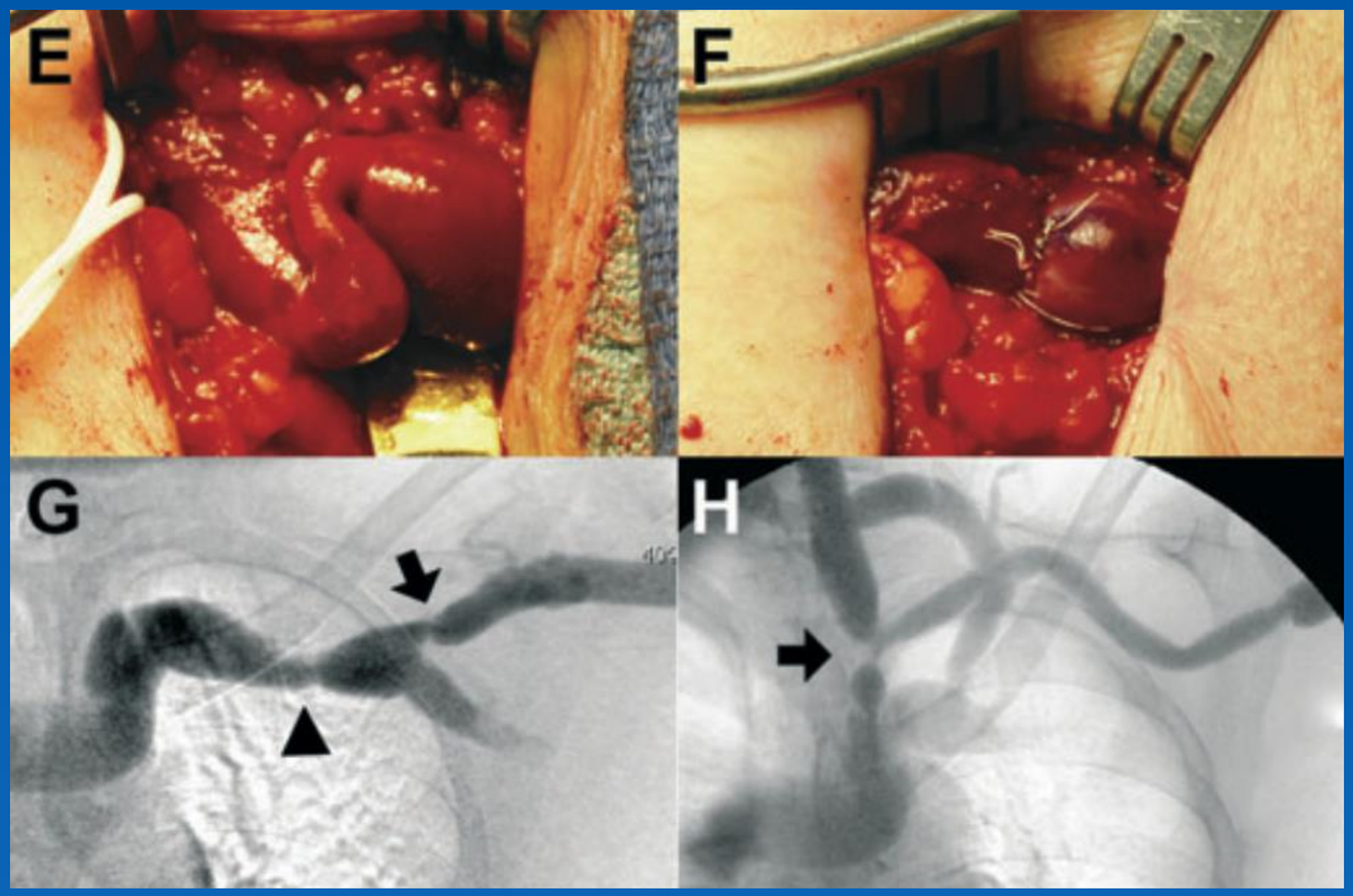
*AKDHC-ASC, Arizona Kidney Disease and Hypertension Center, Phoenix, Arizona, †University Vascular Access Center, University of Tennessee College of Medicine, Memphis, Tennessee, and ‡Division of Nephrology and Hypertension, Albany Medical College, Albany, New York



cephalic vein transposition / “cephalic turn-down”

basilic vein transposition

Seminars in DialysisVol 26, No 4 (July–August) 2013 ,33–41



stenotic segment resection

cephalic-jugular vein bypass graft

Seminars in DialysisVol 26, No 4 (July–August) 2013 ,33–41

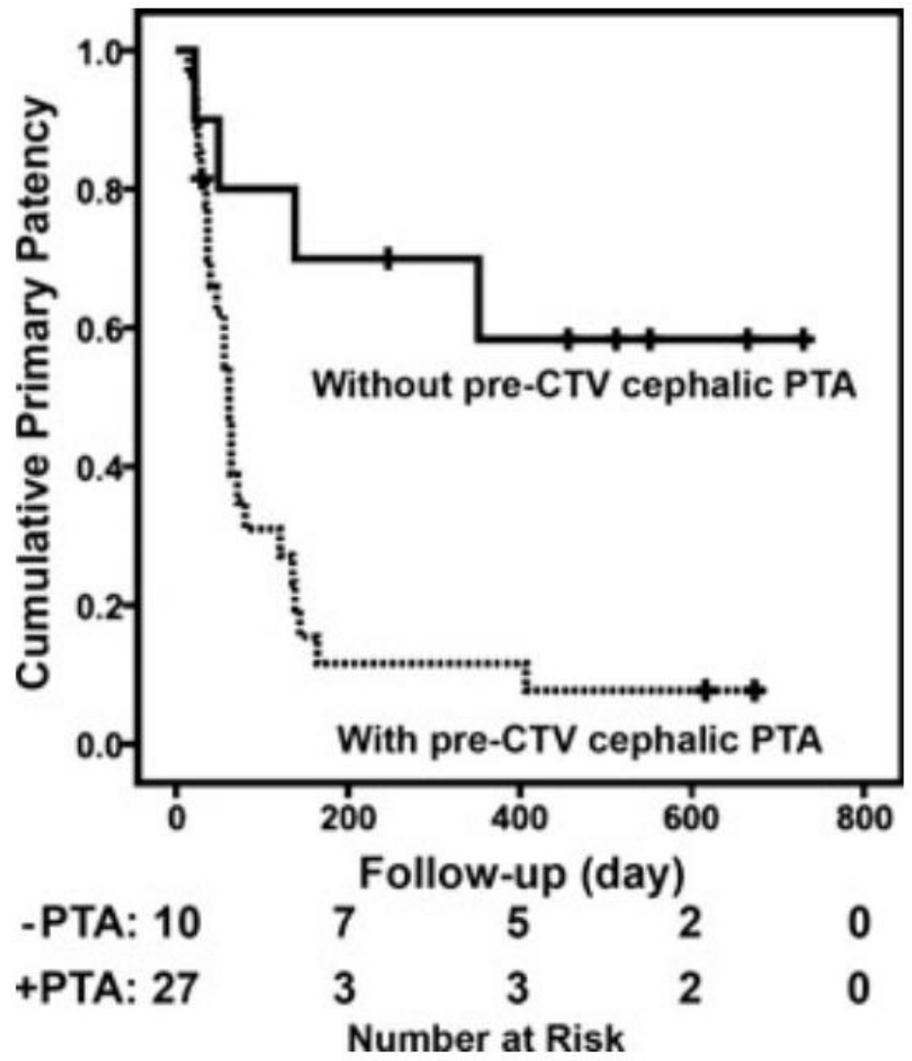


FIG. 4. Pre-CTV PTA of the proximal cephalic vein was associated with lower primary patency of the transposed cephalic vein. The cumulative primary patency curves of the transposed cephalic vein for the two subgroups are depicted: with PTA (dotted line, +PTA) and without PTA (solid line, -PTA) of the proximal cephalic vein prior to CTV.

- Pre angioplasty of cephalic vein was the only significant predictor for the low primary patency rate.

Seminars in DialysisVol 26, No 4 (July–August) 2013 ,33–41

J Vasc Access 2014; 15 (4): 272-277

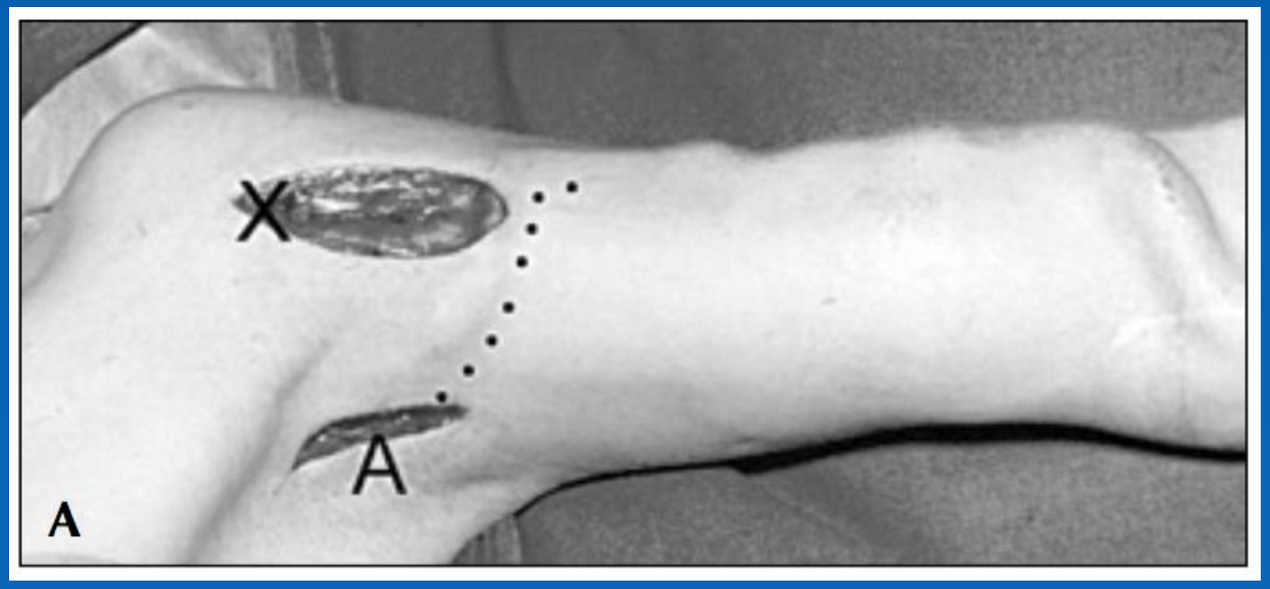
DOI: 10.5301/jva.5000195

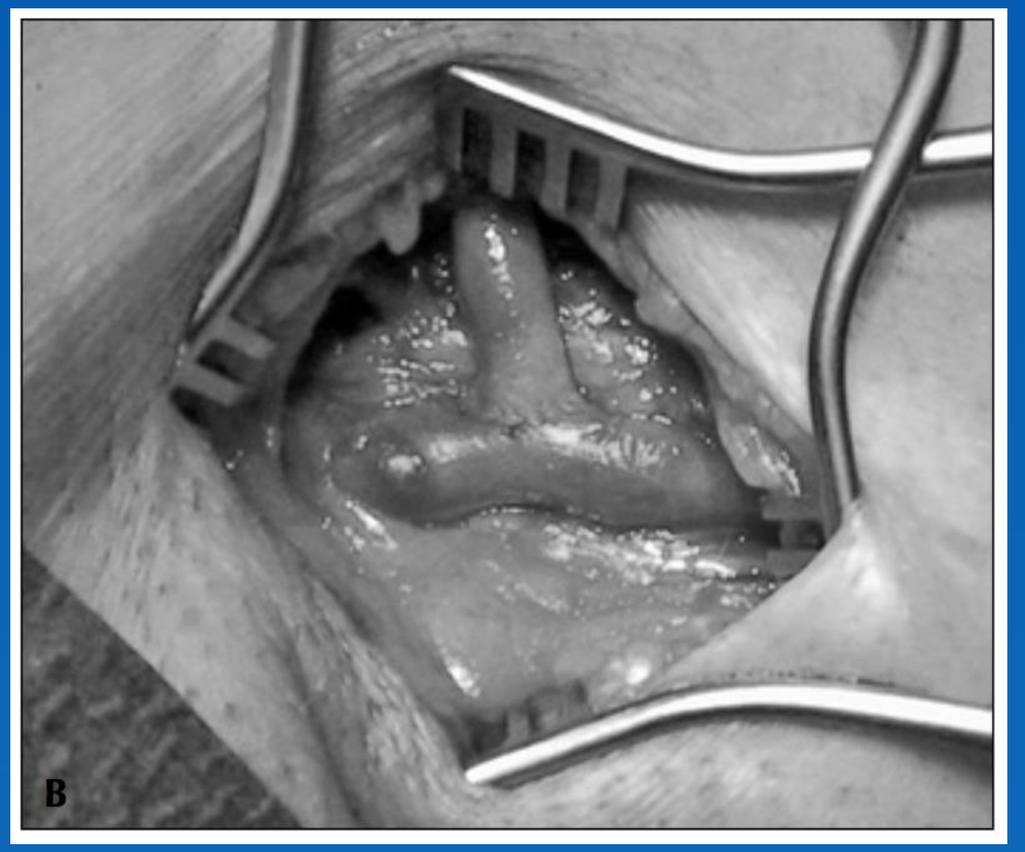
ORIGINAL ARTICLE

Surgical treatment of cephalic arch stenosis by central transposition of the cephalic vein

Fragiska Sigala[1], Regine Saßen[2], Elissaios Kontis[3], Laura D. Kiefhaber[1], Rolf Förster[4], Volker Mickley[1]

[1] Department of Vascular Surgery, Clinical Center Mittelbaden, Community Hospital Rastatt, Rastatt - Germany
[2] Department of Radiology, Clinical Center Mittelbaden, Community Hospital Rastatt, Rastatt - Germany
[3] Institute of Liver Studies, King's Health Partners at King's College Hospital, London - UK
[4] Maltese Vascular Center, Maltese Hospital St. Hildegardis, Cologne - Germany





- **Results** : 1 year primary patency was 79% with reintervention rate of 0.1/patient/year (1 year primary potency of PTA 0-38% , re-intervention rate 0.9-1.9/patient/year)

- **Conclusion** : Cephalic vein transposition can be recommended as first-line treatment of CAS

J Vasc Access 2014; 15(4): 272-277

- **Advantage of surgery**
  - favorable patency rate
  - treat pre-stenotic aneurysm of cephalic vein (aneurysmorhaphy)
  - treat acute thrombosis fistula (thrombectomy)

Cardiovasc Intervent Radiol (2015) 38:1179–1185
DOI 10.1007/s00270-015-1190-4

The Management of Cephalic Arch Stenosis in Arteriovenous Fistulas for Hemodialysis: A Systematic Review

Lakshman Vasanthamohan[1] · Prasaanthan Gopee-Ramanan[1] · Sriharsha Athreya[1,2]

Table 1 Demographics of prospective and retrospective studies of dysfunctional AVF interventions

Investigators	Study type	Intervention or comparison	Patients enrolled (*n*)	Fistulas managed for CAS
Rajan et al. [7]	Retrospective data review	PTA with or without subsequent stent	24	26
Chen et al. [15]	Retrospective data review	Cephalic vein transposition (CVT)	11	11
Kian et al. [3]	Prospective observational study	PTA vs. CVT with subsequent PTA (both on same patients)	13	13
Shemesh et al. [12]	Prospective RCT	Bare stents (BS) vs. stent grafts (SG)	25	25 (12 BS, 13 SG)
Heerwagen et al. [12]	Retrospective data review	Cutting balloon angioplasty (CBA) with or without subsequent PTA	17	25
Shawyer et al. [16]	Prospective observational study	Stent graft	11	6
Wang et al. [8]	Prospective observational study	Surgical revision (multiple techniques)	40	40
Sigala et al. [14]	Retrospective data review	CVT	25	25
Aitken et al. [17]	Retrospective data review	PTA vs. ipsilateral brachiobasilic fistula (BBF) creation	73 (22 PTA, 51 BBF)	22 (PTA only)

Cardiovasc Intervent Radiol (2015) 38:1179–1185
DOI 10.1007/s00270-015-1190-4

CIRSE

CrossMark

CLINICAL INVESTIGATION VENOUS INTERVENTIONS

The Management of Cephalic Arch Stenosis in Arteriovenous Fistulas for Hemodialysis: A Systematic Review

Lakshman Vasanthamohan[1] · Prasaanthan Gopee-Ramanan[1] · Sriharsha Athreya[1,2]

- **Conclusion** :
  - no definitive management strategy for CAS.
  - current literature is too heterogenous to make recommendation or adequate comparison.

Conclusion

- **PTA** : less invasive , high restenosis and re-intervention rate
  - cutting balloon : recommend in fail conventional PTA
  - Stent graft > bare stent
- **Surgery** : favorable patency , may be recommended first line treatment