IS THE CAROTID INTIMA-MEDIA THICKNESS (CIMT) ULTRASOUND ASSESSMENT A VALUABLE PARAMETER TO PREDICT OUTCOMES DURING HEMODIALYSIS ACCESS CREATION?

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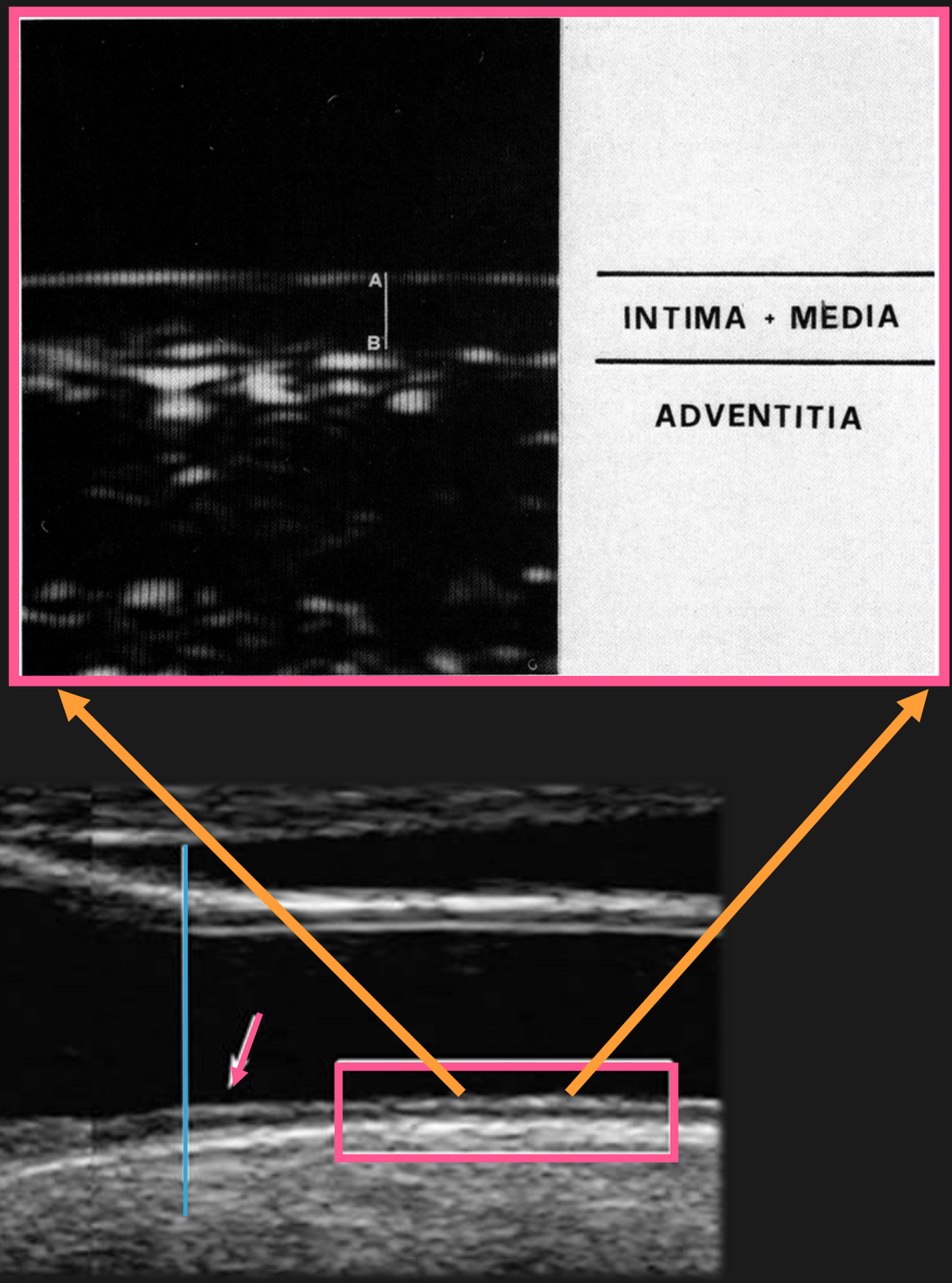
NO CONFLICT OF INTERESTS

CAROTID INTIMA MEDIA THICKNESS (CIMT)

- Non-invasive measurement
- Obtained by ultrasound imaging
  - Mode B
    - Double line pattern

- Increased CIMT → Known cardiovascular risk factor
  - Coronary heart disease (RR 1.4-3.2)
  - Stroke (RR 2.3-3.5)

- 1º Morbidity/mortality cause in hemodialysis patients
  - 50%



Circulation 74, No. 6, 1399-1406, 1986

Arterioscler Thromb Vasc Biol. 2010;30:182-185.

HEMODIALYSIS PATIENTS & CIMT

- Cardiovascular damage
  - Traditional risk factors
  - Non-traditional risk factors
  - Atherosclerotic lesions
    - Calcified
    - Increased CIMT
    - Accelerated presentation

- Objective: Determine in patients with end stage renal disease if CIMT may assist to predict patency, complications of upper arm access or mortality in these patients population.

IJKD 2012;6:203-8

Int Urol Nephrol (2017) 49:1859–1866

METHODS

PATIENTS

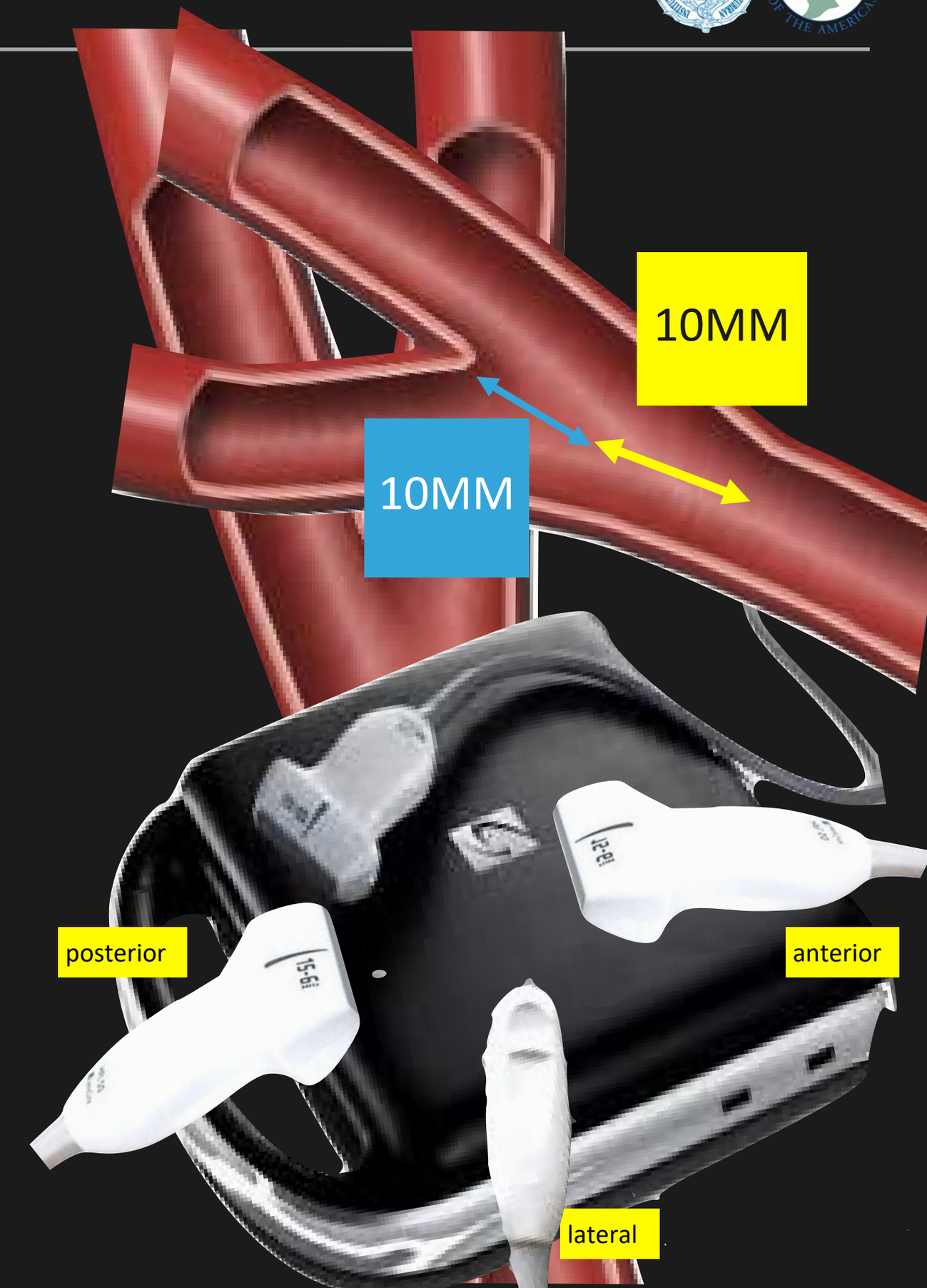
- Cross sectional study during the peri-operative period of arteriovenous fistula (AVF) in patients with end stage renal disease.
- 30 patients of the Instituto Nacional de Ciencias Médicas y Nutrición "Salvador Zubirán" were selected
- Follow up; 24 months. (2010-2016)

DATA COLLECTION

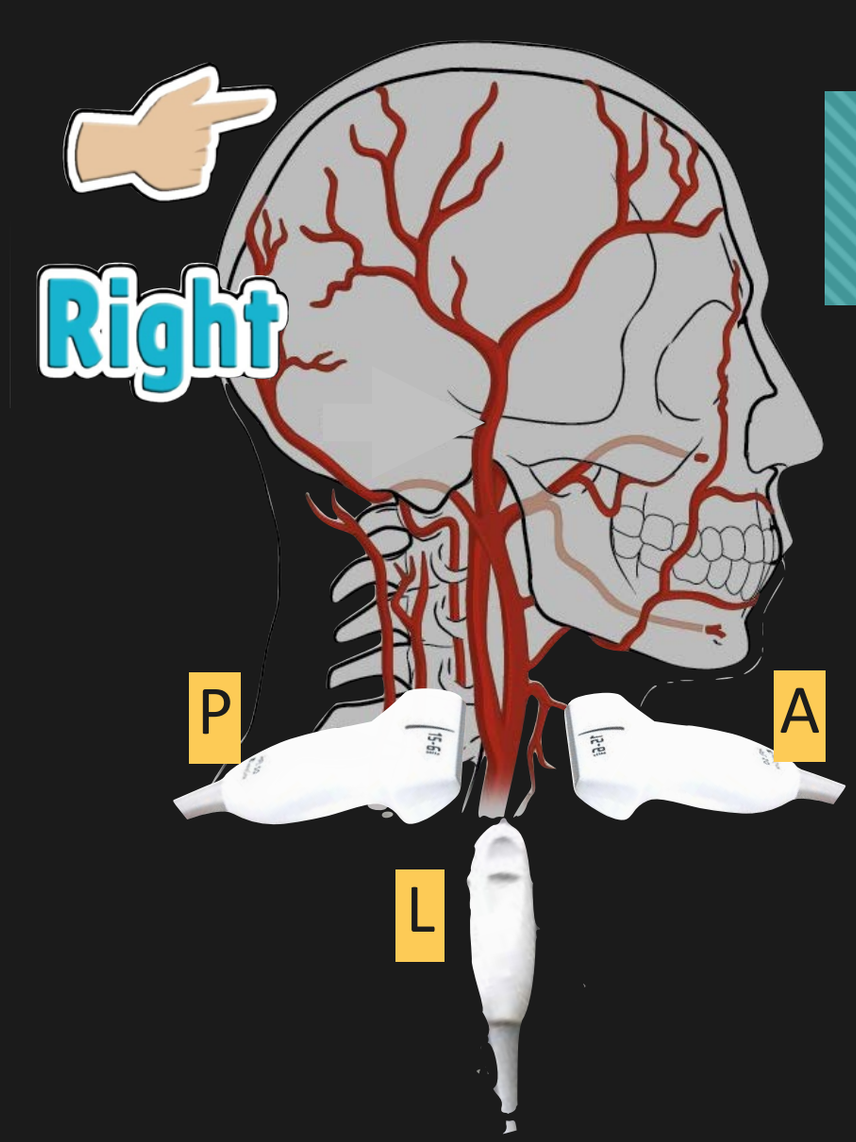
- Population data, past medial history and relevant information related to AVF planning, AVF functionality and patency were collected.
- Informed consent was given.

MEASUREMENT

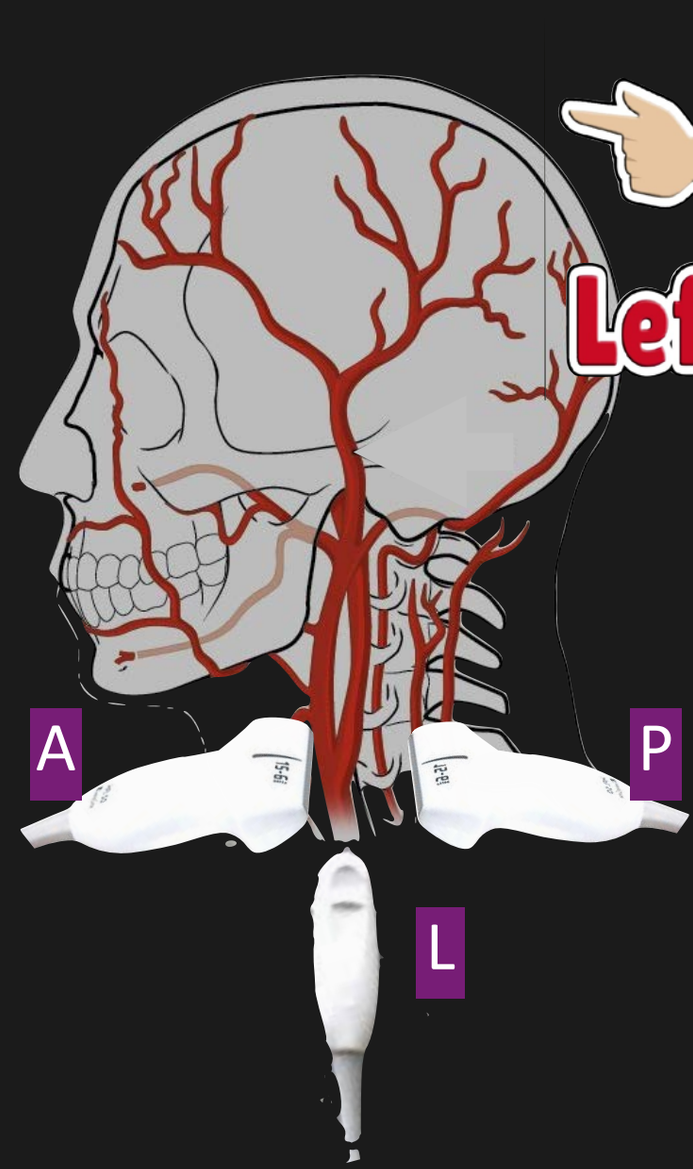
- Ultrasonographic measurement of the CIMT, was determined by 2017 SonoSite Edge Ultrasound FUJIFILM Inc SonoCalc 5.0 IMT, 10Hz probe.
- Software provided mean and maximum IMT mostly in a 10mm width of CCA. (10mm from bifurcation)
- Scanning procedure : **Right** CCA and **left** CCA. Both in anterior, lateral and posterior view.



SIXTH CAROTID INTIMAL (SCI) SCORE



MAXIMUM CCA IMT



$$\frac{RA+RL+RP}{6} + \frac{LA+LL+LP}{6} =$$

<4 SCI (LOW) VS
>=4 SCI* (HIGH)

*Comparison between groups was done using Chi square test, $p<0.05$ was considered significant

RESULTS

SCI SCORE CALCULATION

HI SCI SCORE >=4

LOW SCI SCORE <4

*W- Width, RA Right anterior, RL Right lateral , RP Right posterior, LA Left anterior, LL Left lateral, LP Left posterior. SCI Sixth Carotid Intimal.

All measures shown correspond to Maximum CIMT

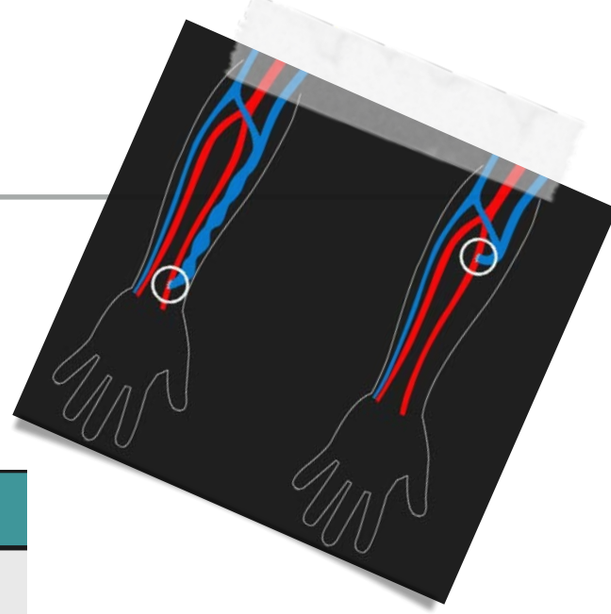
	RA	W	RL	W	RP	W	LA	W	LL	W	LP	W	SCI score
1	0.447	8.8	0.027	4.7	0.321	10	0.807	9.8	1.385	10	1.414	10	4.401
2	0.708	10	0.980	10	0.903	10	0.401	10	0.890	10	0.790	10	4.672
3	0.678	10	0.867	10	0.696	9.7	0.339	10	0.753	10	0.75	10	4.083
4	0.678	10	0.867	10	0.696	9.7	0.339	10	0.753	10	0.75	10	4.083
5	0.736	10	0.785	10	0.737	10	0.848	10	0.871	10	0.952	10	4.929
6	0.908	10	0.696	10	0.536	10	0.862	10	0.582	10	0.717	10	4.301
7	0.299	10	0.791	10	0.684	10	0.628	10	0.665	10	0.459	10	3.526
8	0.482	10	0.562	10	0.649	10	0.559	10	0.538	10	0.538	10	3.328
9	0.398	10	0.294	10	0.427	10	0.296	9.7	1.117	10	0.842	9.8	3.374
10	0.398	10	0.294	10	0.427	10	0.296	9.7	1.117	10	0.842	9.8	3.374
11	0.548	9.2	0.165	10	0.524	10	0.767	10	0.658	10	0.651	10	3.313
12	0.119	10	0.756	10	0.285	10	0.656	10	0.310	10	0.154	10	2.28
13	0.769	10	0.643	8.3	0.768	7.7	0.498	10	0.598	10	0.556	10	3.832
14	0.589	9.6	0.789	10	0.569	10	0.246	9.7	0.389	10	0.347	10	2.929
15	0.589	9.6	0.789	10	0.569	10	0.247	9.7	0.389	10	0.347	10	2.93
16	0.288	8.0	0.080	10	0.298	9.0	0.241	10	0.334	10	0.114	10	1.355
17	0.209	10	0.884	10	0.796	10	0.475	8.3	0.714	8.5	0.731	9.4	3.809
18	0.693	10	0.742	10	0.957	10	0.319	8.7	0.867	8.2	0.824	9.2	4.402
19	0.963	10	0.763	10	0.698	10	0.519	7.7	0.994	8.8	0.799	10	4.736
20	0.189	9.2	0.339	10	0.490	10	0.823	10	0.837	10	0.810	10	3.488
21	0.399	10	0.697	10	0.848	10	0.798	10	0.159	10	0.717	9.7	3.618
22	0.561	10	0.338	10	0.218	10	0.599	10	0.482	10	0.430	10	2.628
23	0.696	9.8	0.602	10	0.762	10	0.629	10	0.795	10	0.635	10	4.119
24	0.307	8.1	0.797	10	1.124	10	0.498	10	0.798	10	0.897	10	4.421
25	0.573	10	0.318	10	0.477	10	0.379	10	0.562	10	0.100	10	2.409
26	0.605	10	0.687	10	0.780	9.7	0.583	9.2	0.615	10	0.462	10	3.732
27	0.494	8.9	0.100	10	0.130	10	0.447	10	0.678	10	0.150	10	1.999
28	0.897	7.0	0.898	9.8	0.480	10	0.704	10	0.798	10	0.837	10	4.614
29	0.505	10	0.475	10	0.785	10	0.180	10	0.754	10	0.639	10	3.338
30	0.167	10	0.475	10	0.595	10	0.645	10	0.786	10	0.749	10	3.417

DEMOGRAPHICS

	SCI >=4 (N=11)	SCI <4 (N= 19)	p value
Age (mean)	51.3 (33-84)	46.8(22-78)	
Female	6 (54.5%)	11(57.8%)	NS
Comorbidities			
Diabetes	6 (54.5%)	8(42.1%)	NS
Hypertension	6 (54.5%)	11(57.8%)	NS
Tabaquism	2 (18.1%)	2(10.5%)	NS
Thrombophilia	1 (9.0%)	3(15.7%)	NS
CAD	2 (18.1%)	1(5.2%)	NS
Stroke	0 (0%)	2(10.5%)	-
Etiology ESRD			
Idiopathic	4(36.6%)	2(10.5%)	NS
Diabetic	5(45.5%)	7(36.8%)	NS
Lupus	1 (9.0%)	3(15.7%)	NS
Drugs			
ASA	1 (9.0%)	1(5.2%)	NS
Anticoagulation	0 (0%)	4(21.0%)	-

*NS, Non Significant

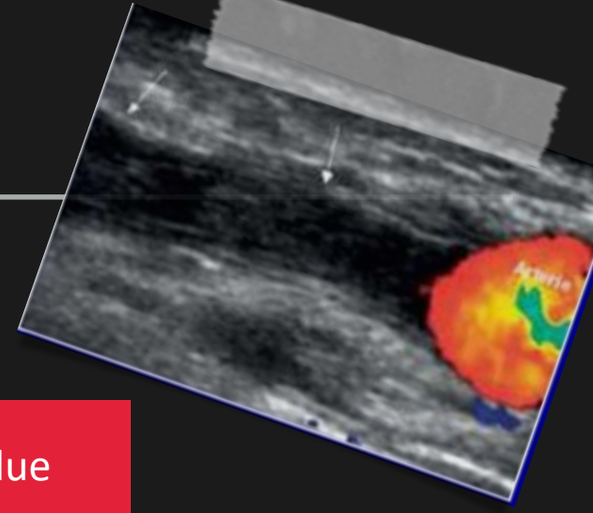
PREOPERATIVE PLANNING



	SCI >=4 (N=11)	SCI <4 (N= 19)	p value
Access history			
Previous catheter	11(100%)	15 (78.9%)	NS
>2 catheter	3(27.2%)	5 (26.4%)	NS
RIJ catheter	8(72.7%)	11(57.8%)	NS
LIJ catheter	4(36.3%)	6(31.5%)	NS
RS catheter	4(36.3%)	5 (26.4%)	NS
LS catheter	5(45.4%)	2(10.5%)	0.02
Femoral	0	0	-
Previous AVF	4(36.3%)	0	-
AVF location			
Upper arm	10(90.9%)	19 (100%)	NS
Dominant	2(18.1%)	5 (26.4%)	NS
AVF type			
Autologous	9(81.8%)	14(73.6%)	NS
Conventionall	8(72.7%)	15 (78.9%)	NS

*RIJ right internal jugular, LIJ left internal jugular, RS right subclavian, LS left subclavian , AVF arteriovenous fistula

AVF OUTCOMES



	SCI >=4 (N=11)	SCI <4 (N= 19)	p value
Patency rates			
Primary	11(100%)	19(100%)	-
Primary assisted	1(9.09%)	4(21.0%)	0.39
Secondary	2(18.1%)	2(10.5%)	0.55
Complications			
Early infection	1(9.09%)	1(5.26%)	0.68
Late infection	0	1(5.26%)	-
Early thrombosis*	1(9.09%)	1(5.26%)	0.68
Late thrombosis	7(63.6%)	5(26.3%)	0.04
Mortality	6(54.5%)	3(15.7%)	0.02
Atheroma	4(36.3%)	2(10.5%)	0.08

*never develops adequately to support dialysis or fails within the first 3 mo of its use (*Kidney Int* **64**: 1487–1494, 2003)

CONCLUSIONS:

- There is a significant association between **High SCI score (>=4)** and **late thrombotic** events of **upper arm access.**

- **High SCI score (>=4)** is also associated to an **increased mortality** as increased CIMT does in this group of patients.

- **SCI score** still proved **useful** even **in normal CIMT isolated measures.**