



Transkraniјalna doplersonografija

Zavod za kardiovaskularni zaboluvanja - Ohrid

Klinika za Nevrologija – Klinicki Centar Srbija, Belgrad (oktombri-dekembri 2015 god)

Dr.Biljana Tegovska

25.01 2016 god





Transkranijalna doplersonografija

-Transkranijalna kolor dopler sonografija (TCCD) oвозmoжува vizuelizacija na intrakranijalnite krvni sadovi, arteriite na bazata na mozokot I mozocnite veni i sinusi

- Rune Aaslid vo 1982. god. Vo Bern uspeal da dobie doplerski signal na protok vo intrakranijalnite arterii niz intaktna temporalna koska so primena na pulsiracki ultrazvuk so sonda od 2 mHz.





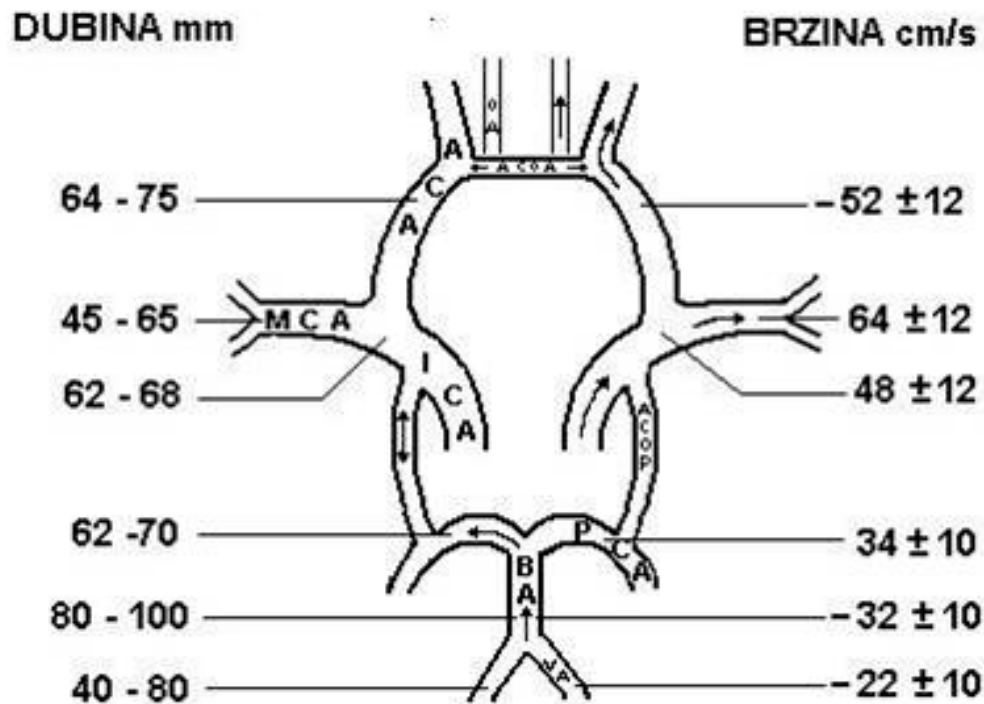
- Neinvazivna dijagnostika na cerebrovaskularni poremetuvanja
- Pratenje i detekcija na vazospazmi,
- Monitoring na mozocniot krvotok
- Detekcija na mikroembolusi
- Testovi na avtoregulacija na mozocniot krvotok





TCCD :

- identifikacija na krvnite sadovi na mozokot vrz osnova na : položbata, dlabocinata, pravecot na protokot, karakteristiki na pulsniot bran i kompresivnite testovi





Prednosti

- neinvaziven
- безболен
- безбеден
- brz
- eftin

Mani

- vo golema mera zavisi od iskustvoto na ispituvacot
- zavisi od transparentnosta na prozorite





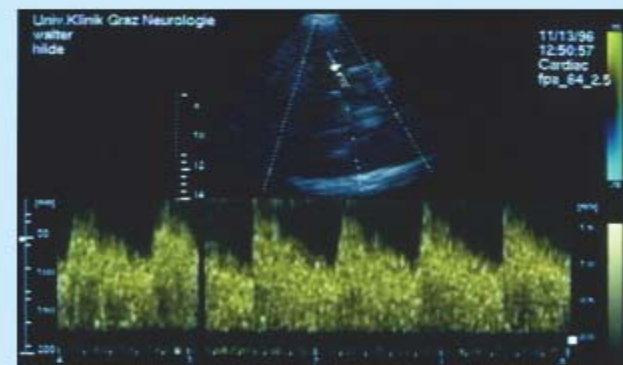
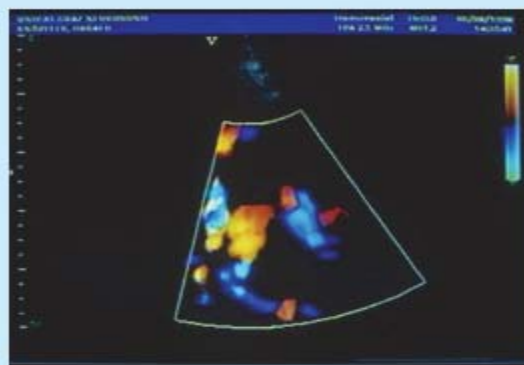
Transcranial Color- Coded Duplex Sonography (TCCD)

TCCD allows real-time imaging of the brain by simultaneous illustration of brain parenchyma and intracranial vessels and combines 3 techniques:

B - Mode

Color - Mode

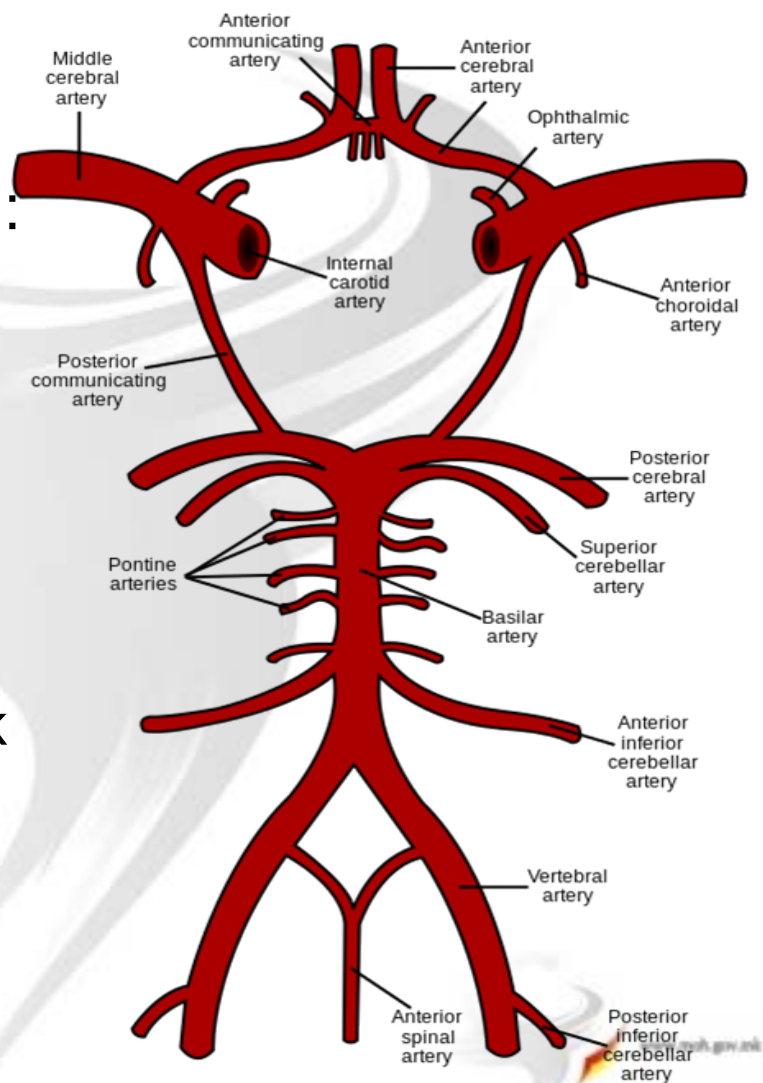
Doppler - Mode

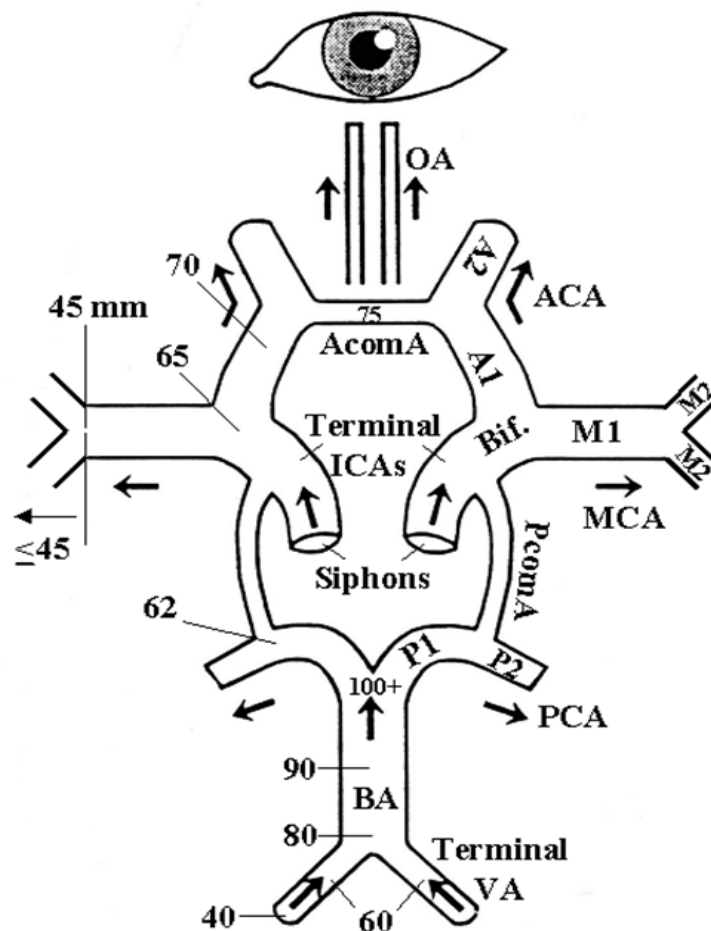




Arteriite na Willis-oviot krug
mozat da se identifikuvaat spored:

- Anatomskata lokalizacija na mozocnite strukturi
- Determiniranje na nivniot pravec i brzina na protok





MFV MCA > ACA > sifon > PCA > BA > VA



Tehnika na ispituvanje

- Za ovaa metoda se koristi sonda so frekvencija od **2.0—3.5 MHz**
- Postojat **tri** prozori za insoniranje na intrakranijalnite arterii :
 - **temporalen**
 - **subokcipitalen**
 - **orbitalen**





TCCD

temporalen prozor



-Niz temporalniot prozor
mozat da se insoniraat

- a. cerebri media (ACM)
- a. cerebri posterior (ACP)
- a. cerebri anterior (ACA)
- a. carotis interna (ICA)

I





TCCD / Intracranial Cerebrovascular Evaluation / MCA

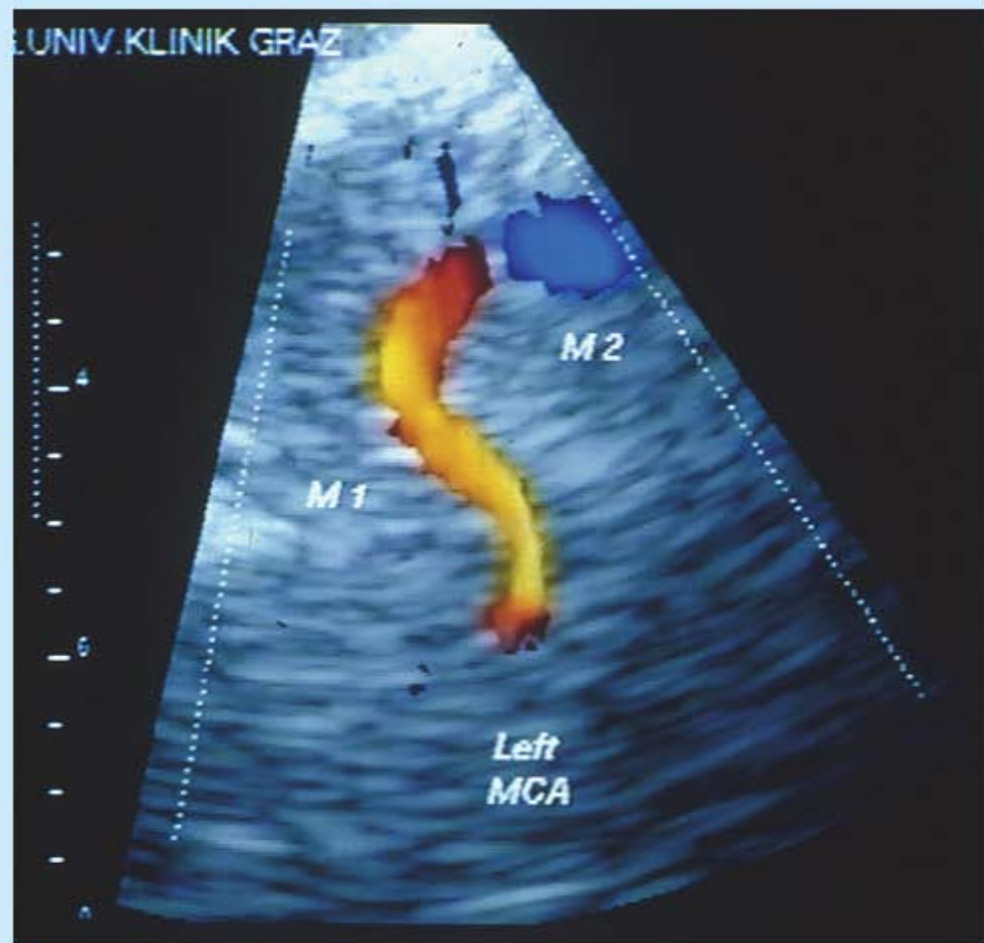
Transtemporal axial approach

Depth:

M1 segment: 60-65 mm

M2 segment: 40-45 mm

Color coded red





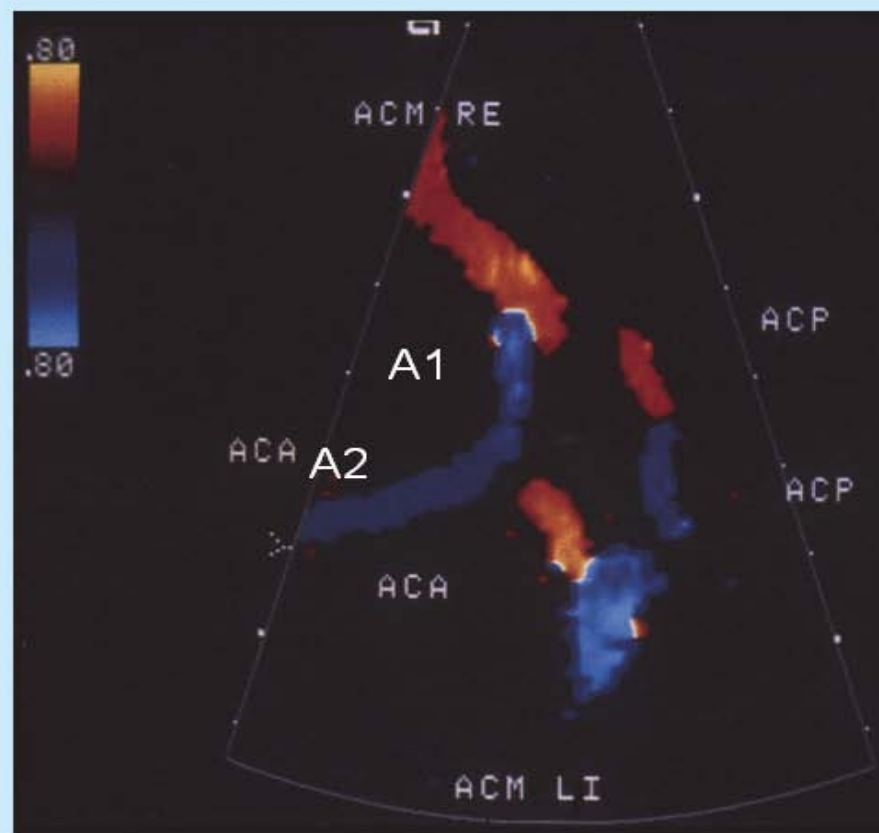
TCCD / Intracranial Cerebrovascular Evaluation / ACA

Transtemporal axial approach

Depth:

A1 segment: 60-65 mm

Color coded blue





TCCD / Intracranial Cerebrovascular Evaluation / PCA

Transtemporal axial approach

Depth: 60-65 mm

P1 segment: color coded red

P2 segment: color coded blue





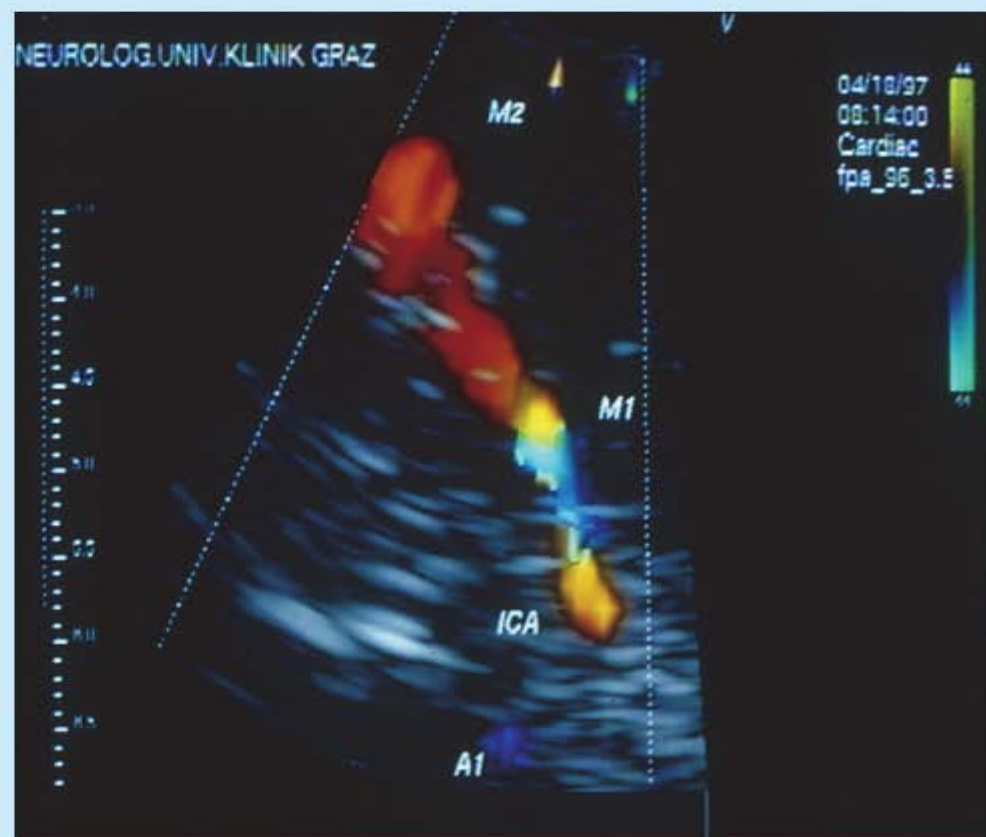
TCCD / Intracranial Cerebrovascular Evaluation / ICA

Transtemporal axial approach

Transtemporal coronal approach

Depth: 60-65 mm

Color coded red





- Ogranicuvanja na transtemporalnata insonacija se glavno povrzani so “netransparentnost ” na koskenite prozori, pretežno kaj postari lica
- TCCD e tehnicki neizvodлива kaj ~10-20% od pacientite

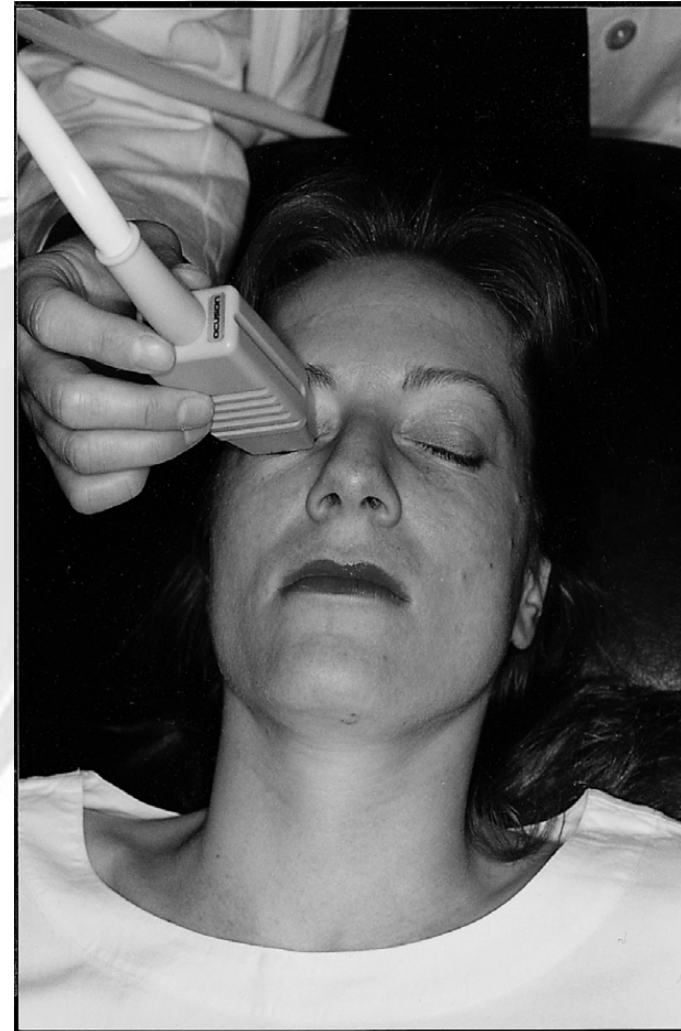




TCCD

orbitalen prozor

- Transorbitalnata ultrasonografija oвозmoжува vizuelizacija na oftalmicnata arterija i karotidniot sifon
- Pri nivna insonacija dolzinata na snimanjeto treba da bide svedena na minimum, a akusticnata sila reducirana na 10-15% vo sporedba so transtemporalniot prozor





TCCD / Intracranial Cerebrovascular Evaluation / ICA / OA

ICA:

Transorbital approach

Depth: 65-70 mm

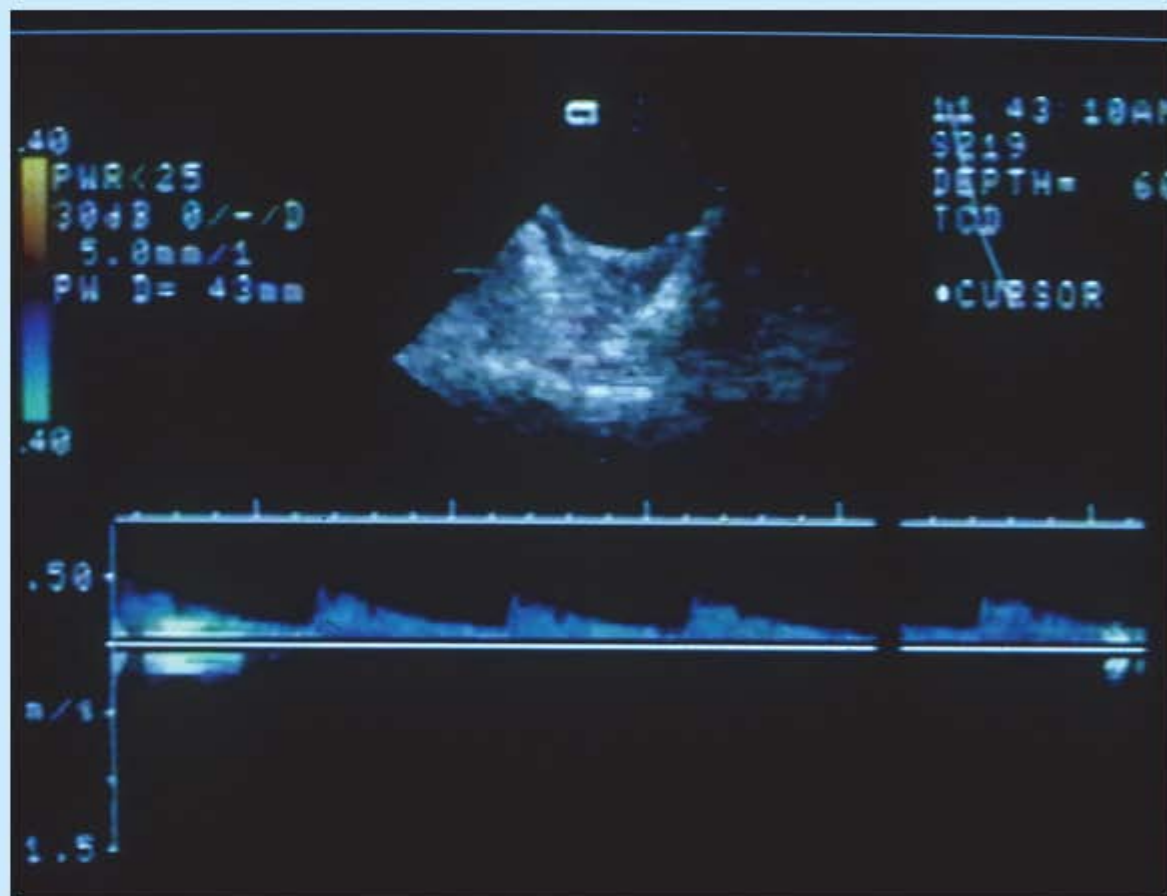
Color coded red/blue

OA:

Transorbital approach

Depth: 40-60 mm

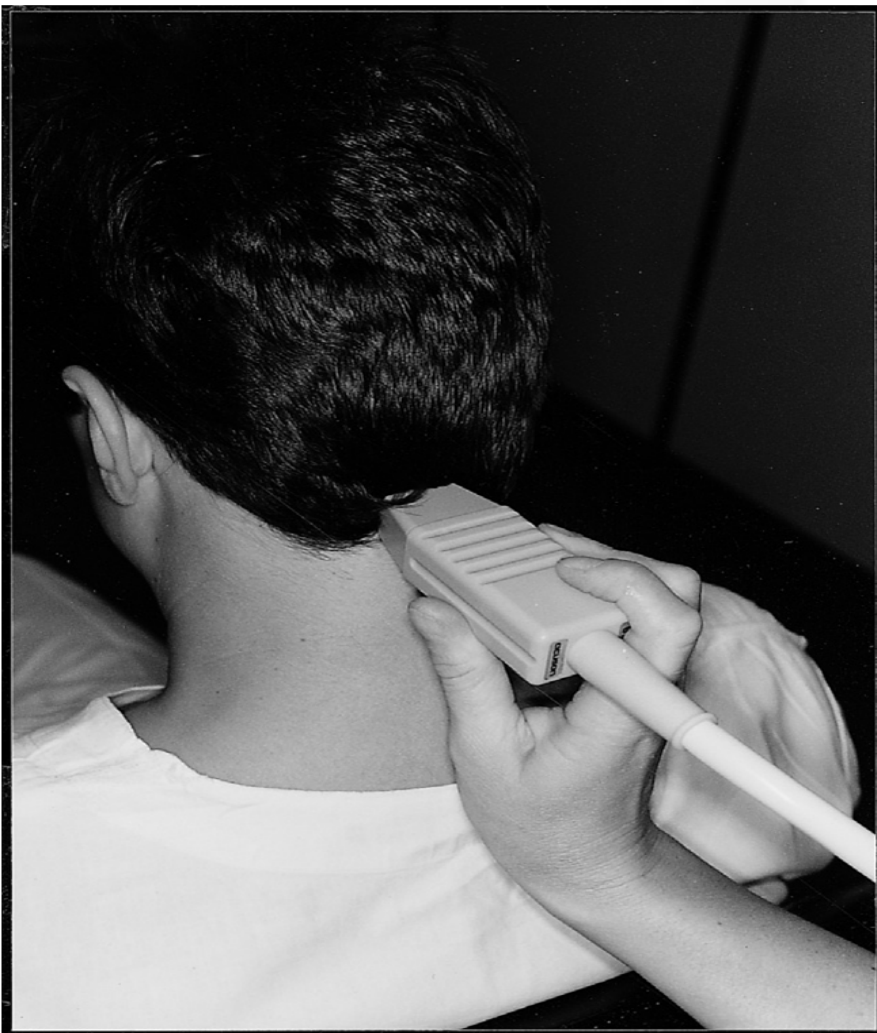
Color coded red





TCCD

subokcipitalen prozor



Se insoniraat dvete vertebralni
(a.vertebralis AV) I bazilarnata
arterija (a. basilaris AB)

- dijametar (hipoplazija)
- proksimalna ili distalna
okluzija
- proksimalna ili distalna
stenoza
- V4 intrakranijalna stenoza
- disekcija
- subclavian steal sy



TCCD / Intracranial Cerebrovascular Evaluation / VA

Transnuchal coronal approach

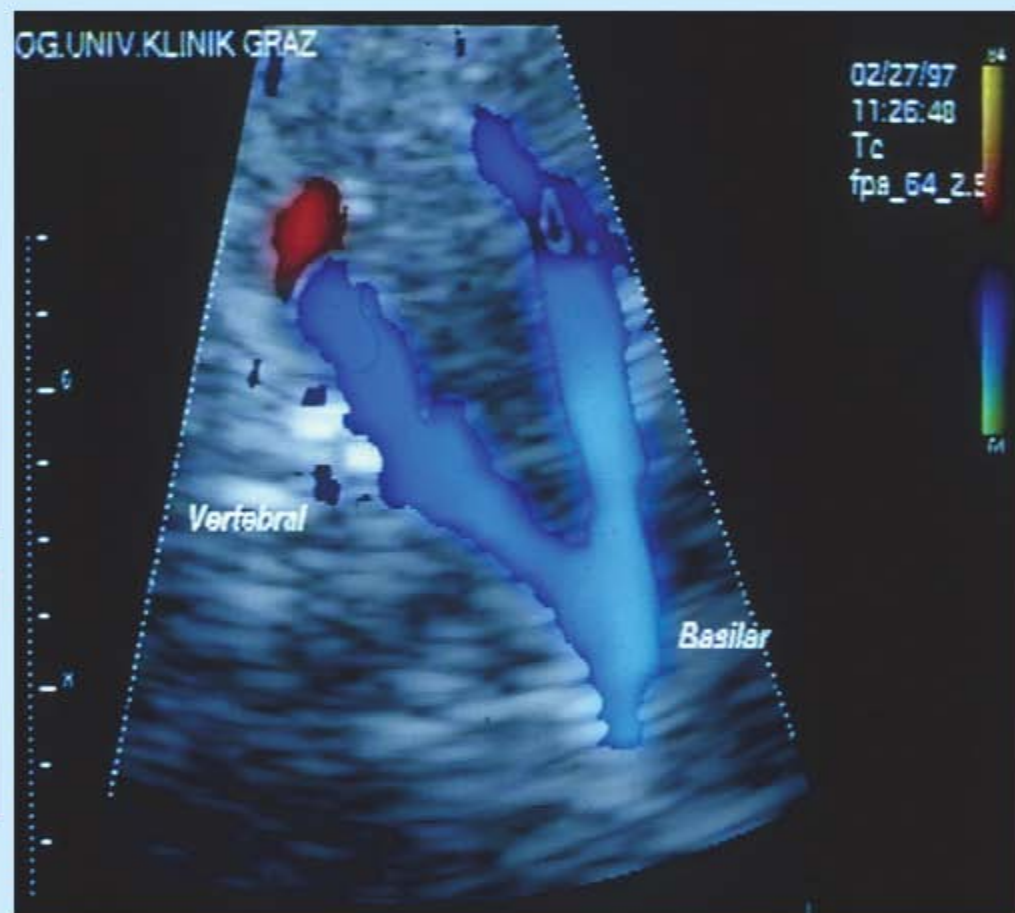
Depth: 50-60 mm

V3 segment: color coded red

V4 segment: color coded blue

Posterior inferior cerebellar artery (PICA)

Anterior inferior cerebellar artery (AICA)



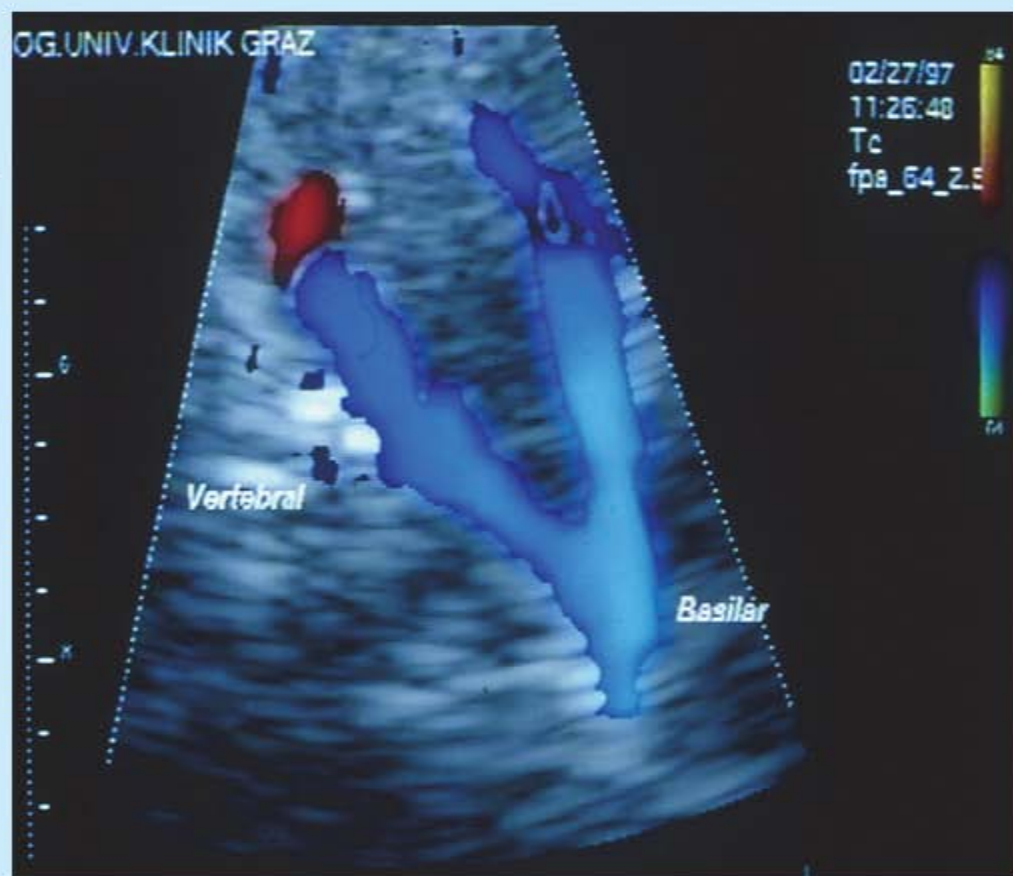


TCCD / Intracranial Cerebrovascular Evaluation / BA

Transnuchal coronal approach

Depth: 70-75 mm

Color coded blue



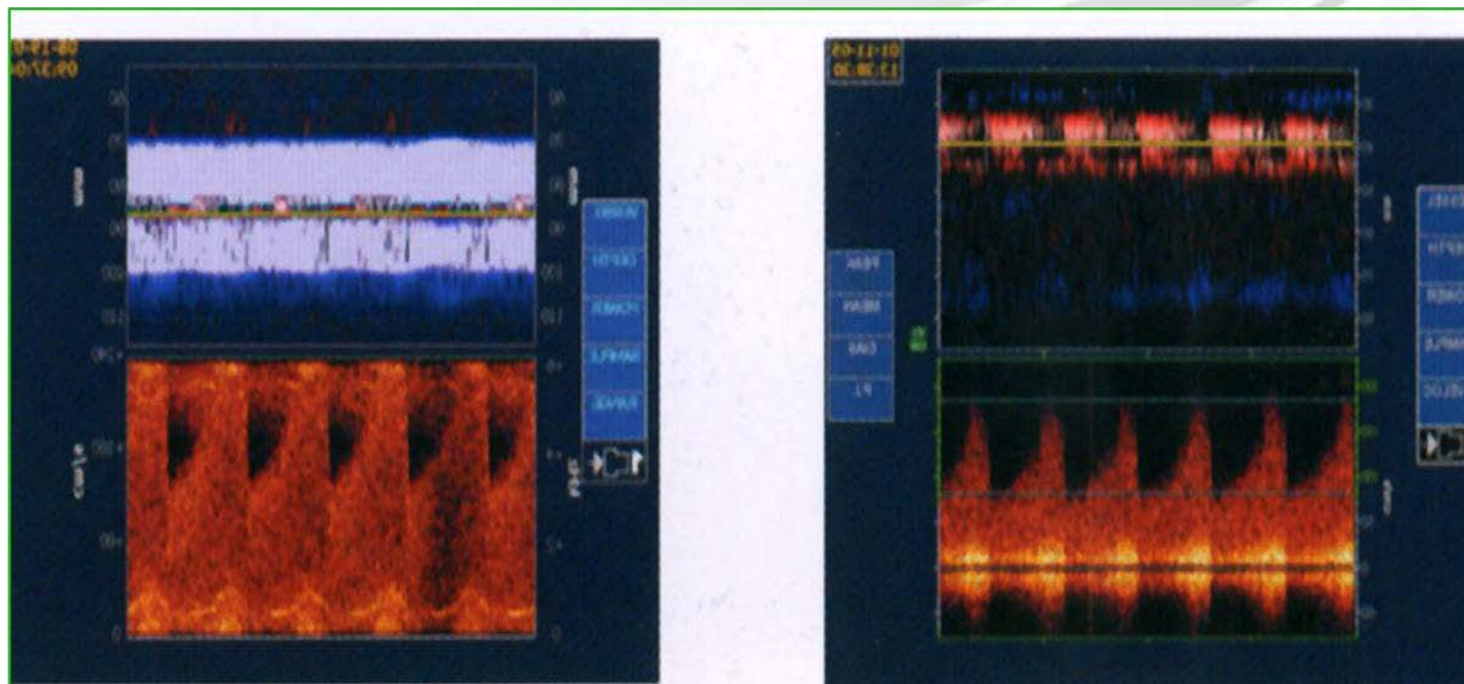


Indikacii za TCCD

Evidencija/klasa	Senzitivn.	Specific.	
• Bolest na srpesti kletki	86%	91%	A/I
• Desno-lev srcev šant	70-100%	95%	A/II
• Stenoza na cerebralni art	50-90%	80-95%	B/II-III
• Okluzija na cerebralni art	55-95%	90-98%	B/III
• Ekstrakran. ICA stenoza	49-95%	42-100%	C/II-III
• Vazomotorna reaktivnost			B/II-III
• Karotid. endarterektomija			B/II
• Cerebr. mikroembolizacija			
• Aorto-kor. baj-pass embolizacija			B/II-IV
• Cerebralna tromboliza	5 -100 %	76-100%	C/III
• Vazospazam posle SAH	25-100%		I-II
• Cerebralen cirk. arrest- -mozocna smrt	91-100%	97-100%	III



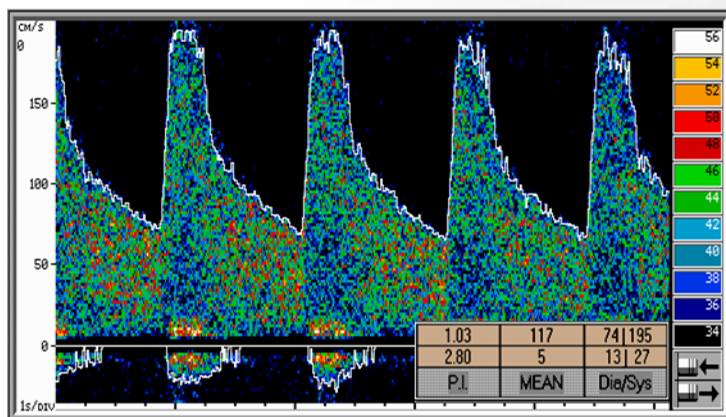
Stenoza na cerebralni arterii - ACM





Stenoza na cerebralni arterii

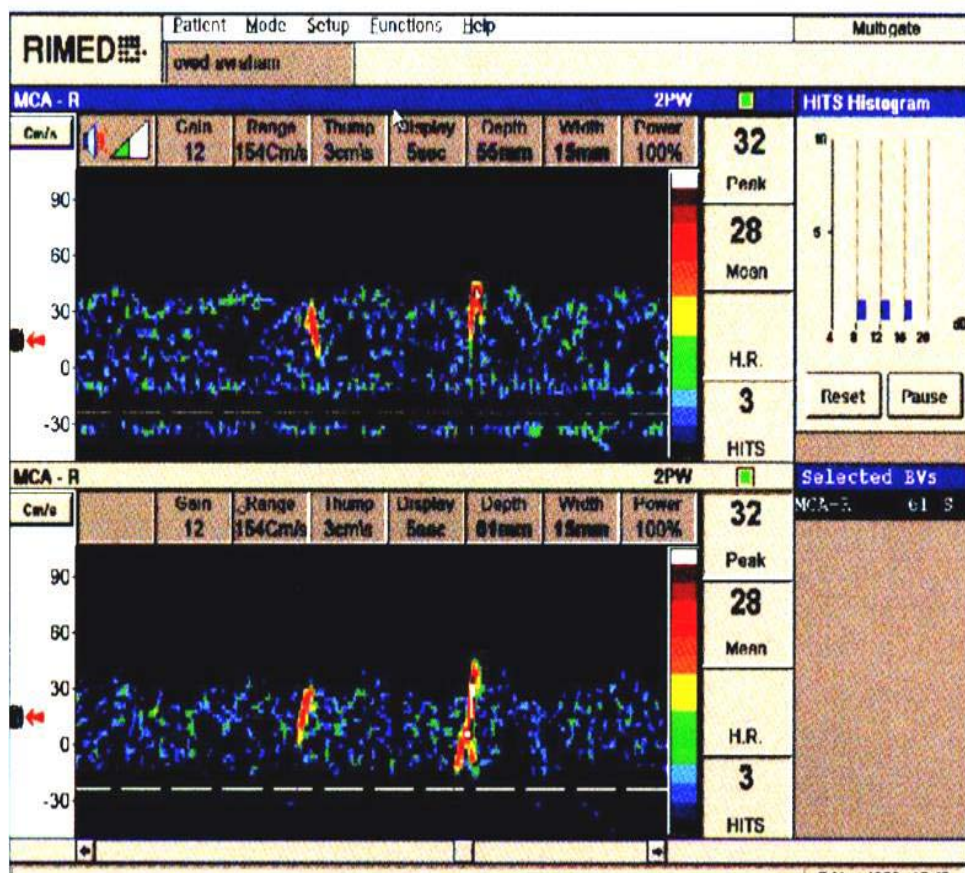
- **SIGIFIKANTNO ZGOLEMUVANJE NA BRZINATA NA PROTOK** – stenoza cerebralnite arterii
- **ACM, ACA, ACP, terminalna ICA**
- **Stenoza – sredna brzina pogolema od 80 c/s**
- **stenoza $\geq 50\%$, sredna brzina pogolema od 100 c/sec**





MONITORING – DETEKCIJA NA MIKROEMBOLUSI

HITS (high intensity transient signals)



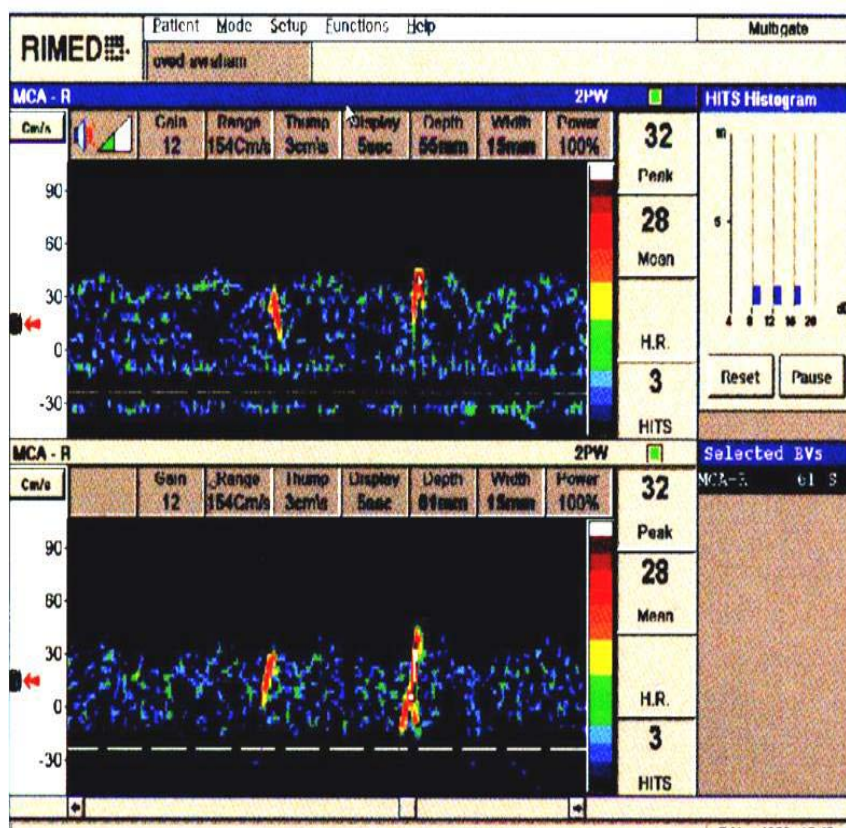


MONITORING – DETEKCIJA NA MIKROEMBOLUSI

HITS (high intensity transient signals)

- MIKROEMBOLUSI

- egzulceriran plak,
- kardioembolizam
- karotidna endarterektomija,
- A-C baj-pass





Desno-lev kardijalen i ekstrakardijalen šant

- Detekcija na desno-lev kardijalen ili ekstrakardijalen (pulmonalen) šant
- Se primenuva zaradi procenka na postoenje uslovi za paradoksalna embolizacija
- So vbrizguvanje kontrast vo kubitalnata vena, ako postoji sant, kontrastot doagja do cerebralnata cirkulacija I se detektira kako mikroembolusni signali (MES)





VAZOMOTORNA reaktivnost (VMR)

- Odreduvanje na sposobnost za sirenje na arteriolite so cel avtoregulacija na cerebralniot protok pod dejstvo na vazodilatatorni agensi
- TEST NA ZADRŽUVANJE NA ZDIV (BHI) =
 $(SBPk-SBPp):SBPp \times 100:30 \text{ sec}$
- Indeks VMR ≥ 0.69





VAZOSPAZAM kaj subarahnoidalna hemoragija

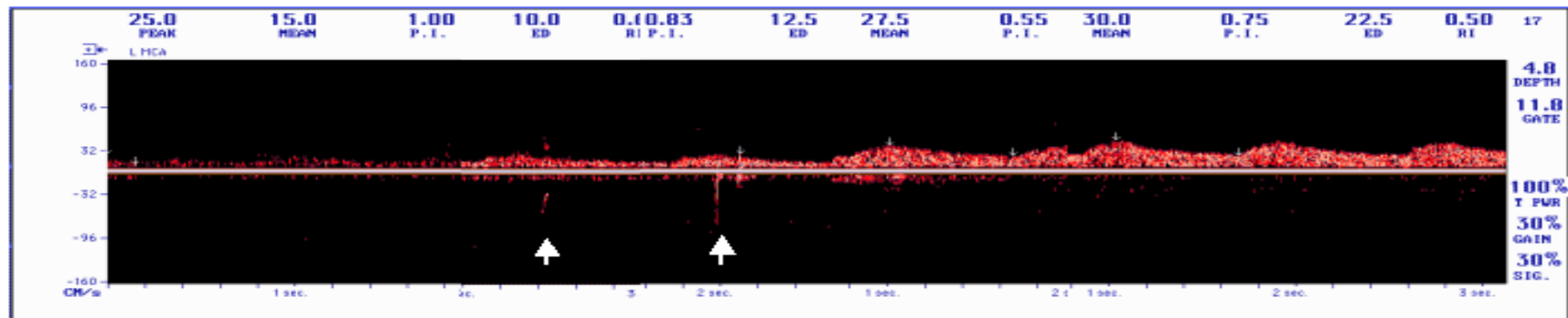
- Vazospazam ACM (bilateralen monitoring)
(zgolemuvanje na LINDEGARDOV odnos nad 3)
- Lindegardov odnos: Sistolna brzina ACM = 1.7(norm)
Sistolna brzina ACI
- Vazospazam ≥ 3
- Pratenje na pojava i traenje na vazospazam,
odreduvanje na vremeto za arteriografija,
odreduvanje na traenje na medikamentozna terapija,
vreme za operativno lečenje



TCD PRATENJE NA TROMBOLIZA

Opening Up the Middle Cerebral Artery with TPA

TPA bolus at 09:55 end of TPA infusion



Artery begins to open!

09:55
22

10:05
22

10:15
16

10:50
0

NIH Stroke Scale Scores

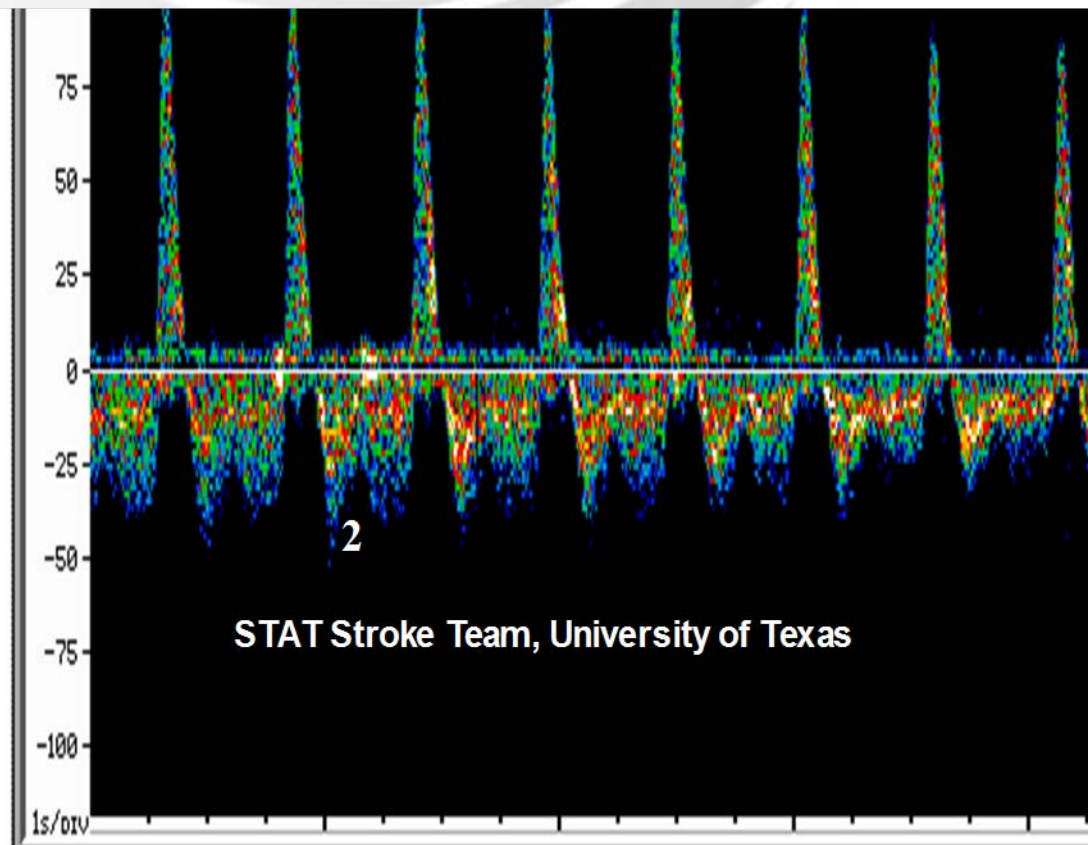


CEREBRALEN CIRKULATOREN AREST

Method: The TCD protocol examined at least 3 major intracranial arteries (MCAs, BA).

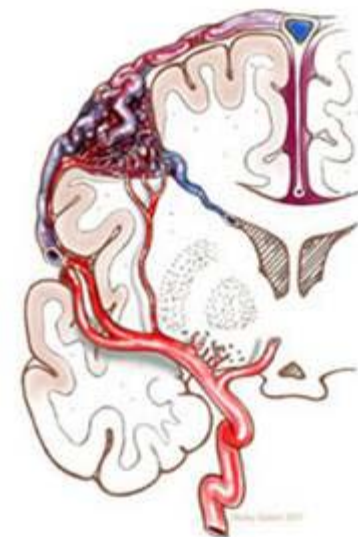
The following algorithm was applied:

1. Positive MCA or BA end-diastolic flow (EDF) = no cerebral Circulatory Arrest (CCA)
2. Absent EDF = uncertain CCA;
3. Reversed minimal EDF = possible CCA;
4. Reverberating flow = Probable CCA, this flow should be monitored for at least 30 min.

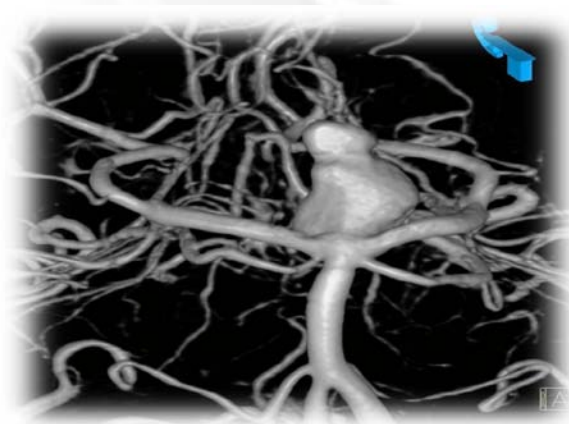




- ARTERIOVENSKI MALFORMACII



- ANEVRIZMI



- EHO NA MOZOCEN PARENHIM

Evaluation of midbrain structures Brainstem raphe

- Normal (fig. B): highly echogenic, continuous line
- Hypoechogenic (fig. A): interrupted or invisible from both sides



- Major depression, depression in PD
- Severe Wilson's disease, severe SCA17



PREGLED NA MOZOCNITE VENI I VENSKI SINUSI

