

Neurosonologia

Fortuna Resort, Chianciano Terme (Siena) 13-15 maggio 2022



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Neurosonology: the aim

Review

Thieme

Neurosonological Diagnosis in the Acute Phase of Stroke is a Sign of Qualified Care

Neurosonology makes the difference in acute Stroke Care

In acute ischemic stroke, occlusion or stenosis of an arterial segment induces individually variable and complex changes in cerebral haemodynamic. Acute arterial occlusion may persist, may partially or completely recanalize, re-occlude after initial recanalization or may be compensated by collateral blood flow. The main scope of this article is **to motivate neurologists to apply neurosonography specifically in the acute phase of stroke in order to get an independent assessment and unique hemodynamic information** instead of leaving neurovascular competence to radiologists. Purposeful use of neurosonologic techniques makes the difference in high quality stroke care.

Il trattamento dell'Ictus richiede:

VELOCITA'

• Prima lo trattiamo e migliore è l'outcome

DINAMISMO

• E' una patologia che si modifica rapidamente

MONITORAGGIO



La neurosonologia è:

- Veloce
- Dinamica
- Permette il monitoraggio



Neurosonology in Stroke Unit



Cervical Duplex Ultrasound (CDU) to study: Carotid, vertebral and subclavian arteries.

Transcranial Doppler (TCD) or Transcranial Color duplex Sonography (TCCS) to study: intracerebral arteries of the Circle of Willis

TCD monitoring

Contrast agents if needed



Neurosonology in Stroke Unit

Acute ischemic stroke diagnosis and treatment :

- Stenosis/occlusion of Carotid or/and vertebral artery
- Stenosis/occlusion of intracranial arteries
- Monitoring of recanalization
- Monitoring after the reperfusion therapy



Identification of major etiological subtypes:

- Large artery Atherosclerotic stenosis
- Small Vessel Disease
- Cryptogenic /ESUS
- Cardioembolic
- Unusual (dissection, inflammation...)



- Stenosis
- Occlusion
- CEA
- CAS





Acute stroke diagnosis and treatment The Neuroimaging: why?



Acute Stroke Diagnosis:

- Is it an ischemic or an hemorrhagic stroke?
- Could we treat it?



Acute Stroke Diagnosis and treatment:

- Do we have the time to treat it?
- Is there salvageable penumbra?



Acute Stroke Diagnosis and treatment:

- Is there a large artery occlusion?
- Is Mechanical Thrombectomy needed?

Acute stroke diagnosis and treatment Neurosonology is complementary



Neurosonology provides:

- Real-time information
- Bed-side examinations
- Monitoring
- Follow-up

When?

- During Emergency
- During acute reperfusion therapy
- After Therapy
- To provide differential diagnosis
- During follow-up

Where?

- In Emergency Room, in Stroke Unit, in angiographic Suite...
 How many time?
- Whenever you need it















B-mode ultrasonografia per identificare Color e Power-doppler per identificare i vasi le strutture del parenchima cerebrale

Velocimetria

Neurosonology in Stroke Unit

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- Occlusion
- CEA
- CAS





Acute ischemic stroke

Neurosonology provides:

- Localization of occlusion and degree of residual flow
- Collateral status
- Recanalization timing
- Persistent vessel patency or reocclusion
- Hemodynamic change after reperfusion

Yield and Accuracy of Urgent Combined Carotid/Transcranial Ultrasound Testing in Acute Cerebral Ischemia

Oleg Y. Chernyshev, MD, PhD; Zsolt Garami, MD; Sergio Calleja, MD; Joon Song, MD; Morgan S. Campbell, MD; Elizabeth A. Noser, MD; Hashem Shaltoni, MD; Chin-I Chen, MD; Yasuyuki Iguchi, MD, PhD; James C. Grotta, MD; Andrei V. Alexandrov, MD

Stroke 2005;36:32-37



CDU: Start on the affected side in transverse B-mode planes followed by color or power-mode sweep from proximal to distal carotid segments, or intertransverse VA segments.

TCD/TCCS: Begin insonation in the nonaffected side, to compare the affected side ed identified MCA, ACA; PCA

Acute ischemic stroke and extended time treatment



R.G. Nogueira, A.P. Jadhav, D.C. Haussen, A. Bonafe, R.F. Budzik, P. Bhuva, D.R. Yavagal, M. Ribo, C. Cognard, R.A. Hanel, C.A. Sila, A.E. Hassan, M. Millan, E.I. Levy, P. Mitchell, M. Chen, J.D. English, Q.A. Shah, F.L. Silver, V.M. Pereira, B.P. Mehta, B.W. Baxter, M.G. Abraham, P. Cardona, E. Veznedaroglu, F.R. Hellinger, L. Feng, J.F. Kirmani, D.K. Lopes, B.T. Jankowitz, M.R. Frankel, V. Costlat, N.A. Vora, A.J. Yoo, A.M. Malik, A.J. Furlan, M. Rubiera, A. Aghaebrahim, J.-M. Olivot, W.G. Tekle, R. Shields, T. Graves, R.J. Lewis, W.S. Smith, D.S. Liebeskind J.L. Saver, and T.G. Jovin, for the DAWN Trial Investigators*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging

G.W. Albers, M.P. Marks, S. Kemp, S. Christensen, J.P. Tsai, S. Ortega-Gutierrez, R.A. McTaggart, M.T. Torbey, M. Kim-Tenser, T. Leslie-Mazwi, A. Sarraj, S.E. Kasner, S.A. Ansari, S.D. Yeatts, S. Hamilton, M. Mlynash, J.J. Heit, G. Zaharchuk, S. Kim, J. Carrozzella, Y.Y. Palesch, A.M. Demchuk, R. Bammer, P.W. Lavori, J.P. Broderick, and M.G. Lansberg, for the DEFUSE 3 Investigators* Mechanical thrombectomy is recommended by Current guidelines in patients with Large intracranial Vessel Occlusion (LVO) The publication of the positive results from recent extended time treatment trials highlights the problem of bringing the right patient to the right place.

- Advanced neuroimaging is required
- If a LVO is present, bypassing Primary Stroke
 Unit should be a strategic choices

Therefore we need to select the patient who should be transferred directly to an Interventional Stroke Center

Centralizzazione primaria

Original Paper

Cerebrovascular Diseases Cerebrovasc Dis 2012;33:262–271 DOI: 10.1159/000334667

Transcranial Ultrasound from Diagnosis to Early Stroke Treatment – Part 2: Prehospital Neurosonography in Patients with Acute Stroke – The Regensburg Stroke Mobile Project

Felix Schlachetzki^a Moriz Herzberg^a Thilo Hölscher^d Michael Ertl^a Markus Zimmermann^b Karl Peter Ittner^b Hendrik Pels^c Ulrich Bogdahn^a

Conclusion: Prehospital neurological as well as transcranial vascular assessments during patient transport can be performed by a trained neurologist with high sensitivity and specificity.

Research Article

Prehospital Identification of Middle Cerebral Artery Occlusion - A Stroke Education Program and Transcranial Ultrasound for Paramedics

Conclusion: The proposed web based **educational training course may enable paramedics to perform not just a short neurological examination but also good quality TCCS**, a combination highly suitable for patient selection for endovascular embolectomy.

Antipova et al. Ultrasound J (2019) 11:29 https://doi.org/10.1186/s13089-019-0143-6 The Ultrasound Journal

Open Access

REVIEW



Daria Antipova^{1*}⁽ⁱ⁾, Leila Eadie¹, Ashish Stephen Macaden² and Philip Wilson¹

Study	TP	P FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
Bar 201	0 22	2 2	0	7	1.00 (0.85, 1.00)	0.78 [0.40, 0.97]	-	
Brunse	r 2009 30	0 4	3	63	0.91 (0.76, 0.98)	0.94 [0.85, 0.98]	-	-
Guan 2	013 35	5 1	0	92	1.00 (0.90, 1.00)	0.99 [0.94, 1.00]	-	
Rathak	rishnan 2008 16	6 3	5	81	0.76 [0.53, 0.92]	0.96 [0.90, 0.99]		
Tsivgo	lis 2007 34	4 5	9	84	0.79 [0.64, 0.90]	0.94 [0.87, 0.98]		-
Tsivgo	lis 2008 17	7 8	8	182	0.68 [0.46, 0.85]	0.97 [0.93, 0.99]	_	•
Wada	002 3	3 1	0	86	1.00 (0.29, 1.00)	0.99 [0.94, 1.00]	0 0.2 0.4 0.6 0.8 1	0 0.2 0.4 0.6 0.8 1
Fig. 2 Forest plot. Es	timated diagnosti	tic ac	cura	cy of	transcranial ultraso	nography in detecti	ng steno-occlusive lesi	ions in acute stroke populati

Conclusions: Transcranial ultrasonography **might** potentially be used for the selection of subjects with acute LVO, to help streamline patient care and allow direct transfer to specialized endovascular Centres.

Could be used at the pre-hospital stage to justify direct transfer to a regional thrombectomy Centre in suitable cases.

regery physics entr transmit trans

In Emergency Room: a patient affected by an acute hemiparesis comes





CDU: Hypoechoic plaque with irregular surface causing a mild stenosis (50% in longitudinal plane, ECST, PVS 100 cm/s)



TCCS: no large vessel occlusion



CDU: no significant stenosis with slight reduction of systolic velocity in ICA



TCCS: : no color signal on M1 and systolic spikes on M1 (M1 distal occlusion)



Monitoring during reperfusion therapy

Real-time Validation of Transcranial Doppler Criteria in Assessing Recanalization During Intra-arterial Procedures for Acute Ischemic Stroke An International, Multicenter Study

Georgios Tsivgoulis, MD; Marc Ribo, MD; Marta Rubiera, MD; Spyros N. Vasdekis, MD; Kristian Barlinn, MD; Dimitrios Athanasiadis, MD; Reza Bavarsad Shahripour, MD; Sotirios Giannopoulos, MD; Elefterios Stamboulis, MD; Mark R. Harrigan, MD; Carlos A. Molina, MD; Andrei V. Alexandrov, MD





AM Demchuk et al Stroke. 2001;32:89-93.

Compared with angiography, transcranial Doppler had the following accuracy parameters for detection of complete recanalization (TIBI 4 and 5 versus thrombolysis in myocardial infarction 3, flow grades): sensitivity, 88% (95% confidence interval, 72%–96%); specificity, 89% (79%–95%); positive predictive value, 81% (65%–91%); negative predictive value, 93% (84%–98%); and overall accuracy 89% (80%–94%).

Conclusions—TIBI criteria can accurately predict brain recanalization in real time as compared with thrombolysis in myocardial infarction angiographic scores.

Tsivgoulis G et al Stroke. 2013;44:394-400.

Monitoring during reperfusion therapy

The arterial occlusion may persist



Right PCA before Thrombolysis



Right PCA after Thrombolysis

The arterial occlusion may partially or



Left MCA before Thrombolysis



Left MCA after Thrombolysis

Monitoring during reperfusion therapy

Timing of Recanalization and Functional Recovery in Acute Ischemic Stroke

Conclusions Earlier tPA treatment after stroke onset is associated with faster tPA-induced recanalization. **Earlier onset-to-recanalization time results in improved functional recovery** and survival in AIS patients with proximal intracranial occlusions.

			() · · ·	· ·	
Voriabla	Univariable anal	ysis	Multivariable analysis		
Variable	Odds ratio (95% CI)	Р	Odds ratio (95% CI)	Р	
Age (/1 yr increase)	0.96 (0.95-0.97)	<0.001	0.97 (0.95-0.99)	0.001	
Male sex	1.64 (1.13–2.37)	0.009	1.70 (1.06–2.71)	0.027	
NIHSS-score (/1 point increase)	0.86 (0.83-0.89)	<0.001	0.85 (0.82-0.89)	<0.001	
Hypertension	0.64 (0.44-0.95)	0.026	1.18 (0.71–1.99)	0.518	
Diabetes mellitus	0.83 (0.54-1.26)	0.372	-		
Atrial fibrillation	0.73 (0.49–1.07)	0.108	-		
Hypercholesterolemia	1.08 (0.75-1.56)	0.687	-		
Coronary artery disease	0.98 (0.65-1.48)	0.913	-		
Baseline TIBI score 0–1	0.64 (0.45-0.92)	0.015	1.05 (0.64–1.72)	0.842	
Isolate ICA or tandem ICA/MCA occlusion	0.30 (0.17-0.55)	<0.001	0.53 (0.26-1.09)	0.083	
Systolic blood pressure before tPA-bolus (/10 mm Hg increase)	0.96 (0.90-1.03)	0.275	-		
Diastolic blood pressure before tPA-bolus (/10 mm Hg increase)	0.98 (0.87-1.11)	0.749	-		
Mean serum glucose before tPA-bolus (/10 mg/dL increase)	0.96 (0.93-1.00)	0.050	-		
Time from symptom onset to tPA-bolus (/10 min increase)	0.97 (0.93-1.01)	0.128	-		
Early recanalization	5.43 (3.67-8.04)	<0.001	6.19 (3.88–9.88)	<0.001	
Endovascular reperfusion therapies	2.18 (0.65–7.33)	0.209	-	-	

Table 2. Association of early (within 1-hour from tPA-bolus) recanalization with 3-month favorable functional outcome in the study population (n=480)

tPA, tissue plasminogen activator; CI, confidence interval; NIHSS, National Institutes of Health Stroke Scale; TIBI, thrombolysis in brain ischemia; ICA, internal carotid artery; MCA, middle cerebral artery.

Tsivgoulis G and CLOTBUST-PRO investigators Journal of Stroke 2020;22(1):130-140

Monitoring after reperfusion therapy

Microemboli After Successful Thrombectomy Do Not Affect Outcome but Predict New Embolic Events

 Faheem Sheriff, MD*; Mariana Diz-Lopes, MD*; Ayaz Khawaja, MD; Farzaneh Sorond, MD, PhD; Can Ozan Tan, PhD; Elsa Azevedo, MD, PhD; Maria Angela Franceschini, PhD; Henri Vaitkevicius, MD; Karen Li, MD; Andrew Donald Monk, MD; Sarah LaRose Michaud, BA; Steven K. Feske, MD; Pedro Castro, MD, PhD

Table 3.	Comparison of the Risk of Composite Outcome	Vascular Event, Ischemic	Stroke/TIA and All-Cause	Mortality in Patients W	ith MES-Positive Compared With
MES-Nega	ative Using Cox Proportional Hazard Regression	l			

	Recurrent Ischemic Stroke or TIA				*Composite Outcom	е	All-cause Mortality			
	n	HR (95% CI)	P Value	n	HR (95% CI)	P Value	N	HR (95% CI)	P Value	
Unadjusted analysis										
MES-positive	7	5.78 (1.20-27.9)	0.03	8	4.50 (1.19–16.9)	0.03	2	0.38 (0.08-1.82)	0.29	
MES-negative	2	Reference		3	Reference		8	Reference		
†Adjusted analysis										
MES-positive	7	8.22 (1.55-43.6)	0.01	8	6.73 (1.63–27.8)	0.01	2	0.40 (0.07–2.27)	0.30	
MES-negative	2	Reference		3	Reference		8	Reference		

Conclusions—MES detected by transcranial Doppler following endovascular treatment of anterior circulation occlusions do not predict clinical or radiological outcome. **However, such emboli are an independent marker of recurrent embolic events within 90 days.** (Stroke. 2020;51:154-161. DOI: 10.1161/STROKEAHA.119.025856.)

Monitoring during and after reperfusion therapy

The arterial may re-occlude after initial recanalization

A 73 years old patients affected by hypertension and diabetes, came to Emergency Department one hour after the beginning of dysarthria, left hemianopsia and hyposthenia.





A CT: was negative for haemorrhage (ASPECT 10)

AngioCT: occlusion of P1 in right PCA.



Intravenous Thrombolysis with rtPA was started and a Mechanical Thrombectomy was successfully performed

The arterial may re-occlude after initial recanalization

In the following 2 days the patient presented a progressively worsening bilateral hemianopsia

TCCS: severely reduced flow in both right and left P1 segment of PCA





MR: bilateral occipital infarctions

Predictors of Unexpecte Successful Mechanical Ischemic St

Th

Mosimann PJ et al. Stroke.

Twenty-Four-Hour Reo Mechanical T Associated Factors and

Marto JP et al .Stroke. 201

Because the Re-occlus for example carefully r



ation

24-48 hours after rombectomy is rare but come. vith re-occlusion are: ission

ments or stenosis at the

this early complication tervention is over

Risk of intracranial haemorrhage after a successful thrombectomy



CT Angiography: left ICA and M1 distal occlusion



TCCS after 12 hours: systolic velocity increase on the left MCA

A 65 years old patient, current smoker and affected by hypertension comes to Emergency Department because of a sudden aphasia and right hemiplegia due to an acute occlusion of left Internal carotid and M1 (NIH 20). CT: ASPECT 9

An intravenous thrombolysis and a successful thrombectomy were performed with a dramatic clinical improvement (NIH 5)



CT: 48 H after



CT Angiography after left ICA and M1 recanalization

Risk of intracranial haemorrhage after thrombectomy

Ultrasound Identification of Patients at Increased Risk of Intracranial Hemorrhage After Successful Endovascular Recanalization for Acute Ischemic Stroke

Claudio Baracchini¹, Filippo Farina¹, Alessio Pieroni¹, Anna Palmieri¹, Caterina Kulyk¹, Federica Viaro¹, Joseph-Domenico Gabrieli², Giacomo Cester², Francesco Causin², Renzo Manara²

World Neurosurg. 2019;125:e849-e855

Increased middle cerebral artery mean blood flow velocity index after stroke thrombectomy indicates increased risk for intracranial hemorrhage

Kneihs M et al. J Neurointerv Surg. 2018 Sep;10(9):882-887

Original Contribution

Blood Pressure After Endovascular Thrombectomy

Modeling for Outcomes Based on Recanalization Status

Marius Matusevicius, MSc; Charith Cooray, MD, PhD; Matteo Bottai, PhD; Michael Mazya, MD, PhD; Georgios Tsivgoulis, MD, PhD; Ana Paiva Nunes, MD; Tiago Moreira, MD, PhD; Jyrki Ollikainen, MD; Rosanna Tassi, MD; Daniel Strbian, MD; Danilo Toni, MD, PhD; Staffan Holmin, MD, PhD; Niaz Ahmed, MD, PhD

Stroke. 2020;51:519-525

Cerebrovascular Diseases

Cerebrovasc Dis DOI: 10.1159/000506855 Received: November 13, 2019 Accepted: February 28, 2020 Published online: April 21, 2020

Controlling Blood Pressure Under Transcranial Doppler Guidance after Endovascular Treatment in Patients with Acute Ischemic Stroke

Hongbo Chen et al Cerebrovasc Dis 2020;49(2):160-169

Neurosonology in Stroke Unit



 Acute ischemic stroke diagnosis and treatment :

- Stenosis/occlusion of Carotid or/and vertebral artery
- Stenosis/occlusion of intracranial arteries
- Monitoring of recanalization
- Monitoring after the reperfusion therapy



Identification of major etiological subtypes:

- Large artery Atherosclerotic stenosis
- Small Vessel Disease
- Cryptogenic /ESUS
- Cardioembolic
- Unusual (dissection, inflammation...)





Follow-up:

- Stenosis
- Occlusion
- CEA
- CAS

Large artery atherosclerotic occlusive disease

Large Artery Atherosclerotic Occlusive Disease

John W. Cole, MD, MS

Continuum 2017;23:133-157



Symptomatic carotid stenosis

CDU is an excellent tool to evaluate carotid, vertebral and subclavian atherosclerotic plaques providing details about:

- composition and surface of the lesion
- degree of the stenosis by means of spectral Doppler ultrasound



severe symptomatic carotid artery stenosis (85% in longitudinal plane, ECST; PVS 360 cm/s, EDV 158 cm/s)

Large artery atherosclerotic occlusive disease Symptomatic vertebral artery stenosis/occlusion

Review

Ultrasound Assessment of Extracranial Carotids and Vertebral Arteries in Acute Cerebral Ischemia

Klearchos Psychogios ^{1,2,3}, Georgios Magoufis ⁴, Odysseas Kargiotis ¹, Apostolos Safouris ¹, Eleni Bakola ¹, Maria Chondrogianni ¹, Panagiotis Zis ⁵, Elefterios Stamboulis ¹ and Georgios Tsivgoulis ^{2,*}

Medicina 2020,56,711

A 75 years old patient, previous smoker, affected by hypertension, diabetes, came to Emergency Department due to recurrent dizziness events.
CDU showed the occlusion of the right vertebral artery and a significant stenosis at the origin of left vertebral artery. A left vertebral artery stenting intervention led to symptom resolution



Large artery atherosclerotic occlusive disease

Transcranial Doppler sonography for detecting stenosis or occlusion of intracranial arteries in people with acute ischaemic stroke (Review)

Mattioni A, Cenciarelli S, Eusebi P, Brazzelli M, Mazzoli T, Del Sette M, Gandolfo C, Marinoni M, Finocchi C, Saia V, Ricci S Cochrane Database of Systematic reviews 2020

Symptomatic intracranial stenosis



A 79 years old patient, previous smoker, previous myocardial infarction, affected by hypertension, came to Emergency Department due to dysarthria and left hemiparesis CT showed an ischemic lesion in left internal capsule Angiography identified a right M1 stenosis confirmed by TCCS (PSV 304 cm/s e EDV 124 cm/s). A best medical therapy was chosen followed by TCCS evolution monitoring



Unusual causes

Neurosonology and Imaging in Uncommon Causes of Stroke

Seung Min Kim*, Sang Hee $\mathrm{Ha}^{\dagger},$ Sang Mi $\mathrm{Noh}^{\ddagger},$ Sung Hyuk Heo $^{\dagger},$ Bum Joon Kim †

Department of Neurology, VHS Medical Center*, Seoul; Department of Neurology, Kyung Hee University Hospital[†], Seoul; Department of Neurology, The Catholic University of Korea St. Vincent Hospital[‡], Suwon, Korea

Cerebral artery dissections can be determined sonographically by:

- Wall vessel abnormalities such as hypoechogenic increase of wall thickness (intramural hematoma) causing stenosis or occlusion.
- Increased peripheral flow resistance and post-stenotic changes.
- Further sonographic follow-up are necessary during the acute phase because of the disease dynamic, to detect occlusion progression or recanalization

Cerebral artery dissections



Unusual causes

Mobile Thrombus



A 50 years old patient current smoker, affected by hypertension, came to the Emergency Department a day after the beginning of slight aphasia CDU showed a mobile thrombus on the left

internal carotid artery

Unfractionated heparin was started with resolution of the thrombus some days later

Unusual causes

Carotid artery webs in embolic stroke of undetermined source with large intracranial vessel occlusion

Marc-Antoine Labeyrie¹, Fabiola Serrano¹, Vittorio Civelli¹, Clément Jourdaine¹, Peggy Reiner², Jean-Pierre Saint-Maurice¹, Hugues Chabriat² and Emmanuel Houdart¹

- Carotid web is a non-atheromatous and non-dissecting membrane-like strand that protrudes into the lumen of the carotid artery.
- This is an underrecognized cause of stroke.
- Carotid web may cause a high rate of stroke recurrence explained by the flow stagnation along the superior surface of the septum that leads to the formation of a superimposed thrombus

International Journal of Stroke 2021, Vol. 16(4) 392–395 © 2020 World Stroke Organization Article reuse guidelines: sagepub.com/journals-permissions DOI: 10.1177/1747493020929945 journals.sagepub.com/home/wso SAGE

Carotid web





A 65 years old patient affected by hypertension, comes to our Stroke Unit 2 days after an IVT performed in Spoke Hospital for aphasia.

-28.0 cm/s

> The CDU: showed a strand protruding in the lumen of left ICA as a carotid web. Same days after a carotid stent was inserted

Unusual causes Inflammatory Cerebrovascular Diseases Giant cell arteritis



A 70 years old woman without risk factors, came to Emergency Department for a sudden Wallenberg Syndrome preceded by many days of bitemporal headache.

CUD: bilateral vertebral arteries vessel wall edema, with multiple stenosis and bilateral temporal arteries Halo Sign **CUD:** Hypoechogenic vessel wall edema (halo sign) is pathognomonic with high specificity (97 %).

Local stenosis (flow accelerations) can be observed

The use of ultrasound to assess giant cell arteritis: review of the current evidence and practical guide for the rheumatologist

Sara Monti^{1,2}, Alberto Floris³, Cristina Ponte^{4,5}, Wolfgang A. Schmidt⁶, Andreas P. Diamantopoulos⁷, Claudio Pereira¹, Jennifer Piper¹ and Raashid Luqmani¹ Rheumatology 2018;57:227-235

Rilievo di segnali microembolici: cardioembolismo/ESUS

Segnali Ultrasonori di breve durata ed alta intensità e passano rapidamente sul volume campione

- Durata <300 msec</p>
- Ampiezza >3-7 dB
- Unidirezionali al flusso
- Suono tipico (cip)
- Registrazione per 30' 60'





Eur J Vasc Endovasc Surg (2016) 52, 565-580

MES ed Ictus acuto

REVIEW

Transcranial Doppler Ultrasound Detection of Microemboli as a Predictor of Cerebral Events in Patients with Symptomatic and Asymptomatic Carotid Disease: A Systematic Review and Meta-Analysis

L.M.J. Best ^{a,*}, A.C. Webb ^b, K.S. Gurusamy ^a, S.F. Cheng ^a, T. Richards ^a

Diagnosi eziologica

Carotidea: ipsilaterali

- Cardioembolica: bilaterali
- SVD: generalmente assenti

Diagnosi patogenetica

- embolica
- emodinamica

Valore prognostico

- correlazione tra MES e recidiva
- Valutazione terapeutica
- Riduzione MES in base alla terapia

Bazan et al. Ultrasound J (2020) 12:6 https://doi.org/10.1186/s13089-020-0156-1 The Ultrasound Journal

ORIGINAL ARTICLE

Open Access

Relationship of spontaneous microembolic signals to risk stratification, recurrence, severity, and mortality of ischemic stroke: a prospective study

Rodrigo Bazan¹, Gustavo José Luvizutto², Gabriel Pereira Braga¹, Silméia Garcia Zanati Bazan³, Inão Carlos Hueb³, Carlos Clayton Macedo de Freitas¹, Pedro Tadao Hamamoto Filho^{1*}[®], Módolo¹, André Petean Trindade⁴, Marcone Lima Sobreira⁵, Hélio Rubens de Carvalho Nunes¹, a⁶ and Octávio Marques Pontes-Neto⁶

MOLECULAR MEDICINE REPORTS 8: 1135-1142, 2013

Microembolic signal monitoring of TOAST-classified cerebral infarction patients

JIANDONG JIANG¹, YULONG JIANG¹, SHOUQIN FENG², DEJIN SUN¹, AIXIA ZHUANG¹, QINGHONG ZENG¹, YI ZHANG³, HONGMEI HUANG⁴, HONGXIA NIE¹ and FANG ZHOU¹

Departments of ¹Neurology, ²Neurological Examination, ³Radiology and ⁴Ultrasound, Lianyungang Second Hospital, Lianyungang, Jiangsu 222006, P.R. China

Received October 19, 2012; Accepted June 19, 2013

DOI: 10.3892/mmr.2013.1609

Original Research Article

Micro-embolic signal monitoring in stroke subtypes: A systematic review and meta-analysis of 58 studies European Stroke Journal 2021, Vol. 6(4) 403–411 © European Stroke Organisation 2021 Article reuse guidelines: sagepub.com/journals-permissions DOI: 10.1177/23969873211060819 journals-asgepub.com/home/eso SAGE

STROKE JOURNAI

EUROPEAN

Pachipala Sudheer[®], Shubham Misra, Manabesh Nath, Pradeep Kumar, Deepti Vibha, M.V.Padma Srivastava, Manjari Tripathi, Rohit Bhatia, Awadh Kishor Pandit and Rajesh K Singh

Valutazione del parenchima

Shift della linea mediana



Valutazione idrocefalo



VASOSPASMO: Diagnosi e monitoraggio





Fistola artero-venosa



EMORRAGIA

EMORRAGIA: è evidenziabile come un'area iperecogena che ben si delinea rispetto al tessuto circostante

- Solo emorragie in sede centrali e di discrete dimensioni sono evidenziabili.
 Non serve come esame di screening
- Serve nel follow-up delle lesioni evidenziabili
- Serve nel follow-up dello shift della linea mediana



Neurosonology in Stroke Unit

Acute ischemic stroke diagnosis and treatment :

- Stenosis/occlusion of Carotid or/and vertebral artery
- Stenosis/occlusion of intracranial arteries
- Monitoring of recanalization
- Monitoring after the reperfusion therapy



Identification of major etiological subtypes:

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- Unusual (dissection, inflammation...)



- Stenosis
- Occlusion
- CEA
- CAS





Follow up



CUD: intra-stent stenosis by an intimal wall flap

CUD: thrombosis after a CEA

Take home messages

- Neurosonology offers us a wide-range of opportunities regarding acute phase monitoring options, causal and preventive investigation alternatives, and the possibility to understand complex hemodynamic contexts impacting further decision choices.
- But mostly it gives to neurologists the possibility to get an independent assessment every time during the stroke care.
- At last, my opinion is the same as that expressed in this interesting paper, that is worth reading: "Neurosonology makes the difference in acute Stroke Care"





