NEUROSONOLOGY AND CEREBRAL HEMODYNAMICS

НЕВРОСОНОЛОГИЯ И МОЗЪЧНА ХЕМОДИНАМИКА

Official Journal of the Bulgarian Society of Neurosonology and Cerebral Hemodynamics

Издание на Българската асоциация по невросонология и мозъчна хемодинамика

REGIONAL TEACHING COURSE
of the European Academy of Neurology

October 6–8, 2017 | Sofia, Bulgaria

Lectures in Slides

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LECTURES IN SLIDES

Contents

The Quality of Acute Stroke Unit. A Stroke Register

D. Staykov

Department of Neurology, Hospital of the Brothers of St John Eisenstadt – Austria

Outline

- Stroke as an important treatment target
- Stroke units -integral part of a regional stroke care network
- What have stroke units contributed to stroke care
- Stroke registries
- Research of stroke unit care
- Implications for improvement of quality of care

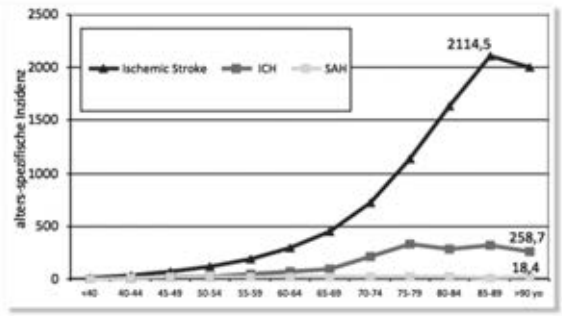
- One in six persons suffers a stroke
- No. 3 cause of mortality worldwide
- 25% early mortality in stroke patients
- Major cause of disability

Disability Adjusted Life Years - DALY

> 50% of disability in neurology caused by ICH and ischemic stroke

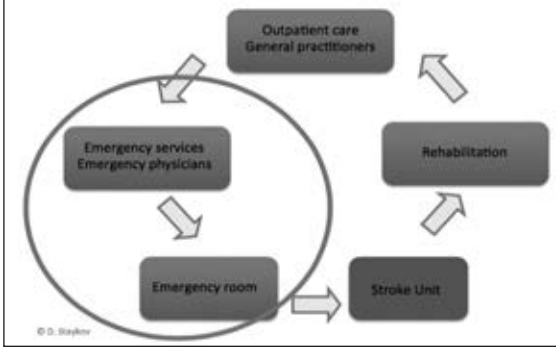
Chin & Vora 2014 Neurology

Age-specific incidence of stroke



Source: Statistisches Bundesamt 2007

The classical regional network



Early assessment - FAST

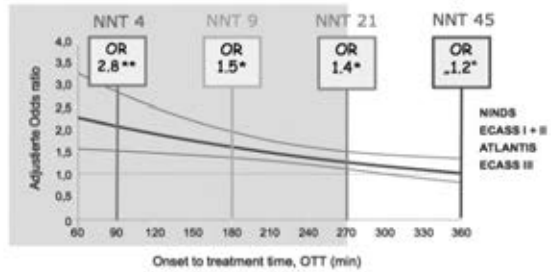
Prehospital assessment

- Exact history of event
- Simple symptom assessment (e.g. FAST)
- Time window (essential information)
  - Time of symptom onset
  - Last seen well (e.g. went to bed at 10 p.m.)
- Medication (OAC ?)

Time is brain

Pooled analysis **ECASS, ATLANTIS, NINDS, and EPITHET**
Good outcome (mRS≤1) after 3 months

Efficacy / time



Lees KR, Bluhmki E, von Kummer R, et al. Lancet 2010;375:1695-1703

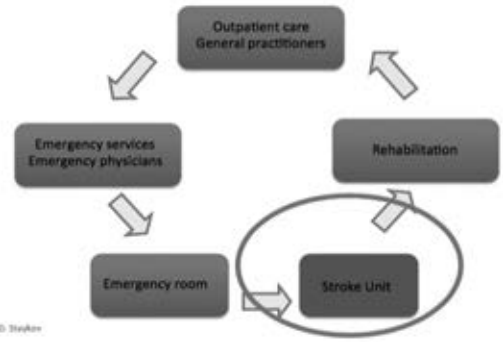
Time loss at 3 levels - measures

- Patients
  - Lack of knowledge of symptoms
  - Ignorance
- Emergency services
  - Too slow
  - No priorization
- Hospital
  - No stroke team
  - No expertise
  - 3-hour effect

→

- Patients
  - Education of laypersons
- Emergency services
  - Education of paramedics and emergency physicians
- Hospital
  - Neurologist in ER
  - „Gatekeeper", triage
  - Referral to internal medicine, ENT etc.

The classical regional network



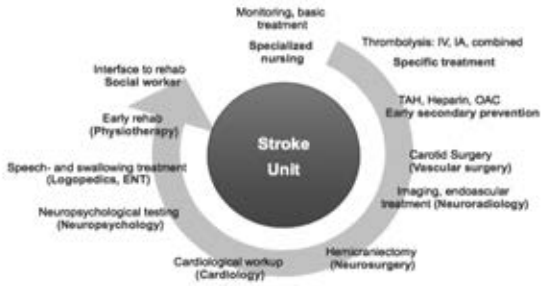
What is a stroke unit?

- A ward dedicated to the treatment of stroke
- 24/7 monitoring of vital parameters
- 24/7 neurological /stroke expertise
- Access to specific diagsnostics and treatments
- Multidisciplinary team of doctors, nurses, therapists

„A broad approach with many small elements put together by a trained staff"
(Langhorne & Pollock. Age and Aging 2002; 31: 365-71)

Management platform **stroke unit**

Intredisciplinary team



Stroke units save lives

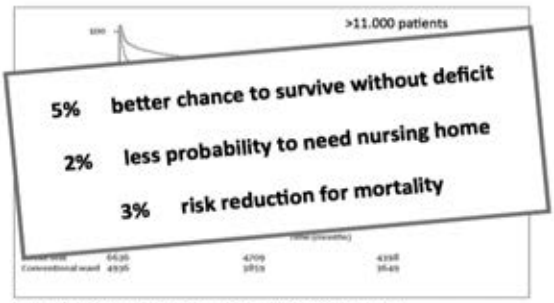


Figure 2: Survival curves for patients admitted to stroke unit or conventional ward

Candelise & al. Lancet 2007; 369: 299-305

Stroke unit care

Cochrane database systematic review

- More organized care = improved outcomes
- Conslusion:

  " Stroke patients who receive organized inpatient care in a stroke unit are more likely to be alive, independent, and living at home one year after the stroke. The benefits were most apparent in units based in a discrete ward. We observed no systematic increase in the length of inpatient stay. "

Stroke trialists collaboration 2013 Cochrane Syst Database Rev

Quality criteria for stroke units

German Stroke Society

Regional vs. Supra-Regional SU

- Different requirements for
  - 24/7 diagnostic modalities (radiology, cardiology etc.)
  - Access to specialized neuroradiology, neurosurgery, ICU
  - Personnel, capacity, volume of patients per year etc.

R-SU

CT, 24h/365d availability
Certified Stroke Unit

SR-SU (Comprehensive SU)

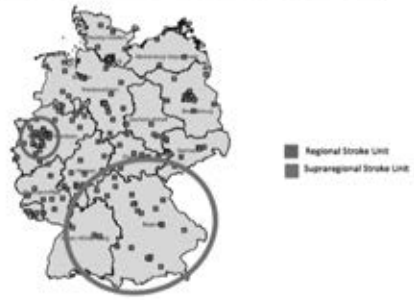
Thrombectomy

Neurosurgery

Interventional treatment:
neuroradiology, neurosurgery
Neuro - ICU
Stroke Center

© D. Steyken

Infrastructure of stroke care in Germany

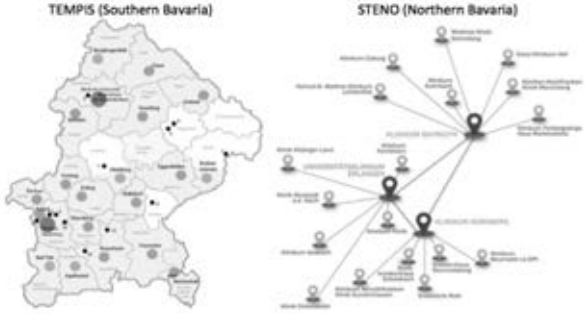


Stiftung Deutsche Schlaganfall-Hilfe 2010

Telemedicine networks in less dense areas

TEMPIS (Southern Bavaria)

STENO (Northern Bavaria)



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Stroke registries are essential for quality control

- Regional registries (e.g. Bavarian Stroke Registry)
- National registries (e.g. Austrian Stroke Registry)
- Treatment related (stroke unit, thrombolysis)

- Scientific evaluation of Quality Indicators (QIs)
- Benchmarking
- Research on practical aspects of care provision

© D. Steyken 19

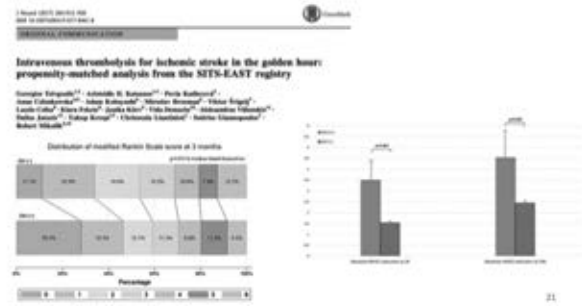
Target ranges and results of the 15 quality indicators — Wiedmann 2014 DA

Quality indicator	Target range %	Total, %	Quality assurance projects with mandatory participation, %	Total range Minimum	Total range Maximum	p value*
Antiaggregation ≤ 48 h after stroke	≥ 95	93.4	91.7	86.6	98.4	<0.0001
Antiaggregation as secondary prevention	≥ 95	95.2	93.7	87.4	98.0	<0.0001
Anticoagulation in atrial fibrillation	≥ 80	77.8	75.2	72.4	80.1	<0.0001
Brain imaging in patients with suspected stroke[a]	≥ 95	99.4	99.0	98.6	99.9	<0.0001
Vascular imaging in cerebral infarction and transient ischemic attack (TIA)	≥ 95	93.8	89.8	84.3	96.7	<0.0001
Dysphagia screening	≥ 90	86.2	86.4	74.8	93.1	<0.0001
Early rehabilitation—physiotherapy/occupational therapy	≥ 90	94.4	93.3	90.4	97.8	<0.0001
Early rehabilitation—speech therapy	≥ 90	88.5	85.9	81.7	91.3	<0.0001
Early mobilization[a]	≥ 90	91.4	91.3	86.8	92.7	<0.0001
Information for patients and their relatives[a,c]	≥ 90	86.1	87.6	75.4	91.8	<0.0001
Patients with brain imaging within 1 h of admission in patients admitted within 2 h after stroke onset[a,d]	≥ 50	95.5	95.1	93.5	96.0	<0.01
Early systemic thrombolysis in eligible patients[a]	≥ 60	88.7	86.9	49.7	63.6	<0.0001
Door to needle time ≤ 60 min, when interval onset/admission ≤ 2 h	–	98.7	98.3	95.6	99.2	<0.001
Treatment in a stroke unit[a,e]	–	77.2	86.0	65.8	84.1	<0.0001
Discharge destination rehabilitation of patients with disabilities impairing everyday activities[a,e]	–	75.1	84.9	54.7	80.1	–

In bold print: quality indicators for which target ranges were not achieved in the nationwide mean 2012
* p values each relate to one test for significant differences between registers with regard to likelihood of success of achieving one quality indicator
[a] Computed tomography or magnetic resonance imaging
[b] Data not consistently documented in one quality assurance project
[c] Data not included in the following registers: Hamburg, Schleswig-Holstein, Rheinland-Pfalzhütte

The SITS registry – golden hour thrombolysis

- SITS = Safe Implementation of Thrombolysis in Stroke



Intravenous thrombolysis for ischemic stroke in the golden hour: propensity-matched analysis from the SITS-EAST registry

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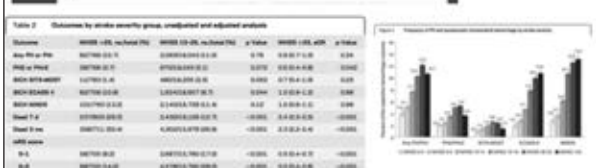
SITS – thrombolysis in severe stroke

IV thrombolysis in very severe and severe ischemic stroke

Results from the SITS-ISTR Registry

Manya 2015 Neurology



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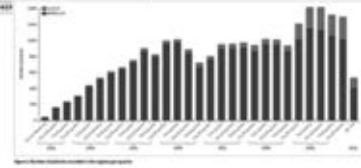
Implementation and outcome of thrombolysis with alteplase 3-4·5 h after an acute stroke: an updated analysis from SITS-ISTR

Ahmed 2010 Lancet Neurol



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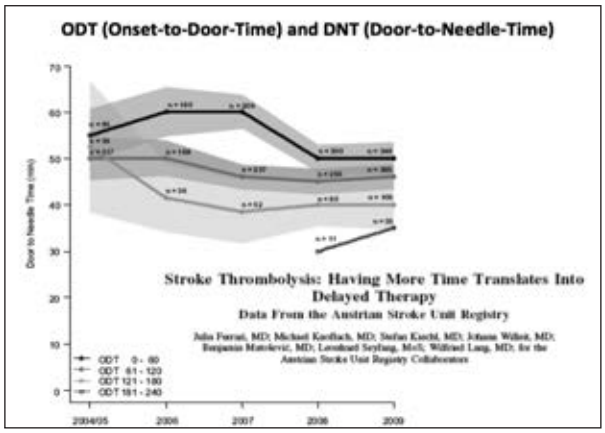
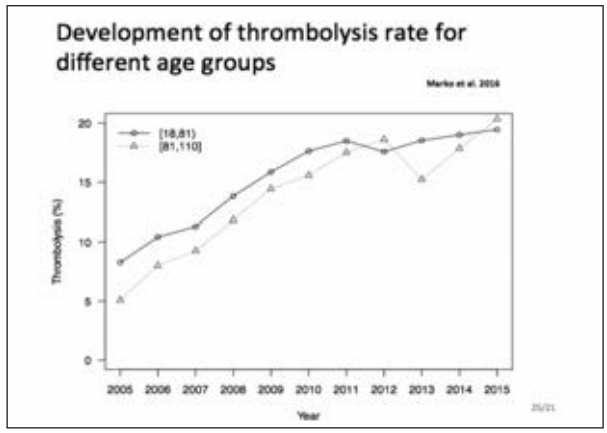
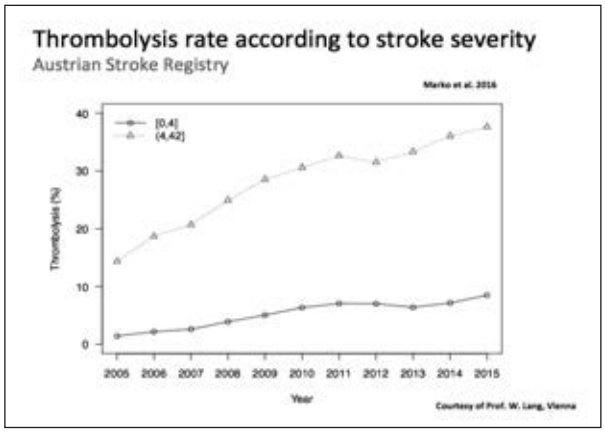
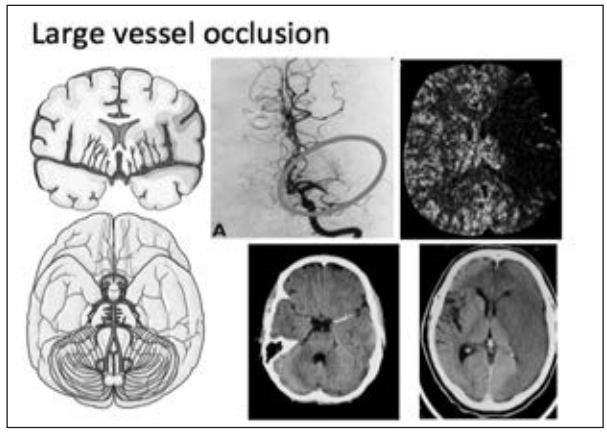
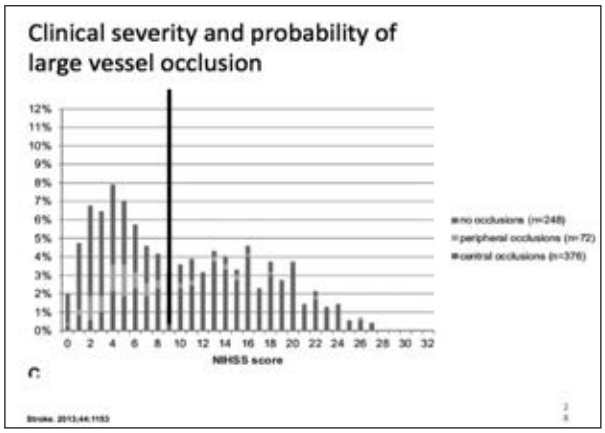
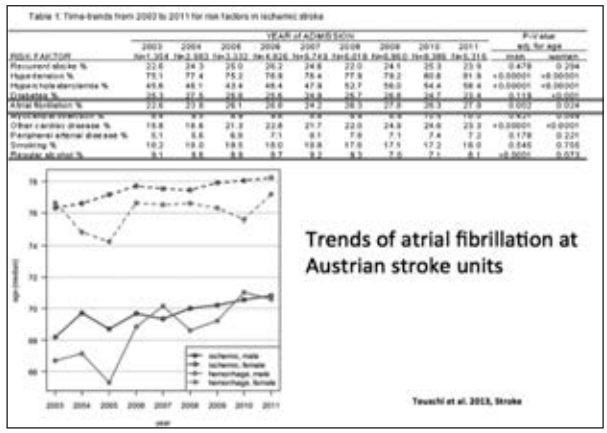

ODT (Onset-to-Door-Time) and DNT (Door-to-Needle-Time)
Stroke Thrombolysis: Having More Time Translates Into Delayed Therapy
Data From the Austrian Stroke Unit Registry
ODT 0 - 60
ODT 61 - 120
ODT 121 - 180
ODT 181 - 240
2004/05
2006
2007
2008
2009

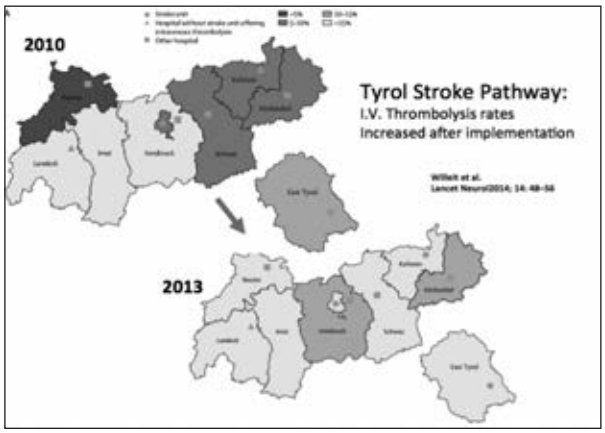

Development of thrombolysis rate for different age groups
Marko et al. 2016
[18,81)
[81,110]
Thrombolysis (%)
Year
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Thrombolysis rate according to stroke severity
Austrian Stroke Registry
Marko et al. 2016
[0,4]
(4,42]
Thrombolysis (%)
Year
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Courtesy of Prof. W. Lang, Vienna


Large vessel occlusion
A


Clinical severity and probability of large vessel occlusion
no occlusions (n=248)
peripheral occlusions (n=72)
central occlusions (n=376)
NIHSS score
C
Stroke. 2013;44:1153


Trends of atrial fibrillation at Austrian stroke units
Toell et al. 2013, Stroke


2010
2013
Tyrol Stroke Pathway:
I.V. Thrombolysis rates
Increased after implementation
Willeit et al.
Lancet Neurol2014; 14: 48–56

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Tips How to Start Your Career as Junior Neurologist in Europe

M. Pereira

EAN, RRFS – Residents and Research Fellows – Coimbra, Portugal

Presentation plan

1. What is EAN-RRFS
2. Educational opportunities
3. Available fellowships
4. Available grants
5. Other interesting summer/spring schools

1. What is EAN-RRFS

ENS

European Federation of Neurological Societies

volunteer-based, non-profit organisation

European Association of Young Neurologists and Trainees

1. What is EAN-RRFS

JOINT CONGRESS ISTANBUL 2014

2014 ean the home of neurology

BERLIN, GERMANY, JUNE 20 - 23, 2015

2015 ean

RESIDENT and RESEARCH FELLOW SECTION

1. What is EAN-RRFS

A. Major aims

B. Office

C. Recent and upcoming activities

D. Membership

A. Major Aims

Key objectives:

- to **represent** and **inform neurology trainees** at an **international** level
- to **help** those who wish to **spend time in other countries** for clinical training or research
- to **improve the training of neurologists** by learning from the successes and mistakes of different countries
- **connecting young neurologists** for clinical exchange
- to build a **platform for communication** among junior neurologists

B. Office and members

Viktoria Papp, Denmark — Chair

Anna Sauerbier, UK — Secretary

Lisa Klingelhoefer, Germany — Treasurer

Peter Balicza, Hungary Past Chair

ean

B. Office and members

EAN-RRFS delegates in neurological societies and committees

- Education Committee – Miguel Pereira, Portugal
- Liaison Committee - Marta Melis, Italia
- Teaching Course Sub-Committee – Viktoria Papp, Denmark
- Quality Assurance Subcommittee – Panagiotis Zis, UK/Greece
- UEMS European Board of Neurologists - Panagiotis Zis, UK/Greece

C. Activities

EAN scientific panels

As delegate in the EAN scientific panel, junior colleagues can be involved in the development of neurological guidelines to provide evidence-based guidance for clinical neurologists and other health care professionals.

C. Activities

Dementia and cognitive disorders	Sandra Vujovic	Bosnia and Hertzgovina
Multiple sclerosis	Antonio Carotenuto	Italy
Stroke	Diana de Sousa	Portugal
Sleep-wake disorders	David Schreier	Switzerland
Neuroepidemiology	Maria B. Milenkova/Stoyanova	Bulgaria
Neuro-ophthalmology and -otology	Roman Schniepp	Germany
Palliative care	Katarina Tudor	Croatia
Neuro-oncology	Maria-Lucia Muntean	Germany
Neurogenetics	Karolina Dzierzc	Poland
Neurorehabilitation	Rémy Phan Ba	Belgium
Neurotoxicology	Marco Spinaci	Italy
Epilepsy	Vincent Kerveman	Belgium
Infectious diseases	Elena Cecilia Bilkko Rasca	Romania
Movement disorders	Antonella Macerollo	United Kingdom
Autonomic nervous system disorders	Simone Vigneri	Italy
Child Neurology	Magdalena Ogrodnik	Poland
Neurophysiology	Panagiotis Zis	United Kindgom
General neurology	Monica Margoni	Italy
Higher Cortical functions	Miguel Pereira	Portugal
Muscle disorders	Paolo Ripellino	Switzerland
Neurocritical care	Simona Alexandra Boniczky	Denmark
Neuroimmunology	Dominia Vecchio	Italy

C. Activities

- Neurotraumatology
- Headache
- Pain
- Neuroimaging
- ALS and frontotemporal dementia
- Neuropathies
- Coma and chronic disorders of consciousness
- Neurosonology

How to apply... Send the following to the RRFS (rrfs@ean.org):
* CV
* Motivation letter

Become representatives to the EAN scientific panels!

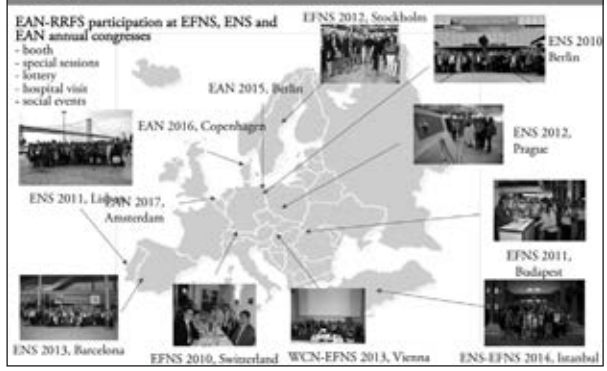
C. Activities

National representative in EAN-RRFS

AIM:
- to have a better link between countries, to facilitate the speed of information flow and to exchange experiences

AS A REPRESENTATIVE:
- to disseminate information in your own country about the available grants, regional teaching courses, spring school, congress activities (social events, special session)
- to encourage juniors to prepare interactive case reports for eBrain
- to inform EAN-RRFS and each other in the representative's team if our country organizes interesting activity/course for junior neurologist that could be useful for juniors from other countries, as well.

C. Activities



C. Upcoming activities

4th CONGRESS OF THE EUROPEAN ACADEMY OF NEUROLOGY
Lisbon, Portugal, June 16-19, 2018

EAN-RRFS booth

EAN-RRFS hospital visit
Followed by get-together dinner
To be confirmed

EAN-RRFS lottery

EAN-RRFS special session (to be determined)
"Meet the experts and learn about clinical work and research (clinical and laboratory) around Europe"

Become a member of the EAN-RRFS!

D. Membership

– Eligibility

- Resident in Neurology
- Research Fellow
- PhD student
- One of the above up to a maximum of 3 years beyond

– Procedure

- Complete application form
- A curriculum vitae (CV)
- Eligibility has to be proven annually by a signed confirmation of the physician in charge of the residency programme

– Email us the documents to: rrfs@ean.org

D. Membership

Registration via EAN website
Membership fee per calendar year:
45€ (high income)
25€ (low income countries)

Pay the first year and have the second year for free

Privileges of residents are:

- Participation in RRFS activities
- Participation in EAN activities, such as Scientific panels, committees, newsletter via RRFS
- Access to the registered user area on the EAN website
- Monthly mailshots of the EAN electronic newsletter Neuropenews
- Reduced fees at EAN annual congress
- Free online access to:
  the European Journal of Neurology (EJoN)
  the online learning platform eBrain
  the Guidelines
  EAN educational grants (if applicable)
  selected congress webcasts
- AAN Joint Membership (20% off the AAN membership fee for EAN members and 10% off the EAN membership fee for AAN members)

D. Membership

2. Educational opportunities

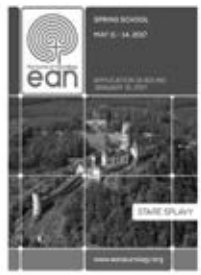
www.ean.org

2. Educational opportunities

- 4 days course in English: May 10-13, 2018
- Application deadline: January 31, 2018
- Topics:
  1. Movement Disorders and Narcolepsy (in co-operation with MDS-ES)
  2. Neuro-ophthalmology/-otology
  3. Inflammatory Myopathies

  A half-day trip to Prague is planned.

  Participants pay only for their travel.



Spring School: Staré Splavy, Czech Republic

2. Educational opportunities

Regional Teaching courses (2 Europe+ 1 Africa)

- ✓ RTCs aim to provide:
- ➢ basic teaching in neurology
- ➢ establish friendly relations with the young colleagues

- the language is English
- duration: 3 days
- Morning: one plenary session with three speakers
- Afternoon: small tuition groups (case-based videoclips, etc.)

2. Educational opportunities

eBrain

2. Educational opportunities

eBrain

- world's largest, most comprehensive web-based training resource in clinical neuroscience
- interactive online learning, supports training and continuous professional development
- approximately 20 modules of e-learning, with each of the 550+ individual lessons taking around 20-30 minutes to complete
- covers all fields of neurology

➢ Free for EAN (+EAN-RRFS) members
➢ http://www.ebrainjnc.com/

2. Educational opportunities

E-publication: interactive case

- Cases with difficult diagnostic or management issues
- Virtual interactive case report in eBrain
- Template and guidance are available

http://www.ebrainjnc.com/learning/course/view.php?id=721#section-1

- Cases are announced once a month in the "Education corner" of EAN page with the authors' name and photo
- 1st step: send a short description of the case (max 200 words.) to Dr. Antonella Macerollo (a.macerollo@ucl.ac.uk)

2. Educational opportunities

Abstract reviewer and poster chair

- All abstracts are reviewed by 3 neurologists
- Chance to be selected as chairperson of a poster session
- 31 different topics
- If you are interested send an email to rrfs@ean.org

3. Available fellowships

3. Available fellowships

Clinical fellowships

3. Available fellowships

Clinical fellowships (Former Department to Department Programme)

History
- Since 2001, originally devoted to young neurologists from Eastern Europe
- Later extended to participants from Western Europe and Mediterranean countries
- Since the beginning more than 750 **neurologists** took advantage of these grants

Purpose (subject to negotiation)
- **Provide clinical observational experience** at a **hosting department outside the country of residence**
- At least **6 weeks**

Award
- **35 grants**
- **2250 Euro**
- travel expenses of up to **300 Euro**
- Total: **2550 Euro**

3. Available fellowships

Clinical fellowships

Eligible
- residents of neurology (with a minimum training in Neurology of 2 years) or certified clinical neurologist, with no more than 3 years clinical practice since completing training.
- fluent in English or in the local language of the hosting country
- have been accepted by an approved host department
- awardees from previous years (applies also to former D-D programme) are no more qualified

Important! Find your hosting department before application to EAN!

3. Available fellowships

Clinical fellowships

Eligible
- residents of neurology (with a minimum training in Neurology of 2 years) or certified clinical neurologist, with no more than 3 years clinical practice since completing training.
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- have been accepted by an approved host department
- awardees from previous years (applies also to former D-D programme) are no more qualified

Important! Find your hosting department before application to EAN!

3. Available fellowships

Research fellowships
12 months
2000 euros per month
(+travel costs)

1) Research training fellowship
(**12 months**)

2) Research experience fellowship
(**6 months**)
- specific research methodology or technique

4. Available grants

Welcome to the 3rd Congress of the European Academy of Neurology!

4. Available grants

Bursaries
- **200** bursaries
- **free registration to the congress**
- **up to four nights hotel accommodation**

Eligible:
- ✓ Eligible are PhD (neurology) students, residents of neurology or certified clinical neurologists (with no more than 3 years practice since completing training) who are working in Europe and whose abstract has been accepted.
- ✓ It is also possible for colleagues in training from Algeria, Egypt, Jordan, Kyrgyzstan, Lebanon, Libya, Morocco, Palestine, Tunisia and Syria as well as from sub-Saharan countries belonging to the H1NARI Group A list of countries as established by WHO (www.who.int/hinari/eligibility/en/) to apply for bursaries.
- ✓ abstract submission deadline: 13 January 2017

4. Available grants

4. Available grants

EAN-RRFS grants
- Up to **4** grants are available
- Amount : **250** Euro
- Help with reimbursement of entry fees for the **10th European Board Examination in Neurology** (Amsterdam, Netherlands)
- Applications should be sent to EAN-RRFS Office, via email: rrfs@ean.org

The following should be submitted:
- ✓ **A short CV**
- ✓ **Proof document that your application for the UEMS/EBN examination is accepted**
- ✓ Copy of **passport** (in an attached picture file)
- ✓ **have not received any other financial support**

It will be announced and reminder will be sent by email to RRFS members.

4. Available grants

10th European Board examination in neurology

- Structured examination – helps to harmonize the postgraduate training of Neurologists and sets European standards
- Close to national examination
- High pass rate
- Test own knowledge in comparison to Neurologists from different countries
- Leads to a qualification (FEBN)
- It is an **additional sign of excellence** but no legal consequence is attached nor the right to practise within the EU or elsewhere is affected.

4. Available grants

EAN-RRFS travel grants
- **4** travel grants
- Amount : **250** Euro

Eligible:
- ✓ trainees who have successfully presented their work at a conference during the year 2017
- ✓ or attended a course which significantly improved their clinical or research skills
- ✓ have not received any other financial support

Apply: motivation letter, your CV, approval of the participation of the congress/course, declaration stating that you have not received any other financial support.

- ✓ Application deadline will be around November 2017.

5. Other interesting summer/ spring schools

1. 7th Eilat International Educational Course: Pharmacological Treatment of Epilepsy, Jerusalem, Israel, October 15-20, 2017
http://www.eilatedu2017.com/
Bursaries are available, deadline: December 2, 2016.

2. 11th Baltic Sea Summer School on Epilepsy, Helsingor, Denmark 11 - 15 June 2018
http://www.baltic-earth.eu/helsingor2018/index.html

3. European Stroke Organisation - Summer school, 2018 Berlin, Germany
http://www.eso-stroke.org/eso-stroke/esoc-meetings/summer-school.html

4. European Committee for treatment and research in Multiple Sclerosis
http://www.ecrims.eu/ecrims-summer-schools

5. MDS-ES Winter/Summer School for Young Neurologists
http://www.movementdisorders.org/MDS/Education/Upcoming-Courses.htm

Take home messages

1. Become a EAN member
2. Many opportunities to increase neurological knowledge (eBrain, CME, courses)
3. Many opportunities to connect with other european neurologists

Address for correspondence:
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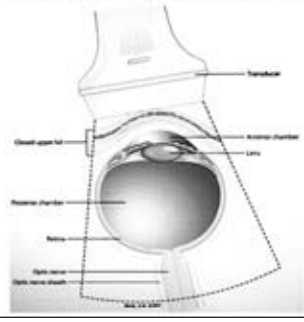
São Matinho do Bispo, Coimbra, Portugal
E-mail: miguelatcp@gmail.com

Neuro-Orbital and Temporal Artery Ultrasound Examination

F. Perren

University Hospital of Geneva – Geneva, Switzerland

Part 1: Neuro-orbital sonography



Introduction

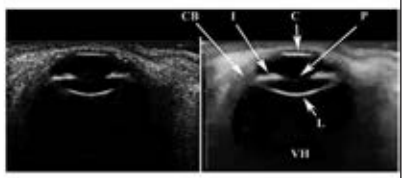
- US examination since the 60's: ophtalmologists (vitreous hemor. & lens opacification)[1]
- TCD Insonation through orbita with a 2 MHz PW probe in the early 80's (intracranial ICA)[2]
- US technique needed long time to adapt power for safety
- In recent years, neurologists interested in clinical information (papilledema, ON structure, intraorbital vessels)[3]
- Possible thank improved B-mode, lower transmission of energy

1. AJR 1991;157:1079-86; 2. J Neurosurg 1982; 57: 769-774; 3. Ultraschall Med 2014;35:422-431

Anatomy

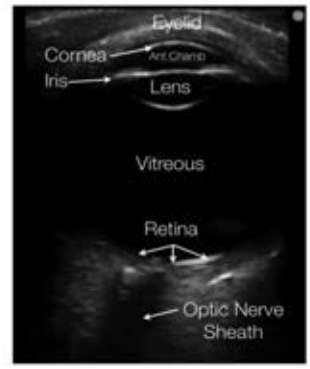
Clinically relevant structures:

- Ocular globe
- ON
- Papilla
- Intraorbital vessels (OA, CRA)



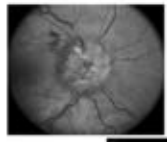
Anatomy

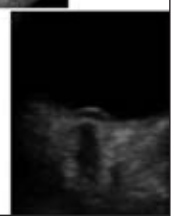
- Eyeball diameter: ± 24mm
- Optic apparel: cornea, anterior chamber, pupilla/iris, lens, vitreous body, sclera, retina



Anatomy

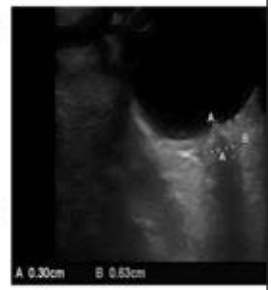
- Papilla (optic nerve disc): origin of the ON, diameter of 1-1.5 mm.
- CRV and CRA pass the papilla.
- ICHT: (high CSF pressure, reduced VF or inflammation) lead to swelling of the papilla (papilledema)



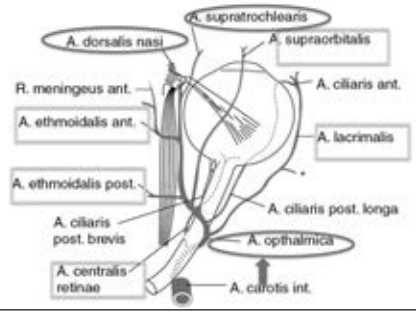


The Optic Nerve (ON):

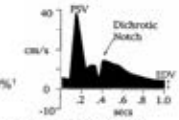
- is an extracranial part of the brain sheated by the dura, arachnoidea and pia
- CSF communication to the subarachnoidal space of the brain
- its intraorbital length is ± 2.8 cm (lamina cribrosa – optic canal)
- about 1.2-2cm distal to the globe, the CRA and CRV penetrate the nerve sheet
- diameter of the ON sheet (ONSD) is 5mm (can differ between right and left side)



Intraorbital vessels



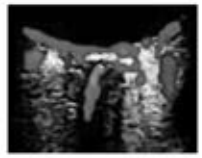
The ophtalmic artery (OA) :



- 1st part located within inferolateral area of the ON in about 90%[1]
- External Ø of 1.7mm[1]
- crosses the ON: 73% superiorly, 27% inferiorly[1]
- 1st branch of the intraorbital part: CRA (26-47%)[1], medial posterior ciliary artery (26%)[1]
- The CRA enters the ON 7.52.2mm (5.3-12.5mm) behind the bulb
- The Post. Ciliary Aa. run forward, divide into multiple branches and penetrate the sclera close to the ON medially, laterally or superiorly[2]

1. Manual of Neurosonology, Cambridge University Press, 2016; Min Invasive Neurosurg 2007;50:202-208

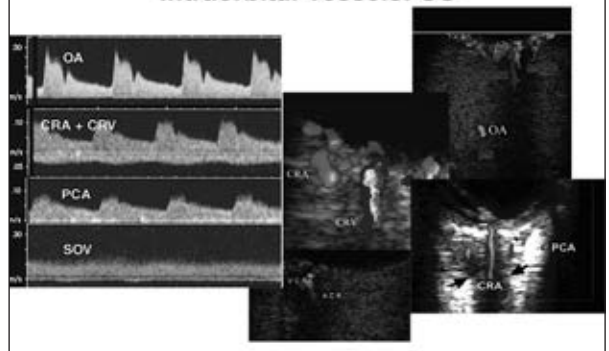
Intraorbital Vessels



- Color-mode imaging
- CRA (branch of the OA)
- CRV running in parallel
- Post Ciliary A. located near the ON
- Alterations of mFV, direction of the flow
- Normal FV

Orbital vessel	Mean (cm/s) [10]	Peak systolic velocity (mean cm/s) [9]
Central retinal artery (CRA)	10.3	11.6
Central retinal vein (CRV)	2.9	–
Ophthalmic artery (OA)	31.4	41.7
Posterior ciliary artery (PCA)	12.4	16.6

Intraorbital Vessels: US



Surv Ophtalmol 1996;40:255-67; J Clin Ultrasound 2003;31:258-73

Neuro-orbital Examination

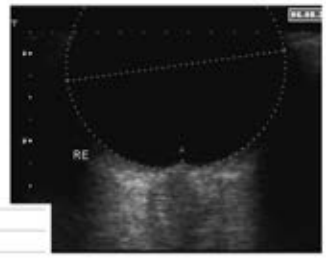
- Probe: linear array 6-12MHz, (up to 15 MHz) or sectorial array 2 MHz
- Supine position, eyes closed during whole examination (remove contact lenses)
- Probe on the lateral upper closed eyelid (avoid uncontrolled pressure!)
- Patients should try not to move and « to look straight »
- Machine Settings: safety aspects: cavitation, T° increase; CI: recent surgery
- During image processing remove probe from the eyelid

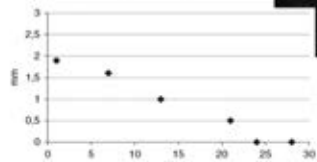
- Current guidelines[1]:
- Acoustic output intensity: <50mW/cm²
- Mechanical index (MI): <0.23; TI<0.2
- Ispta<17mW/cm²
- Color mode adapted to lower velocities
- Examination time: ≤ 1min/eye

1. www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070911.pdf

Papilla/Optic disc Examination

- B-mode
- Landmark: origin of the ON
- Plane with maximum disc elevation or excavation selected
- Measure prominence using circle of the optic bulb
- Normal <0.5mm
- Optimal to control therapeutical effect on ICP (after LP)

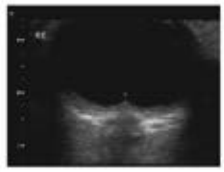




1. Manual of Neurosonology, Cambridge University Press, 2016

Raised ICP/Papilledema

- Cut-off value to predict ICP> 20cm H_2O: 5.7-6mm (sensitivity 87-95%; specificity 79-100%)[1,2]



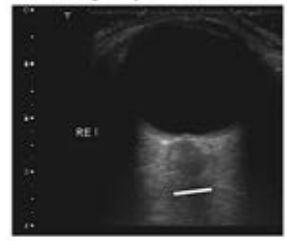
1. Intensive Care Med 2008;34:2062-67; 2. Br J Ophtalm 2002;86:1109-113

Optic Nerve Sheet Diameter / ONSD

- ON: B-mode: hypoechogenic structure
- ON Ø: behind the papilla: N 4-5mm[1]
- ON enlargement with intracranial HT
- Close association between MRI and US ON Ø[2,3]
- Demyelinating diseases: smaller Ø, increased echogenicity[4]

ONSD NORMAL RANGES:

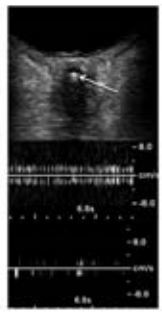
Normal Adults	< 5 mm
Children >1 yr	< 4.5 mm
Infants < 1 yr	< 4 mm



1. Intensive Care Med 2008;34:2062-67; 2. Eur J ultrasound 2002;15:145-9; 3. BMC Neurol 2013;13:187; 4. Br J Ophtalm 2002;86:1109-113

Occlusion of the CRA (CRAO): the retrobulbar « spot sign »

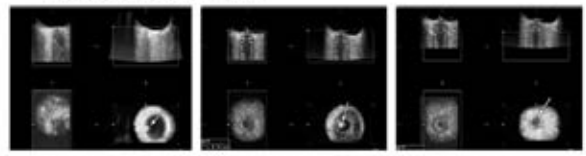
- CRAO occurs mainly in the elderly population
- leads to severe retinal ischemia
- is a common cause of sudden blindness[1-3]
- Ttt: conservative or invasive: superselective IA or IV thrombolysis
- B-mode US: CRA absence of flow and « spot sign » highly predictive of embolic occlusion[4-6] and could differentiate embolic from vasculitic origin[4,7]
- Retrobulbar spot sign may predict: a-a origin (calcified component) and absence of success of ttt (thrombolysis) and recovery of vision[7]



1. Klinische Monatsblatter fur Augenheilkunde 2010;227:712-720. 2. Transact Am Ophthalmologic Soc 1962;60:316-334. 3. Prog Retinal Eye Res 2009;28:34-62 4. Ultraschall Med 2012;33:E263–E267 5. Ophthalmology 2002;109:744-747 6. J Neurom 2015; 25:251-6. 7. Stroke 2015;

3D-4D US

- Allows imaging of the type, size, location and severity of optic disc and ON edema and its differentiation from other types of eye lesions.
- Normal optic disc resulted in a smooth and sharp contour without swelling.
- Papilledema was presented as a hyperechoic prominence into the vitreous and the ONSD was increased in association with the degree of optic disc swelling.



Space–time imaging of mild (A) and severe (B) optic disc swelling, associated with optic nerve edema (C)

New Trends in Neurosonology and Cerebral Hemodynamics — an Update. Perspectives in Medicine (2012) 1, 86—88

3D-4D US

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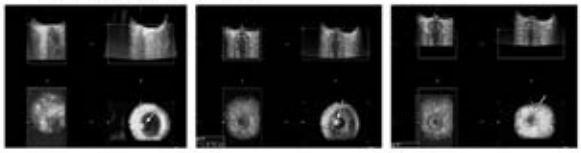


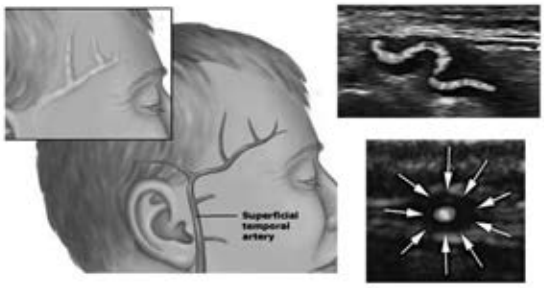
Space–time imaging of mild (A) and severe (B) optic disc swelling, associated with optic nerve edema (C)

New Trends in Neurosonology and Cerebral Hemodynamics — an Update. Perspectives in Medicine (2012) 1, 86—88

Possible neuro-orbital US applications include:

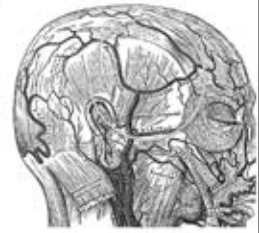
- Swelling of the papilla (bedside test): in the ICU (high reproducibility, easy documentation)
- OS sheet diameter (ICHT)
- Real-time information about intraorbital vascularization and BFV of orbital vessels: OA
- CRAO
- Carotido-cavernous fistula (SOV)
- 4D neuro-orbital US
- Orbital US: fast, mobile and noninvasive tool

Part 2: Temporal Artery sonography



Temporal artery :

- the common **superficial temporal artery** is a major artery of the head. It arises from the ECA and divises into 2 branches: parietal and frontal.
- Its pulse is palpable superior to the zygomatic arch, anterior and superior to the tragus



https://upload.wikimedia.org/wikipedia/commons/7/7b/Gray506.png

Temporal arteritis (Giant cell arteritis, Horton's):

- Systemic autoimmune primary large and medium vessel vasculitis, most common in the white population, >99% are ≥50 y.o. at disease onset
- Incidence 20/100.000/y; prevalence 15-30/100.000
- Headache in the temporal region occurs in 74% and 64% have swollen, tender, and firm temporal arteries (with reduced pulse), 37% jaw claudication; 32% AION
- 85% have ESR ≥50mm/h
- Temporal biopsy positive in 85%

Schmidt WA, Handbook on neurovascular ultrasound. 2006;21:96-104; J Clin Neuroophthalmol 1983;3:105–108; Open Access Rheumatology: Research and Reviews 2017:9 55–59

US of the Temporal artery

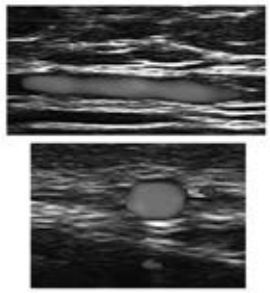
- the diameter of the lumen and each layer of the temporal fascia, including the wall of the temporal arteries, is about 0.7mm
- 8–15 MHz linear probe, color frequency 10MHz
- PRF: about 2.5 kHz; low WF
- Color box steering and beam steering maximal (color covers the artery lumen exactly)

Schmidt WA, Handbook on neurovascular ultrasound. 2006;21:96-104; Best Pract Res Clin Rheumatol 2005;19:223–242

US of the Temporal artery

Sensitivities and specificities with regard to clinical diagnosis and histology are high (A meta-analysis of 23 studies on temporal artery US including 2,036 cases showed sensitivities of 87% and specificities of 96% with regard to 'halo', stenoses and occlusions.

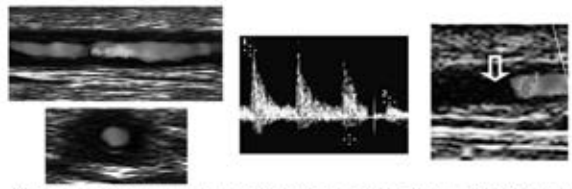
US almost completely depicts the whole length of the common superficial temporal arteries, including the frontal and parietal ramus (delineated both in longitudinal and transverse scans to an area as distal as possible)



Best Pract Res Clin Rheumatol 2005;19:223–242; Ann Intern Med 2005;142:359–369.

US of Temporal Arteritis

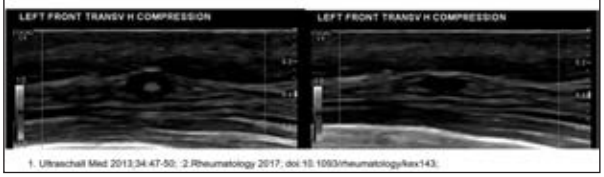
- Inflammation of the vessel wall, stenosis or occlusion can be depicted with US
- Dark (hypoechoic), circumferential wall thickening ('halo') around the lumen of an inflamed temporal artery (edema)
- Stenoses are present if BFV is more than twice the rate recorded in the area of stenosis compared with the area before the stenosis,
- Temporal artery ultrasound should be performed as early as possible (before ttt)
- CAVE: Inflammation is often segmental (false negative histology)
- The wall swelling is hypoechoic in acute temporal arteritis



Schmidt WA, Handbook on neurovascular ultrasound, 2006;21:96-104; Lancet 1995;345:866; N Engl J Med 1997;337:1336–1342.

US of Temporal Arteritis (GCA)

- Temporal artery « compression sign »[1,2]: TA compression in patients with GCA, elicits contrasting echogenicity between the diseased artery wall and the surrounding tissue (compression sign).
- Positive if: visibility of the TA upon transducer-imposed compression of the artery
- A recent study[2] showed: Cut-off values for the IMT measurement of common superficial temporal arteries is 0.42, frontal branches 0.34, parietal branches 0.29.



1. Ultraschall Med 2013;34:47-50; 2.Rheumatology 2017; doi:10.1093/rheumatology/kex143.

Conclusions

- Ultrasound technology has made it possible to become in recent years an accurate and noninvasive tool to examine safely neuro-orbital structures.
- It has become an interesting rapid diagnostic imaging method in the ICU (e.g. ONSD).
- Reliable ultrasound examination of the temporal artery is possible and has been proved to be the first line choice in the diagnosis of temporal arteritis/giant cell arteritis.

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Guidelines on the Fibromyalgia Syndrome

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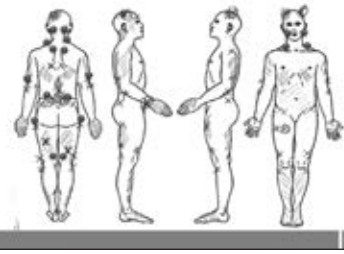
Fibromyalgia syndrome (FMS) – Characteristics

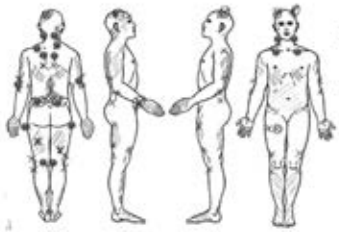
- Chronic, deep aching widespread pain with additional symptoms (Häuser, 2010):
  - Sleep disturbance
  - Fatigue (physical and mental)
  - Depressed mood
- Typically localized beginning and then spread over the body
- Prevalence 2-5% in western countries (Branco, 2010)
- Mostly middle-aged women, but also men and aged patients (Eich, 2012)

FMS – Diagnostic criteria

- American College of Rheumatology, ACR 1990 (Wolfe, 1990)
- Preliminary new ACR criteria 2010 (Wolfe, 2010)
- German AWMF Guideline (Eich, 2017)



"Old" criteria – ACR 1990



- Chronic pain (> 3 months) axial and in all 4 body quadrants
- ≥ 11 of 18 positive tender points

Wolfe et al., 1990

(Preliminary) new criteria – ACR 2010

Widespread Pain Index	Symptom Severity Score
Shoulder girdle	Fatigue
Lower arm	Unrefreshed wakening
Upper arm	Cognitive impairment
Hip	Somatic symptoms
Thigh	
Calf	**WPI ≥7 and SS ≥5 or WPI 3-6 and SS ≥9 + ≥3 months + no alternative cause for symptoms**
Jaw	
Chest	
Abdomen	
Upper back	
Lower back	
Neck	

Wolfe et al., 2010

German AWMF interdisciplinary guideline

http://www.awmf.org/leitlinien/detail/ll/041-004.html

Chronic widespread pain >3 months

Exclusion of alternative causes

Tender point criterion not fulfilled

Physical/mental fatigue and unrefreshed sleep and feeling of stiffness and swelling of the hands or feet or face?

FMS based on symptom criteria

Eich et al., 2017

FMS – Obligatory somatic diagnostics at first evaluation

- Complete **medical history** incl. drug history
- Complete **physical examination** (incl. neurological, orthopedic examination)
- Further **key symptoms?**
- **Pain drawing**
- **Basic laboratory**
  - *BSG, CRP, cell count, CK, Ca2+, TSH*
- Further diagnostics only if alternative diagnoses assumed

Eich et al., 2017

Basic concepts of FMS management

- Aim:
  - Highest possible life quality and reduction of symptoms
- Treatment after common decision with the patient and considering comorbidities
- For long-term treatment: self management!

Stepwise treatment

- **Mild disease courses:**
  - Education; physical and mental activity; activation of personal resources
- **Severe disease courses :**
  - Stepwise physical activity; drug treatment; multimodal therapy
- **Adverse disease courses :**
  - Multidisciplinary, multimodal treatment; individual psychotherapy; drug treatment

Drug therapy

- Licensed drugs for FMS symptoms:
  - USA
    - Pregabalin 450 mg/d
    - Duloxetine 60-120 mg/d
    - Milnacipran 100 mg/d
  - Germany
    - None

Temporarily limited drug treatment (treatment cessation after max. 6 months)

Drug	Recommendation AWMF
Amitriptylin 10-50 mg/d	Recommended
Duloxetin 60 mg/d	Recommended when comorbid depressive or generalized anxiety
Pregabalin 150-450 mg/d	Recommended when comorbid generalized anxiety
Quetiapin 50-300 mg/d	Open recommendation when comorbid major depression and if no response to duloxetin
Serotonin-Wiederaufnahmehemmer (Fluoxetin, Paroxetin)	Open recommendation when comorbid depressive symptoms
Opioide, schwach (Tramadol)	No positive recommendation possible

Sommer 2017

Negative recommendation

Drug	Recommendation AWMF
Muscle relxant	negative recommendation
MAO-inhibitor	negative recommendation
Flupirtin, cannabinoids	negative recommendation
Hormones	strong negative recommendation
Anxiolytics	strong negative recommendation
Dopamine agonists	strong negative recommendation
Hypnotics, ketamin, milnacipran, NSAR, local anesthetics, strong opioids, virostatics	strong negative recommendation

Sommer 2017

No positive, no negative recommendation

Drug	Recommendation AWMF
Gabapentin	Weder positive noch negative Empfehlung
Guaifenesin	Weder positive noch negative Empfehlung
Noradrenalin-Wiederaufnahmehemmer	Weder positive noch negative Empfehlung
Acetsalicylsäure, Paracetamol und Metamizol	Weder positive noch negative Empfehlung
Tilidin	Weder positive noch negative Empfehlung
Vitamin D, Memantin, Mirtazapin, Oxytocin Nasenspray, Melatonin, Nalrexon, topisches Capsaicin, Esreboxetine, Kombination von Pregabalin und Duloxetin	Weder positive noch negative Empfehlung

Sommer 2017

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Differential Diagnosis of Syncope and Seizure. Transient Loss of Consciousness

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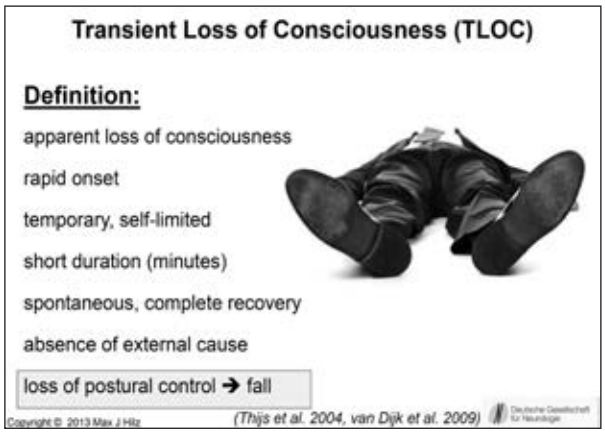
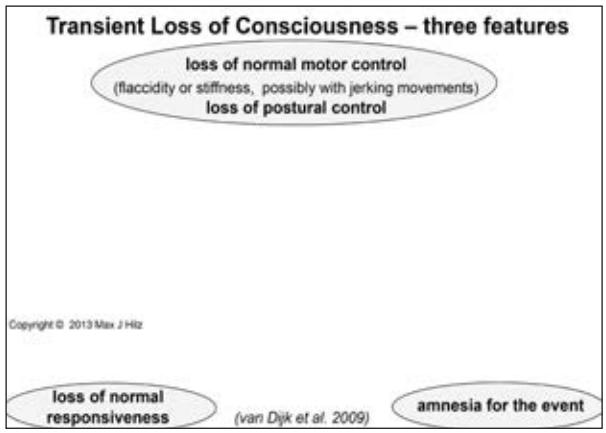
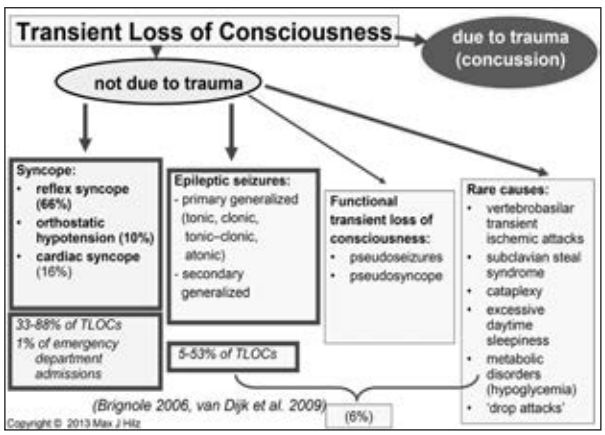
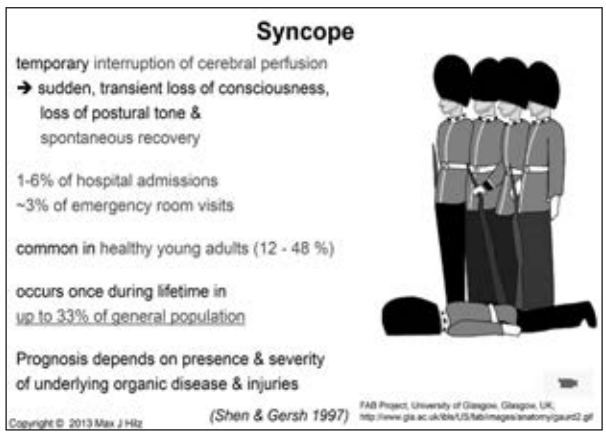
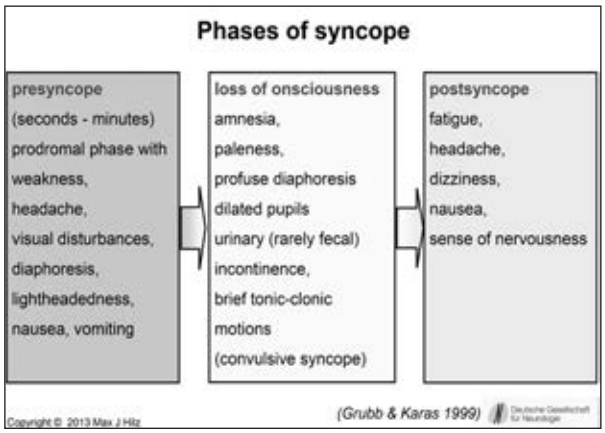
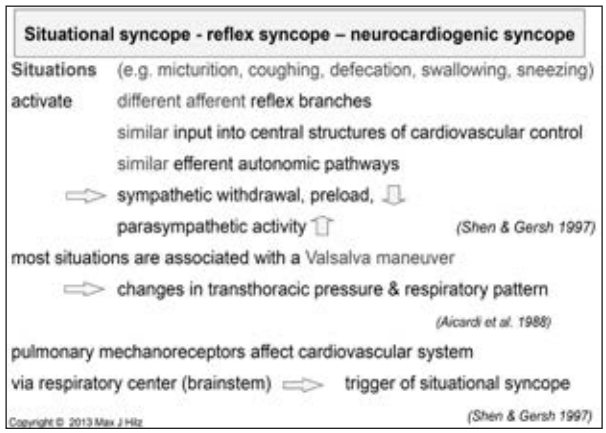












Micturition syncope :

Sudden emptying of distended bladder

➡ mechano-receptor stimulation

➡ **reflex bradycardia & vasodilation**

frequent in men with nycturia

syncope also due to

upright posture

& Valsalva maneuver

(Kaufmann 1997)

Defecation syncope:

differential diagnoses

epileptic seizure

transient ischemic attack (TIA)

glossopharyngeal syncope:

pain in posterior pharynx &
external auditory canal

➡ activation of dorsal
motor nucleus of vagus

(Kong et al. 1964, Lagerlund et al. 1988)

swallowing syncope:

related to glossopharyngeal syncope
associated with esophageal abnormality
(stricture, tumor)

(Kadish et al. 1986, Levin & Posner 1972, Wik & Hillestad 1975)

syncope after exercise:

frequently occurring in young, healthy persons
physical activity (= high sympathetic tone,
tachycardia, peripheral vasoconstriction)
sudden termination of activity
➔ intense venous pooling
While sympathetic over-activity still persists
➔ reduced cardiac preload
➔ activation of **Bezold – Jarisch reflex**
(and of baroreflex)

➔ *bradycardia, vasodilatation*
➔ *"exercise-syncope"*

(Elchina et al. 1947, Flag & Asanite 1983, Huycke et al. 1967, Osswald et al. 1994, Pedersen et al. 1989, Sneddon et al. 1994)

Carotid sinus hypersensitivity

1. cardioinhibitory (70-75%)
   asystole for at least 3 seconds
   parasympathetic activation:
   transient sinus bradycardia, AV block
2. vasodepressor (5-10%)
   systolic blood pressure fall > 50 mm Hg
   (or 30 mmHg & presyncopal symptoms)
   sympathetic inhibition: hypotension,
3. mixed response
   bradycardia & blood pressure fall

„Vatermörderkragen"

(Pfeiffer 1999, Shen & Gersh 1997, Thomas 1969)

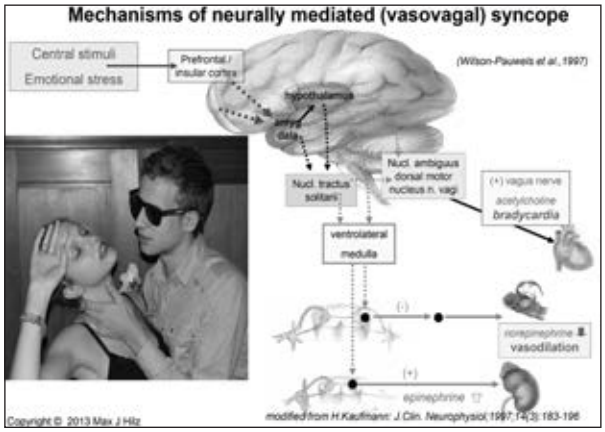
Vasovagal syncope

(Pre-) syncope with hypotension
and – at times - bradycardia
in response to emotional stimuli
e.g. stress
painful situations
venipuncture
feeling of disgust

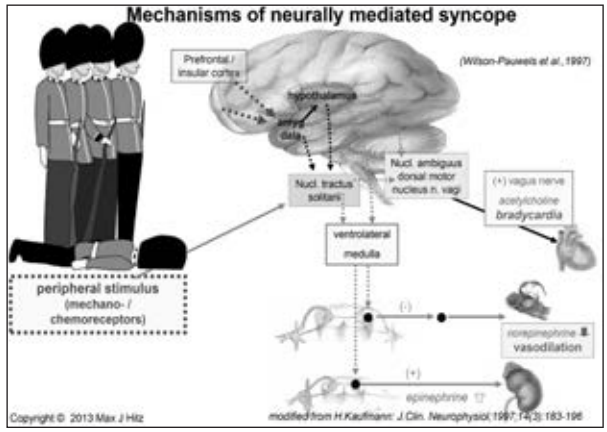
occurs in 40% of the population
peak at: 13–16 years of age
first episode rarely beyond age 35

(van Dijk et al. 2009)

Mechanisms of neurally mediated (vasovagal) syncope



Mechanisms of neurally mediated syncope



Good prognosis of reflex syncope

- no increased cardiac or neurological morbidity or mortality
- HOWEVER:
  - risk of trauma
  - psychologic problems,
  - problems at school,
  - problems at work
  - driving is prohibited !!

Syncope due to orthostatic hypotension

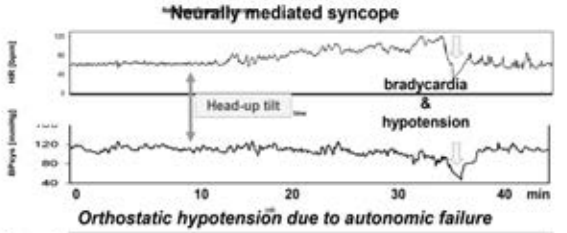
blood pressure fall within 3 min.
after standing-up / 60° passive head-up tilt:
(systolic ≥ 20 mmHg / diastolic ≥ 10 mmHg)
(Am. Autonomic Society & Academy of Neurology,1996)

Symptoms:
- weakness, dizziness, blurred vision
- difficulties to concentrate
- coat-hanger-like neck pain
- nausea, palpitations

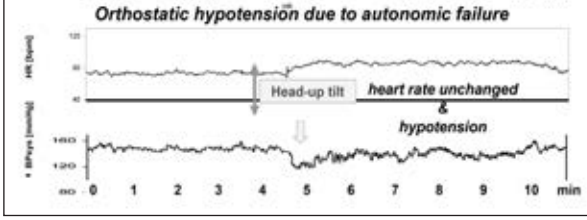
→ **syncope**

minimal heart rate response,
excessive hypotension during Valsalva,
pathologic findings with autonomic tests,
often neurologic or internal diseases
(e.g. diabetes mellitus, MSA)

Neurally mediated syncope



Orthostatic hypotension due to autonomic failure



Convulsive syncope

brief, tonic-clonic movements of individual muscle groups

at times quite difficult to differentiate from epileptic seizures

can occur independently from the etiology of syncope.

differentiation by simultaneous Video-EEG-recording (rarely available)

serum prolactin levels are unreliable

as prolactin levels increase after epileptic seizure & after syncope

better but not definite differentiation by serum creatine kinase:

prominent creatine kinase increases usually after seizure.

(blood sample must be drawn within 3 hours after seizure/syncope !)

Epileptic seizures

primary generalized ⟺ secondary generalized

tonic, tonic–clonic, atonic seizures

abnormal neuronal activity in both cerebral hemispheres
⇨ loss of consciousness

rarely triggered by e.g. flashing or flickering lights or startling

Caveat:
- STARTLING can trigger startle epilepsy
  but also syncope in hereditary prolonged QT syndromes.

(van Dijk et al. 2009, Thijs et al. 2004)

Epileptic seizures

epileptic aura *(e.g. epigastric aura with rising sensation in abdomen, unpleasant smelly, „ Déjà-vu " phenomenon)*

emission of a initial cry

automatisms, supposedly normal actions

ictally symmetric and rhythmic motor jerks

in epilepsy, but not in syncope, jerks can begin unilaterally & before the fall.

Jerks are coarse, symmetrical, rhythmic.

eyes usually open (also during syncope !)

gaze directed towards one side, pronounced head deviation,

cyanotic facial color (also occurs in cardiac syncope, but is less common in reflex syncope !)

epileptic seizure duration usually > 1 min *(van Dijk et al. 2009)*

JG van Dijk, RD Thijs, DG Benditt, W Wieling. Nat. Rev. Neurol. 2009;5:438–48.

Epileptic seizures

prolonged reorientation

lateral tongue bite

Seizure-related petechial rash

("trout phenomenon": seizure induced petechial eruptions on face, neck, breast)

slow recovery after seizure,

extended disorientation, confusion

& headache

epilepsy typical EEG pattern

lesions seen on cranial CT / MR images *(van Dijk et al. 2009)*

lateral tongue bite with epileptic seizire high specifity !

tongue bit rarely with syncope, eventually at tongue tip

JG van Dijk, RD Thijs, DG Benditt, W Wieling. Nat. Rev. Neurol. 2009;5:438–48.

Functional 'psychogenic' Pseudo-epilepsy

„Psychogenic nonepileptic seizures (PneS)"

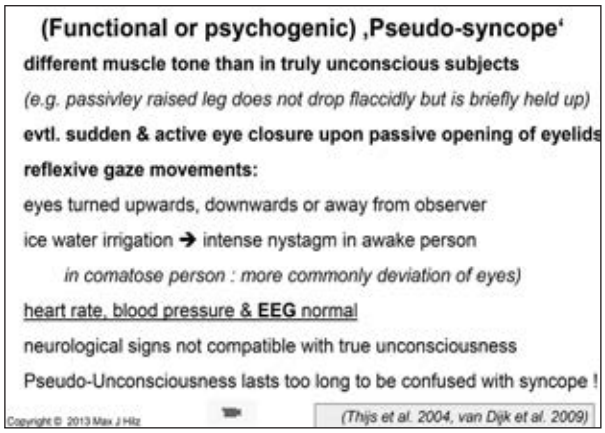
frequently misdiagnosed as epilepsy (20% in tertiary epilepsy clinics)
women >> men; young > old individuals, high frequency of attacks,
multiple somatic symptoms without somatic explanation

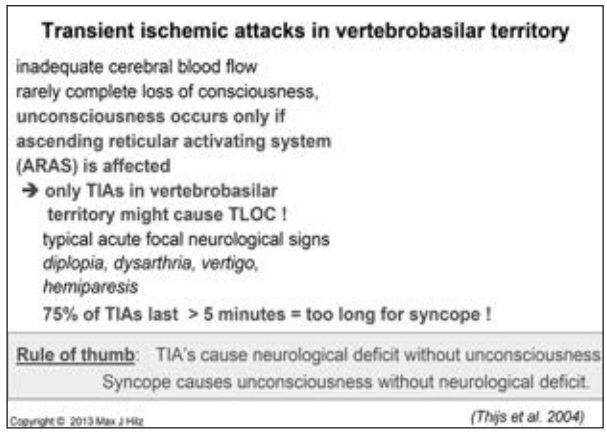
psychological problems,
stress (acute, chronic),

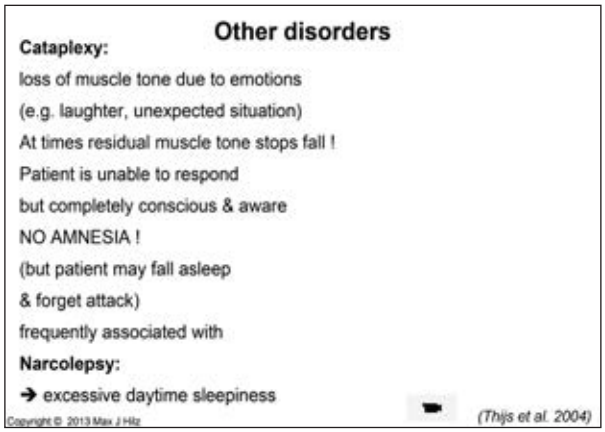
history of abuse
(physical and/or sexual)

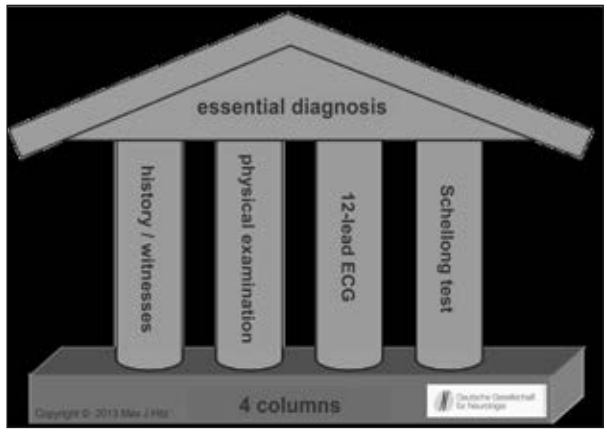
repeated evaluations (outpatient / inpatient clinics)

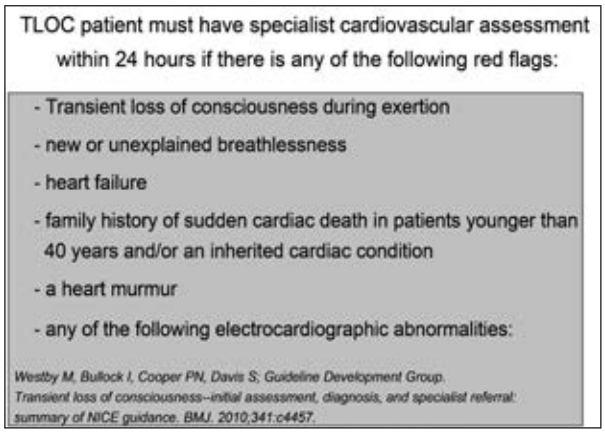
JG van Dijk, RD Thijs, DG Benditt, W Wieling. Nat. Rev. Neurol. 2009;5:438–48.

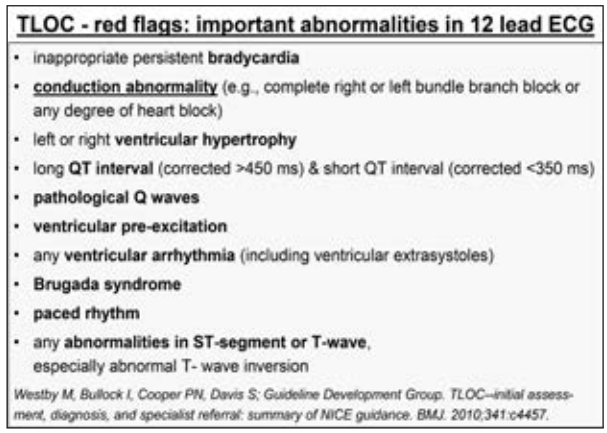












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