Complete Summary

GUIDELINE TITLE

EFNS guideline on neuroimaging in acute stroke. Report of an EFNS task force.

BIBLIOGRAPHIC SOURCE(S)

Masdeu JC, Irimia P, Asenbaum S, Bogousslavsky J, Brainin M, Chabriat H, Herholz K, Markus HS, Martinez-Vila E, Niederkorn K, Schellinger PD, Seitz RJ, EFNS. EFNS guideline on neuroimaging in acute stroke. Report of an EFNS task force. Eur J Neurol 2006 Dec;13(12):1271-83. [161 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

This guideline should be reviewed and if necessary revised not later than 2008.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute stroke

GUIDELINE CATEGORY

Diagnosis
Evaluation
Risk Assessment
Technology Assessment

CLINICAL SPECIALTY

Emergency Medicine
Internal Medicine
Neurology
Nuclear Medicine
Radiology

INTENDED USERS

Emergency Medical Technicians/Paramedics
Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

- To develop and publish a European Federation of Neurological Societies (EFNS) Guideline on the use of neuroimaging for the management of acute stroke
- To provide updated and evidence-based recommendations regarding the use of diagnostic neuroimaging techniques, including cerebrovascular ultrasonography (US), in patients with stroke and thus guide neurologists, other healthcare professionals and healthcare providers in clinical decision making and in the elaboration of clinical protocols

TARGET POPULATION

Patients with acute stroke

INTERVENTIONS AND PRACTICES CONSIDERED

1. Computed tomography (CT), perfusion CT (PCT)
2. Magnetic resonance imaging (MRI), diffusion-weighted (DWI) and perfusion-weighted (PWI) MRI
3. Magnetic resonance angiography (MRA)
4. Single photon emission computed tomography (SPECT)
5. Positron emission tomography (PET) (considered but not recommended)
6. Ultrasonography (US)
7. CT angiography (CTA)
8. Digital subtraction angiography (DSA)
9. Transcranial Doppler (TCD)
10. CT venography

MAJOR OUTCOMES CONSIDERED

Sensitivity, specificity, and usefulness of diagnostic tests

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The Cochrane Library was consulted and no studies were found regarding the use of neuroimaging techniques in stroke. A comprehensive literature review using the MEDLINE database has been conducted by searching for the period 1965–2005. Relevant literature in English including existing guidelines, meta-analyses, systematic reviews, randomized controlled trials, and observational studies has been critically assessed.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Evidence Classification Scheme for a Diagnostic Measure

Class I: A prospective study in a broad spectrum of persons with the suspected condition, using a "gold standard" for case definition, where the test is applied in a blinded evaluation, and enabling the assessment of appropriate tests of diagnostic accuracy

Class II: A prospective study of a narrow spectrum of persons with the suspected condition, or a well-designed retrospective study of a broad spectrum of persons with an established condition (by "gold standard") compared to a broad spectrum of controls, where test is applied in a blinded evaluation, and enabling the assessment of appropriate tests of diagnostic accuracy

Class III: Evidence provided by a retrospective study where either persons with the established condition or controls are of a narrow spectrum, and where test is applied in a blinded evaluation

Class IV: Any design where test is not applied in blinded evaluation OR evidence provided by expert opinion alone or in descriptive case series (without controls)

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Selected articles have been rated based on the quality of study design, and clinical practice recommendations have been developed and stratified to reflect the quality and the content of the evidence according to European Federation of Neurological Societies (EFNS) criteria (see the "Availability of Companion Documents" field in this summary).

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The author panel critically assessed the topic through analysis of the medical literature. A proposed guideline with specific recommendations was drafted for circulation to all panel members. Each panelist studied and commented in writing on each successive guideline draft, revised to progressively accommodate the panel consensus. After the approval of the panelists, two independent experts gave their opinion on the final version.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Rating of Recommendations

Level A rating (established as useful/predictive or not useful/predictive) requires at least one convincing class I study or at least two consistent, convincing class II studies.

Level B rating (established as probably useful/predictive or not useful/predictive) requires at least one convincing class II study or overwhelming class III evidence.

Level C rating (established as possibly useful/predictive or not useful/predictive) requires at least two convincing class III studies.

Good clinical practice point (GCPP) supported primarily by expert opinion

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guidelines were validated according to the European Federation of Neurological Societies (EFNS) criteria (see "Availability of Companion Documents" field).

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of evidence (class I-IV) supporting the recommendations and ratings of recommendations (A-C, good clinical practice point [GCPP]) are defined at the end of the "Major Recommendations" field.

Imaging of the Brain

Non-contrast computed tomography (CT) scan is the established imaging procedure for the initial evaluation of patients with stroke to document or exclude intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH) (**class II, level C**). However, CT use has been consecrated more by availability than by randomized studies comparing its effectiveness with magnetic resonance imaging (MRI). Either CT or MRI should be used for the definition of stroke type and treatment of stroke (**class I, level A**).

Given the controversial nature of data on early CT infarct signs involving more than one-third of the territory of the middle cerebral artery (MCA) as predictors of the outcome of intravenous (IV) recombinant tissue plasminogen activator (rtPA) treatment, the presence of such signs cannot be construed as an absolute contraindication to thrombolysis in the first 3 hours after stroke (**class IV**, **level GCPP**). Perfusion CT is helpful when MRI is not available and for the study of stroke patients for whom MRI is contraindicated (**class IV, level GCPP**). MRI has a higher sensitivity than conventional CT for the documentation of infarction within the first hours of stroke onset, lesions in the posterior fossa, identification of small lesions, and documentation of vessel occlusion and brain edema (**class I, level A**). In conjunction with MRI and magnetic resonance angiography (MRA), perfusion and diffusion MR are very helpful for the evaluation of patients with acute ischemic stroke (**class I, level A**). Perfusion and diffusion MR are helpful to select patients for intravenous thrombolysis beyond 3 h (**class II, level B**). MRI with MRA is the method recommended for the diagnosis and follow-up of arterial dissection (**class II, level B**).

Single photon emission computed tomography (SPECT) is helpful to predict the malignant course of brain swelling with large hemispheric infarctions (**class III, level C**). SPECT is also helpful in the evaluation of cerebral perfusion in non-acute cerebrovascular disease, for instance in the days after a SAH (**class III, level C**).

Detection of Hemorrhagic Stroke

In stroke, MRI can detect acute and chronic ICH (**class I, level A**). Although the detection of SAH is possible with MRI, currently CT scan is the diagnostic procedure of choice (**class I, level A**).

Imaging of Extracranial Vessels

Ultrasonography (US) is the non-invasive screening technique indicated for the study of vessels involved in causing symptoms of carotid stenosis (**class IV, GCPP**). MR angiography has slightly higher sensitivity and specificity than US to

determine carotid stenosis and occlusion, but other factors, such as availability, may render one procedure more useful than the other (**class II, level B**). CT angiography (CTA) has a sensitivity and specificity similar to MR for carotid occlusion and similar to US for the detection of severe stenosis (**class II**, **level B**). Digital subtraction angiography (DSA) is generally recommended for grading carotid stenosis prior to endarterectomy (**class I, level A**), but when there is concordance of non-invasive methods cerebral arteriography may not be necessary (**class IV, level GCPP**).

Imaging of Intracranial Vessels

Transcranial Doppler (TCD) is very useful for assessing stroke risk of children aged 2 to 16 years with sickle cell disease (**class I, level A**), detection and monitoring of vasospasm after SAH (**class I, level A**), diagnosis of intracranial steno-occlusive disease (**class II, level B**), diagnosis of right-to-left shunts (**class II, level A**), and for monitoring arterial reperfusion after thrombolysis of acute MCA occlusions (**class II, level B**). TCD can detect cerebral emboli and impaired cerebral hemodynamics. The presence of embolic signals with carotid stenosis predicts early recurrent stroke risk (**class II, level A**). The detection of impaired cerebral hemodynamics in carotid occlusion may identify a group at high risk of recurrent stroke (**class III, level B**).

MRA and CTA are very useful for the diagnosis of intracranial stenosis and cerebral aneurysms >5 mm (**class II, level B**). MRA is the recommended technique for screening cerebral aneurysms in individuals with a history of aneurysms or SAH in a first-degree relative (**class II, level B**). DSA is the recommended technique for the diagnosis of cerebral aneurysm as the cause of SAH (**class I, level A**). MRI with MRA is recommended for the diagnosis and follow-up of cerebral venous thrombosis (CVT) (**class II, level B**). Alternatively, CT venography is accurate and can be used for the same purpose (**class III, level C**).

Definitions:

Evidence Classification Scheme for a Diagnostic Measure

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Rating of Recommendations

Level A rating (established as useful/predictive or not useful/predictive) requires at least one convincing class I study or at least two consistent, convincing class II studies.

Level B rating (established as probably useful/predictive or not useful/predictive) requires at least one convincing class II study or overwhelming class III evidence.

Level C rating (established as possibly useful/predictive or not useful/predictive) requires at least two convincing class III studies.

Good clinical practice point (GCPP) supported primarily by expert opinion

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for selected recommendations (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate use of neuroimaging for the diagnosis and management of acute stroke

POTENTIAL HARMS

Angiography carries the risk of stroke and death, and many centers are not using digital subtraction angiography (DSA) prior to carotid endarterectomy

CONTRAINDICATIONS

CONTRAINDICATIONS

- Pregnancy, diabetes, renal failure, and allergy to contrast material are relative contraindications to perform a perfusion brain computed tomography (CT).
- Limitations and contraindications for the use of magnetic resonance imaging (MRI) are: claustrophobia, agitation, morbid obesity, the presence of

intracranial ferromagnetic elements, an aneurysm recently clipped or coiled, otic or cochlear implants, some old prosthetic heart valves, pacemakers, and some, not all, neurostimulators.

QUALIFYING STATEMENTS

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- This guideline provides the view of an expert task force appointed by the Scientific Committee of the European Federation of Neurological Societies (EFNS). It represents a peer-reviewed statement of minimum desirable standards for the guidance of practice based on the best available evidence. It is not intended to have legally binding implications in individual cases.
- The resulting report is intended to provide updated and evidence-based recommendations regarding the use of diagnostic neuroimaging techniques, including cerebrovascular ultrasonography (US), in patients with stroke and thus guide neurologists, other healthcare professionals and healthcare providers in clinical decision making and in the elaboration of clinical protocols. It is not intended to have legally binding implications in individual situations.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The European Federation of Neurological Societies has a mailing list and all guideline papers go to national societies, national ministries of health, World Health Organisation, European Union, and a number of other destinations. Corporate support is recruited to buy large numbers of reprints of the guideline papers and permission is given to sponsoring companies to distribute the guideline papers from their commercial channels, provided there is no advertising attached.

IMPLEMENTATION TOOLS

Staff Training/Competency Material

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Masdeu JC, Irimia P, Asenbaum S, Bogousslavsky J, Brainin M, Chabriat H, Herholz K, Markus HS, Martinez-Vila E, Niederkorn K, Schellinger PD, Seitz RJ, EFNS. EFNS guideline on neuroimaging in acute stroke. Report of an EFNS task force. Eur J Neurol 2006 Dec;13(12):1271-83. [161 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006 Dec

GUIDELINE DEVELOPER(S)

European Federation of Neurological Societies - Medical Specialty Society

SOURCE(S) OF FUNDING

European Federation of Neurological Societies

GUIDELINE COMMITTEE

European Federation of Neurological Societies Task Force on Neuroimaging in Acute Stroke

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

None of the authors has a conflict of interest with regard to the contents of this manuscript.

GUIDELINE STATUS

This is the current release of the guideline.

This guideline should be reviewed and if necessary revised not later than 2008.

GUIDELINE AVAILABILITY

Electronic copies: Available to registered users from the European Federation of Neurological Societies Web site.

Print copies: Available from Dr Jose Masdeu, Neurological Sciences, University of Navarra Medical School, C.U.N., Avda. Pio XII 36, 31008 Pamplona, Spain; Phone: +34 948 255 400; Fax: +34 948 29 65 00; E-mail: masdeu@unav.es

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Brainin M, Barnes M, Baron JC, Gilhus NE, Hughes R, Selmaj K, Waldemar G; Guideline Standards Subcommittee of the EFNS Scientific Committee. Guidance for the preparation of neurological management guidelines by EFNS scientific task forces – revised recommendations 2004. Eur J Neurol. 2004 Sep;11(9):577-81. Electronic copies: Available in Portable Document Format (PDF) from the European Federation of Neurological Societies Web site.
- Guideline papers. European Federation of Neurological Societies. Electronic copies: Available from the European Federation of Neurological Societies Web site.
- Continuing Medical Education questions available from the European Journal of Neurology Web site.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on April 13, 2007. The information was verified by the guideline developer on May 15, 2007.

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