

Stroke Treatment After 24 Hours

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GENERAL STROKE TREATMENT

✘ Content

- + Monitoring
- + Pulmonary and airway care
- + Fluid balance
- + Blood pressure
- + Glucose metabolism
- + Body temperature

MONITORING

- ✘ Continuous monitoring
 - + Heart rate
 - + Breathing rate
 - + O₂ saturation
- ✘ Discontinuous monitoring
 - + Blood pressure
 - + Blood glucose
 - + Vigilance (GCS), pupils
 - + Neurological status (e.g. NIH stroke scale or Scandinavian stroke scale)

PULMONARY FUNCTION

✘ Background

- + Adequate oxygenation is important
- + Improve blood oxygenation by administration of > 2 liters O₂
- + Risk for aspiration in patients with side positioning
- + Hypoventilation may be caused by pathological respiration pattern
- + Risk of airway obstruction (vomiting, oropharyngeal muscular hypotonia): mechanical airway protection

BLOOD PRESSURE

✘ Background

- + Elevated in most patients with acute stroke
- + BP drops spontaneously during the first days after stroke
- + Blood flow in the critical penumbra passively dependent on the mean arterial pressure
- + There are no adequately sized randomized, controlled studies guiding BP management

BLOOD PRESSURE

✘ Specific issues

- + Elevated BP (e.g. up to 200mmHg systolic or 110mmHg diastolic) may be tolerated in the acute phase of ischemic stroke without intervention
- + BP may be lowered if this is required by cardiac conditions
- + Upper level of systolic BP in patients undergoing thrombolytic therapy is 180mmHg
- + Avoid and treat hypotension
- + Avoid drastic reduction in BP

GLUCOSE METABOLISM

✘ Background

- + High glucose levels in acute stroke may increase the size of the infarction and reduce functional outcome
- + Hypoglycemia can mimic acute ischemic infarction
- + Routine use of glucose potassium insulin (GKI) infusion regimes in patients with mild to moderate hyperglycemia did not improve outcome¹
- ✘ It is common practice to treat hyperglycemia with insulin when blood glucose exceeds 180mg/dl² (10mmol/l)

1: Gray CS et al.: Lancet Neurol (2007) 6:397-406

2: Langhorne P et al.: Age Ageing (2002) 31:365-71.

BODY TEMPERATURE

✘ Background

- + Fever is associated with poorer neurological outcome after stroke
 - + Fever increases infarct size in experimental stroke
 - + Many patients with acute stroke develop a febrile infection
- ✘ There are no adequately sized trials guiding temperature management after stroke
- ✘ It is common practice treat fever (and its cause) when the temperature reaches 37.5 °C

GENERAL STROKE TREATMENT

Recommendations (1/4)

- Intermittent monitoring of neurological status, pulse, blood pressure, temperature and oxygen saturation is recommended for 72 hours in patients with significant persisting neurological deficits (**Class IV, GCP**)
- Oxygen should be administered if sPO_2 falls below 95% (**Class IV, GCP**)
- Regular monitoring of fluid balance and electrolytes is recommended in patients with severe stroke or swallowing problems (**Class IV, GCP**)

GENERAL STROKE TREATMENT

Recommendations (2/4)

- Normal saline (0.9%) is recommended for fluid replacement during the first 24 hours after stroke (**Class IV, GCP**)
- Routine blood pressure lowering is not recommended following acute stroke (**Class IV, GCP**)
- Cautious blood pressure lowering is recommended in patients with any of the following; extremely high blood pressures (>220/120 mmHg) on repeated measurements, or severe cardiac failure, aortic dissection, or hypertensive encephalopathy (**Class IV, GCP**)

GENERAL STROKE TREATMENT

Recommendations (3/4)

- Abrupt blood pressure lowering should be avoided (**Class II, Level C**)
- Low blood pressure secondary to hypovolemia or associated with neurological deterioration in acute stroke should be treated with volume expanders (**Class IV GCP**)
- Monitoring serum glucose levels is recommended (**Class IV, GCP**)
- Treatment of serum glucose levels $>180\text{mg/dl}$ ($>10\text{mmol/l}$) with insulin titration is recommended (**Class IV, GCP**)

GENERAL STROKE TREATMENT

Recommendations (4/4)

- Severe hypoglycemia (<50 mg/dl [<2.8 mmol/l]) should be treated with intravenous dextrose or infusion of 10–20% glucose (**Class IV, GCP points**)
- The presence of pyrexia (temperature $>37.5^{\circ}\text{C}$) should prompt a search for concurrent infection (**Class IV, GCP**)
- Treatment of pyrexia ($>37.5^{\circ}\text{C}$) with acetaminophen and fanning is recommended (**Class III, Level C**)
- Antibiotic prophylaxis is not recommended in immunocompetent patients (**Class II, Level B**)

ANTIPLATELET THERAPY

× Background

- + Aspirin was tested in large RCTs in acute (<48 h) stroke^{1,2}
- + Significant reduction was seen in death and dependency (NNT 70) and recurrence of stroke (NNT 140)
- + A phase 3 trial for the glycoprotein-IIb-IIIa antagonist abciximab was stopped prematurely because of an increased rate of bleeding³

1: International-Stroke-Trial: Lancet (1997) 349:1569-1581

2: CAST-Collaborative-Group: Lancet (1997) 349:1641-1649

3: Adams HP, Jr. et al.: Stroke (2007)

ANTICOAGULATION

- ✘ Unfractionated heparin
 - + No formal trial available testing standard i.v. heparin
 - + IST showed no net benefit for s.c. heparin treated patients because of increased risk of ICH¹
- ✘ Low molecular weight heparin
 - + No benefit on stroke outcome for low molecular heparin
- ✘ Heparinoid (orgaran)
 - + TOAST trial neutral²

1: International-Stroke-Trial: Lancet (1997) 349:1569-1581

2: TOAST Investigators: JAMA (1998) 279:1265-72.

NEUROPROTECTION

- ✘ No adequately sized trial has yet shown significant effect in predefined endpoints for any neuroprotective substance

SPECIFIC TREATMENT

Recommendations (4/5)

- Aspirin (160–325 mg loading dose) should be given within 48 hours after ischemic stroke **(Class I, Level A)**
- If thrombolytic therapy is planned or given, aspirin or other antithrombotic therapy should not be initiated within 24 hours **(Class IV, GCP)**
- The use of other antiplatelet agents (single or combined) is not recommended in the setting of acute ischemic stroke **(Class III, Level C)**
- The administration of glycoprotein-IIb-IIIa inhibitors is not recommended **(Class I, Level A)**

SPECIFIC TREATMENT

Recommendations (5/5)

- Early administration of unfractionated heparin, low molecular weight heparin or heparinoids is not recommended for the treatment of patients with ischemic stroke (**Class I, Level A**)
- Currently, there is no recommendation to treat ischemic stroke patients with neuroprotective substances (**Class I, Level A**)

ELEVATED INTRACRANIAL PRESSURE

- ✘ Basic management
 - + Head elevation up to 30°
 - + Pain relief and sedation
 - + Osmotic agents (glycerol, mannitol, hypertonic saline)
 - + Ventilatory support
 - + Barbiturates, hyperventilation
 - + Achieve normothermia
- ✘ Hypothermia may reduce mortality¹

ELEVATED INTRACRANIAL PRESSURE

- ✘ Malignant MCA/hemispheric infarction
 - + Pooled analysis of three European RCTs (N=93)^{1,2}:
 - ✘ Significantly decreases mortality after 30 days
 - ✘ Significantly more patients with mRS ≤ 4 or mRS ≤ 3 in the decompressive surgery group after one year
 - ✘ No increase of patients surviving with mRS=5
 - + Surgery should be done within 48 hours^{1,2}
 - + Side of infarction did affect outcome^{1,2}
 - + Age >50 years is a predictor for poor outcome³

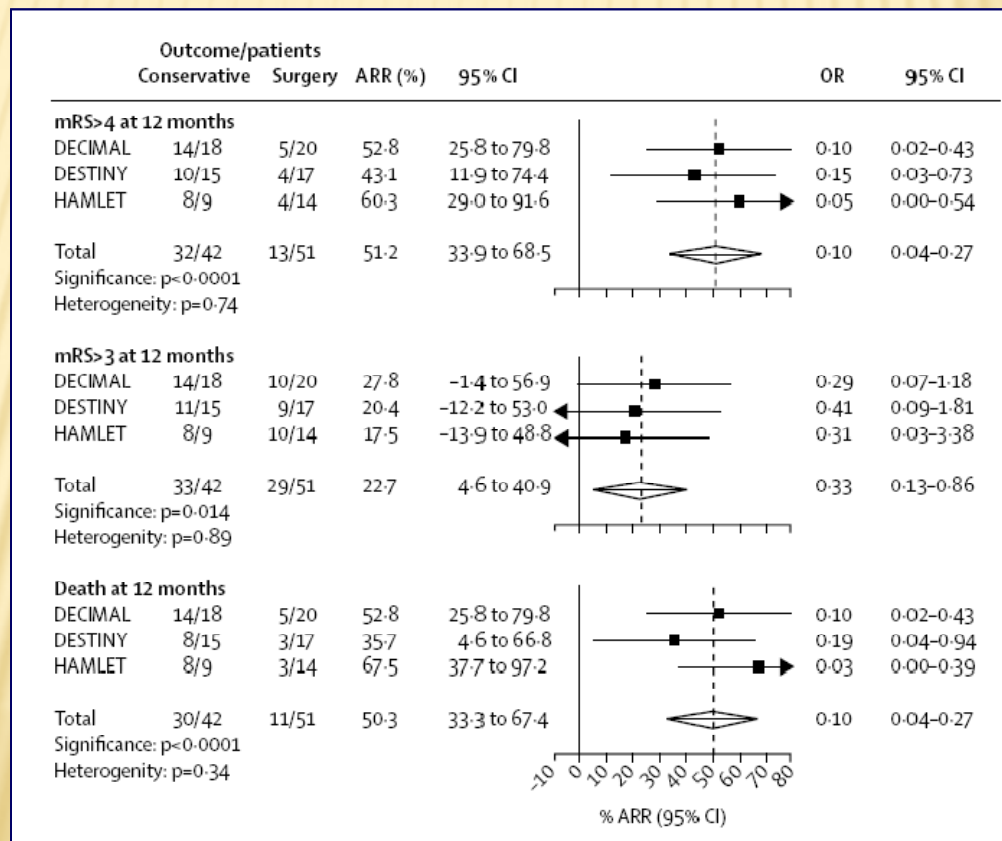
1: Vahedi K et al.: Lancet Neurol (2007) 6:215-22

2: Jüttler E et al.: Stroke (2007) 38:2518-25

3: Gupta R et al.: Stroke (2004) 35:539-43

ELEVATED INTRACRANIAL PRESSURE

Absolute risk reduction (ARR) and odds ratio (OR) for unfavorable outcome at 12 months: combined analysis of decompression trials¹



1: Vahedi K et al.: Lancet Neurol (2007) 6:215-22

ELEVATED INTRACRANIAL PRESSURE

Recommendations (1/2)

- Surgical decompressive therapy within 48 hours after symptom onset is recommended in patients up to 60 years of age with evolving malignant MCA infarcts (**Class I, Level A**)
- Osmotherapy can be used to treat elevated intracranial pressure prior to surgery if this is considered (**Class III, Level C**)

ELEVATED INTRACRANIAL PRESSURE

Recommendations (2/2)

- No recommendation can be given regarding hypothermic therapy in patients with space-occupying infarctions (**Class IV, GCP**)
- Ventriculostomy or surgical decompression can be considered for treatment of large cerebellar infarctions that compress the brainstem (**Class III, Level C**)

MANAGEMENT OF COMPLICATIONS

- ✘ Aspiration and pneumonia
 - + Bacterial pneumonia is one of the most important complications in stroke patients¹
 - + Preventive strategies
 - ✘ Withhold oral feeding until demonstration of intact swallowing, preferable using a standardized test
 - ✘ Nasogastric (NG) or percutaneous enteral gastrostomy (PEG)
 - ✘ Frequent changes of the patient's position in bed and pulmonary physical therapy
 - + Prophylactic administration of levofloxacin is not superior to optimal care²

1: Weimar C et al.: Eur Neurol (2002) 48:133-40

2: Chamorro A et al.: Stroke (2005) 36:1495-500

MANAGEMENT OF COMPLICATIONS

✘ Urinary tract infections

- + Most hospital-acquired urinary tract infections are associated with the use of indwelling catheters¹
- + Intermittent catheterization does not reduce the risk of infection
- + If urinary infection is diagnosed, appropriate antibiotics should be chosen following basic medical principles

MANAGEMENT OF COMPLICATIONS

- ✘ Deep vein thrombosis and pulmonary embolism
 - + Risk might be reduced by good hydration and early mobilization
 - + Low-dose LMWH reduces the incidence of both DVT (OR 0.34) and pulmonary embolism (OR 0.36), without a significantly increased risk of intracerebral (OR 1.39) or extracerebral haemorrhage (OR 1.44)^{1,2}

1: Diener HC et al.: Stroke (2006) 37:139-44

2: Sherman DG et al.: Lancet (2007) 369:1347-55

MANAGEMENT OF COMPLICATIONS

✘ Pressure ulcer

- + Use of support surfaces, frequent repositioning, optimizing nutritional status, and moisturizing sacral skin are appropriate preventive strategies¹

✘ Seizures

- + Prophylactic anticonvulsive treatment is not beneficial

✘ Agitation

- + Causal treatment must precede any type of sedation or antipsychotic treatment

MANAGEMENT OF COMPLICATIONS

✘ Falls

- + Are common in every stage of stroke treatment
- + Risk factors include cognitive impairment, depression, polypharmacy and sensory impairment¹
- + A multidisciplinary package focusing on personal and environmental factors might be preventive²
- + Exercise, calcium supplements and bisphosphonates improve bone strength and decrease fracture rates in stroke patients^{3,4}

1: Aizen E et al.: Arch Gerontol Geriatr (2007) 44:1-12

2: Oliver D et al.: BMJ (2007) 334:82

3: Pang MY et al.: Clin Rehabil (2006) 20:97-111

4: Sato Y et al.: Cerebrovasc Dis (2005) 20:187-92

MANAGEMENT OF COMPLICATIONS

✘ Dysphagia and feeding

- + Dysphagia occurs in up to 50% of patients with unilateral hemiplegic stroke and is an independent risk-factor for poor outcome¹
- + For patients with continuing dysphagia, options for enteral nutrition include NG or PEG feeding
- + PEG does not provide better nutritional status or improved clinical outcome, compared to NG^{2,3}

1: Martino R et al.: Stroke (2005) 36:2756-63

2: Dennis MS et al.: Lancet (2005) 365:764-72

3: Callahan CM et al.: J Am Geriatr Soc (2000) 48:1048-54

MANAGEMENT OF COMPLICATIONS

Recommendations (1/4)

- Infections after stroke should be treated with appropriate antibiotics (**Class IV, GCP**)
- Prophylactic administration of antibiotics is not recommended, and levofloxacin can be detrimental in acute stroke patients (**Class II, Level B**)
- Early rehydration and graded compression stockings are recommended to reduce the incidence of venous thromboembolism (**Class IV, GCP**)
- Early mobilization is recommended to prevent complications such as aspiration pneumonia, DVT and pressure ulcers (**Class IV, GCP**)

MANAGEMENT OF COMPLICATIONS

Recommendations (2/4)

- Low-dose s.c. heparin or low molecular weight heparins should be considered for patients at high risk of DVT or pulmonary embolism (**Class I, Level A**)
- Administration of anticonvulsants is recommended to prevent recurrent seizures (**Class I, Level A**)
- Prophylactic administration of anticonvulsants to patients with recent stroke who have not had seizures is not recommended (**Class IV, GCP**)
- An assessment of falls risk is recommended for every stroke patient (**Class IV, GCP**)

MANAGEMENT OF COMPLICATIONS

Recommendations (3/4)

- Calcium/vitamin-D supplements are recommended in stroke patients at risk of falls (**Class II, Level B**)
- Bisphosphonates (alendronate, etidronate and risedronate) are recommended in women with previous fractures (**Class II, Level B**)
- In stroke patients with urinary incontinence, specialist assessment and management is recommended (**Class III, Level C**)
- Swallowing assessment is recommended but there are insufficient data to recommend a specific approach for treatment (**Class III, GCP**)

MANAGEMENT OF COMPLICATIONS

Recommendations (4/4)

- Oral dietary supplements are only recommended for non-dysphagic stroke patients who are malnourished (**Class II, Level B**)
- Early commencement of nasogastric (NG) feeding (within 48 hours) is recommended in stroke patients with impaired swallowing (**Class II, Level B**)
- Percutaneous enteral gastrostomy (PEG) feeding should not be considered in stroke patients in the first 2 weeks (**Class II, Level B**)

REHABILITATION

✘ Early rehabilitation

- + More than 40 % of stroke patients need active rehabilitation
- + Active rehabilitation should start early, providing the patient is clinically stable
- + Passive rehabilitation should be given if the patient is unconscious or paralyzed
- + Rehabilitation should be continued as long as perceptable recovery is taking place

REHABILITATION

- ✘ Multidisciplinary stroke team for rehabilitation
 - + Stroke physician
 - + Nurses experienced in stroke management
 - + Physiotherapist trained in stroke rehabilitation
 - + Occupational therapist skilled in stroke
 - + Speech therapist familiar with speech problems in stroke patients
 - + Neuropsychologist accustomed to stroke rehabilitation
 - + Social worker familiar with the problems of stroke patients

SETTING OF REHABILITATION

Recommendations (1/2)

- Admission to a stroke unit is recommended for acute stroke patients to receive coordinated multidisciplinary rehabilitation (**Class I, Level A**)
- Early discharge from stroke unit care is possible in medically stable patients with mild or moderate impairment providing that rehabilitation is delivered in the community by a multidisciplinary team with stroke expertise (**Class I, Level A**)

SETTING OF REHABILITATION

Recommendations (2/2)

- Rehabilitation should be continued after discharge during the first year after stroke **(Class II, Level A)**
- Early initiation of rehabilitation is recommended **(Class III, Level C)**
- It is recommended that the duration and intensity of rehabilitation is increased **(Class II, Level B)**

ELEMENTS OF REHABILITATION

Recommendations (1/3)

- Physiotherapy is recommended, but the optimal mode of delivery is unclear (**Class I, Level A**)
- Occupational therapy is recommended, but the optimal mode of delivery is unclear (**Class I, Level A**)
- While assessment for communication deficits is recommended, there are insufficient data to recommend specific treatments (**Class III, GCP**)
- Information should be provided to patient and carers but evidence does not support use of a dedicated stroke liaison service for all patients (**Class II, Level B**)

ELEMENTS OF REHABILITATION

Recommendations (2/3)

- Rehabilitation must be considered for all stroke patients, but there is limited evidence to guide appropriate treatment for the most severely disabled **(Class II, Level B)**
- While assessment for cognitive deficits appears desirable, there are insufficient data to recommend specific treatments **(Class I, Level A)**
- Patients should be monitored for depression during hospital stay and throughout follow up **(Class IV, Level B)**

ELEMENTS OF REHABILITATION

Recommendations (3/3)

- Drug therapy and non-drug interventions are recommended to improve mood (**Class I, Level A**)
- Drug therapy should be considered to treat post stroke emotionalism (**Class II, Level B**)
- Tricyclic or anticonvulsant therapy are recommended to treat post-stroke neuropathic pain in selected patients (**Class III, Level B**)
- Botulinum toxin should be considered to treat post-stroke spasticity, but functional benefits are uncertain (**Class III, Level B**)