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
  - $O_2$ 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
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.
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 outcome
- It is common practice to treat hyperglycemia with insulin when blood glucose exceeds 180mg/dl (10mmol/l)

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 to 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)*
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)
**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 >180mg/dl (>10mmol/l) with insulin titration is recommended *(Class IV, GCP)*
**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°C) should prompt a search for concurrent infection (**Class IV, GCP**)
- Treatment of pyrexia (>37.5°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 bleeding\(^3\)

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 ICH\(^1\)

- Low molecular weight heparin
  - No benefit on stroke outcome for low molecular heparin

- Heparinoid (orgaran)
  - TOAST trial neutral\(^2\)

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**

<table>
<thead>
<tr>
<th>Recommendations (5/5)</th>
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<tr>
<td>▪ Early administration of unfractionated heparin, low molecular weight heparin or heparinoids is not recommended for the treatment of patients with ischemic stroke <em>(Class I, Level A)</em></td>
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<td>▪ Currently, there is no recommendation to treat ischemic stroke patients with neuroprotective substances <em>(Class I, Level A)</em></td>
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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 mortality

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 outcome\(^3\)

ELEVATED INTRACRANIAL PRESSURE

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

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)
### 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 patients\(^1\)
  - 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 care\(^2\)

MANAGEMENT OF COMPLICATIONS

- Urinary tract infections
  + Most hospital-acquired urinary tract infections are associated with the use of indwelling catheters\(^1\)
  + 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)

MANAGEMENT OF COMPLICATIONS

- Pressure ulcer
  - Use of support surfaces, frequent repositioning, optimizing nutritional status, and moisturizing sacral skin are appropriate preventive strategies\(^1\)

- Seizures
  - Prophylactic anticonvulsive treatment is not beneficial

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

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MANAGEMENT OF COMPLICATIONS

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

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 outcome\(^1\)
- 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\(^2,3\)

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

- Drug therapy should be considered to treat post-stroke emotionalism \textit{(Class II, Level B)}

- Tricyclic or anticonvulsant therapy are recommended to treat post-stroke neuropathic pain in selected patients \textit{(Class III, Level B)}

- Botulinum toxin should be considered to treat post-stroke spasticity, but functional benefits are uncertain \textit{(Class III, Level B)}