Rehabilitation of arm paresis after stroke

DGNR S2e practice guideline
Handout based on a talk held at the WCNR 2010

For full text see:
Platz T. Rehabilitative Therapie bei Armparese nach Schlaganfall.
Question

PICO

Patient characteristics
do among stroke patients with arm paresis

Interventions
rehabilitation therapy (e.g., physiotherapy, occupational therapy, acupuncture, electrostimulation, robot-assisted therapy, biofeedback-therapy, medication)

Comparison
with different intensities (e.g., augmented exercise therapy time) or different contents

Outcome
lead to a reduction of paresis, improvement of active movement capacities, strength, or arm function?
Literature search - RCTs

PubMed search
Patient characteristics
(Cerebrovascular Accident OR Stroke OR cerebrovascular disorders)
AND (Upper Extremity OR arm)
Intervention
AND (Rehabilitation OR Physical Therapy Modalities OR Biofeedback OR Durable Medical Equipment OR Occupational therapy OR exercise therapy OR physiotherapy OR therapy )

Fields: All fields, limits: Human, Randomized Controlled Trial
17.06.2006 245 → 61 selected references
Hand search → 48 additional selected references

References 109 selected references (10.2008)

Literature search - Reviews

PubMed search
Metaanalysis
17.05.2008 7 → 5 selected reviews

Cochrane Library search
06.2007 → 6 selected reviews
Hand search
10.2008 → 1 selected review

References 12 selected reviews (10.2008)
Question
- Systematic literature search
- Critical appraisal
- Synopsis & recommendations

Arm-Rehabilitation

CP development was based on
- a systematic literature search
- a critical appraisal of individual references
- a critical summary of the evidence available for each type of intervention, i.e., a best evidence synthesis
- a rating of the certainty of the estimated therapeutic effect
- consensus-based recommendations derived from the body of evidence

Among other aspects the methodology includes the use of the
- Oxford Centre for Evidence-based Medicine Levels of Evidence
- Grading of Recommendations Assessment, Development and Evaluation (GRADE) system
### Critical appraisal of individual references - RCTs

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were study participants randomly allocated?</td>
<td>105</td>
<td>1</td>
</tr>
<tr>
<td>2. Were participants (P) and examiner (E) blinded with regard to treatment allocation?</td>
<td>81</td>
<td>25</td>
</tr>
<tr>
<td>3. Was randomisation kept secret (allocation concealment)?</td>
<td>39</td>
<td>67</td>
</tr>
<tr>
<td>4. Was the study design prospective?</td>
<td>106</td>
<td>0</td>
</tr>
<tr>
<td>5. Were inclusion and exclusion criteria clearly defined?</td>
<td>102</td>
<td>4</td>
</tr>
<tr>
<td>6. Were experimental and control group(s) comparable at baseline?</td>
<td>86</td>
<td>21</td>
</tr>
<tr>
<td>7. Were outcome parameters clearly defined and adequately assessed?</td>
<td>103</td>
<td>3</td>
</tr>
<tr>
<td>8. Received groups - with exception of the study treatment - comparable treatment?</td>
<td>65</td>
<td>41</td>
</tr>
<tr>
<td>9. Had side effects been documented?</td>
<td>39</td>
<td>67</td>
</tr>
<tr>
<td>10. Were all participants analysed in the group they had originally been allocated to (intention-to-treat)?</td>
<td>58</td>
<td>54</td>
</tr>
<tr>
<td>11. Had adequate follow-up assessments been performed?</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>12. Do the data justify the conclusions that had been drawn?</td>
<td>103</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Overall validity

<table>
<thead>
<tr>
<th>Overall validity</th>
<th>++</th>
<th>+</th>
<th>-</th>
<th>--</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Number of references

<table>
<thead>
<tr>
<th>Number of references</th>
<th>5</th>
<th>93</th>
<th>8</th>
<th>0</th>
</tr>
</thead>
</table>

*no = no or not documented

---

### Critical appraisal of individual references - Reviews

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Was the question addressed clearly described and distinct</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>2. Was the literature search adequately described?</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>3. Was the quality of the selected references assessed?</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>4. Were inclusion and exclusion criteria for references defined?</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>5. Did the review consider all relevant positive and negative effects of the intervention(s)?</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>6. Was it meaningful to combine the studies that had been selected for the review?</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>7. Had adequate follow-up assessments been considered?</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>8. Justify the results the conclusions?</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Overall validity

<table>
<thead>
<tr>
<th>Overall validity</th>
<th>++</th>
<th>+</th>
<th>-</th>
<th>--</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Number of references

<table>
<thead>
<tr>
<th>Number of references</th>
<th>4</th>
<th>8</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>
Synopsis & recommendations

Quality of evidence and definitions

<table>
<thead>
<tr>
<th>Quality of evidence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality</td>
<td>Further research is very unlikely to change our confidence in the estimate of effect</td>
</tr>
<tr>
<td>Moderate quality</td>
<td>Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate</td>
</tr>
<tr>
<td>Low quality</td>
<td>Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate</td>
</tr>
<tr>
<td>Very low quality</td>
<td>Any estimate of effect is very uncertain</td>
</tr>
</tbody>
</table>

GRADE: an emerging consensus on rating quality of evidence and strength of recommendations

Synopsis & recommendations

Consensus-based recommendations

A strong recom. – “ought to”
B recommendation – “should”
0 open – “can”

GRADE: an emerging consensus on rating quality of evidence and strength of recommendations
Arm-Rehabilitation

- Question
- Systematic literature search
- Critical appraisal
- Synopsis & recommendations

Consensus-based recommendations

Time, duration, and intensity of active training

- Rehabilitation of arm motor control should start early (very low quality, B)
- If deficits remain and effects of therapy can be documented arm rehabilitation is recommended in later phases (very low quality, B)
- For the subacute phase, >= 30 minutes daily additional therapy should be provided when additional recovery or its acceleration is intended (high quality, A)
Consensus-based recommendations

Arm-Rehabilitation

Classical physiotherapy schools
- a differential recommendation
  can not be given (high quality, 0)

Sport therapeutic and psychological strategies
- a specific recommendation can not be given (low quality, 0)

Repetitive training of selected movements
- e.g., shoulder movements, aimed movements, finger sequence
  movements, can be performed (low quality, 0)

Consensus-based recommendations

Arm-Rehabilitation

Bilateral training
- training should be active and can include bilateral training (moderate
  quality, B)

Circuit training
- 3 hrs. per week for several weeks should be considered, esp. in the
  chronic phase (moderate quality, B)

Self training with intermittent supervision
- should be considered when the arm is already functional (90 minutes
  therapist – patient – contact time per week) (low quality, B)
Consensus-based recommendations

**Impairment-oriented training**
- Impairment-oriented training offers two modular therapies, i.e., the *Arm Basis Training (ABT)* for severe arm paresis and the *Arm Ability Training (AAT)* for mild arm paresis.

**Arm Basis Training**
- The Arm Basis Training should be performed in addition to standard care when improvement of selective arm movements is intended with subacute stroke patients with severe arm paresis (moderate quality, B).

**Arm Ability Training**
- The Arm Ability Training should be performed in addition to standard care when improvement of sensorimotor function is intended with subacute stroke patients with mild arm paresis (moderate quality, B).

Consensus-based recommendations

**Task-oriented training**
- Task-oriented training is a treatment option. A differential recommendation cannot be given (high quality, 0).

**Constraint-induced movement therapy (CIMT)**
- CIMT (or modified CIMT) ought to be offered to (subacute and chronic) stroke pts. with at least partially preserved hand function and lack of spontaneous use of their affected hand (learnt non-use) when it can be organised (high quality, A).
- Modified CIMT (mCIMT) is less intensive (e.g., 2 hours therapy, 5 – 6 hrs. restriction) and can therefore more easily be organised.
### Consensus-based recommendations

<table>
<thead>
<tr>
<th>Arm-Rehabilitation</th>
</tr>
</thead>
</table>

#### Trunk restraint
- Trunk restraint during reach to grasp movement training can be used when compensatory trunc movements are observed (low quality, 0)

#### Mirror therapy
- Mirror therapy should be performed in addition to standard care when improvement of motor function is intended with subacute or chronic stroke patients (moderate quality, B)

---

<table>
<thead>
<tr>
<th>Arm-Rehabilitation</th>
</tr>
</thead>
</table>

#### Mental training
- Daily mental training (10 – 30 minutes) with imagined use of the affected hand during daily life should be performed in addition to active motor training when improvement of motor function is intended with subacute or chronic stroke patients with residual motor function (moderate quality, B)

#### Action observation
- Alternating observation of actions (video) followed by active training can be used when improvement of motor function is intended with subacute or chronic stroke patients (low quality, 0)
**Consensus-based recommendations**

**Arm-Rehabilitation**

**Neuromuscular electrical stimulation (NMES)**

- Types: NMES, EMG-ES, FES

- NMES (shoulder, forearm) and EMG-ES (forearm) can be used when improvements of arm function are intended with severe arm paresis (moderate quality, 0)
- When EMG-ES of forearm extensors is used, bilateral training (with the lesser affected hand) should be performed (moderate quality, B)
- Therapy can be provided in groups, with selected patients also as home training (very low quality, 0)
- In patients with severe hand paresis and partially preserved proximal arm function multi-channel FES with grasp and release should be considered (moderate quality, 0)
- Exclusion criteria should be taken into consideration

**Consensus-based recommendations**

**Arm-Rehabilitation**

**Arm-Robot-Therapy**

- In patients with severe paresis arm-robot-therapy should be applied as specifically indicated when improvement of selective arm movements is intended and the therapy can be offered (moderate quality, B)
### Consensus-based recommendations

<table>
<thead>
<tr>
<th>Arm-Rehabilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Somatosensory stimulation</strong></td>
</tr>
<tr>
<td>- Electric, pneumatic-compressive or thermic somatosensory stimulation seem to have a potential for motor rehabilitation, a recommendation can not be given (low quality, 0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>EMG-Biofeedback</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- can be used, a specific recommendation can not be given (low quality, 0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Acupuncture, electroacupuncture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- can be used, a specific recommendation can not be given (low quality, 0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arm-Rehabilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>rTMS</strong></td>
</tr>
<tr>
<td>- rTMS of the contralesional motor cortex can be used, a recommendation can not be given (low quality, 0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Epidural electric stimulation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- A specific recommendation can not be given (very low quality, 0); considering potential risks any application should be made within study protocols only</td>
</tr>
</tbody>
</table>
Consensus-based recommendations

**L-Dopa**
- L-Dopa can be used in subacute stroke patients with severe arm paresis to support the arm rehabilitation (off label) (moderate quality, 0)

**d-Amphetamine**
- A recommendation for the drug's use outside study protocols is not given (moderate quality, 0)

**Transplantation of human neuronal cells**
- A recommendation for this treatment outside study protocols is not given (very low quality, 0)

---

Arm-Rehabilitation

**Competition Network**

**Stroke**

- Question
- Systematic literature search
- Critical appraisal
- Synopsis & recommendations

**Thanks to:**
Sybille Roschka
DGNR practice guideline commission
PD Dr Kopp (AWMF)
Dipl-Psych Breer
BDH

critical appraisal
consensus (recommendations)
methodology
literature support
financial support (SR)