The Significance of Intensity of Rehabilitation of Stroke —
A Controlled Trial

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SUMMARY Of the 373 stroke patients 95 were admitted to the feasibility study of stroke rehabilitation. The patients were divided into two groups, an intensive and a normal treatment group. In this study, the functional recovery of stroke, measured by ADL and motor function was significantly better in the intensive treatment group. There was no difference in institutionalization or incidence of death between the groups. The gain of ADL and motor function was greatest during the first three months after stroke in the intensive treatment group. The conclusion is that intensified physiotherapy seems to improve the functional recovery of stroke patients.

INTENSIVE REHABILITATION as a tool to reduce disability and dependency has been criticized on the basis that much of the return could be attributed to spontaneous recovery. Lehmann et al showed that significant permanent functional gains could be made in a rehabilitation center in patients admitted even a year after the onset of stroke. It could be assumed that the improvement was not solely due to spontaneous recovery.

Garraway et al compared the management of elderly patients with acute stroke randomized to a stroke unit or to medical units. A significantly higher proportion of patients discharged from the stroke unit were assessed as independent compared with patients discharged from the medical units. In the follow-up to this study the difference in functional outcome had disappeared after a year, however.

Smith et al allocated stroke patients at random to one of three different courses of outpatient rehabilitation. Improvement was greatest in those receiving intensive treatment and least in those receiving no routine treatment.

Wood-Dauphinee et al examined the effect of interdisciplinary team care versus traditional care in a randomized controlled trial. For motor performance and functional abilities, male survivors performed better with team care. Female survivors performed better with the traditional method for motor performance, whereas in terms of functional abilities there was no difference in women between the treatment groups.

This paper compares the effectiveness of two intensities of physiotherapy attempting to assess its importance in stroke rehabilitation.

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Methods Measuring Functional Recovery

The technique for assessment of ADL and ambulation described by Lehmann et al. was modified by the authors. The following eight activities were assessed: self-feeding, dressing, bowel and bladder control, walking, bathing, toilet transfers and rising from a sitting position. A four point scale was used for all activities other than walking and bladder and bowel control as follows:

1. Totally in need of help.
2. Marked need for help.
3. Special equipment of devices are essential, needs only a little help from others.
4. Performs without aid of special equipment or help from others.

The maximum ADL score was 27. The interviews and observations were made by the study nurse or by physiotherapists who were specially trained and supervised. The physiotherapist who was responsible for measuring outcome, acted independently and was not involved in treating the patients.

A test of range of motion and strength was used to define the severity of neuromuscular disability and the presence or absence of neuromuscular recovery. In these tests, formulated by Katz and Ford, the patient was asked to perform a series of seven manoeuvres with the upper limb and five with the lower limb on the affected side. All manoeuvres were tested using defined positions for evaluating motion.

Each movement was assessed with patients in a supine position, as first demonstrated by the examiner. Every manoeuvre was scored with a 4-point scale as follows:

1. No movement at all.
2. Only a little movement.
3. Partial movement.
4. Full movement.

Treatment of Patients in the Study and Measuring the Amount of Therapy

The patients in NT received the normal physical therapy in the conventional medical wards, the duration and amount of which was determined by the internists. The patients were discharged from these departments to their homes or, if it was not possible, to old age homes or chronic care departments of community hospitals, where some of them were able to obtain physiotherapy. The guiding principle was, however, that no patient’s therapy was worsened as a result of the study.

The patients in IT were also initially treated in medical wards of the local University Hospital. After this initial period the majority of patients was admitted to Vaajasalo Hospital. This hospital is a former epilepsy hospital which is now a part of the regional neurological health care organization. Its one department was redesigned into a rehabilitation unit with the purpose especially to treat stroke patients. The rest of patients in IT were treated in neurological wards of the University Hospital. The principle was that physiotherapy should be given as long as functional recovery was taking place or the patient could perform independently at home. The amount of therapy was measured as the number of sessions of therapy given by physical, occupational or speech therapist. Usually one physiotherapy session lasted half an hour. When a patient in IT was in the medical ward of University Hospital, she/he was treated by a physiotherapist twice a day.

Statistical Methods

The significance of the difference between the means of two independent groups was calculated with student’s t-test. The analysis of covariance was applied in the study, when the material could be corrected in regard to the confounding factors.

Results

The Amount of Treatment

There was no statistically significant difference between the groups according to the length of stay in hospital, six and twelve months after the stroke.

At the three-month follow-up, patients in IT had significantly more rehabilitation days than NT (p < 0.05). However, at 6 and 12 months after the stroke there was no difference (table 2). At the three-month follow-up, there was a statistically significant difference between study groups in terms of the frequency of treatment by a physical therapist (p < 0.01) and assis-
Effect of Rehabilitation on Functional Recovery and Outcome of Patients

In the analysis of covariance there was a difference of 28% (p < 0.01) between study groups for ADL scores at 3 month follow-up (table 4) in favour of IT. The difference persisted also at 6 and 12 months, but was not statistically significant. In this analysis the difference in the initial ADL score between the study groups was taken into consideration, and a covariance adjustment was made to allow for this difference. The initial ADL score was lower in IT (p < 0.05), but after three months the situation was reversed. The effect of age was statistically significant (p < 0.001), while that of sex and interaction of sex and study groups was not at any time point of follow-up.

There was significant difference between study groups in gain of motor function at 3 and 6 months (p < 0.01), and 12 months (p < 0.05) (table 5). As was the case with ADL, the initial motor function score was also significantly (p < 0.001) different in the two groups. Age, sex and interaction of sex and study group had no statistically significant effect.

Outcome of Patients

There were only five recurrences of stroke, three of them in IT. There was no statistical difference between the groups. Six months after the stroke the mortality was slightly higher in NT, and at the 12-month follow-up the patients of this group were more often in an

<table>
<thead>
<tr>
<th>Time period from the stroke</th>
<th>Rehabilitation days</th>
<th>Significance of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intensive treatment</td>
<td>Normal treatment</td>
</tr>
<tr>
<td>3 months</td>
<td>45.7 ± 2.7</td>
<td>37.1 ± 3.5</td>
</tr>
<tr>
<td>(n = 50)</td>
<td>(n = 43)</td>
<td>p &lt; 0.05</td>
</tr>
<tr>
<td>6 months</td>
<td>68.2 ± 5.0</td>
<td>63.0 ± 6.9</td>
</tr>
<tr>
<td>(n = 48)</td>
<td>(n = 41)</td>
<td>n.s.</td>
</tr>
<tr>
<td>12 months</td>
<td>85.4 ± 7.7</td>
<td>84.3 ± 11.3</td>
</tr>
<tr>
<td>(n = 47)</td>
<td>(n = 39)</td>
<td>n.s.</td>
</tr>
</tbody>
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Effect of Rehabilitation on Functional Recovery and Outcome of Patients

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<th>ADL score</th>
<th>Relative difference</th>
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<tbody>
<tr>
<td></td>
<td>Intensive treatment</td>
<td>Normal treatment</td>
</tr>
<tr>
<td>One week</td>
<td>10.5 ± 1.3</td>
<td>13.6 ± 1.7</td>
</tr>
<tr>
<td>(n = 50)</td>
<td>(n = 45)</td>
<td>23†</td>
</tr>
<tr>
<td>3 months*</td>
<td>21.0 ± 1.3</td>
<td>16.3 ± 1.7</td>
</tr>
<tr>
<td>(n = 41)</td>
<td>(n = 33)</td>
<td>29‡</td>
</tr>
<tr>
<td>6 months*</td>
<td>21.6 ± 1.2</td>
<td>18.6 ± 1.5</td>
</tr>
<tr>
<td>(n = 42)</td>
<td>(n = 35)</td>
<td>16</td>
</tr>
<tr>
<td>12 months*</td>
<td>21.1 ± 1.3</td>
<td>18.4 ± 1.6</td>
</tr>
<tr>
<td>(n = 42)</td>
<td>(n = 35)</td>
<td>15</td>
</tr>
</tbody>
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*Difference between means in relation to normal treatment group mean, statistical significance by ANCOVA with covariance adjustment for age (p < 0.01) and one-week ADL score (p < 0.001) and with sex as another factor (n.s.), indicated as tp < 0.05 and tp < 0.01.

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Discussion

On the basis of historical data, the groups were comparable in terms of age, diagnostic distribution, social class, working capacity, ADL, prevalence of primary cardiovascular diseases and diabetes mellitus. However, the ADL and motor function scores differed at the time of one week follow-up between the two groups so that IT had lower scores. This fact was equalized in the analysis of covariance. Length of therapy was considered as the number of days including skilled physiotherapy, while the frequency as the number of sessions of therapy was given.

Three months after the stroke patients in IT had received statistically more physiotherapy and more frequent treatment by a physical therapist and an assistant physical therapist. At the 6- and 12-month follow-ups the differences were not statistically significant. The amount of occupational therapy was quite low, and there was no difference between the groups.

In the study of Smith et al, patients in the intensive care group received twice as much physio- and occupational therapy as those in conventional rehabilitation. Garraway et al reported that patients in medical units had significantly longer and more frequent treatment than those in the stroke unit although these latter patients had received more occupational therapy.

One problem in controlled rehabilitation studies is that many of the control patients begin the rehabilitation on their own initiative. Furthermore, the general level of stroke care and the attitudes of staff may improve as a result of the study.

The amount of speech and occupational therapy was quite low among patients, and there was no difference in the amounts between the study groups. In addition to physiotherapy, the result may have been influenced by two confounding factors, namely the possible difference in general care of the IT and NT groups and the difference in atmosphere and attendance of the staff in the hospitals the patients were treated. These things can rarely be avoided in any rehabilitation study, since the therapy can never be "blind" and the patient groups can rarely be avoided in any rehabilitation study, since the therapy can never be "blind" and the patient groups often are treated in separate wards.

Patients with the best improvement were discharged home, so that active therapy was usually no longer possible. Patients with slower recovery were more often institutionalized and thus continued to receive physical therapy. The proportion of patients of both groups in institution after six and twelve months was approximately equal. Garraway et al. and Brocklehurst et al. have stated that the quantity of therapy was greatest in the groups of patients who were most disabled. These factors may also have affected the amount of therapy given to IT and NT patients and may partly explain the disappearance of statistical significance after the three month follow-up.

Rehabilitation seems to improve the prognosis of functional recovery of stroke patients. The motor function scores of the intensively treated patients were significantly higher than that of those who received only routine treatment. The improvement was greatest during the first three months after stroke. The impact of rehabilitation on activities of daily living appears smaller than on motor function. The utilization of occupational therapy at the time of the study was relatively small because of the lack of qualified personnel. The significance of occupational therapy to the ADL has been clearly shown. In the present data an effect of rehabilitation was detected only during the three first months. There was a difference in length and frequency of physical therapy between groups at three months, but not later on. It seems that the first three months are of special importance in the rehabilitation of stroke patients.

No effect on the outcome of patients was detected in terms of death or institutionalization in this study, even if percentually both these outcomes were slightly more common among the patients who received normal treatment. In two recent studies there was similarly a trend towards better survival in the intensively treated group of patients. The small sample size makes it rather difficult throughout the study to reach statistically significant differences between the groups. Probably some part of negative results or disappearance of differences is due to type II error.

References

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