Alterations in Upper Limb Performance and Capacity in the Early and Late Sub-acute Phases of Stroke

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Introduction

Incomplete upper limb (UL) recovery has been identified as the strongest predictor of lower health-related quality of life one year after stroke. Upper limb (UL) capacity appears to play a significant role in coping with challenges following stroke. Other studies suggest that even patients in the chronic phase can achieve meaningful improvements in UL capacity if intensive training is provided and/or if a certain level of function allows integration of the affected UL in daily activities. In many European countries, the most intensive rehabilitation is completed after three months, and at six months, the majority of patients will be back at their homes or care facilities. The course of spontaneous biological recovery indicates that no essential improvements in UL capacity should be expected after three months. The early sub-acute phase, which lasts for up to three months after a stroke, and the late sub-acute phase, which lasts for three to six months, are the transitional periods for many stroke survivors [1].

Upper limb recovery at an activity level can be described as an increase in capacity or performance using terminology from the ICF. Capacity is a measure of an individual's functional capacity and test-taking abilities. Performance reflects UL application in natural settings. Current evidence suggests that there are correlations between accelerometry and the Action Research Arm Test (ARAT), Motor Activity Log (MAL), and Fugl-Meyer Motor Assessment (FMA). UL performance as measured by accelerometers does not appear to significantly improve after the sub-acute phase of stroke. This study is an additional analysis of a cohort of subjects whose data were used in previous publications. We aimed to investigate the changes in UL capacity and performance from 3 to 6 months post-stroke. As expected, higher scores on UL capacity assessments are associated with a higher degree of UL performance in everyday life. However, several studies have found mismatches between measured UL capacity and perceived or actual UL performance. Some people achieve relatively good UL capacity without translating In addition, we wanted to investigate the connection between the actual UL performance in patients' everyday lives, as measured by accelerometers three and six months after stroke, and the UL capacity that was assessed by ARAT. Between three and six months, we predicted that the included patients' UL capacity, as measured by ARAT, and UL performance, as measured by accelerometers, would both change statistically significantly. We did not anticipate clinically relevant changes in UL capacity, which is defined as an improvement of 6 points on ARAT between three and six months after the stroke. In addition, we hypothesized that an R value of at least 0.60 would indicate a moderate association between ARAT and use ratio [2].

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Participants, design and methods

This study was an extension of an earlier prospective longitudinal study's data analysis. From June 2018 to March 2020, patients admitted to a Danish neurorehabilitation canter were included. Criteria for inclusion included: 1) Stroke, either once or multiple times; 2) within 14 days of having a stroke, admitted to neurorehabilitation; 3) a score of 10 on the Shoulder Abduction Finger Extension (SAFE) test; 4) a minimum of 18 years old; and 5) sufficient cognitive abilities to follow the procedures of the assessment. Patients who were found to have: 1) a bleeding under the brain; 2) residual UL deficits, such as those caused by a stroke; 3) if neither the accelerometry data nor the ARAT score were present. In accordance with the Declaration of Helsinki, each patient who participated in the study gave written, informed consent. The study was approved by the Central Denmark Region's regional ethics committee with the number 628213 after being reported to the Danish data protection agency. Assessments Demographic and medical data, such as sex, age, stroke type, and affected side, were gathered from the patients' medical records. Previous work based on the same cohort has been published. The ARAT was used to measure UL capacity three months and six months after the stroke. A wide variety of hand and arm activities are represented by the ARAT. Patients can receive scores anywhere from 0 (the lowest) to 57 (the highest). To accurately measure UL capacity, the ARAT is valid and reliable [3].

Secondary variables The selection of variables that were thought to have the potential to influence the relationship between UL capacity and UL performance was based on clinical reasoning or on the findings of previous studies. The selected variables were: UL pain, dominant hand affected, sex, and self-efficacy were measured at three and six months after the stroke. On a numerical scale ranging from 0 (worst) to 10, UL pain was assessed. Self-viability was enrolled with the stroke self-adequacy survey, which goes from 0-39 (best). STATA 16 was used for the analysis of the data. Descriptive statistics were used to present the medical information and demographics of the patients. When continuous variables were normally distributed, the mean and standard deviation (SD) were used to summarize them; otherwise, the median and IQR were used [4].

Discussion

In this study, we focused on UL capacity and UL performance from a cohort of 67 stroke survivors in the early and late sub- acute phases. From three to six months after the stroke, we discovered that while UL performance did not improve, UL capacity, as measured by ARAT, did. Although this is true at the group level, studies by Persson et al. have shown that large inter-individual differences can exist, so this finding is somewhat surprising considering that many studies have reported no significant improvement in UL capacity after three months. These studies, which are consistent with ours, suggest that some patients continue to significantly improve in the late subacute phase. According to Ward et al., even people with chronic stroke can significantly improve with the right amount of training. It would be clinically relevant to identify patients whose capacity is likely to continue improving over time and to modify rehabilitation services accordingly. In our review, essentially individuals in the mid-scope of ARAT scores gotten to the next level. Due to the ceiling effect on ARAT, individuals who had already reached a relatively high level of UL capacity were unable to attain a level of improvement comparable to that. Nine of the patients in our sample had a score of 57, and eight had a score of 56 at three months. Because of this, it was reasonable to anticipate that

either very little or no improvement would occur. From three to six months, people on the lower end of the scale had no change in their UL capacity. They have a poor prognosis for UL capacity and very limited rehabilitation potential if pronounced impairments persist, as suggested by previous research. According to accelerometry data, the relatively large change in capacity did not result in improved performance of the affected UL. There are mismatches between capacity and performance, and it has been reported that increased UL capacity does not necessarily translate into increased UL performance [5].

Conclusion

Nearly half of the patients whose ARAT score allowed for such an increase showed a clinically significant improvement in UL capacity from three to six months after stroke, according to our findings. Mid-range ARAT scores at three months showed that those who improved had mostly moderate UL capacity, while patients with poor UL capacity did not improve. On the other hand, the UL use ratio did not change between three and six months, which suggests either that compensatory strategies based on the performance of the unaffected UL were already too ingrained or that changes in UL capacity were not significant enough to translate into daily performance. Apps, vibrating bracelets, and other methods to remind patients to include their affected UL may contribute to the

conversion of improved UL capacity into improved performance. Expanded power and measure of physiotherapy and word related treatment with an emphasis on self-viability and move of ability to everyday execution might be justified for patients with potential for proceeded with progress.

References

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