Measurement of Motor Recovery After Stroke

Outcome Assessment and Sample Size Requirements

Pamela W. Duncan, PhD, PT; Larry B. Goldstein, MD; David Matchar, MD;
George W. Divine, PhD; and John Feussner, MD

Background and Purpose: The purpose of this study was to analyze recovery of motor function in a cohort of patients presenting with an acute occlusion in the carotid distribution. Analysis of recovery patterns is important for estimating patient care needs, establishing therapeutic plans, and estimating sample sizes for clinical intervention trials.

Methods: We prospectively measured the motor deficits of 104 stroke patients over a 6-month period to identify earliest measures that would predict subsequent motor recovery. Motor function was measured with the Fugl-Meyer Assessment. Fifty-four patients were randomly assigned to a training set for model development; 50 patients were assigned to a test set for model validation. In a second analysis, patients were stratified on basis of time and stroke severity. The sample size required to detect a 50% improvement in residual motor function was calculated for each level of impairment and at three points in time.

Results: At baseline the initial Fugl-Meyer motor scores accounted for only half the variance in 6-month motor function ($r^2=0.53$, $p<0.001$). After 5 days, both the 5-day motor and sensory scores explained 74% of the variance ($p<0.001$). After 30 days, the 30-day motor score explained 86% of the variance ($p<0.001$). Application of these best models to the test set confirmed the results obtained with the training set. Sample-size calculations revealed that as severity and time since stroke increased, sample sizes required to detect a 50% improvement in residual motor deficits decreased.

Conclusions: Most of the variability in motor recovery can be explained by 30 days after stroke. These findings have important implications for clinical practice and research. (*Stroke* 1992;23:1084–1089)

KEY WORDS • motor activity • prognosis • rehabilitation

目的

➤ **ADLについては急性期の指標で予後予測が報告されている。一方、運動機能についての報告は少ない。**

➤ **本研究では発症から6ヶ月時の運動機能を急性期の指標で予測することである。**

デザイン

- ➤ 多施設疫学研究
- ➤ 前向き観察研究
- ➤ 採用基準（40歳以上、発症から24時間以内に入院、神経学的な異常所見を認める、神経学的な異常を認める脳卒中の既往がない、TIAではない、6ヶ月以内に死亡する可能性があるような他疾患を有していない、今後塞栓性脳梗塞のリスクがある症例でないこと（新規のaf、6ヶ月以内にAMIの既往があるなど）
- ➤ 最終的に104例で解析を行った

アウトカム

- ➤ メインアウトカム：Barthel Index、Fugl-Meyer
- ➤ 測定時期：入院時、5日、30日、90日、180日

統計学的解析方法

- ➤ 入院時、5日、30日、90日のデータから180日後のFugl-Meyerを予測するため、多変量解析を実施。
- ➤ 重症度別に群分けし、ADLの回復推移をグラフ化する

結果

TABLE 2. "Best" Models for Prediction of Motor Function 6 Months After Hemispheric Ischemic Stroke

Model	r^2 (n)		
	Baseline (motor score only)	5 Days after stroke (motor and sensory scores)	30 Days after stroke (motor score only)
Training set	53.2 (54)	74.2 (52)	86.2 (53)
Test set	42.4 (50)	71.2 (49)	88.6 (48)

Amount of variance (r^2) in motor scores 6 months after stroke accounted for in each model is given. Best model at each time point in training set was confirmed in test set. Measurements for three patients were not available at 5 and 30 days.

➢ **180日のFugl-Meyerを予測するのは5日のmotor, sensory score、30日のFugl-Meyerのmotor scoreである。**
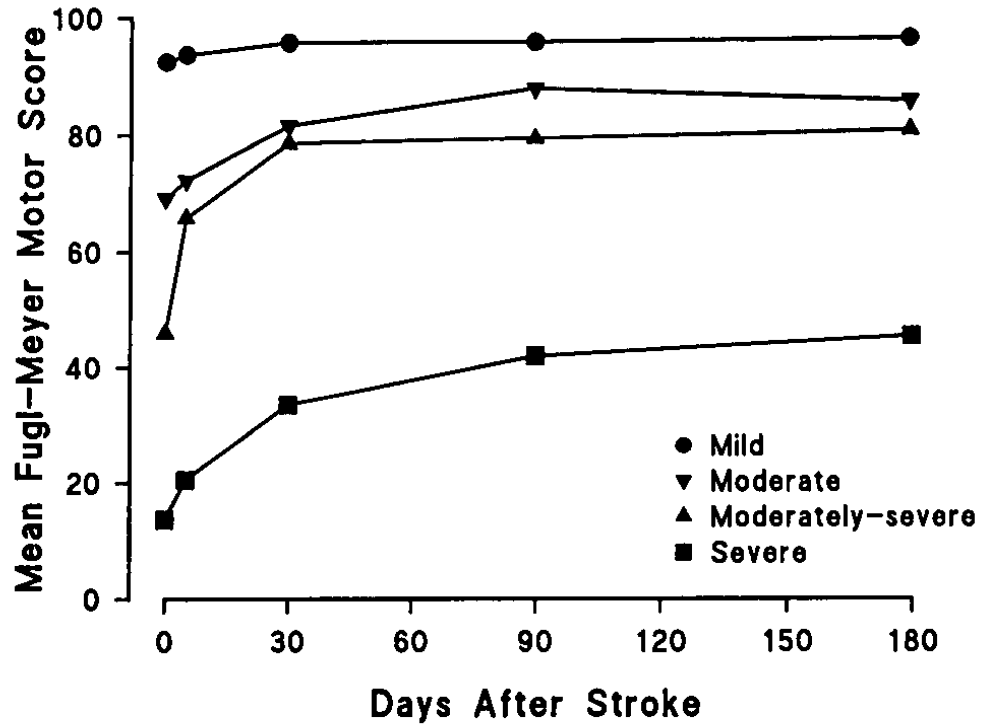
結果

FIGURE 1. *Graph showing recovery of motor function after stroke based on Fugl-Meyer motor scores. Patients are stratified into groups based on the initial severity of motor deficit measured with Fugl-Meyer Assessment (see text). Regardless of initial severity of stroke, the most dramatic recovery occurs within the first 30 days. Moderate and most severe stroke patients continue to experience some recovery for 90 days. Graph represents mean Fugl-Meyer scores.*
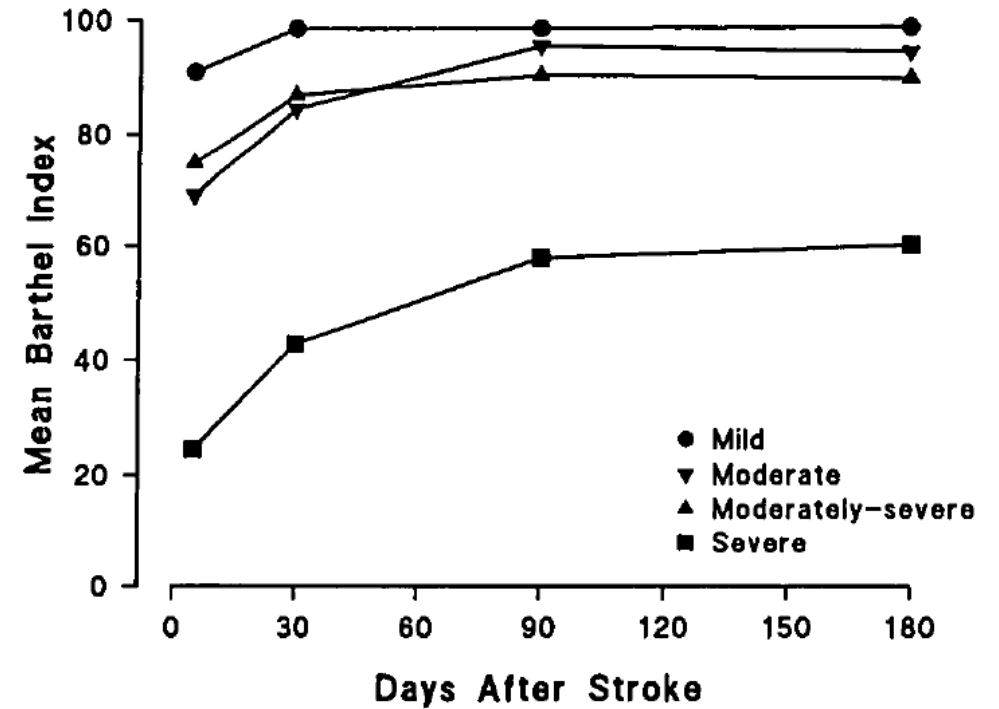
FIGURE 2. *Graph showing recovery of activities of daily living (ADL) after stroke. Patients are stratified into groups based on initial severity of motor deficit measured with Fugl-Meyer Assessment (see text). The patterns of recovery of ADL parallel motor recovery patterns measured with Fugl-Meyer Assessment. Graph represents mean ADL scores by Barthel Index.*

結果

TABLE 3. Functional Outcomes of Patients Stratified by Severity and Time After Stroke

Fugl-Meyer motor score	Barthel Index scores at 6 months			
	>60 Points		100 Points	
	%	n	%	n
Baseline status				
Severe	66	32	19	32
Moderately severe	92	13	62	13
Moderate	100	22	73	22
Mild	100	37	92	37
5-Day status				
Severe	65	31	19	31
Moderately severe	100	5	60	5
Moderate	100	11	64	11
Mild	100	53	89	53
30-Day status				
Severe	56	25	8	25
Moderately severe	75	4	25	4
Moderate	100	8	50	8
Mild	100	64	84	64

%, Percent of patients; n, number of patients.

- ➢ BI 60点以上を自立、100点をfull recoveryと定義
- ➢ 各時期のFugl-Meyerのmotor socreでBIを予測可能
- ➢ 5日でsevere以外はBI 60点以上が100%

考察

➢ 年齢、病巣や病巣の大きさ、入院前の運動機能、社会的背景などは統計学的にはFugl-Meyerの予測指標とはならなかった。

➢ 発症後5日目のFugle-Meyerの指標で、6ヶ月後のFugl-Myer scoreは70％説明できる。

➢ 但し、リハビリテーションのストラテジーは明確でなく、どんな対象者に、どんな内容、量を提供すべきか不明確。