

# **Outcome after modern neurosurgical care and formalised rehabilitation following severe brain injury**

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien vid Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinargatan 3, Göteborg, torsdagen den 10 juni kl. 9.00

av  
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The thesis is based on the following papers:

## Paper I

Sörbo A, Rydenhag B, Stibrant Sunnerhagen K, Blomqvist M, Svensson S, Emanuelson I  
**Outcome after severe brain damage, what makes the difference?**  
Brain Injury July 2005; 19(7): 493-503

## Paper II

Sörbo A, Blomqvist M, Emanuelson I, Rydenhag B  
**Psychosocial adjustment and life satisfaction until five years after severe brain damage**  
International Journal of Rehabilitation Research 2009; 32(2):139-47

## Paper III

Skoglund T, Eriksson-Ritzén C, Sörbo A, Jensen C, Rydenhag B  
**Health status and life satisfaction after decompressive craniectomy for malignant middle cerebral artery infarction**  
Acta Neurologica Scandinavica 2008; 117(5):305-10

## Paper IV

Sörbo A, Eriksson-Ritzén C, Emanuelson I, Rydenhag B  
**Outcome and life satisfaction one year after decompressive craniectomy**  
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# Outcome after modern neurosurgical care and formalised rehabilitation following severe brain injury

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## ABSTRACT

### **Aims:**

The overall aims were to evaluate the results of the treatment concepts for severe brain injury including decompressive craniectomy (DC), early rehabilitation and long-term follow-up, primarily according to the psychosocial consequences of the brain damage and life satisfaction. The first study was a cross-sectional study to assess and compare the consequences for outcome for two groups with severe traumatic brain injury (TBI) or subarachnoid haemorrhage (SAH), one group that received early, long-term formalised rehabilitation and the other that received late or no formalised rehabilitation. The second study was a descriptive, prospective study with follow-up until five years after severe TBI/SAH. The third was a retrospective study of the long-term outcome in patients with malignant middle cerebral artery infarction (MMI) who were treated with DC, while the fourth was a prospective one-year follow-up study of patients with different diagnoses who were treated with DC.

### **Methods:**

The main outcome measures were the structured form for the Swedish Neuro Database, the Glasgow Outcome Scale (GOS), the Extended Glasgow Outcome Scale (GOSE), the Functional Independence Measure (FIM), the Head Injury Evaluation Chart (HIEC), the Community Integration Questionnaire (CIQ), the National Institutes of Health Stroke Scale (NIHSS), the Barthel Index (BI), the short form health survey (SF-36) and the life satisfaction checklist (LiSat-11). Changes over time for the follow-up group and the individuals in the second study, as measured with the GOSE, were analysed using a statistical method that is suitable for small data sets and takes account of the non-metric properties of the data.

### **Results:**

The first study revealed a better outcome for the group that received early formalised specialist rehabilitation and long-term follow-up. No patient remained in a vegetative state in this group as compared with three in the other, 50% were independent as compared with 17% in the other and the frequency of return to work was 55% among the former workers/students as compared to no return to work in the other group.

In the second study, the change over time according to the degree of neurological deficit and day-to-day living abilities (GOSE) was significant at group level until one year after the injury, but important changes were found for some individuals until five years after injury.

In the third retrospective study, the patients who were treated with DC because of MMI remained in an impaired neurological condition. Their life satisfaction was lower as compared with a healthy population, but 83% still rated "life as a whole" as satisfactory.

The fourth study revealed that 20% of the surviving participants had a favourable outcome as measured with the GOSE. Most patients (90%) had received specialist rehabilitation. Of those who were able to convey their satisfaction with life, 88% reported that life as a whole was satisfactory one year after the injury/onset of disease.

### **Conclusions:**

The studies show that an effective chain of medical and rehabilitation activities can produce a good outcome/living situation and that life can be satisfactory for patients after severe brain injuries in spite of neurological deficits.

*Key words:* outcome, severe brain injury, life satisfaction, early formalised rehabilitation, long-term follow-up, change over time, decompressive craniectomy