Outcome in 134 patients with prolonged posttraumatic unawareness

Part 2: Functional outcome of 72 patients recovering consciousness

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Most publications regarding the outcome of traumatic brain injury include patients with periods of unconsciousness of varying durations. The aim of the present paper is to describe the outcome of 72 patients who suffered from prolonged unawareness for more than 30 days and subsequently recovered consciousness. Almost half of the patients were independent in activities of daily living and another 20% were only partially dependent. Cognitive and behavioral deficits were the most common central nervous system sequelae of injury. Eight patients (11.1%) were able to resume working in the open job market and 35 (48.6%) were engaged in sheltered workshops. Most of the patients (72%), including all those who were working, were living with their families. Although the mean rehabilitation period was about 15 months, over 70% of these severely injured patients are considered to be socially integrated, enabling them to enjoy a reasonable quality of life.

KEY WORDS ~ prolonged unawareness □ outcome □ head trauma □ coma

Following traumatic brain injury, many patients lose consciousness for varying periods of time. Duration of coma and the length of posttraumatic amnesia are traditionally recognized as useful parameters for evaluation of the extent of brain damage. Due to rapid evacuation of patients with brain injury to large, well-equipped hospitals, early diagnosis by computerized tomography, surgical intervention, and better intensive care and postoperative care (including monitoring of intracranial pressure and resuscitation procedures), modern medicine has increased the number of survivors following the acute phase of trauma. Many of these survivors remain in a state of prolonged coma, a term that we have now abandoned in favor of "prolonged unawareness." This was necessary because "coma" is commonly defined today in terms of three elements: closed eyes, no utterance of sounds with meaningful content, and no adequate motor reaction to external stimuli. If any of these parameters is missing, the term "coma" cannot be applied, and hence there is a need for a new definition.

Many of these unfortunate patients with prolonged unawareness are transferred to nursing homes and are lost to critical medical care and follow-up review. In Israel, all of these patients are cared for at one critical care unit, at the Loewenstein Rehabilitation Hospital (LRH), for periods of up to 1 year. The aim of the present report is to describe the functional outcome of 72 patients comprising 53.7% of a group of 134 patients treated between 1974 and 1983 who recovered consciousness after spending more than 1 month in a state of prolonged unawareness.

Summary of Cases

Patient Population

Seventy-two (54%) of 134 patients, described in Part 1 of this study, recovered consciousness after being in a state of prolonged unawareness. Once they regained consciousness, the patients were transferred from the critical care unit to the rehabilitation department for brain-injured patients at the LRH. The type of brain injury, accompanying nonneurological lesions, duration of prolonged unawareness, and surgical interventions (cranial and extracranial) were carefully recorded. Outcome was evaluated according to the following guidelines: 1) whether the patient recovered consciousness or not (either remaining in a persistent vegetative state (PVS) or deceased); 2) assessment of locomotor,
communicative, cognitive, and behavioral deficits upon recovery of consciousness; and 3) social and vocational outcome, evaluated by independence in the activities of daily life (ADL), whether the patient was living at home, and vocational outcome. The final evaluation presented here is based on the patients' status at least 1 year after discharge from the rehabilitation hospital.

The entire study group of 134 patients included 108 (80.5%) males and 26 females (19.5%). Mean age (± standard deviation) was 26.8 ± 14.6 years, the range being 3 to 79 years. The age groups and the relationship of age to outcome are presented in Table 1. Half of the 72 patients in the recovery group had suffered additional trauma. Intracranial interventions were performed at the acute stage in 48.6% of these patients, and communicative hydrocephalus requiring shunting was found in 9.7%. Tracheostomy was almost the rule and was performed in 87.5% (63 patients). The mean hospital stay of these patients was 15.4 ± 8.3 months (range 3 to 52 months). The recorded data were coded further for subsequent computer analysis.

**Outcome**

Over half (53.7%) of the 134 patients who were in prolonged unawareness lasting more than 1 month regained consciousness. The age distribution for the recovery and nonrecovery groups is presented in Table 1. Half of the patients comprised patients who suffered from loss of consciousness or posttraumatic amnesia of varying duration, which is usually easier to determine than posttraumatic amnesia, is less than 2 weeks. Many authors have tried to relate initial GCS scores to outcome. Several studies have found that initial GCS scores of 7 or less could not predict recovery of consciousness in patients who suffered from prolonged unawareness for periods longer than 1 month.

As expected, the extent of central nervous system lesions determined the outcome in the 72 patients who recovered consciousness. Disturbances in acquisition of information by telereceptors, especially in the visual system, were quite common. Locomotor deficits due to paresis/plegia, ataxia, and extrapyramidal dysfunction were also very common (Table 2).

Almost half of the patients were independent in ADL and another 20% were only partially dependent. Eight (11.1%) of the 72 patients were able to resume working in the open job market and 35 patients (48.6%) were engaged in sheltered workshops. Most of the patients (72%), including all of those who were working, were living with their families (Table 3).

**Discussion**

The introduction of computerized tomography and the better understanding, monitoring, and treatment of secondary brain damage following brain trauma have probably been responsible for a higher survival rate of patients following severe brain insult. Langfitt and Gennarelli7 showed that not much progress was made before the mid-1970's with regard to the mortality rate following brain trauma. Rapid evacuation of patients from the site of the accident and institution of definitive neurosurgical care were found to significantly improve the outcome in patients with traumatic brain injury. 2,7 The introduction of the Glasgow Coma Scale (GCS) has enabled a more uniform evaluation of the initial severity of brain damage, although some interobserver variability has been described. 19 Many authors have tried to relate initial GCS ratings to outcome. 9,22 Sazbon and Groswasser17 have shown that initial GCS scores of 7 or less could not predict recovery of consciousness in patients who suffered from prolonged unawareness for periods longer than 1 month.

The durations of coma and posttraumatic amnesia are established yardsticks in the evaluation of severity of brain damage. According to various authors, good outcome following brain damage is to be expected if the duration of coma, which is usually easier to determine than posttraumatic amnesia, is less than 2 weeks. Most of the series in the literature dealing with prognosis and outcome of traumatically brain-injured patients comprise patients who suffered from loss of consciousness or posttraumatic amnesia of varying durations. 1,3,5,6,8,10,11,20,21 As most of the patients who do not recover consciousness are usually transferred from neurosurgical wards or critical care units to nursing homes, information about their fate is rather scarce. To the best

### Table 1

<table>
<thead>
<tr>
<th>Outcome</th>
<th>3–15 Yrs</th>
<th>16–30 Yrs</th>
<th>31–45 Yrs</th>
<th>46–60 Yrs</th>
<th>61+ Yrs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>recovery</td>
<td>20 27.8</td>
<td>35 48.6</td>
<td>11 15.3</td>
<td>4 5.5</td>
<td>2 2.8</td>
<td>72 100</td>
</tr>
<tr>
<td>nonrecovery</td>
<td>15 24.2</td>
<td>29 46.9</td>
<td>9 14.5</td>
<td>7 11.3</td>
<td>2 3.2</td>
<td>62 100</td>
</tr>
<tr>
<td>total</td>
<td>35 26.1</td>
<td>64 47.8</td>
<td>20 14.9</td>
<td>11 8.2</td>
<td>4 3.0</td>
<td>134 100</td>
</tr>
</tbody>
</table>

*Data available for only 70 patients.*

### Table 2

<table>
<thead>
<tr>
<th>Deficit</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>acquisition of information</td>
<td>16.6</td>
</tr>
<tr>
<td>auditory deficits</td>
<td>18.6</td>
</tr>
<tr>
<td>visual field defects</td>
<td>27.1</td>
</tr>
<tr>
<td>deficient ocular motility</td>
<td>66.6</td>
</tr>
<tr>
<td>locomotor deficits</td>
<td>16.6</td>
</tr>
<tr>
<td>paresis/plegia</td>
<td></td>
</tr>
<tr>
<td>ataxia</td>
<td></td>
</tr>
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</table>

(11.1%) of the 72 patients were able to resume working in the open job market and 35 patients (48.6%) were engaged in sheltered workshops. Most of the patients (72%), including all of those who were working, were living with their families (Table 3).
of our knowledge there are few series in the literature that focus specifically on the functional outcome of patients suffering from prolonged unawareness for periods exceeding 1 month.

We found only four series that presented the outcome of patients in prolonged unawareness. Higashi, et al.,4 reported a series of 110 patients who were in a PVS for over 3 months, 35 of whom had suffered trauma. By the end of the 1st year, 41% had died and only 8.2% had recovered consciousness, but no specific information was provided separately for the head-injured patients. Bricolo, et al.,1 described 135 patients with "prolonged posttraumatic unconsciousness" lasting more than 2 weeks. By 1 year after trauma, 30% had died and 62% survived with varying degrees of disability. Outcome was evaluated according to the Glasgow Outcome Scale (GOS), showing that 8% remained in PVS. No specific data were given for patients unconscious for over 1 month. Although we are very familiar with the GOS, we prefer to use actual work placement as an integrative criterion for evaluating outcome following traumatic brain injury, because this was found by Melamed, et al.,12 to be objective and measurable. Furthermore, it provides a good indication of social integration of patients with traumatic brain injury and was found to correlate with patients' subjective evaluation of the quality of their life.12-14

Our results regarding mortality during the 1st year after injury,12 are in accord with those of Higashi, et al.,4 and Vigouroux, et al.21 The figures presented by Bricolo, et al.,1 are lower, most probably due to the fact that their series included patients with shorter periods of unconsciousness. On the other hand, no proper comparison can be made with the results of Higashi, et al., as only a third of their cases were of traumatic origin. Although the percent of recovery presented by Vigouroux, et al., was similar to ours, careful inspection of the terms they used show that it is almost impossible to compare the results. Vigouroux, et al., used terms like "invalid" and "handicapped" whereas we use objective, measurable terms for defining functional outcome. It is striking that over 70% of our patients, although suffering from significant physical and mental sequelae of brain damage, were living at home. The rest of the patients were cared for in nursing homes, usually because of a combination of severe motor deficits which rendered them dependent in ADL.

Eight patients (11%) were able to resume working in the open job market; although this position was in most cases inferior to that held before injury, it has contributed much toward their quality of life. Almost half of the patients (48.6%) used community services like sheltered workshops, which enabled them to be active (at least partially) in social life outside the immediate family circle. Altogether, almost 60% of the patients who recovered consciousness after periods of prolonged unawareness exceeding 1 month were leading active vocational and social lives. Although these results are inferior to those found in series dealing with the general outcome of patients with traumatic brain injury, it is highly encouraging to find that, if these patients are subjected to intensive rehabilitation, over half will ultimately regain consciousness. Most of the patients will show some degree of physical and mental handicap; however, over 70% of them will be able to live with their families and be engaged in community activity, ensuring a reasonable quality of life.

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