

Rehabilitation of Danish veterans with spinal cord injuries during international missions

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ABSTRACT

INTRODUCTION: In the past decades, Danish soldiers have participated more frequently in combat which has resulted in an increased number of severe injuries. The aim of this study was to describe the initial treatment and rehabilitation as well as the level of function, employment, social relations, participation in leisure time activities, health, quality of life (QoL) and late complications at a follow-up in six veterans who sustained a spinal cord injury (SCI) during international military missions.

METHODS: Medical records were retrieved regarding the initial treatment and rehabilitation. Questionnaires based on international experience related to SCI were used.

RESULTS: The six male veterans were generally satisfied with their rehabilitation and found that they had influenced its course. All veterans had consultation with psychologists during hospitalisation, and two were advised to attend further consultations with military psychologists following discharge. The length of hospitalisation corresponded to the mean hospitalisation period for SCI patients in Denmark. At discharge, the veterans were independent with regard to clothing, toileting and mobility. All resumed work after discharge, five in the military. Satisfaction with their current work was related to whether their work skills corresponded to the work tasks at hand. Four found that their QoL was very good; one that it was satisfactory another that it was unsatisfactory.

CONCLUSION: Danish veterans with SCI were generally satisfied with their initial rehabilitation. They regained independence, and all returned to work.

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Since 1948, Denmark has participated with United Nations observers in peacekeeping missions. Over the past decades, missions have also been peace-making, and Danish soldiers have more frequently participated in combat which has resulted in an increased number of severe injuries [1]. In the 1992-2009 period, approximately 26,000 Danish soldiers took part in international military missions, and 123 soldiers were wounded [2]. From 1985 to 2010, six soldiers sustained a spinal cord injury (SCI) during international missions.

A study conducted in 2009 at 17 centres for SCI in

the U.S. Veterans Affairs System on veterans from Iraq and Afghanistan described complex injuries in addition to the SCI, including extensive fractures, tissue and muscle injuries, traumatic brain injury, post-traumatic stress disorder (PTSD), psychosocial problems delaying rehabilitation, and a need for assistance for career development or education as well as follow-up after discharge [3].

A similar study among Danish veterans with SCI has not been conducted, and the purpose of this study is to describe the initial treatment and rehabilitation of the six veterans. In addition, the study describes the veterans' satisfaction with rehabilitation, as well as level of function, employment, social relations, participation in leisure time activities, health, quality of life (QoL) and late complications during a follow-up.

METHODS

The six spinal cord-injured veterans were identified by the two departments that handle SCI treatment in Denmark and by contact to the Danish Armed Forces Health Services.

Data regarding the SCI veterans' initial treatment and rehabilitation were collected from medical records at the Department of SCI, Glostrup Hospital/Hornbæk and at the SCI Centre of Western Denmark, Viborg Hospital.

At follow-up by telephone interview, the veterans answered 33 selected questions from the project International Labour Market Integration Assessment in persons with Spinal Cord Injury (ILIAS), which contains a total of 76 questions [4]. The questions were related to education, work integration, level of function and social conditions, as well as self-rated health, QoL and participation in social activities within the past four weeks.

A total of 38 questions concerning bladder and bowel function and pain were based on the International SCI Data Sets [5-7]. In addition, 13 questions from a questionnaire used at discharge from the Department of SCI in Hornbæk regarding satisfaction with the rehabilitation were related to the volume and the intensity of the training, the possibility for unsupervised self-training and how the staff catered for the individual SCI patient's needs [8].

The study was approved by the Danish Data

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TABLE 1

Data on six veterans with spinal cord injury: age, cause of spinal cord injury (SCI), vertebral level, SCI level, severity, and function assessed by the American Spinal Injury Association Impairment Scale (AIS) the Spinal Cord Independence Measure (SCIM) and the Functional Independence Measure (FIM). The last measure was evaluated at admission to initial rehabilitation and at discharge. Length of hospital stay is specified.

Veteran no.	Age at the time of SCI, years	Vertebral level and cause	Spinal cord level/AIS ^a	SCIM ^b /FIM ^c admission	SCIM ^b /FIM ^c discharge	Length of stay, months
1	22	T8 Fracture due to shot	T5/AIS A	–	–	5.5
2	28	Th5 Pressure damage due to projectile	T5/AIS A	FIM: 97	FIM: 107	8
3	21	Th12 fracture Vehicle triggered landmine	T9/AIS A	–	FIM: 117	5
4	24	Th7-burst fracture Vehicle triggered landmine	T12/AIS D	SCIM: 40	SCIM: 81	7
5	25	L1 burst fracture Vehicle hit by roadside bomb	L1/AIS D	SCIM: 61	SCIM: 91	6
6	25	Th11-bilateral facet joint Dislocation due to a 12-m fall	T11/AIS A	–	–	12

– = no data.

MMT = manual muscle testing.

a) AIS is used to determine the degree of motor and sensory function below the level of the SCI. A complete or incomplete injury is defined as absence or presence of sensory and motor function in the most caudal sacral segment. A = complete; B = sensory incomplete without motor function > 3 levels below the motor level of injury on both sides of the body; C = motor incomplete, with preserved motor function below the level of injury and where > 50% of the key muscles below the injury level have a degree < 3 by MMT; D = motor incomplete with preserved motor function below the level of injury and where > 50% of key muscles below the injury level have a degree > 3 by MMT; E = normal sensory and motor function in all segments.

b) SCIM is used to determine the level of function in a person with SCI in relation to self-care, respiration, sphincter management and mobility. Total score is indicated on a 0-100 scale, with higher scores indicating better functioning.

c) FIM is a tool to assess the physical and cognitive level of function, but is not SCI-specific. Total score is indicated on an 18-126 scale, corresponding to total dependency and full self-reliance, respectively, in relation to the need for assistive devices or personal assistance. A higher score indicates less need of assistance after discharge.

TABLE 2

Occurrence of problems and late effects in the years after the initial rehabilitation among the six veterans with spinal cord injury.

Veteran no.	Complications, late complications and actions after the initial rehabilitation
1	Still being treated 4 yrs after injury for high blood pressure, suspected renal condition
2	Laparotomy 1 yr after injury because ileostomy is impractical during transfers to wheelchair Surgery for ventral hernia of the abdominal wall due to several abdominal operations
3	2 large non-symptomatic kidney stones
4	Slightly reduced range of motion in the right elbow due to fracture 10 mo. after injury a screw in the right malleolus was causing trouble and was therefore removed 20 mo. after injury the spondylodesis in the spine was removed due to right lumbar pain During surgery a cyst with metallosis and exostosis at the sacrum was removed At follow-up 6 mo. later back pain was reduced but still present
5	Discovery of 1 unrecognised fracture in the lower left leg with no indication for further action May exercise until pain is experienced Botulinum toxin injection in the right calf muscle due to light spasticity 22 mo. after injury
6	8 yrs after injury the spondylodesis in the spine was dislocated and was removed Hospitalisation 26 yrs after injury due to decubitus at the tuber ischiadicum and trochanter as well as severe ischaemia of the right lower limb resulting in the amputation of the right leg Debridement of the decubitus and exarticulation at the right hip were made Hospitalisation in 3 different departments during a total of 16 mo. During hospitalisation several complications related to decubitus occurred

Protection Agency through the common registration system for health research in the Capital Region, journal number GLO-2012-10, and informed consent was provided by all six veterans.

Trial registration: GLO-2012-10.

RESULTS

Initial course after spinal cord injury

The six veterans were all men aged 21-28 years at the time they sustained SCI, and they were all treated initially at local hospitals or military hospitals (Table 1). Five were transferred to Rigshospitalet in Copenhagen and one to Aarhus University Hospital (former Aarhus Municipal Hospital) within 4-6 days, where five had spinal surgery 2-6 days after their injury and one 18 days after his injury.

Four veterans from Iraq and Afghanistan suffered polytrauma due to explosions, including traumatic brain injury, vertebral and extremity fractures, musculoskeletal injuries, gastrointestinal, kidney and liver injuries, ulcer problems, etc., and one had methicillin-resistant *Staphylococcus aureus* (MRSA). The above injuries complicated the rehabilitation and resulted in re-hospitalisation and treatment in specialised units. They all had thoracic lesions and one had lumbar spinal cord lesions; four of the lesions were complete. The total length of hospitalisation was 5.5 to 12 months (Table 1). All veterans consulted psychologists during hospitalisation and two were advised to attend further consultations with military psychologists after discharge, but PTSD or other mental disorders were not described in the medical records. Furthermore, all veterans were offered counselling concerning sexuality, and five accepted this offer. At discharge from the initial rehabilitation, all six veterans took some sort of medicine; four received medicine for their bowel function, three were on analgesics, and two received medicine for long-term treatment of urinary

tract infection. In addition, some had to take medication for spasticity, anticoagulation, antibiotics due to ostitis and sleeping pills. They were all offered the usual follow-up examinations every second year after discharge. In the years after discharge, all six veterans experienced physical complications related to their injuries (Table 2).

Satisfaction with rehabilitation

In general, all veterans were “very satisfied” or “satisfied” with the initial rehabilitation and found that they had influenced its course. In relation to training volume, two were “less satisfied” and “dissatisfied”, respectively, and one veteran was “dissatisfied” with the exercise intensity. Regarding the possibility of unsupervised self-training, one veteran was “dissatisfied”.

Level of functioning

All six veterans were independent in relation to dressing and outdoor mobility.

Outcome measures related to level of functioning have changed over the period within which the veterans were injured, and the Spinal Cord Independence Measurement (SCIM) was introduced instead of the Functional Independence Measure (FIM). For veterans who were scored at admission and discharge with the same measure, an increase was observed in the level of functioning (Table 1).

Bladder and bowel management and pain

All six veterans managed to use the toilet independently. For bladder emptying, four of the six used self-catheterization and one used a suprapubic catheter; three had had incontinence within the past three months, and four reported having received treatment for urinary tract infection within the past year.

Four used anorectal digital stimulation for bowel management, and one used transanal colonic irrigation. The mean time for bowel evacuation was from few minutes to more than one hour. Two had experienced faecal incontinence within the past three months.

Three out of the six reported current nociceptive or neuropathic pain, with an intensity of 2-4 on a 0-10 numeric rating scale.

Social conditions and job

Four of the six veterans were either cohabiting or married.

Five veterans resumed work in the armed forces after discharge. All of those who returned to the armed forces resumed work in another position. At follow-up, five veterans were employed, and one had left the armed forces. The total number of years in work as from discharge from initial rehabilitation ranged from one to



The rehabilitation of veterans with spinal cord injury is complex because the injury affects all body systems below the level of the neurological lesion. The purpose of the rehabilitation is to make the individual as independent as possible. Photo: Henrik Frandsen.

25 years, and the number of working hours per week ranged from 20 to 37 (Table 3).

Four described their qualifications for their present job as being “just right”, and three were equally “very satisfied” or “satisfied” with their present job. Two described their qualifications as “much higher” or “higher” than needed for their current job and were equally “dissatisfied” or “partly satisfied/ partly dissatisfied” with their present job (Table 3).

Two veterans had at some point received support in terms of employment with personal assistance for disabled employees or job training.

Quality of life, self-rated health and participation in leisure time activities and social relationships

Five of the veterans assessed their QoL as “very good” or “satisfactory”.

Four considered their health to be “good” and two were “dissatisfied” with their health. Further details are provided in Table 3. Participation in various forms of leisure time activities and social relations such as sports, indoor and outdoor activities and paying or receiving visits from family and friends varied within the past four weeks and responses ranged from “not at all” to “19 times and more”.

DISCUSSION

Generally, the veterans were “very satisfied” or “satisfied” with the initial rehabilitation, but a few were “less satisfied” or “dissatisfied” with the training volume, the exercise intensity and the possibility for unsupervised

 TABLE 3

International Labour Market Integration Assessment in persons with spinal cord injury questionnaire information for employment status at follow-up, highest level of education achieved, qualifications according to current job and satisfaction with current job. Description of first job after discharge from primary rehabilitation and time from discharge to start of employment, self-rated health and quality of life at the time of follow-up listed for the six veterans with spinal cord injury.

Veteran no.	Employment status at follow-up	Education	Job qualification according to current job ^a	Satisfaction with current job ^b	Job and time from discharge	Advice or support in relation to job return	Self-rated health at follow-up	Quality of life at follow-up ^c
1	37 h	Technical assistant	Just right	Very satisfied	Returned to the armed forces immediately after discharge	No	Unsatisfied	Very good
2	Unemployed	Language officer	Much higher than needed	Unsatisfied	Returned to the armed forces immediately after discharge	No	Unsatisfied	Unsatisfied
3	37 h	Elementary school	Just right	Partly satisfied/ partly dissatisfied	Returned to the armed forces in another position 17 mo. after discharge	No	Good	Satisfactory
4	37 h	Elementary school	Just right	Satisfied	Returned to the armed forces in another position 2 mo. after discharge	Yes (job training)	Good	Very good
5	20 h	Skilled worker	Higher than needed	Partly satisfied/ partly dissatisfied	Returned to the armed forces in another position 6 mo. after discharge	Yes	Good	Very good
6	Self-employed	Elementary school	Just right	Very satisfied	Self-employed immediately after discharge	No	Good	Very good

a) Response options: "Much higher than needed", "Higher than needed", "Just right", "Lower than needed" and "Much lower than needed".

b) Response options: "Very satisfied", "Satisfied", "Partly satisfied/partly dissatisfied", "Unsatisfied" and "Very unsatisfied".

c) Response options: "Very good", "Good", "Satisfactory" "Unsatisfied" and "Very unsatisfied".

self-training. In the future, it is important to be aware that young men who have been accustomed to hard physical work, including veterans, may need more intensive training than that usually offered during SCI rehabilitation.

In four veterans from Iraq and Afghanistan, the rehabilitation was complicated because of polytrauma due to explosions. Polytrauma have been described among U.S. veterans from Iraq and Afghanistan, and especially traumatic brain injury, fractures, musculoskeletal injuries and PTSD were highlighted as the most frequent concomitant lesions to the SCI. Hearing loss, burns and multi-drug-resistant infections have also been described, but to a lesser extent [3, 9]. Danish spinal cord-injured veterans from Afghanistan had similar injuries, and one had MRSA. PTSD was not described in the medical records, but has been reported in 2.4% of all Danish veterans from 1992-2009. Since PTSD or other psychiatric diagnoses are usually recorded some years after returning from international missions, it cannot be excluded that PTSD or other psychiatric diagnoses will occur among Danish veterans with SCI, though the risk may be low owing to the low number of SCI veterans [10].

On average, the length of stay in hospital from injury to discharge was six months, which corresponds to the average hospital stay for individuals with SCI in Denmark [11].

In the years after discharge from the initial rehabilitation, all six veterans reported complications related to their injuries, which is consistent with the need for fol-

low-up after discharge described among U.S. veterans with polytrauma and SCI [3, 9].

After discharge, all of the SCI veterans returned to work, primarily in the armed forces in another position, which is very positive since the literature shows that 21-67% of spinal cord-injured persons return to work after discharge [12]. This is probably owed to the special arrangements the armed forces offers veterans [1]. As described previously, the likelihood of getting a job after a SCI is higher the younger the person is, and if the person was working at the time of injury. Time from discharge to commencement of work is also reduced if the person can return to the same workplace after injury in a less physically demanding job [12-14]. In addition, all six veterans were independent in relation to clothing, toileting and outdoor mobility, which is significantly associated with getting a job [12]. Furthermore, two veterans received job training or counselling in order to gain employment, which corresponds to a previously described demand for assistance for vocational or educational programmes among US SCI veterans from Iraq and Afghanistan [3]. Such initiatives have also previously been described as being positively associated with returning to work [12]. Satisfaction with current job appears to be related to the qualifications needed and three out of four veterans who considered that their qualifications were adequate were satisfied with their current job. In comparison, a study among individuals with traumatic SCI by Schönherr et al described that 65% found that their job was satisfactory [15].

Five veterans assessed their QoL as “very good” or “good”, and four considered their health to be “good”, but one veteran, who was unemployed at the time of follow-up, was dissatisfied with his QoL and self-perceived health. It has previously been reported that QoL and health are positively influenced by having a job, i.e. individuals with SCI who are employed report higher levels of QoL and a better health than those who are unemployed [12-14]. In general, spinal cord-injured persons report a lower level of QoL and health than the general population [14-18].

Participation in various forms of leisure time activities and social relations within the past four weeks ranged from “not at all” to “19 times and more”. Three veterans indicated that they had not participated in “sports or physical activity” within the past four week, which is consistent with the literature where 50% or more did not participate in sports and athletics [19]. Some veterans expressed seasonal variation, which the questionnaire did not account for. Four of the SCI veterans were either cohabiting or married, which corresponds to the group of veterans in general, where the majority are cohabiting or married [2].

The limitations of the present study include the small number of individuals included. Still, the study is interesting and relevant because of the extent to which an SCI affects all body systems below the lesion level, resulting in significant challenges. An SCI is therefore associated with significant resource requirements for the individual and for society [20]. With regard to the method used, a risk of information bias is present due to the use of questionnaires. It is also a limitation that a tool such as the SF-36 or equivalent, with reference numbers in the general population, has not been used to describe the veterans’ self-assessed QoL and health. It is therefore uncertain whether the veterans’ self-assessed health and QoL is higher or lower than that of the general population.

CONCLUSION

All six veterans were generally satisfied with their rehabilitation. But in the future, the SCI centres should be aware that young men who have been accustomed to hard physical work, including veterans, may need more intensive training than that usually offered during SCI rehabilitation. The veterans were independent in relation to daily living skills, and all resumed work after discharge, which is a higher proportion than that observed for individuals with SCI in general. Veterans who considered their qualifications appropriate for their current job were satisfied with the job. One veteran was dissatisfied with his QoL, and two were dissatisfied with their health, and all six veterans experienced physical complications related to their injuries. PTSD was not described

in this group of veterans with SCI. Participation in leisure time activities and social relations within the past four weeks varied.

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